



Algas-SDI™

...Innovative liquid vaporizing and gas mixing solutions

ISO 9001
Certified

GA 500 GAS ANALYZER

OPERATIONS & MAINTENANCE MANUAL

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P/N: 52667

ECLIPSE
Innovative Thermal Solutions

WARNING

Read the OPERATION MANUAL before operating this equipment.

- **NOTE:** Algas-SDI reserves the right to use alternate manufacturers' components as vendor delivery applicability dictates. Literature contained in the Operation Manual has been supplied by vendors. Please check to be sure supplied data matches your configuration. Contact Algas-SDI if any questions exist.
- This equipment uses LPG-a flammable fuel, or NH₃-a toxic gas, (depending on the model), handled under pressure. Inherent hazards exist and a thorough understanding of the equipment is required to allow safe operation and maintenance.
- Allow only a **TRAINED** and **FULLY QUALIFIED PERSON** to service this equipment.
- Any time a component must be replaced, use the same type, model, etc. **DO NOT SUBSTITUTE!** The consequence from such actions are unpredictable and may lead to dire consequences. When components are replaced with components not approved for use in our FM/CSA listed equipment, the FM/CSA listing becomes void for that unit.

WARRANTY AND COPYRIGHTS

WARRANTY

Algas-SDI International, LLC (ASDI) warrants that the equipment is free of defects in materials and workmanship under normal use and service. ASDI agrees to repair or replace, at our option, without charge f.o.b. factory, any part which has proven defective to the satisfaction of Algas-SDI International, LLC within one (1) year from the date of the original installation or within 18 months from the date of shipment, whichever is earlier. Equipment, which in the opinion of ASDI, has been damaged by improper installation or operation, or has been abused or tampered with in any way, will not be accepted for return under warranty.

Algas-SDI International, LLC will not accept back charges for work performed by others upon or in conjunction with ASDI equipment, unless prior authorization is given by means of an Algas-SDI International, LLC purchase order. Algas-SDI International, LLC will not be liable by reason of shutdown, non-operation or increased expense of operation of other equipment, or any other loss or damage of any nature, whether direct or consequential, arising from any cause whatsoever.

Algas-SDI International, LLC makes NO other warranty of any kind, whatsoever expressed or implied; and all warranties of merchantability and fitness for a particular purpose are hereby disclaimed by Algas-SDI International, LLC and excluded from these terms of sale. No person has any authority to bind Algas-SDI International, LLC to any representation or warranty other than this warranty.

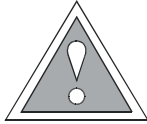
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SYMBOLS AND CONVENTIONS

Special symbols are used to denote hazardous or important information. You should familiarize yourself with their meaning and take special notice of the indicated information.

Please read the following explanations thoroughly.



GENERAL WARNING OR CAUTION

Indicates hazards or unsafe practices which can result in damage to the equipment or cause personal injury. Use care and follow the instructions given.



FLAMMABLE GAS HAZARD

Indicates a potential hazard which can result in severe personal injury or death. Use extreme care and follow the instructions given.



ELECTRICAL DISCONNECT REQUIRED

Indicates a potentially dangerous situation which can result in severe personal injury or death or damage to equipment. Use great care and follow the instruction given.

ASDI CONTACT NUMBERS

If you have questions, need help with your equipment, or want information on other products, contact Power Equipment at::

Telephone: 804-236-3800

Facsimile: 804-236-3882

Email: sales@peconet.com

Internet: <http://www.peconet.com>

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APPENDIX A: COMPONENT INFORMATION

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INTRODUCTION

1

DESCRIPTION

The Algas-SDI GA500 is a fuel gas analyzing device which burns a sample of fuel gas, under highly controlled conditions and produces an electronic output to provide information, in the form of an indicator or recorder, concerning the combustion characteristics of the fuel gas. The output can also be used in a controlling instrument, which in turn can control a device used to add air or an inert gas to the fuel gas for purposes of stabilizing the gas. The GA500W version of this analyzer is designed to detect changes in the heating index of the fuel gas being analyzed; and provides a function referred to as "Wobbe Index". The GA500WC version of this analyzer is designed to detect changes in both the heating index and specific gravity of the fuel gas being analyzed; and provides the function referred to as "Wobbe Index", "Calorific Value", and "Specific gravity".

The instrument receives a fuel gas sample and uses compressed air to provide the required flame geometry in a precision burner. A larger volume of compressed air, under highly controlled conditions, passes through a measurement chamber where the amount of heat added by the burner is measured in an accurate and precise thermally isolated atmosphere.

A change in heating value of the gas will change the amount of heat added to the measurement chamber. Likewise, a change in specific gravity will cause flow rate changes in the burner gas mixing system providing the sample to the burner, also changing the amount of heat added to the measurement chamber. Since the flow rate change (due to a change in specific gravity) is a square root function, the interreaction of changes in heating value and changes in specific gravity results in a Wobbe Index output.

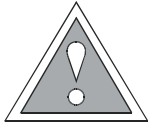
UNIVERSAL MODEL

Since all applications, other than laboratory analyses, are only interested in values of Calorific Value (CV) or Wobbe Index at a given specific set point; the Algas-SDI GA500W is the standard unit for these applications. This unit provides a signal from the analyzer to one or more electronic displays which may be calibrated to a specific value required by the process. The displays will then indicate any deviation from the desired CV or Wobbe Index.

NOTE:

All discussions in this manual refer to the Universal Model

CAUTION



Natural gas, propane, butane, and various other hydrocarbons are combustible gases, transmitted under pressure, which, when mixed with the proper amount of air, or released free into the atmosphere, can be ignited from a source of ignition. Natural gas is lighter than air but the others are heavier than air. In any case, adequate ventilation is necessary in enclosed areas where equipment and distribution lines are installed, to prevent accumulation of gas from a possible leak in the system. It is most important that any system of piping, vessels or equipment handling fuel gas be carefully checked for leaks and repaired when necessary. Fuel gas contains an odorant in order to make its presence detectable. The presence of this odor indicates a leak that should be repaired at once. It is most important that you read the following instruction book carefully before attempting to operate your equipment.

WARNING



All electrical equipment and controls furnished with this system are enclosed in standard industrial enclosures appropriate for the environment in which the equipment is intended to be installed. The equipment as furnished is intended for indoor operation in a dry environment. As necessary wiring and terminal strips are enclosed in approved enclosures. For the safety of the operator and the equipment, do not operate this equipment with terminal strips and wiring exposed. When making changes to, or removal of wiring, necessitating removing covers from junction boxes and other components of the equipment, make certain all power is disconnected first. In the event it is necessary (for calibration and troubleshooting procedures) to open covers on electrical enclosures with power on, this should be accomplished by trained personnel only. The equipment furnished includes enclosures which are not to be exposed to moisture. Water impinging on open terminal strips which have power applied to them can cause a potential hazard for the operator from electric shock and destroy control equipment. Algas-SDI International will not honor its warranty on equipment which is destroyed by failure on the part of the operator or other personnel to take precautions to keep electrical equipment dry and further, will not be held responsible for injury to personnel due to negligence or any other action or cause beyond its control.

INSTRUMENT SPECIFICATIONS (GA500W Models)

Units: Kcal/Nm³ or Btu/scf

Standard Measuring Range: 7500 – 18800 Kcal/Nm³ or 800 – 2000 Btu/scf

Accuracy: ± 1.5%

Repeatability: ± 0.3%

Linearity: ± 0.2%

Fuel Consumption: 85 liters/hr or 3 scfh (based on a fuel gas with a specific gravity of 0.6)

Gas Pressure: 2.5 kpa or 10" wc minimum
6.9 kpa or 27.7" wc maximum

Air Consumption: 4250 liters/hr or 152 scfh

Air Pressure: 275 kpa or 40 psig minimum
1034 kpa or 150 psig maximum

Electrical Requirements: 115 VAC/1 ph/50-60 hz @ 1 amp
or 230 VAC/1 ph/50-60 hz @ 0.5 amp

Electrical Area Classification: General Purpose

Output: 4 – 20 mA 600 Ohms impedance isolated
Alarm output 2 amp 264 VAC

Dimensions: 635 mm W x 889 mm D x 2235 mm H
or 25 in W x 35 in D x 88 in H

Weight: 113 kg or 250 lbs

Response: Less than one second after deviation of gas sample at the instrument. 50% of deviation within 30 seconds and 90% in one minute. Full scale stability in less than 3 minutes.

INTRODUCTION

INSTRUMENT CONFIGURATION (GA500W Models)

Ignition transformer wired for 120 V 220V

REGULATOR SETTINGS:

Regulator	Setting
1 st stage air regulator	60 psig
2 nd stage burner air regulator	25 psig
1 st stage reference gas regulator	4" WC
1 st stage sample gas regulator	4" WC
2 nd stage gas regulator	2" WC

Set burner air pressure switch to drop out at: 20 psig. Verify proper operation.

Chessel Indicator Configuration Settings

LEVEL	ITEM	DEFAULT SETTING	ACTUAL SETTING
Instrument Configuration	Units	None	
	Decimal Places	None	
	Front Panel Ack/Reset Button	Disabled	
Sensor Input Config.	Input Type	Linear Millivolts	
	Input Impedance	Off	
	Electrical Input Low	0.00	
	Electrical Input High	40.00	
	Displayed Value Low	0	
	Displayed Value High (span)***	<input type="checkbox"/> 25000 kcal/NM ³ <input type="checkbox"/> 2665 BTU/Sft ³	
Alarm Configuration	Alarm 1 Type	Off	
	Alarm 1 Latching	No	
	Alarm 1 Blocking	No	
	Alarm 2 Type	Off	
	Alarm 2 Latching	No	
	Alarm 2 Blocking	No	
	Alarm 3 Type	Off	
	Alarm 3 Latching	No	
	Alarm 3 Blocking	No	
	Alarm 4 Type	Off	
	Alarm 4 Latching	No	
	Alarm 4 Blocking	No	
Relay 1 Output Config.*	Identity of Output	Relay	
	Function of Output	None	
	Sense of the Output	Inverted	
Output Module 1 Config.**	Identity of Module	DC Retransmission	
	Function	Process value retransmission	
	Retransmission Value Low	0	
	Retransmission Value High (span)***	<input type="checkbox"/> 25000 Kcal/NM ³ <input type="checkbox"/> 2665 BTU/ Sft ³	
	Electrical Output	Milliamps	
	Min. Electrical Output	4	
	Max. electrical Output	20	

Display configuration equation: ((desired display)x(current span))/(current display)=(new span)

INSTRUMENT SPECIFICATIONS (GA500WC Models)

Calorific Value: Units Kcal/Nm³ or Btu/scf

Wobbe Index: Units Kcal/Nm³ or Btu/scf

Specific Gravity: Unity

Standard Measuring Range: 7500 – 18800 Kcal/Nm³ or 800 – 2000 Btu/scf

Accuracy: +/- 1.5%

Repeatability: +/- 0.3%

Linearity: +/- 0.2%

Fuel Consumption: 85 liters/hr or 3 scfh (based on a fuel gas with a specific gravity of 0.6)

Gas Pressure: 2.5 kpa or 10 "wc minimum
6.9 kpa or 27.7 "wc maximum

Air Consumption: 4250 liters/hr or 152 scfh

Air Pressure: 275 kpa or 40 psig minimum
1034 kpa or 150 psig maximum

Electrical Requirements: 115VAC/1ph/50-60hz @ 1 amp or
230VAC/1ph/50-60hz @ 0.5 amp

Electrical Area Classification: General Purpose

Output: 4 – 20 mA 600 Ohms impedance isolated
Alarm output 2 amp 264VAC

Dimensions: 635 mm W x 889 mm D x 2235 mm H or 25in W x 35 in D x 88 in H

Weight: 113 kg or 250 lbs

Response: Less than one second after deviation of gas sample at the instrument. 50% of deviation within 30 seconds and 90% in one minute. Full scale stability in less than 3 minutes.

INTRODUCTION

INSTUMENT CONFIGURATION (GA500WC Models)

Transformer and power supply wired for [] 120 V [] 220V

SETTINGS:

Regulator	Setting
1 st stage air regulator	60 psig
2 nd stage burner air regulator	25 psig
1 st stage reference gas regulator	4" WC
1 st stage sample gas regulator	4" WC
2 nd stage gas regulator	2" WC
Flow Meter	Setting
Measurement air	100 scfh
Sample gas	50 cc/min
Reference air	110 cc/min

Set burner air pressure switch to drop out at: 20 psig. Verify proper operation.

Display Configuration	
WI - zero	
WI - span	
SG - Correction	
WI out - 4mA	
WI out - 20mA	
CV out - 4mA	
CV out - 20mA	
SG out - 4mA	
SG out - 20mA	

Bridge voltage _____

Display configuration equation ((desired display)x(current span))/(current display)=(new span)

DESCRIPTION OF OPERATION

Please refer to the piping and wiring diagram on pg. 2-10 when reading the following description.

1. 115 volt AC (220 volt on special order model) electric power enters the unit at terminals #1 and #2 and powers the digital display and electronic network directly, since each has its own supply and also provides power to the primary side of a transformer with a 24 volt AC secondary, which powers the safety and ignition system.
2. The gas to be analyzed enters the gas inlet through a 100 mesh strainer and proceeds to a solenoid valve where flow is stopped until the safety system is energized.
3. Air enters the air inlet of the system passing through two air filters, piped in tandem, through a 100 mesh strainer to a tee connection where air is divided into measurement air and burner air.
4. Burner air proceeds through a burner air pressure regulator with a pressure gauge on the downstream side and then enters the gas-air venturi mixer and at the same time establishes air to an air pressure switch.
5. With the proper burner air pressure registering on the pressure switch, electric power is provided to the gas solenoid valve and the automatic ignition system.
6. The automatic ignition system begins sparking to ignite a flame at the burner.
7. With the gas solenoid activated, gas proceeds through the gas pressure regulator to the venturi mixer and also registers on the gas pressure gauge.
8. As gas is delivered to the burner head, ignition takes place and the automatic ignition system discontinues sparking.
9. Measurement air passes through a primary regulator which reduces the air pressure to an acceptable level for the secondary measurement air regulator. This regulator is used to regulate the measurement air flow as registered on the meter.
10. Air passing through the measurement air flow meter passes over a thermocouple measuring the temperature of the incoming air and then proceeds to the measurement chamber. The measurement chamber contains a second thermocouple measuring the temperature of the products of combustion in the measurement chamber.
11. The output of the thermocouples enter the electronic network which provides an output which translates into Wobbe Index Units.
12. Wobbe Index is indicated in the Wobbe Index Digital Display and this signal also provides input to a remote recorder. The display and/or recorder can be calibrated to display and/or record Wobbe Index.
13. A pressure container of a gas with a known heating value and specific gravity must be supplied by the purchaser and connected to the unit to use as calibrating gas. High-pressure cylinders of gas are available at some gas utilities and at most industrial gas supply companies.

14. On the GA500-WC model a specific gravity sensor is included. A 3-way valve allows for the use of air to calibrate the sensor. The Specific gravity and a calculated Calorific Value can be displayed. Three 4-20mA outputs are provided for Wobbe Index, Calorific Value, and Specific Gravity. The ranges for the outputs are user definable.



1. Place cabinet in a location where access is available to both the front and rear of the cabinet since it is necessary to perform some calibration procedures through the rear door of the cabinet. The unit must not be installed in rooms where the ceiling is lower than 9 feet unless all construction in the ceiling and above is fireproof.
2. If the unit is supplied with casters for mobility, it will be necessary to provide some kind of detent in the floor, or some method of blocking to keep the unit from moving after service connections are made. If service connections are made with flexible tubing, the unit may be installed with the back against the wall provided there is sufficient room to roll the cabinet forward for access through the rear door. In any case, provisions must be made to prevent movement of the cabinet from breaking service connections.
3. Connect electrical service by cutting a hole for conduit (or for a grommet for portable units) at the most convenient location on either side, top or the back. If the unit is to be mounted permanently in position, it is suggested that the electrical service be brought down through the top panel. In such a case, the access must be near the rear of the cabinet, well away from the flue gas outlet which is under the draft diverter panel, Item 7, drawing number D363-603 on page 2-8.
4. Air and gas services must be connected to Connections 8, 9 and 10 on the side of the cabinet. On the WC models an additional connection, at Connection 11, is required to vent the gas from the specific gravity sensor to a safe location. If the unit is to be installed permanently, these connections should be made with copper or stainless steel tubing. If the unit is installed on casters, it is suggested that rigid piping terminate at the wall or ceiling, near the unit, with the final connections from the permanent piping to the unit being made by the use of nylon or teflon instrument tubing, or equal.
5. Instrument air enters at Connection 8 and must be supplied at a pressure not less than 40 psig or more than 150 psig (75 psig recommended).
6. Reference gas, from the reference gas cylinder regulation station, is to be connected to Connection 9. When procuring the reference gas cylinder it is necessary to have the cylinder equipped with a regulator which will provide gas pressure at 10 inches W.C.
7. A sample connection from the gas to be analyzed is made to Connection 9. Sample gas pressure at 10 inches W.C.

NOTE

The sample gas line must be as short as possible, a minimum size, and operated at the reduced pressure, to minimize the time delay in delivering the sample to the analyzer.

8. A regulator must be installed **AT THE GAS LINE SAMPLE CONNECTION** to minimize the amount of gas in the line. Use of a ¼" tube is suggested for the sample line.

OPERATION

Figure 1 – GA500W – RR Gas Analyzer Piping & Wiring Schematic – 363-806 Revision G, Effective S/N: -019

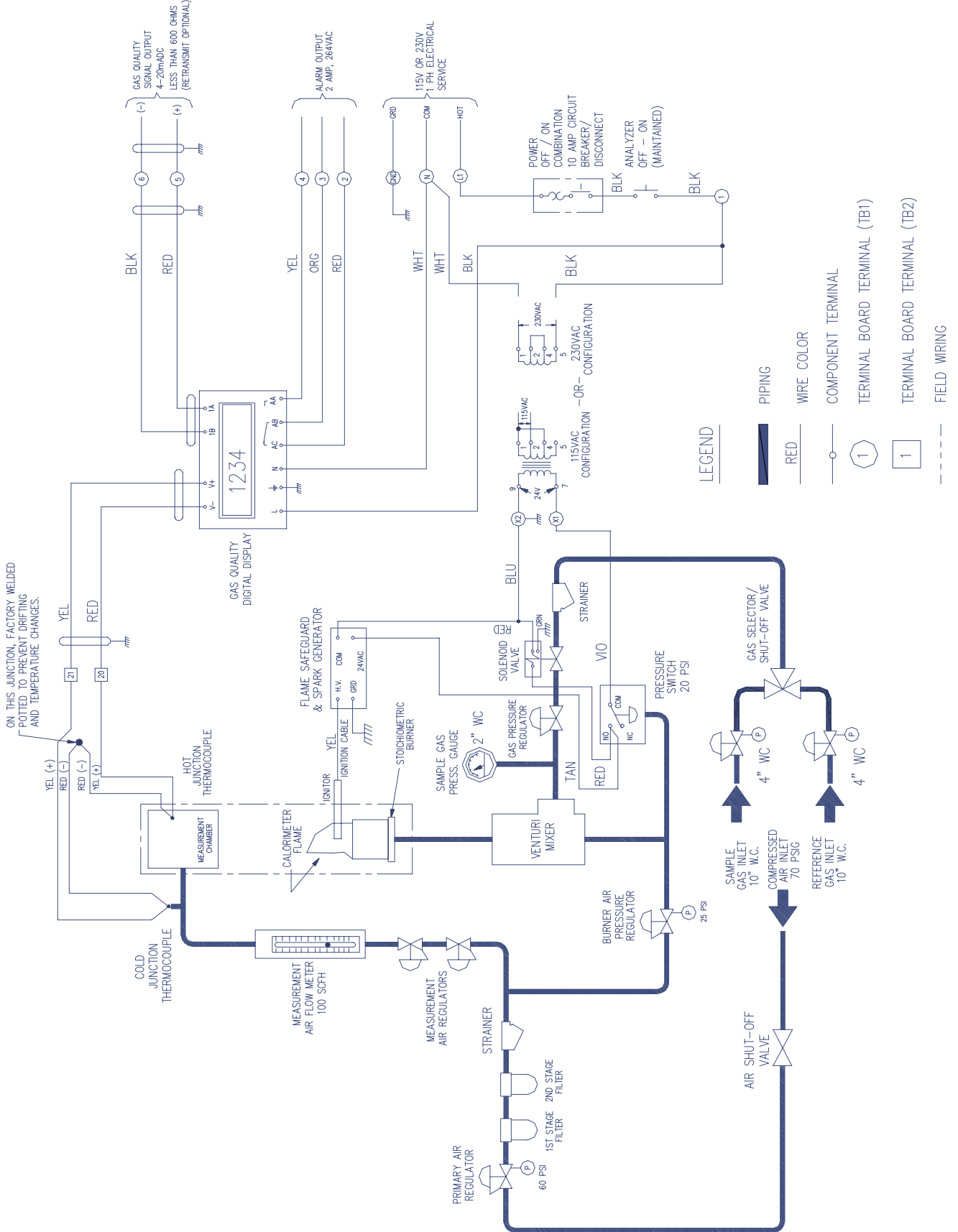
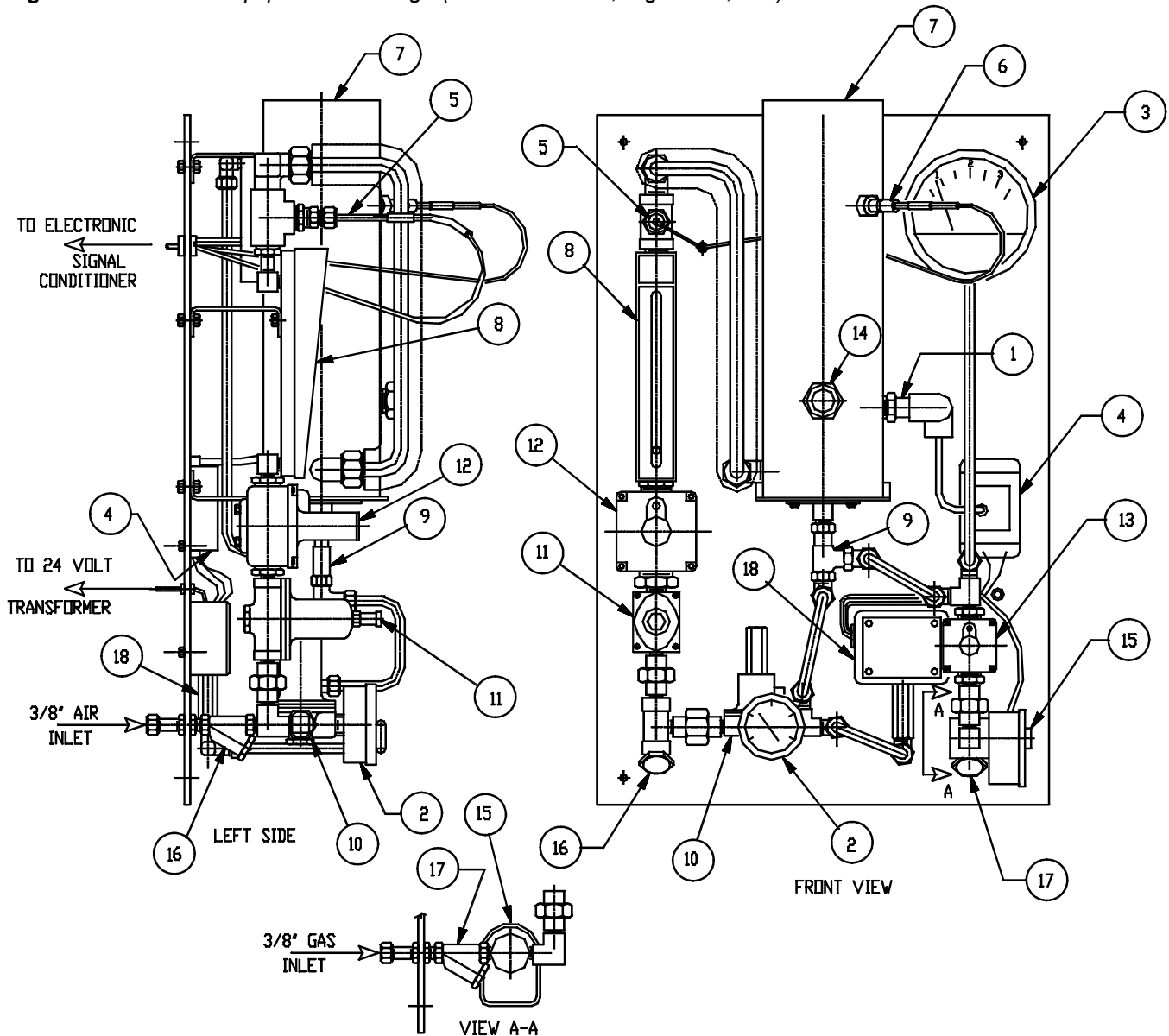


Figure 2 – GA500W Equipment Drawing...(burner chamber, regulators, etc.) – 363-601 Revision A



- | | |
|---|--|
| 1. Flame rod. | 10. Burner air pressure regulator. |
| 2. Burner air pressure gauge. | 11. Measurement air primary regulator. |
| 3. Gas pressure gauge. | 12. Measurement air secondary regulator. |
| 4. Automatic ignition system. | 13. Gas pressure regulator. |
| 5. Cold junction thermocouple. | 14. Sight glass. |
| 6. Hot junction thermocouple. | 15. Gas solenoid valve. |
| 7. Measurement chamber and burner housing assembly. | 16. Air strainer. |
| 8. Measurement air flow meter. | 17. Gas strainer. |
| 9. Venturi mixer. | 18. Air pressure switch. |

Figure 3 – GA500W – RR Gas Analyzer Equipment Drawing – 363-603 Revision C, Effective S/N: –019

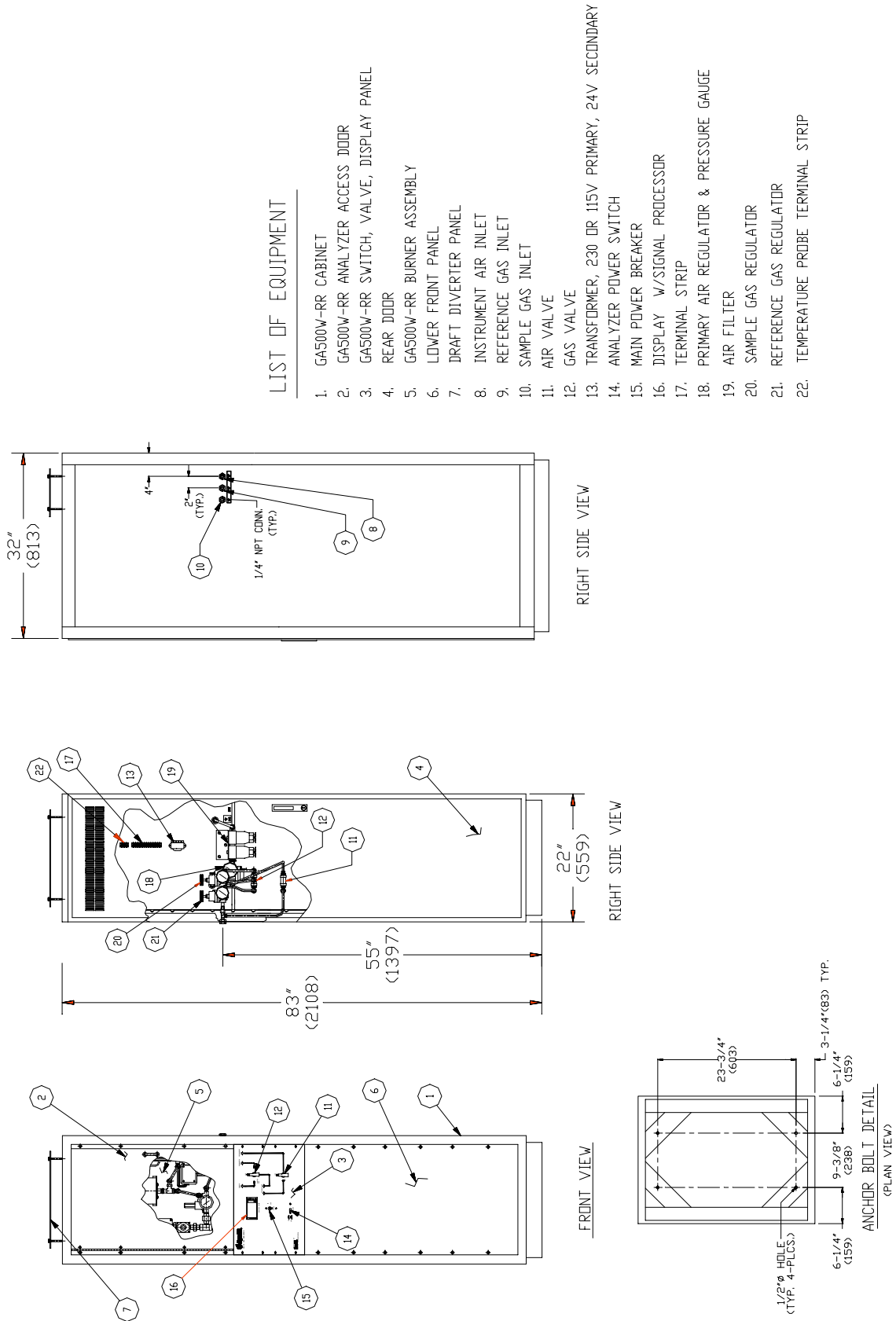


Figure 4 – Control Panel Detail – 363-304 Revision C, Effective S/N: –029

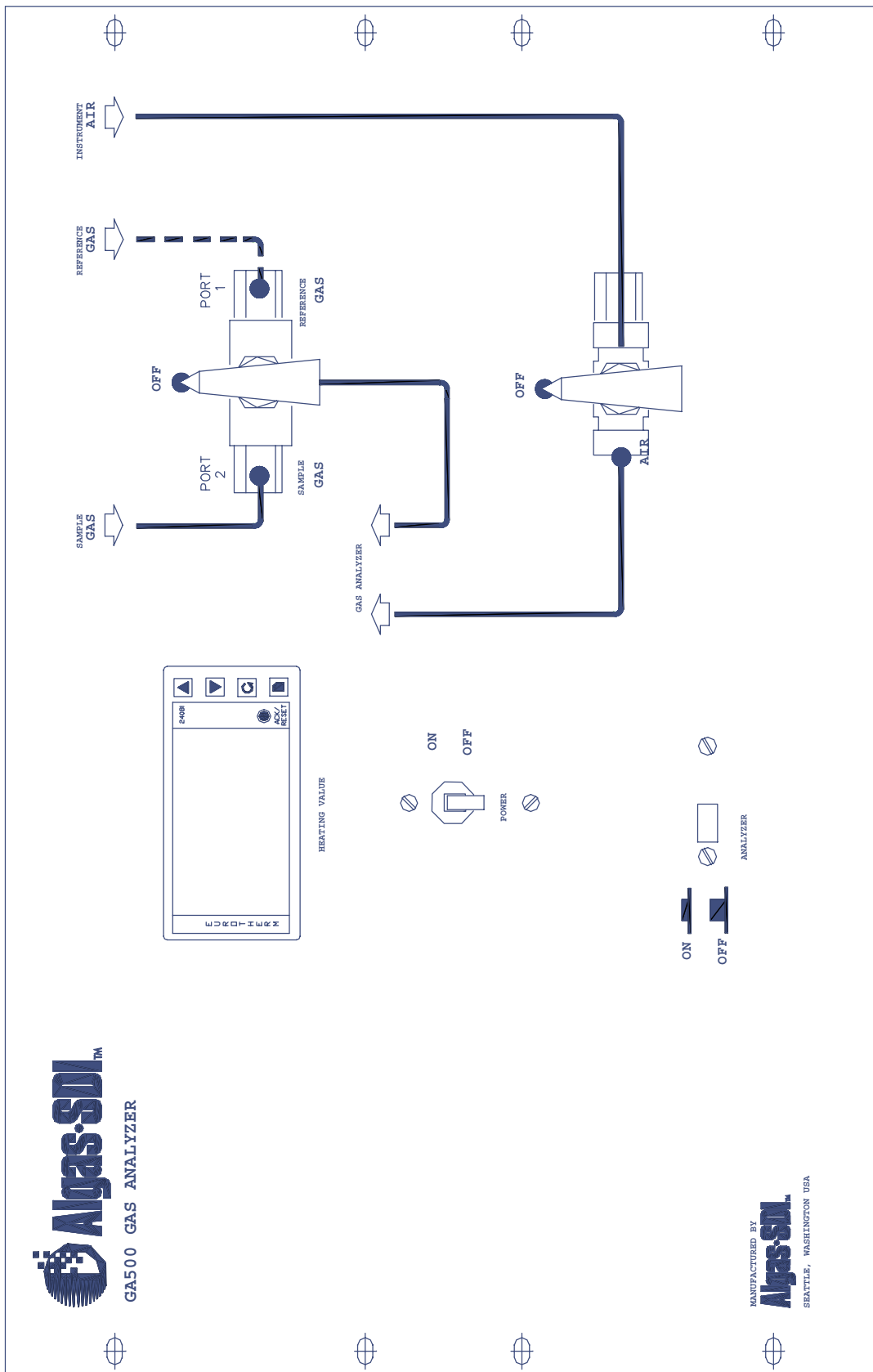


Figure 5 – GA500WC – RR Gas Analyzer Piping & Wiring Schematic

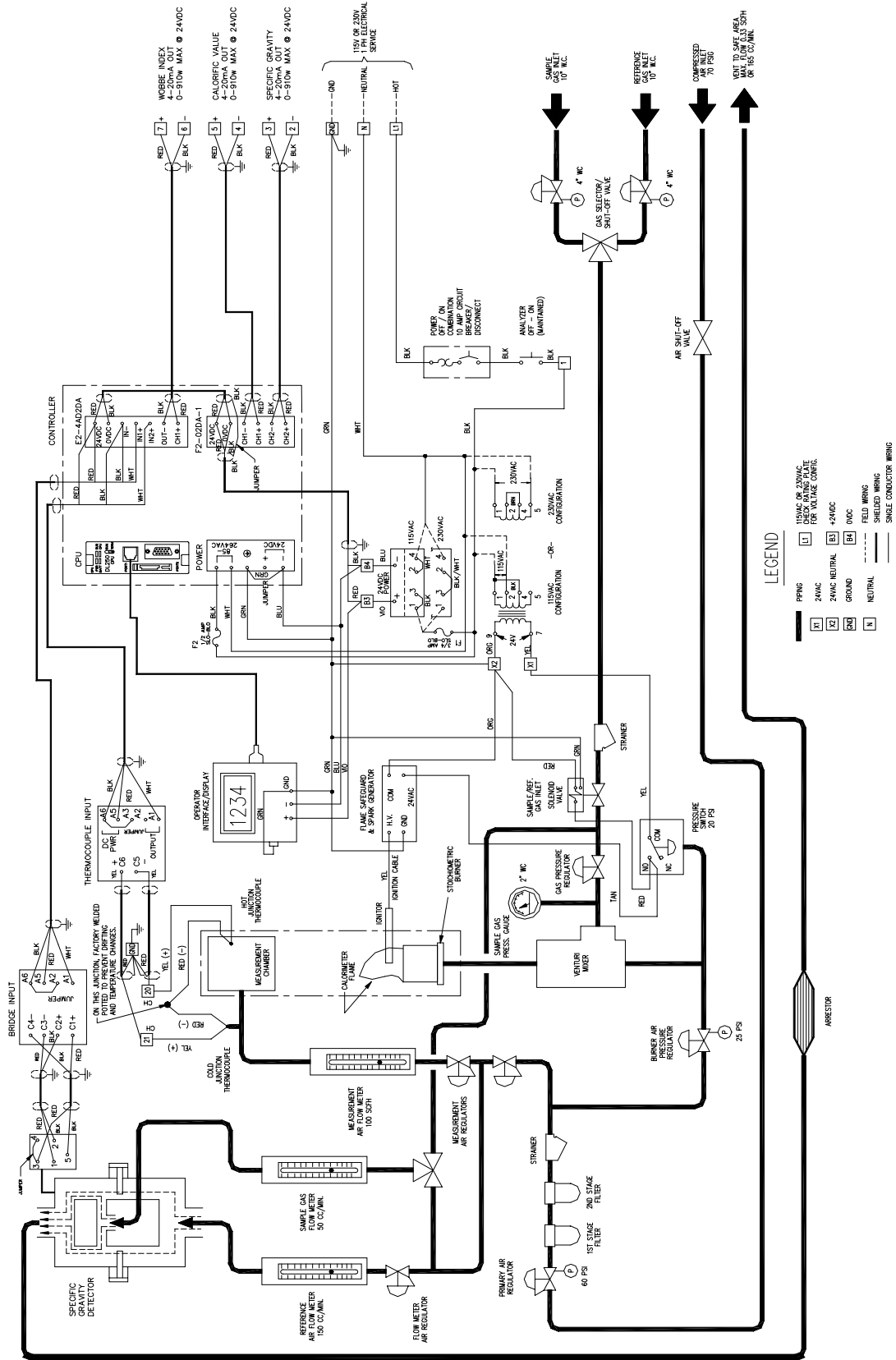
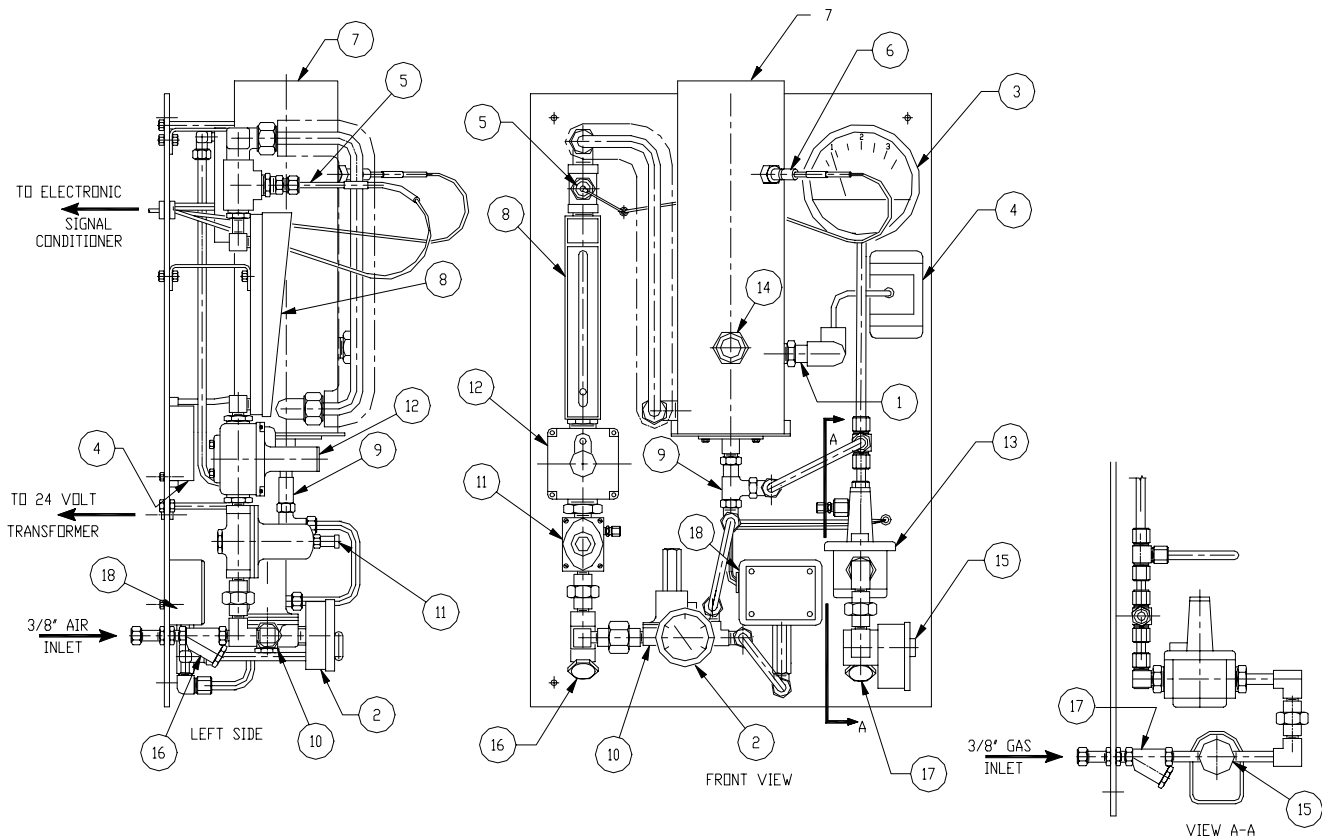


Figure 6 – GA500WC Equipment Drawing...(burner chamber, regulators, etc.)

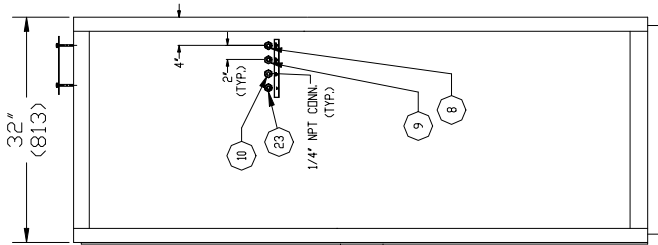


- | | |
|--|---|
| 1. Flame rod. | 10. Burner air pressure regulator. |
| 2. Burner air pressure gauge. | 11. Measurement air primary regulator. |
| 3. Gas pressure gauge. | 12. Measurement air secondary regulator. |
| 4. Automatic ignition system. | 13. Gas pressure regulator. |
| 5. Cold junction thermocouple. | 14. Sight glass. |
| 6. Hot junction thermocouple. | 15. Gas solenoid valve. |
| 7. Measurement chamber and burner housing assembly. | 16. Air strainer. |
| 8. Measurement air flow meter. | 17. Gas strainer. |
| 9. Venturi mixer. | 18. Air pressure switch. |

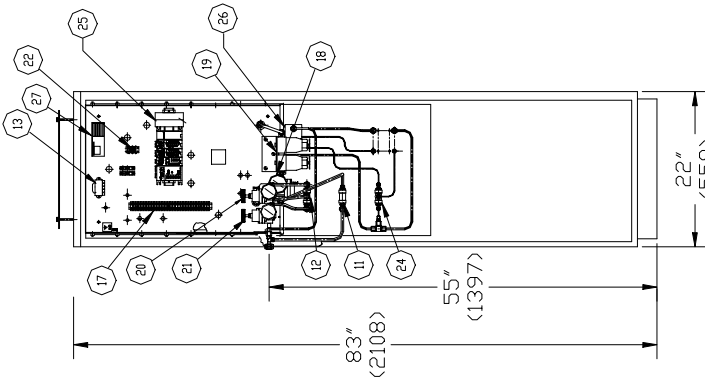
Figure 7 – GA500WC – RR Gas Analyzer Equipment Drawing

LIST OF EQUIPMENT

1. GAS500WC CABINET
2. GAS500WC ANALYZER ACCESS DOOR
3. GAS500WC SWITCH, VALVE, DISPLAY PANEL
4. S.G. ANALYZER FLOW METERS
5. GAS500W BURNER ASSEMBLY
6. LOWER FRONT PANEL
7. DRAFT DIVERTER PANEL
8. INSTRUMENT AIR INLET
9. REFERENCE GAS INLET
10. SAMPLE GAS INLET
11. AIR VALVE
12. GAS VALVE
13. TRANSFORMER, 230 DR 115V PRIMARY, 24V SECONDARY
14. ANALYZER POWER SWITCH
15. MAIN POWER BREAKER
16. COMPUTER INTERFACE PANEL
17. TERMINAL STRIP
18. PRIMARY AIR REGULATOR & PRESSURE GAUGE
19. AIR FILTER
20. SAMPLE GAS REGULATOR
21. REFERENCE GAS REGULATOR
22. TEMPERATURE PROBE TERMINAL STRIP
23. ATMOSPHERIC VENT (VENT TO SAFE LOCATION)
24. SPECIFIC GRAVITY (S.G.) ANALYZER VALVE
25. PLC PANEL
26. SPECIFIC GRAVITY (S.G.) ANALYZER
27. POWER SUPPLY
28. SPECIFIC GRAVITY (S.G.) ANALYZER VALVE

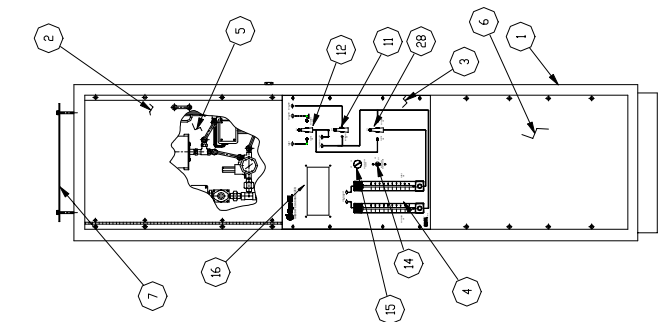


RIGHT SIDE VIEW



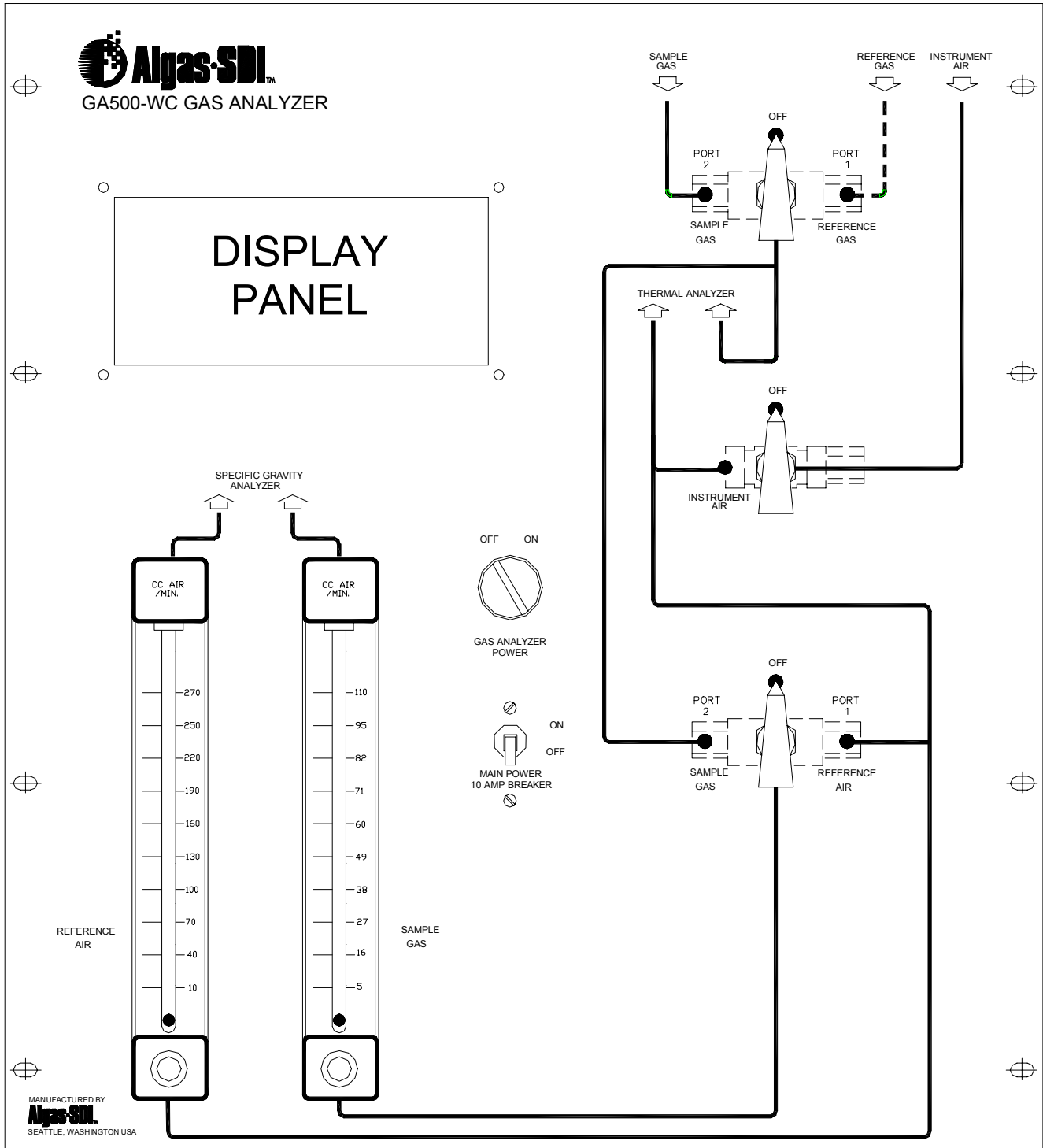
FRONT VIEW

REAR VIEW
(DOOR REMOVED)



ANCHOR BOLT DETAIL
(PLAN VIEW)

Figure 8 – Control Panel Detail



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INITIAL START-UP

Item numbers referenced in the following description, refer to the GA500W equipment drawing No. D363-601, pg. 2-11. Before start-up, check the following items:

1. Check to see that air, gas and electric power supplies are within acceptable limits. Air should be 75 psig and should be dry instrument quality air. Gas pressure to the unit should be 10 inches water column. If pressure is higher, an external gas regulator must be used to lower the pressure.
2. Electrical power is basically 115 volts AC, plus or minus 10% (220 volts on special order model). This means that voltage could drop as low as 105 (198) volts or go as high as 126 (242) volts without affecting the operation.

Referring to control panel detail, pg. 2-9, the main power switch is a combination power switch and circuit breaker which will move toward the center if the breaker is tripped by short circuiting or overloading. In this event, the circuit breaker may be reset by placing in the **OFF** position and then back in the **ON** position.

Place the analyzer switch in the **ON** position by depressing the switch. Depressing it a second time will place the switch back in the **OFF** position.

3. Referring to the drawing on pg.2-7, make certain that gas and air lines are connected to the proper places. The gas line must enter through strainer 17 to solenoid valve 15. The air line is on the opposite side connecting to air strainer 16 which delivers air to regulator 10 and also to measurement air primary regulator 11.
4. Valves are provided on both air supply line and gas supply line. The gas supply line valves are 3-way valves arranged to supply a gas sample from a cylinder of standard gas for calibration purposes or from the plant gas supply which is to be analyzed.
5. It is necessary that a bottle of standard gas be supplied for calibration purposes. The GA500W requires a chemically pure methane. However, any gas with a known heating value and known specific gravity (known Wobbe Index) is satisfactory. The GA500WC requires a gas blend for calibration that has identical Wobbe Index and Specific gravity to the desired mix.
6. Check to see that the air filters have clean elements, properly in place, and that the polycarbonate bowls are clean and dry. Note: Some filters may be furnished with metal bowls.

Any moisture which has been collected can be drained by opening the drain cock at the bottom of the polycarbonate bowls.

After checking all of the above items, start the unit as follows:

1. Establish electric power to the analyzer. The digital display will show a meaningless figure since the measurement chamber is below the minimum Wobbe Index.
2. Operate gas supply valve to introduce calibration gas to the unit. No gas will flow beyond solenoid valve 15 since air pressure switch 18 is not activated until air is present.
3. Open air inlet valve establishing air to the analyzer. Burner air pressure gauge 2 should read approximately 25 psig. If setting is not 25 psig, adjust burner air pressure regulator 10 to show 25 psig on gauge 2.
The low air pressure switch is set at approximately 20 psig so with 25 psig shown on gauge 2, solenoid valve 15 and automatic ignition system 4, are now energized and gas will be drawn into the unit.
4. The burner will be ignited by ignition rod 1. Note: The ignition rod and the flame rod are a single combination rod.
5. When flame rod 1 senses the burner has been ignited, sparking ceases. The flame is visible through site glass 14. If flame rod 1 senses a loss of flame, sparking again commences until flame is reestablished.
6. Gas pressure on gas pressure gauge 3 should read 2" W.C. If it does not read correctly, adjust gas pressure regulator 13 to show 2" water column on gauge 3.
7. Air flow rate on gauge 8 should be 100 SCFH. If the reading on flow gauge 8 is incorrect, adjust measurement air secondary regulator 12 to produce the proper flow rate. Do not adjust primary regulator 11 unless proper control cannot be established by secondary regulator 12. Primary regulator 11 reduces air pressure to approximately 1 psig to the inlet of regulator 12. On the GA500WC adjust the air flow to 150 cc/min and the gas to 50 cc/min.
8. Observe Wobbe Index digital display. As the measurement chamber warms up, the display will begin showing an increasing number. After approximately 30 minutes warm-up time, the display will stabilize with only the unit digit (last digit on the right) changing to a point higher or lower. It is normal for the unit digit to change slightly during operation.
9. If the unit is also connected to a recorder, the recorder will show when stabilization has been achieved.
10. At this point, the digital display should show the Wobbe Index of the calibration gas. Using the usual natural gas, this will be a figure of approximately 1360 Btu/scf or 12758 Kcal/Nm³, or use the Wobbe Index of the calibration gas. If the display is off, set the span using the following equation. $((\text{desired display}) \times (\text{current span})) / (\text{current display}) = (\text{new span})$. On the GA500WC adjust the SG offset until the specific gravity reads correctly.
11. After the unit has been calibrated, manipulate gas valves to introduce the plant gas to be analyzed into the system.
12. If the analyzer is being used to control a blender and a deviation from the calibration point occurs (when analyzing the plant gas) the blender will be adjusted to provide the proper amount of air (or other gas) into the gas stream to bring it back to a proper Wobbe Index.
13. Note that if a momentary failure of gas occurs, the flame rod will automatically reignite the burner when gas is restored.

14. A short term loss of air, causing pressure to drop below the setting of the pressure switch 18, will shut off the gas supply and the ignition system as well. When air is reestablished, above the setting of the air pressure switch, gas will automatically be reestablished by the activation of gas solenoid valve 15 and the ignition system 4 will automatically ignite the burner.
15. Since turning off the air will deactivate the unit, the gas supply valves can be left in the ON position, for short term shut down. Then by simply reestablishing air and electric power, the system is again operative.
16. It is advisable to calibrate the unit at least once each day while it is being used.

NORMAL START-UP

1. Observe air filter for proper operation.
2. Establish electric power.
3. Turn on gas valve.

NOTE:

Gas can be left on at all times if desired as described under initial start-up and calibration.

4. Establish air supply.
5. Check gauges for proper readings:
Gas pressure should be 2" water column
Burner air pressure 25 psig
Measurement air flow rate approximately 100 SCFH (or flow rate established during calibration)
On GA500WC models set the air flow to 150 cc/min and gas flow to 50 cc/min.
6. After display and/or recorder shows stability, check calibration and adjust as necessary.

SHUT DOWN PROCEDURE

1. Turn off air supply. This will shut down entire system but leave display and electronic signal conditioning network active.
2. If system is going to be shut down for a long period of time, also discontinue electric power and close manual valve on the gas supply.

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MAINTENANCE

4

Virtually no maintenance is required on the unit except for checking air filters and strainer and gas strainer, periodically. Internal parts of gas solenoid valve and all four regulators should be replaced as required. If the unit is used often, these items should be checked and replaced, if necessary, at least once a year. Under any circumstances, all components should be completely serviced, with a repair kit, at least once every 5 years.

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TROUBLESHOOTING

5

SYMPTOM	POSSIBLE CAUSE	CORRECTION NOTE NUMBER
Incorrect Burner Air Pressure	1. Air supply malfunction	1
	2. Filters or strainer plugged	2
	3. Regulator adjustment	3
	4. Defective regulator	4
	5. Defective gauge	5
Incorrect Measurement Air Flow	1-4 above	1-4
	6. Defective flow meter	6
Incorrect Gas Pressure	7. Gas supply pressure failure	1
	8. Strainer plugged	2
	9. Regulators adjustment	3
	10. Defective regulator	4
	11. Defective gauge	5
Incorrect Reading on Wobbe Index Display	Items 1-11 above	1-6
	If 1-11 are correct and condition still exist, one or more of the following:	
	A. Cold junction thermocouple	7
	B. Hot junction thermocouple	7
	C. Electronic network	8
	D. Display	9

CORRECTION NOTES (see 'correction note number' in chart):

- | | |
|---|--------------------------------------|
| 1. Correct supply | 5. Replace gauge |
| 2. Replace filter elements and/or clean strainer | 6. Replace flow meter |
| 3. Adjust regulator | 7. Replace thermocouple |
| 4. Replace regulator | 8. Replace electronic network |
| | 9. Replace display |

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APPENDIX A

Component Information

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INSTALLATION AND MAINTENANCE INSTRUCTIONS

2-WAY DIRECT ACTING SOLENOID VALVES NORMALLY CLOSED OPERATION — 1/4 N.P.T.

BULLETIN

8262

ASCO®

FORM NO. V-5927

DESCRIPTION

Bulletin 8262's are 2-way normally closed, direct acting solenoid valves having bodies of brass construction. Standard valves have a General Purpose NEMA Type I Solenoid Enclosure. Valves may also be equipped with a solenoid enclosure which is designed to meet NEMA Type 4 - Watertight, NEMA Type 7 (C or D) Hazardous Locations - Class I, Groups C or D and NEMA Type 9 (E, F or G) Hazardous Locations - Class II, Groups E, F or G. Installation and Maintenance Instructions for Explosion-Proof/Watertight Solenoid Enclosures are shown on Form Nos. V-5391 or V-5380.

OPERATION

Normally Closed: Valve is closed when solenoid is de-energized. Valve opens when solenoid is energized.

NOTE: Inlet port will either be marked "1" or "IN." Outlet port will be marked "2."

IMPORTANT: No minimum operating pressure required.

INSTALLATION

Check nameplate for correct catalog number, pressure, voltage and service.

TEMPERATURE LIMITATIONS

For maximum valve ambient and fluid temperatures, refer to chart below. For higher ambient and fluid temperatures, consult factory. Check catalog number and watt rating on nameplate to determine the maximum temperatures.

WATTAGE	CATALOG NUMBER PREFIX	COIL CLASS	MAXIMUM AMBIENT TEMP. °F	MAXIMUM FLUID TEMP. °F
6	NONE	A	77	180
	FT	F	122	200
	HT	H	140	200
9	NONE	F	77	180
9.7	NONE, FT OR HT	A, F OR H	77	120
11.2*	NONE, FT OR HT	A, F OR H	77	150
16.7*	NONE	F	77	200

*Catalog Nos. 8262C200 and 8262B200 and valves with suffix "W" in the catalog number are limited to 140°F fluid temperature.

POSITIONING

Valve is designed to perform properly when mounted in any position. However, for optimum life and performance, the solenoid should be mounted vertical and upright so as to reduce the possibility of foreign matter accumulating in the core tube area.

MOUNTING

For valve body and mounting bracket mounting dimensions, refer to Figures 1 and 2.

PIPING

Connect piping according to markings on valve body. Apply pipe compound sparingly to male pipe threads only; if applied to valve threads, it may enter valve and cause operational difficulty. Pipe strain should be avoided by proper support and alignment of piping. When tightening the pipe, do not use valve as a lever. Wrenches applied to valve body or piping are to be located as close as possible to connection point.

IMPORTANT: For the protection of the solenoid valve, install a strainer or filter suitable for the service involved in the inlet side as close to the valve as possible. Periodic cleaning is required depending upon service conditions. See Bulletins 8600, 8601 and 8602 for strainers.

WIRING

Wiring must comply with Local and National Electrical Codes. Solenoid housings are provided with a 7/8 diameter hole for 1/2 inch conduit. The general purpose solenoid enclosure may be rotated to facilitate wiring by removing the retaining cap or clip. CAUTION: When metal retaining clip disengages, it will spring upward. Rotate enclosure to desired position. Replace retaining cap or clip before operating.

NOTE: Alternating Current (A-C) and Direct Current (D-C) solenoids are built differently. To convert from one to the other, it is necessary to change the complete solenoid including the core assembly and solenoid base sub-assembly.

SOLENOID TEMPERATURE

Standard catalog valves are supplied with coils designed for continuous duty service. When the solenoid is energized for a long period, the solenoid enclosure becomes hot and can be touched with the hand only for an instant. This is a safe operating temperature. Any excessive heating will be indicated by the smoke and odor of burning coil insulation.

MAINTENANCE

WARNING: Turn off electrical power supply and depressurize valve before making repairs. It is not necessary to remove the valve from the pipe line for repairs.

CLEANING

A periodic cleaning of all solenoid valves is desirable. The time between cleanings will vary depending upon media and service conditions. In general, if the voltage to the coil is correct, sluggish valve operation, excessive noise or leakage will indicate that cleaning is required. Clean valve strainer or filter when cleaning solenoid valve.

PREVENTIVE MAINTENANCE

1. Keep the medium flowing through the valve as free from dirt and foreign material as possible.
2. While in service, operate the valve at least once a month to insure proper opening and closing.
3. Periodic inspection (depending on media and service conditions) of internal valve parts for damage or excessive wear is recommended. Thoroughly clean all parts. Replace any parts that are worn or damaged.

IMPROPER OPERATION

1. **Faulty Control Circuit:** Check the electrical system by energizing the solenoid. A metallic click signifies the solenoid is operating. Absence of the click indicates loss of power supply. Check for loose or blown-out fuses, open-circuited or grounded coil, broken lead wires or splice connections.
2. **Burned-Out Coil:** Check for open-circuited coil. Replace coil if necessary.
3. **Low Voltage:** Check voltage across the coil leads. Voltage must be at least 85% of nameplate rating.
4. **Incorrect Pressure:** Check valve pressure. Pressure to valve must be within range specified on nameplate.
5. **Excessive Leakage:** Disassemble valve and clean all parts. Replace worn or damaged parts with a complete Spare Parts Kit for best results.

COIL REPLACEMENT

Turn off electrical power supply and disconnect coil lead wires. Refer to watt rating stamped on nameplate for identification of solenoid construction. When you have determined the watt rating of solenoid, select the correct paragraph below.

FIGURE 3 SHOWS A SOLENOID WITH A WATT RATING OF 6 A-C, 9.7 D-C OR 9 A-C.

1. Remove retaining cap or clip, nameplate and cover. CAUTION: When metal retaining clip disengages, it will spring upward.
2. Slip the yoke containing a coil, sleeves and insulating washers off the the solenoid base sub-assembly. Insulating washers are omitted when a molded coil is used.
3. Slip coil, sleeves and insulating washers from yoke.
4. Reassemble in reverse order of disassembly paying careful attention to exploded view provided for identification and placement of parts.

ASCO Valves

ASCO®

FIGURE 4 SHOWS A SOLENOID WITH A WATT RATING OF 10.5 A-C, 11.2 D-C OR 16.7 A-C

1. Remove retaining cap or clip, nameplate and housing. CAUTION: When metal retaining clip disengages, it will spring upward.
2. Slip spring washer, insulating washer and coil off the solenoid base sub-assembly. Insulating washers are omitted when a molded coil is used.
3. Reassemble in reverse order of disassembly paying careful attention to exploded views provided for identification and placement of parts.

CAUTION: Solenoid must be fully reassembled as the housing and internal parts are part of and complete the magnetic circuit. Place an insulating washer at each end of coil, if required.

VALVE DISASSEMBLY AND REASSEMBLY

Depressurize valve and turn off electrical power supply. For valves with a watt rating of 6 A-C, 9.7 D-C or 9 A-C, refer to Figure 3. For valves with a watt rating of 10.5 A-C, 11.2 D-C or 16.7 A-C, refer to Figure 4. Proceed in the following manner:

1. Remove retaining cap or clip and slip the entire solenoid enclosure off the solenoid base sub-assembly. CAUTION: When metal retaining clip disengages, it will spring upward.
2. Unscrew solenoid base sub-assembly and remove core assembly, core spring and body gasket.
3. All parts are now accessible for cleaning or replacement. Replace worn or damaged parts with a complete Spare Parts Kit for best results.
4. Reassemble in reverse order of disassembly paying careful attention to exploded views provided for identification and placement of parts.
5. Replace body gasket, core assembly, core spring and solenoid base sub-assembly. Torque solenoid base sub-assembly to 175 ± 25 inch-pounds.
6. After maintenance, operate the valve a few times to be sure of proper operation.

SPARE PARTS KITS

Spare Parts Kits and Coils are available for ASCO valves. Parts marked with an asterisk (*) are supplied in Spare Parts Kit.

ORDERING INFORMATION FOR SPARE PARTS KITS

When Ordering Spare Parts Kits or Coils, Specify Valve Catalog Number, Serial Number and Voltage.

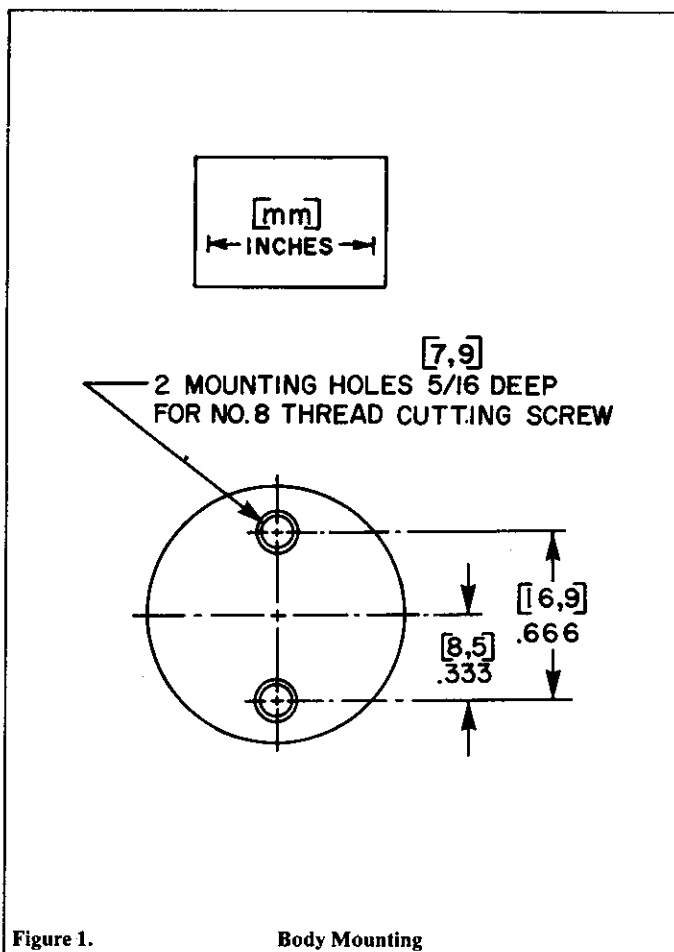


Figure 1. Body Mounting

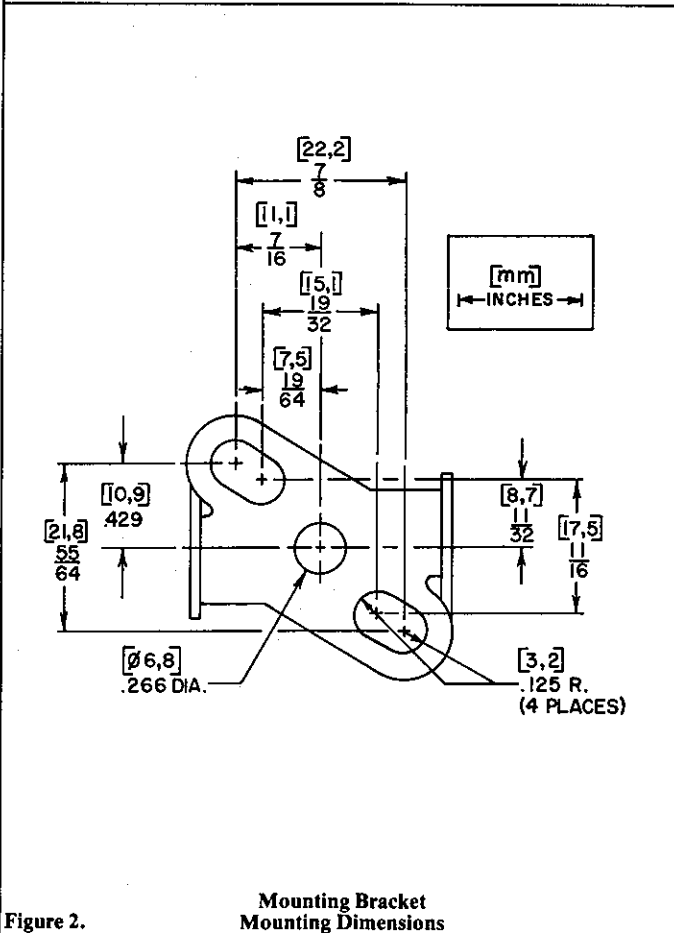
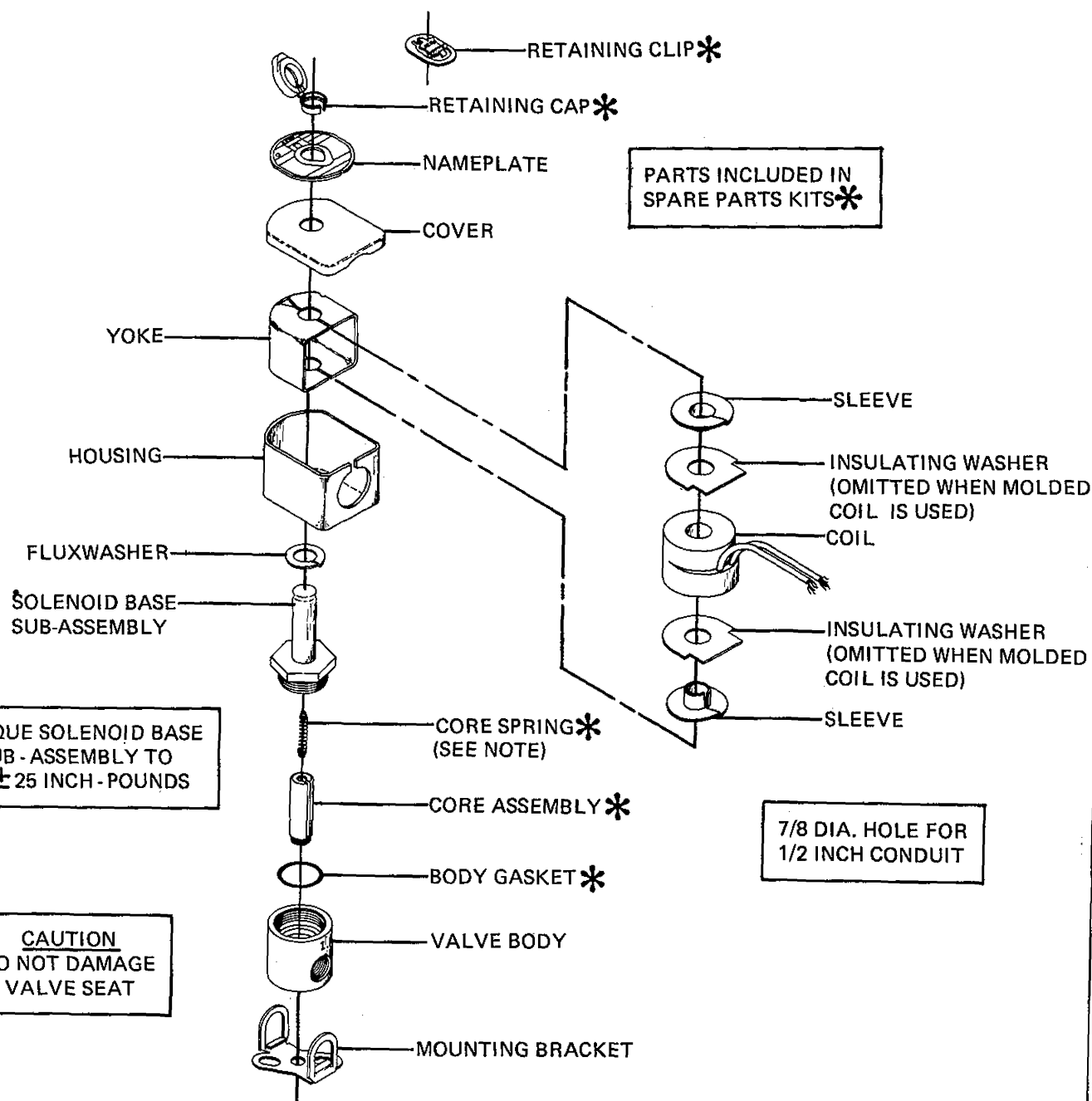


Figure 2. Mounting Bracket Mounting Dimensions



NOTE: A-C (ALTERNATING CURRENT) CONSTRUCTION SHOWN. FOR A-C CONSTRUCTION, EITHER END OF THE SPRING MAY BE INSTALLED INTO TOP OF CORE ASSEMBLY. FOR D-C (DIRECT CURRENT) CONSTRUCTION, INSTALL WIDE END OF CORE SPRING IN CORE ASSEMBLY FIRST, CLOSED END OF CORE SPRING PROTRUDES FROM TOP OF CORE ASSEMBLY.

Bulletin 8262 (6 A-C, 9.7 D-C Or 9 Watts A-C)
 General Purpose Solenoid Enclosure Shown
 For Explosion-Proof/Watertight Solenoid Enclosure, See Form No. V-5391

Figure 3.

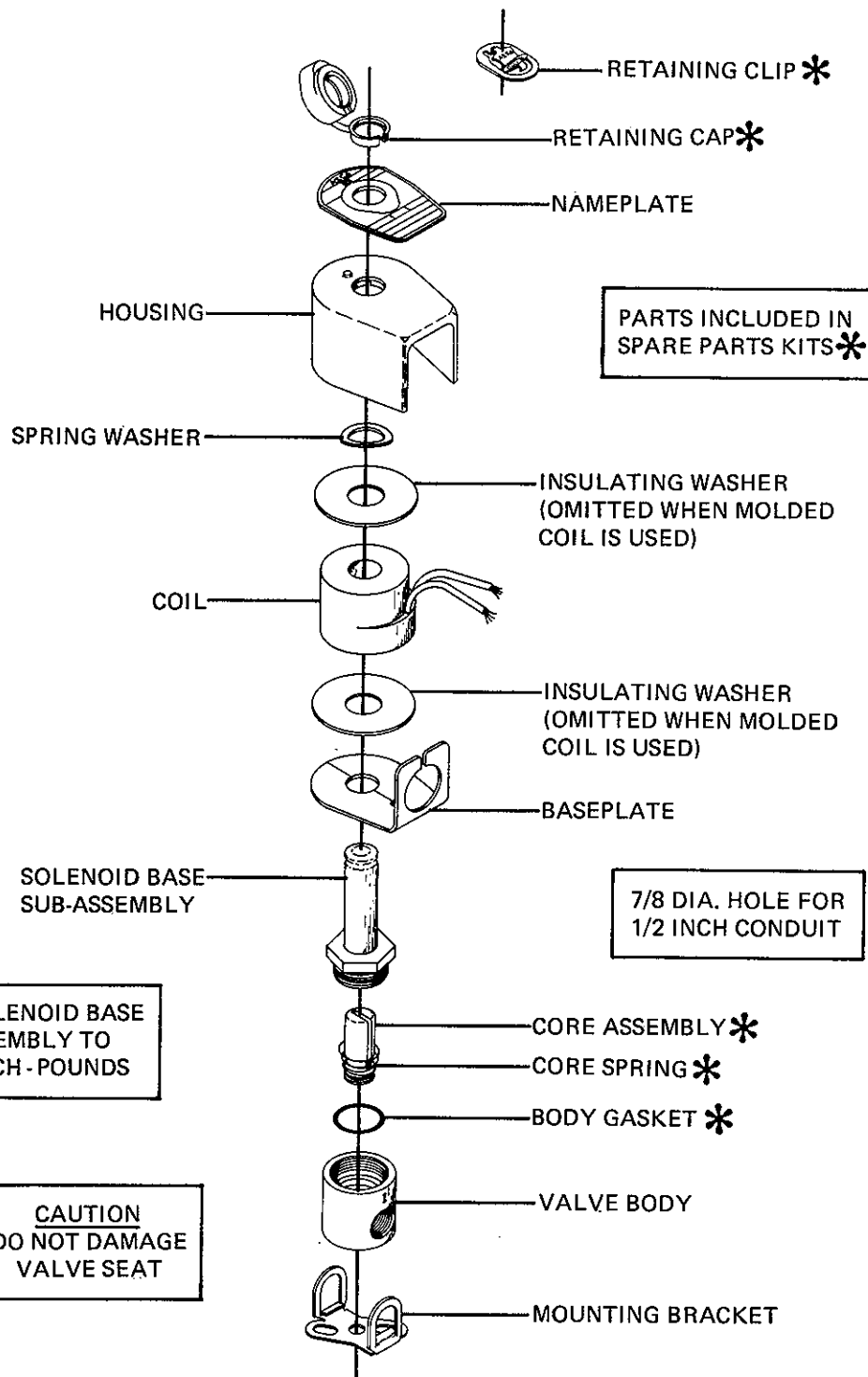


Figure 4.

Bulletin 8262 (10.5 A-C, 11.2 D-C or 16.7 Watts A-C)
 General Purpose Solenoid Enclosure Shown
 For Explosion-Proof/Watertight Solenoid Enclosure, See Form No. V-5380

Installation & Maintenance Instructions



OPEN-FRAME, GENERAL PURPOSE, WATERTIGHT/EXPLOSIONPROOF SOLENOIDS

SERIES

8016G

Form No.V6583R6

—SERVICE NOTICE—

ASCO® solenoid valves with design change letter “G” in the catalog number (example: 8210G 1) have an epoxy encapsulated ASCO® Red Hat II™ solenoid. This solenoid replaces some of the solenoids with metal enclosures and open-frame constructions. Follow these installation and maintenance instructions if your valve or operator uses this solenoid.

DESCRIPTION

Catalog numbers 8016G1 and 8016G2 are epoxy encapsulated pull-type solenoids. The green solenoid with lead wires and 1/2" conduit connection is designed to meet Enclosure Type 1—General Purpose, Type 2—Dripproof, Types 3 and 3S—Raintight, and Types 4 and 4X—Watertight. The black solenoid in catalog numbers prefixed “EF” is designed to meet Enclosure Types 3 and 3S—Raintight, Types 4 and 4X—Watertight, Types 6 and 6P—Submersible, Type 7 (A, B, C, & D) Explosionproof Class I, Division 1, Groups A, B, C, & D and Type 9 (E, F, & G)—Dust—Ignitionproof Class II, Division 1, Groups E, F, & G. The Class II, Groups F & G Dust Locations designation is not applicable for solenoids or solenoid valves used for steam service or when a class “H” solenoid is used. See *Temperature Limitations* section for solenoid identification and nameplate/retainer for service. When installed just as a solenoid and not attached to an ASCO valve, the core has a 0.250–28 UNF–2B tapped hole, 0.38 minimum full thread.

Series 8016G solenoids are available in:

- **Open-Frame Construction**
The green solenoid may be supplied with 1/4" spade, screw, or DIN terminals (Refer to Figure 4).
- **Panel Mounted Construction**
These solenoids are specifically designed to be panel mounted by the customer through a panel having a .062 to .093 maximum wall thickness. (Refer to Figure 3 and section on *Installation of Panel Mounted Solenoid*).

Optional Features For Type 1 – General Purpose Construction Only

- **Junction Box**
This junction box construction meets Enclosure Types 2,3,3S,4, and 4X. Only solenoids with 1/4" spade or screw terminals may have a junction box. The junction box provides a 1/2" conduit connection, grounding and spade or screw terminal connections within the junction box (See Figure 5).
- **DIN Plug Connector Kit No. K236034**
Use this kit only for solenoids with DIN terminals. The DIN plug connector kit provides a two pole with grounding contact DIN Type 43650 construction (See Figure 6).

OPERATION

When the solenoid is energized, the core is drawn into the solenoid base sub-assembly. **IMPORTANT: When the solenoid is de-energized, the initial return force for the core, whether developed by spring, pressure, or weight, must exert a minimum force to overcome residual magnetism created by the solenoid. Minimum return force for AC construction is 11 ounces, and 4 ounces for DC construction.**

INSTALLATION

Check nameplate for correct catalog number, service, and wattage. Check front of solenoid for voltage and frequency.

⚠ WARNING: Electrical hazard from the accessibility of live parts. To prevent the possibility of death, serious injury or property damage, install the open-frame solenoid in an enclosure.

FOR BLACK ENCLOSURE TYPES 7 AND 9 ONLY

⚠ CAUTION: To prevent fire or explosion, do not install solenoid and/or valve where ignition temperature of hazardous atmosphere is less than 165° C. On valves used for steam service or when a class “H” solenoid is used, do not install in hazardous atmosphere where ignition temperature is less than 180° C. See nameplate/retainer for service.

NOTE: These solenoids have an internal non-resettable thermal fuse to limit solenoid temperature in the event that extraordinary conditions occur which could cause excessive temperatures. These conditions include high input voltage, a jammed core, excessive ambient temperature or a shorted solenoid, etc. This unique feature is a standard feature only in solenoids with black explosionproof/dust-ignitionproof enclosures (Types 7 & 9).

⚠ CAUTION: To protect the solenoid valve or operator, install a strainer or filter, suitable for the service involved in the inlet side as close to the valve or operator as possible. Clean periodically depending on service conditions. See ASCO Series 8600, 8601, and 8602 for strainers.

Temperature Limitations

For maximum valve ambient temperatures, refer to chart. The temperature limitations listed, only indicate maximum application temperatures for field wiring rated at 90°C. Check catalog number prefix and watt rating on nameplate to determine maximum ambient temperature. See valve installation and maintenance instructions for maximum fluid temperature. NOTE: For steam service, refer to *Wiring* section, *Junction Box* for temperature rating of supply wires.

Temperature Limitations For Series 8016G Solenoids for use on Valves Rated at 6.1, 8.1, 9.1, 10.6, or 11.1 Watts

Watt Rating	Catalog Number Coil Prefix	Class of Insulation	Maximum † Ambient Temp.
6.1, 8.1, 9.1, & 11.1	None, FB, KF, KP, SF, SP, SC, & SD	F	125°F (51.7°C)
6.1, 8.1, 9.1, & 11.1	HB, HT, KB, KH, SS, ST, SU, & ST	H	140°F (60°C)
10.6	None, KF, SF, & SC	F	104°F (40°C)
10.6	HT, KH, SU, & ST	H	104°F (40°C)

†Minimum ambient temperature –40°F (–40° C).

Positioning

This solenoid is designed to perform properly when mounted in any position. However, for optimum life and performance, the solenoid should be mounted vertically and upright to reduce the possibility of foreign matter accumulating in the solenoid base sub-assembly area.

Wiring

Wiring must comply with local codes and the National Electrical Code. All solenoids supplied with lead wires are provided with a grounding wire which is green or green with yellow stripes and a 1/2" conduit connection. To facilitate wiring, the solenoid may be rotated 360°. For the watertight and explosionproof solenoid, electrical fittings must be approved for use in the approved hazardous locations.

Additional Wiring Instructions For Optional Features:

- **Open-Frame solenoid with 1/4" spade terminals**
For solenoids supplied with screw terminal connections use #12–18 AWG stranded copper wire rated at 90°C or greater. Torque terminal block screws to

10 ± 2 in–lbs [1,0 ± 1,2 Nm]. A tapped hole is provided in the solenoid for grounding, use a #10–32 machine screw. Torque grounding screw to 15 –20 in–lbs [1,7 – 2,3 Nm]. On solenoids with screw terminals, the socket head screw holding the terminal block to the solenoid is the grounding screw. Torque the screw to 15 – 20 in–lbs [1,7 – 2,3 Nm], with a 5/32" hex key wrench.

- **Junction Box**

The junction box is used with spade or screw terminal solenoids only and is provided with a grounding screw and a 1/2" conduit connection. Connect #12–18 AWG standard copper wire only to the screw terminals. Within the junction box use field wire that is rated 90°C or greater for connections. For steam service use 105°C rated wire up to 50 psi or use 125°C rated wire above 50 psi. After electrical hookup, replace cover gasket, cover, and screws. Tighten screws evenly in a crisscross manner.

- **DIN Plug Connector Kit No.K236–034**

1. The open–frame solenoid is provided with DIN terminals to accommodate the DIN plug connector kit.
2. Remove center screw from plug connector. Using a small screwdriver, pry terminal block from connector cover.
3. Use #12–18 AWG stranded copper wire rated at 90°C or greater for connections. Strip wire leads back approximately 1/4" for installation in socket terminals. The use of wire–end sleeves is also recommended for these socket terminals. Maximum length of wire–end sleeves to be approximately 1/4". Tinning of the ends of the lead wires is not recommended.
4. Thread wire through gland nut, gland gasket, washer, and connector cover.

NOTE: Connector cover may be rotated in 90° increments from position shown for alternate positioning of cable entry.

5. Check DIN connector terminal block for electrical markings. Then make electrical hookup to terminal block according to markings on it. Snap terminal block into connector cover and install center screw.
6. Position connector gasket on solenoid and install plug connector. Torque center screw to 5 ± 1 in–lbs [0,6 ± 1,1 Nm].

NOTE: Alternating current (AC) and direct current (DC) solenoids are built differently. To convert from one to the other, it may be necessary to change the complete solenoid including the core and solenoid base sub–assembly, not just the solenoid. Consult ASCO.

Installation of Solenoid

Solenoids may be assembled as a complete unit. Tightening is accomplished by means of a hex flange at the base of the solenoid. The 3/4" bonnet construction (Figure 1) must be disassembled for installation and installed with a special wrench adapter.

Installation of Panel Mounted Solenoid (See Figure 3)

Disassemble solenoid following instruction under *Solenoid Replacement* then proceed

3/4" Valve Bonnet Construction

1. Install retainer (convex side to solenoid) in 1.312 diameter mounting hole in customer panel.
2. Then position spring washer over plugnut/core tube sub–assembly.
3. Install plugnut/core tube sub–assembly through retainer in customer panel. Then replace solenoid, nameplate/retainer and red cap.

15/16" Valve Bonnet Construction

1. Install solenoid base sub–assembly through 0.69 diameter mounting hole in customer panel.
2. Position spring washer on opposite side of panel over solenoid base sub–assembly then replace.

Solenoid Temperature

Standard solenoids are designed for continuous duty service. When the solenoid is energized for a long period, the solenoid becomes hot and can be touched by hand only for an instant. This is a safe operating temperature.

MAINTENANCE

⚠ WARNING: To prevent the possibility of death, serious injury or property damage, turn off electrical power, depressurize solenoid operator and/or valve, and vent fluid to a safe area before servicing.

Cleaning

All solenoid operators and valves should be cleaned periodically. The time between cleaning will vary depending on medium and service conditions. In general, if the voltage to the solenoid is correct, sluggish valve operation, excessive noise or leakage will indicate that cleaning is required. Clean strainer or filter when cleaning the valve.

Preventive Maintenance

- Keep the medium flowing through the solenoid operator or valve as free from dirt and foreign material as possible.
- While in service, the solenoid operator or valve should be operated at least once a month to insure proper opening and closing.
- Depending on the medium and service conditions, periodic inspection of internal valve parts for damage or excessive wear is recommended. Thoroughly clean all parts. Replace any worn or damaged parts.

Causes of Improper Operation

- **Faulty Control Circuit:** Check the electrical system by energizing the solenoid. A metallic *click* signifies that the solenoid is operating. Absence of the *click* indicates loss of power supply. Check for loose or blown fuses, open–circuited or grounded solenoid, broken lead wires or splice connections.
- **Burned–Out Solenoid:** Check for open–circuited solenoid. Replace if necessary. Check supply voltage; it must be the same as specified on nameplate/retainer and marked on the solenoid. Check ambient temperature and check that the core is not jammed.
- **Low Voltage:** Check voltage across the solenoid leads. Voltage must be at least 85% of rated voltage.

Solenoid Replacement

1. On solenoids with lead wires disconnect conduit, coil leads, and grounding wire.

NOTE: Any optional parts attached to the old solenoid must be reinstalled on the new solenoid.

2. Disassemble solenoids with optional features as follows:

- **Spade or Screw Terminals**

Remove terminal connections, grounding screw, grounding wire, and terminal block (screw terminal type only).

NOTE: For screw terminals, the socket head screw holding the terminal block serves as a grounding screw.

- **Junction Box**

Remove conduit and socket head screw (use 5/32" hex key wrench) from center of junction box. Disconnect junction box from solenoid.

- **DIN Plug Connector**

Remove center screw from DIN plug connector. Disconnect DIN plug connector from adapter. Remove socket head screw (use 5/32" hex key wrench), DIN terminal adapter, and gasket from solenoid.

3. Snap off red cap from top of solenoid base sub–assembly.
4. Push down on solenoid. Then using a suitable screwdriver, insert blade in slot provided between solenoid and nameplate/retainer. Pry up slightly and push to remove. Then remove solenoid from solenoid base sub–assembly.
5. Reassemble using exploded views for parts identification and placement

Disassembly and Reassembly of Solenoids

1. Remove solenoid, see *Solenoid Replacement*.
2. Remove finger washer or spring washer from solenoid base sub–assembly.
3. Unscrew solenoid base sub–assembly.

NOTE: Some solenoid constructions have a plugnut/core tube sub–assembly, bonnet gasket and bonnet in place of the solenoid base sub–assembly. To remove bonnet use special wrench adapter supplied in ASCO Rebuild Kit. For wrench adapter only, order ASCO Wrench Kit No.K218948.

4. The core is now accessible for cleaning or replacement.
5. If the solenoid is part of a valve, refer to basic valve installation and maintenance instructions for further disassembly.
6. Reassemble using exploded views for identification and placement of parts.

ORDERING INFORMATION FOR ASCO SOLENOIDS

When Ordering Solenoids for ASCO Solenoid Operators or Valves, order the number stamped on the solenoid. Also specify voltage and frequency.

Torque Chart

Part Name	Torque Value in Inch-Pounds	Torque Value in Newton-Meters
solenoid base sub-assembly	175 ± 25	19,8 ± 2,8
valve bonnet (3/4" bonnet construction)	90 ± 10	10,2 ± 1,1
bonnet screw (3/8" or 1/2" NPT pipe size)	25	2,8
bonnet screw (3/4" NPT pipe size)	40	4,5

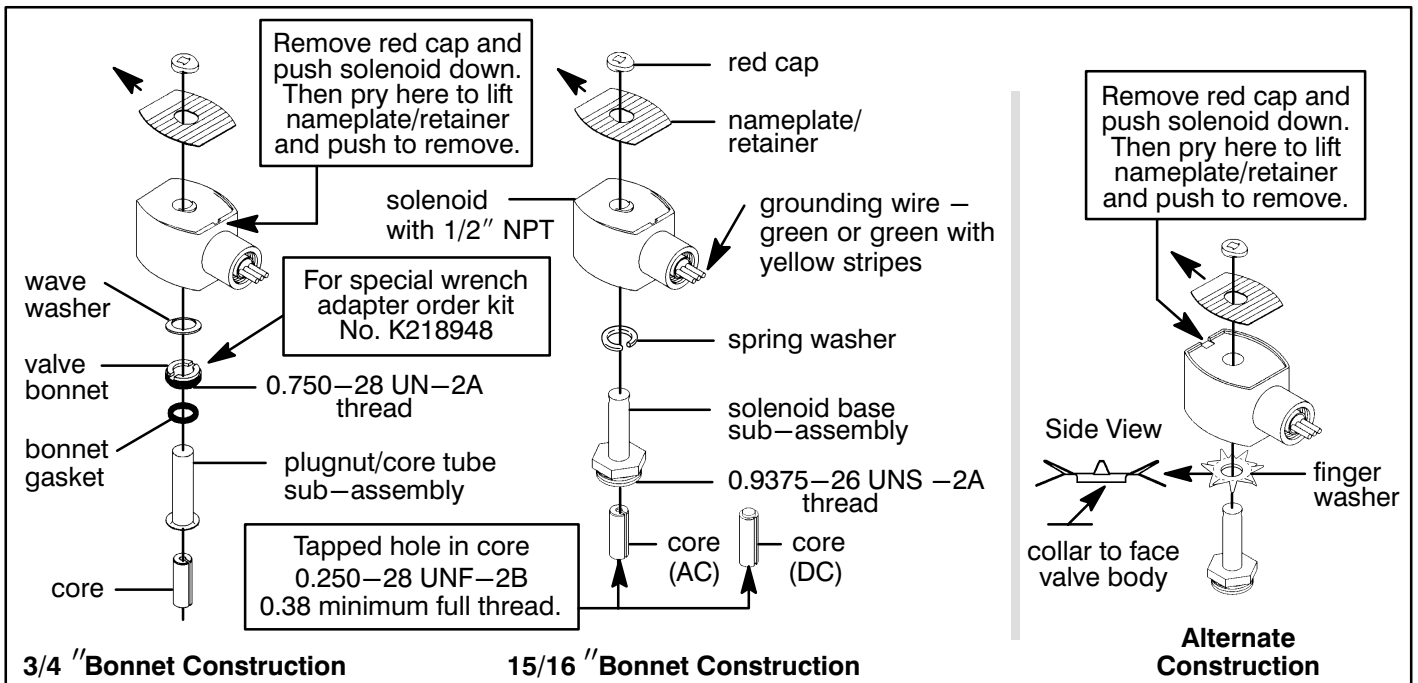


Figure 1. Series 8016G solenoids

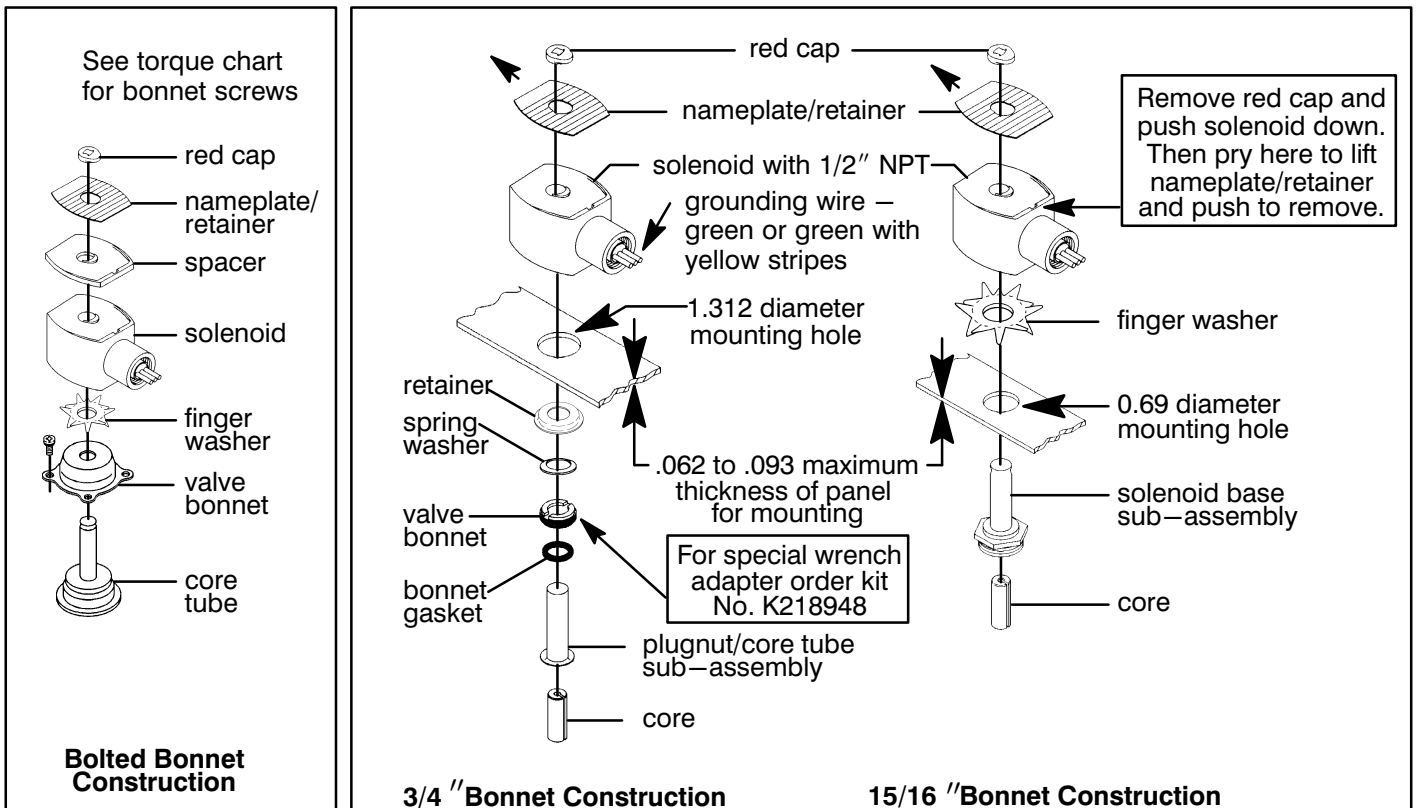


Figure 2. Series 8016G solenoid

Figure 3. Series 8016G panel mounted solenoids

Torque Chart

Part Name	Torque Value in Inch-Pounds	Torque Value in Newton-Meters
terminal block screws	10 ± 2	1,1 ± 0,2
socket head screw	15 – 20	1,7 – 2,3
center screw	5 ± 1	0,6 ± 0,1

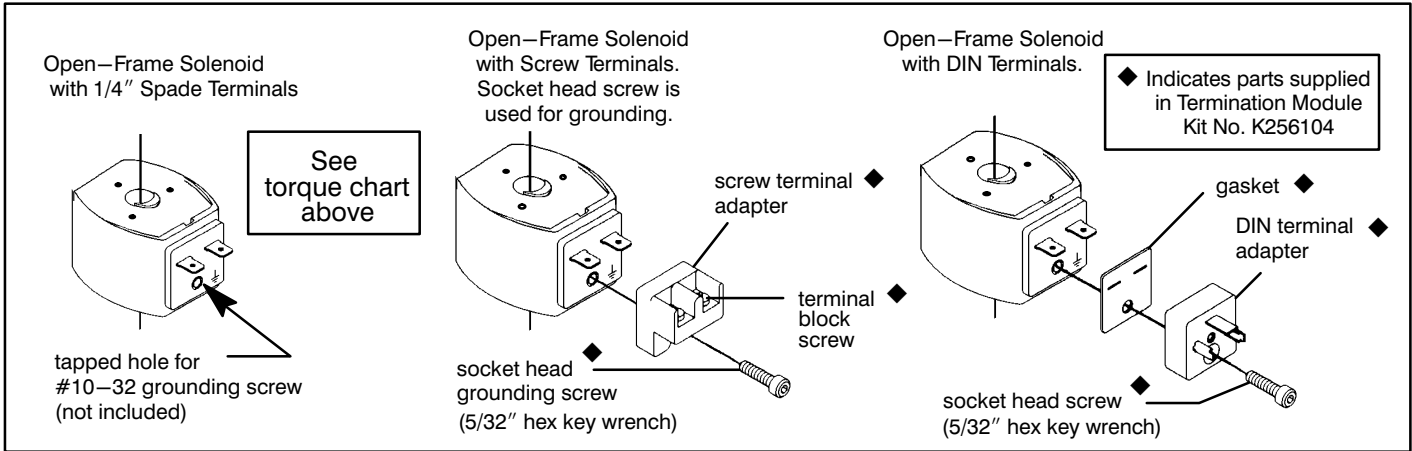


Figure 4. Open-frame solenoids

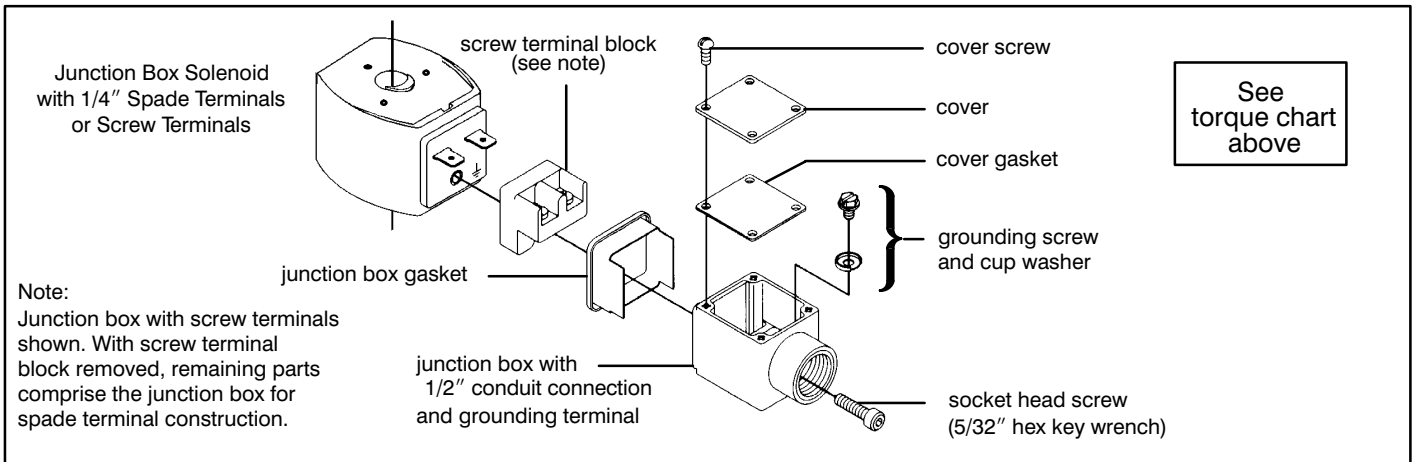


Figure 5. Junction box (optional feature)

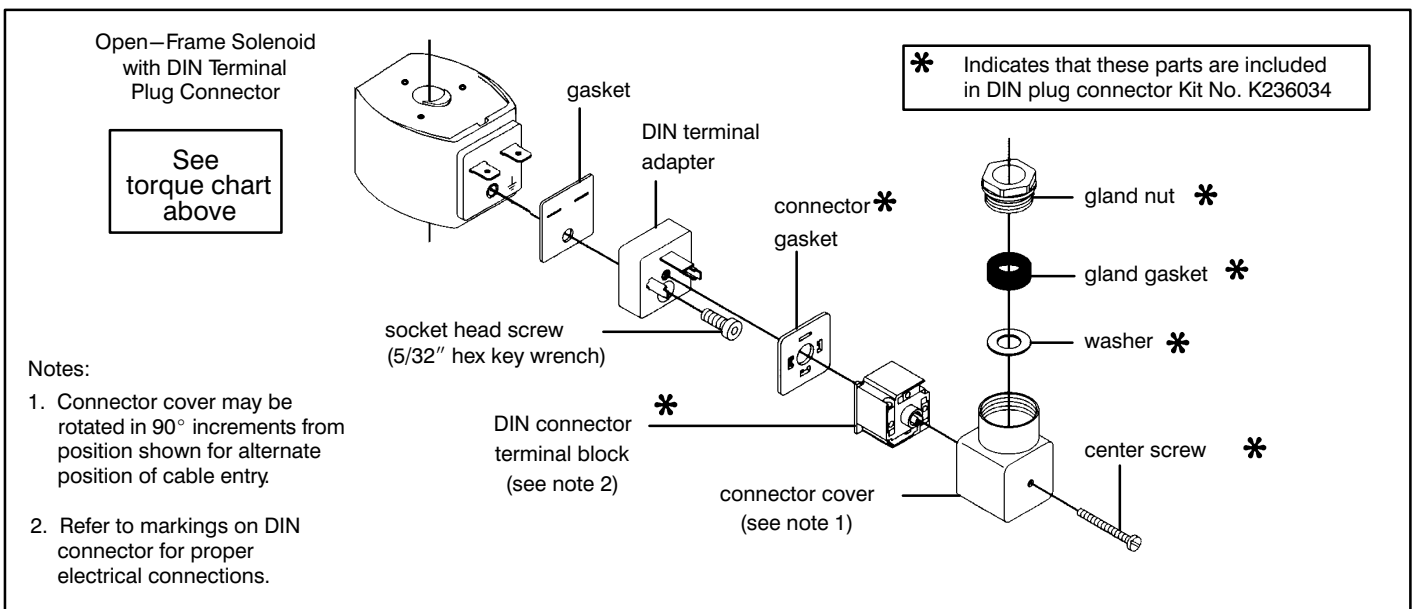


Figure 6. DIN plug connector kit No. K236034 (optional feature)

TECHNICAL INFORMATION

Installation, Operation and Maintenance Balston® Compressed Air and Gas In-Line Filters

These instructions must be thoroughly read and understood before installing and operating this product. If you have any questions or concerns, please call the Technical Services Department at 800-343-4048, 8AM to 8PM Eastern Time. (In the UK, call 01622-676670. In Germany, call +49 551 5043319. For other locations, please contact your local representative.)

General

When properly installed on a compressed air or gas line, Balston in-line filters effectively remove oil, water, and particulate contamination from a gas supply. The quantity of oil and water and the size of the particulate contamination removed from a gas supply is dependent upon the grade of Balston filter cartridge installed in a Balston filter housing.



Warning: Do not expose filter assemblies with plastic or nylon components to solvents, alcohols, or glycols. Exposure to these materials could cause failure of the housing. Use only non-detergent mineral base oils with housings containing polycarbonate components. Use of any other types of oils could lead to dangerous failure of the product.

Filter Housing Installation

Filter housings are pressure vessels and all system connections and accessory outlets must be leak-tight. It is good practice to apply pipe sealant to the male threads before connecting the pipe to the filter ports. **For all stainless steel filters, a non-galling thread lubricant must be used on the threads of the filter bowl.** Any lubricant used must be compatible with the filtered media. The use of lubricant facilitates disassembly at a later time, if necessary.

The flow direction through the filter cartridge should be from the **inside-to-outside**. Some Balston filters have a flow arrow indicating the flow direction from inside-to-outside through the cartridge. Other Balston filters have numbered ports. The filters with numbered ports should be piped from Port 2 to Port 1 to provide inside-to-outside flow through the cartridge.

In coalescing applications, the flow of compressed gas through the filter cartridge should be from inside-to-outside. Suspended liquids will be coalesced throughout the cartridge and will drain from the outside of the cartridge into the bowl of the filter assembly. Accumulated liquids may be drained from the filter bowl by automatic or manual drains. For more details on coalescing filtration and liquid drains, request Literature Pack 1.

For slip stream or bypass sampling applications, the flow through the filter housing should be from Port 1 to Port 2 (outside-to-inside). For more details on slip stream or bypass sampling applications, request information on Balston Sample Filters (Literature Pack 2).

For liquid filtration using a Grade X, Q or H cartridge, the flow direction through the cartridge within the housing should be outside-to-inside (Port 1 to Port 2). In these applications, a support core should be installed to support the cartridge and maintain its structural integrity. See the Replacement Parts drawing for the support core designed to fit your particular housing.

For installations where the compressed gas is sourced from an overhead line, the gas should be piped from the top of the header to the filter. In this way, excessive moisture and dirt are not gravity-fed to the Balston in-line filter. For installations in which long runs of piping carry filtered gas from the filter to the point of use, filters should be located as close to the point of use as possible to trap condensation and particulate which may have been picked up in the pipe.

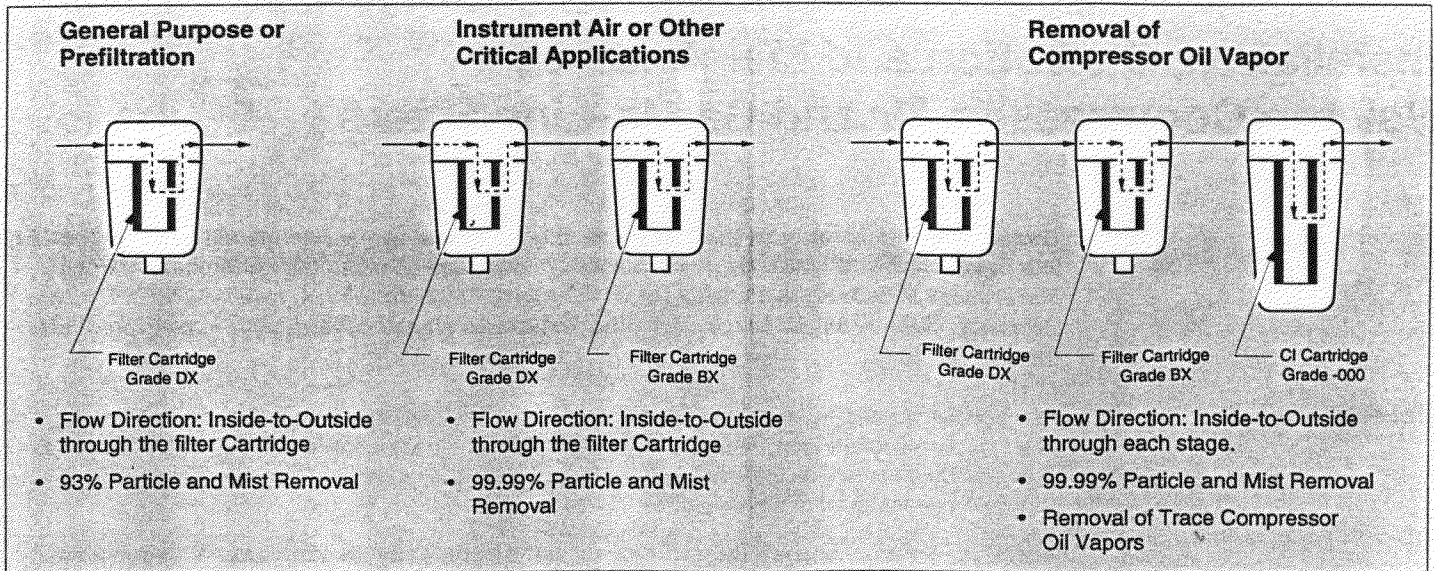
Mounting bracket kits are available for most Balston filters. Some Balston filter assemblies may be pipe mounted if the size and weight of the housing and piping permit it. All fittings must be leak tight before applying gas pressure to the filter.



To avoid personal injury and/or property damage, factory installed bowl guards must remain on the filter assembly while in service.

Do not install Balston 900 Series, 94 Series, and 15/80 Series filter housings in corrosive environments.

The Schematic shows typical schematic installations for three commonly required coalescing applications in compressed air systems.



All installation and maintenance activities should be performed by suitable personnel using reasonable care. Turn off the compressed gas supply and depressurize the filter housing prior to performing routine maintenance.

Filter Cartridge Installation

Most Balston filter housings are ordered separately from Balston filter cartridges. Balston 900 Series coalescing filter assemblies (e.g., A912A-DX), however, are shipped from the factory with the filter cartridge installed. Balston 900 Series adsorbent filter assemblies (e.g., A912A-000) are shipped from the factory with the adsorbent filter packaged separately from the filter housing. The adsorbent cartridge must be installed into the housing prior to installing the housing on the compressed air line. This packaging procedure extends the life of the cartridge by preventing exposure to the atmosphere prior to initial use.

An adhesive-backed label indicating the grade of the filter cartridge is packed inside each box of filter cartridges. This label should be affixed to the filter housing when the first filter cartridge is installed. Using the cartridge grade label will help ensure that the correct filter cartridge is used when maintenance is performed on the housing. The date that the replacement cartridge is installed may be recorded, with a marking pen or grease pencil, on the filter housing label; to provide a ready reference for scheduling routine maintenance.

Balston Microfibre® filter cartridges are sealed in place by compression against a flat surface. Gaskets are not required between the filter cartridge and the filter housing. The filter cartridge is centered by guides on the housing which fit the inside diameter of the cartridge at each end. In most Balston housing designs, the filter cartridge is sealed by tightening a threaded element retainer on a tie rod. Do not use excessive force or tools on the element retainer. The filter cartridge is securely sealed by tightening the element retainer 1-1/2 to 2 turns after it first contacts the filter cartridge. (Note: In high flow, multi-cartridge housings, it may be necessary to tighten the element retainer 3 to 4 turns after contact with the filter cartridge.)



Always replace the filter bowl guard, when applicable, after servicing the Balston filter.

Filter Cartridge Life

The efficiency of the Balston Microfibre filter cartridge is relatively unaffected by liquids entrained in the compressed air or gas stream. The life of the filter cartridge is determined by the increase in flow resistance caused by solids trapped within the depth of the filter cartridge. The change in pressure through the filter cartridge should be monitored while the filter is in use. The filter cartridge should be changed when the flow through the housing falls below an acceptable level, or when the pressure drop becomes too high for the application. In any case, **the filter cartridge should be changed when the pressure drop reaches 5-7 psid.** (Note: The Balston Microfibre filter cartridge cannot be cleaned by back-flushing because the solids are trapped within the depth of the cartridge, not on the surface.)



Failure of the filter cartridge resulting from a high pressure drop or excessive solids loading may cause damage to the filter housing and/or any downstream equipment.

In many applications, the pressure drop through the filter assembly may be measured using two pressure gauges, one directly upstream from the filter assembly, and one directly downstream from the filter assembly. In compressed air filtration, however, the pressure drop through the filter assembly is difficult to measure in this way because of inaccuracies in the pressure gauges and rapid fluctuations in system pressure. For monitoring pressure drop through a compressed air filter assembly, Whatman offers a differential pressure indicator. Please refer to Product Bulletins PK1-11, PK1-12 for more details on the Balston Differential Pressure Indicator.

Ordering Replacement Filter Cartridges

Some Balston filter assemblies have filter cartridges installed when shipped from the factory. If filter cartridges are being ordered separately, either as replacements for an existing assembly or as an original for a new installation, specify both the size and grade of the filter cartridge. Filter cartridges for compressed air and gas filter assemblies are available in boxes of 3 (except X-Grade), 5, or 10. The size of the filter is designated by a three-digit number followed by a two digit number (e.g., 100-12, 150-19, 200-80). The retention efficiency of the filter is designated by a series of letters or numbers following the size designation (e.g., 100-12-DQ, 150-19-BX, 200-80-BH).

Ordering Filter Assembly Replacement Parts

An assembly drawing and a replacement parts list are included with each filter housing. When ordering replacement parts, order by part number and description, as detailed on the replacement parts drawing shipped with the filter. Inspect all seals when changing filter cartridges and replace as needed. Lubricate all replacement seals prior to installation. Use a lubricant which is compatible with the gas being filtered.

Accessories

Automatic Float Drains

If the filter housing is equipped with an automatic float drain, the drain is installed at the factory.

Float drains are available on select assemblies with DX or BX cartridges. They are not available for assemblies with grade CI adsorbent cartridges, grade SA sterile air cartridges, or with the smaller volume housings.

If the filter housing is not equipped with a drain, Whatman offers several different drain assemblies which may be integrated into the housing. See Product Literature Pack 1 or contact your local stocking representative for details.

Differential Pressure Indicators (DPI)

Several Balston Compressed Air Filter Assemblies are shipped with Differential Pressure Indicators (DPIs) installed. The DPI monitors the pressure drop across the filter, and may be used to measure pressure drop across other components in the compressed air system. Differential Pressure Indicators may also be purchased as accessories for other Balston filter assemblies. Balston offers two different models of DPIs: 41-071 and 41-082. More information on these products may be found in Literature Pack 1.

Connect the indicator to the HIGH (upstream) and LOW (downstream) sides of the line as indicated by the marking on the indicator. Some typical installations are illustrated on the last page.

The Balston Differential Pressure Indicators give a quick visual indication of the pressure drop in the line. It is not intended to be an accurate pressure gauge.

Ordering Information

Model	Ports	Maximum Pressure	Maximum Temperature
41-071	1/8" NPT	250 psig	130°F (54°C)
41-082	3/8"-24 UNF	300 psig	150°F (65°C)

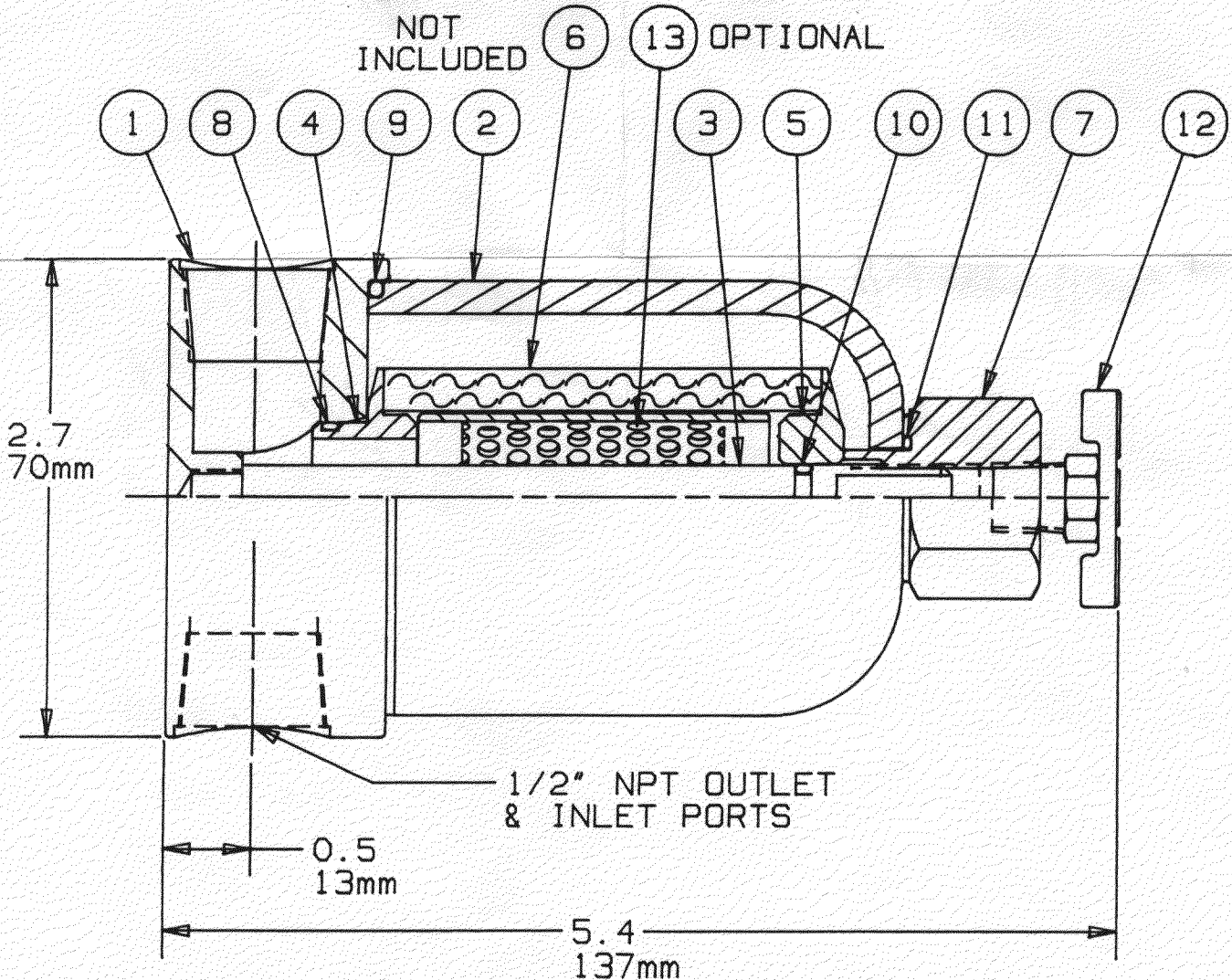
REPLACEMENT PARTS FOR TYPE 92-812A				
ITEM	DESCRIPTION	PART NO.	MAT'L	⊕
1	HEAD	92712	ALUM.	
2	BOWL	92910	ALUM.	
3	TIEROD	92720	ST.STL	
4	HEAD ADAPTER	92410	ALUM.	
5	ELEMENT RETAINER	92730	ALUM.	
6	FILTER TUBE	100-12-[1]	----	
7	TIENUT	92745	ALUM.	
8,9, 10,11	SEAL SET	22082	BUNA	
8,9, 10,11	SEAL SET	22083	VITON	⊕
12	DRAIN VALVE	20120	BRA/STL	
13	SUPPORT CORE	SS-100-12	ST.STL.	⊕
--	MOUNTING BRACKET KIT	11038	STL/PLD	⊕

[1] SPECIFY FILTER TUBE GRADE

⊕ = OPTIONAL PARTS

ORDER BY PART NUMBER AND DESCRIPTION

NOT INCLUDED (6) (13) OPTIONAL



Whatman®

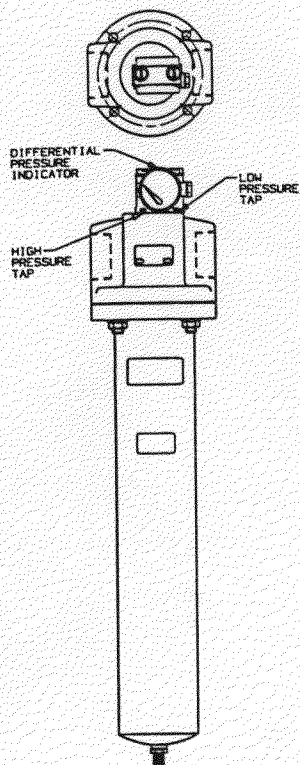
Whatman Inc
260 Neck Rd., Box 8223
Haverhill, MA 01835-0723
800-343-4048 or 508-374-7400
Fax: 508-374-7070

Whatman Canada Ltd
2495 Haines Rd.
Mississauga
Ontario L4Y 1Y7
905-272-1516

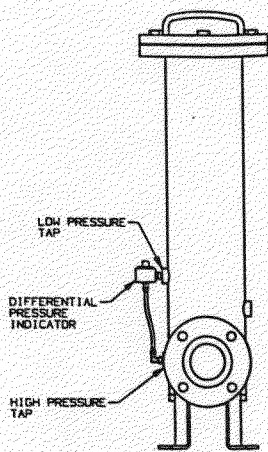
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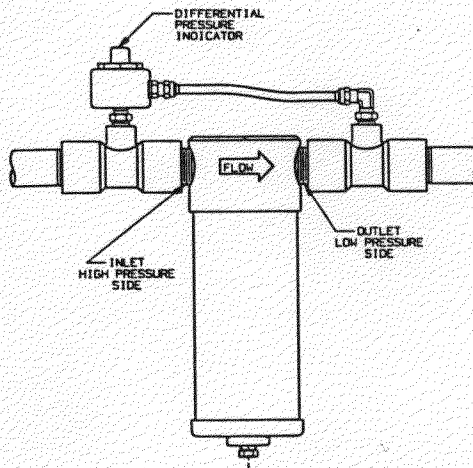
SP-12556B



MODEL A15/80



K-SERIES



TYPICAL
LINE MOUNTING

Whatman

Whatman Inc
100 Ames Pond Drive, P.O. Box 1262
Tewksbury, MA 01876-0962
800-343-4048 or 978-858-0505 Fax: 978-858-0625



Whatman Canada Ltd
2851 Brighton Road
Oakville, Ontario L6H 6C9
905-277-0331

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Springfield Mill, James Whatman Way
Maidstone, Kent ME14 2LE, England
Tel: +44 (01622) 692022 Fax: +44 (01622) 691425



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RATEMASTER® FLOWMETER

Installation and Operating Instructions

DIMENSIONS & MOUNTING INFORMATION

DIMENSIONS - IN INCHES			
	RMA	RMB	RMC
A	4-9/16	8-1/2	15-1/8
B	3	6-7/16	12-1/4
C	1/8 NPT CONN.	1/4 NPT CONN.	1/2 NPT CONN.
D	1-5/8"	3-15/16	8-3/4
E	10-32 THDS.	1/4-20 THDS.	3/8-24 THDS.
F	3/8	5/8	1
G	1-1/16	1-7/8	2-3/4
H	1-3/16	1-3/4	2-1/4
I	11/16	1	1-7/16
J	1	1-7/16	1-31/32
K	1-3/8	1-13/16	2-1/2
L	3/4	1-1/4	2
M	4-13/16	8-3/4	15-3/8
N	1	1-1/2	2-1/4

PANEL CUT OUT (FOR FLUSH MOUNTING)

HIGH	4-5/8	8-9/16	15-3/16
WIDE	7/8	1-5/16	2-1/16

PANEL HOLE SIZES (FOR SURFACE MOUNTING)

PIPE	7/16	5/8	15/16
BOLT	1/4	9/32	13/32

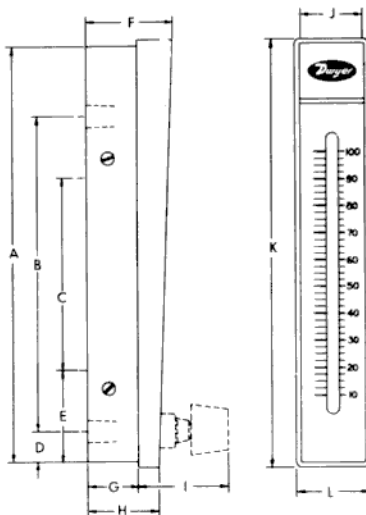


Figure 1

Dwyer Rate-Master® Series RM Flowmeters are furnished in three models (see Figure 1) each available in a broad choice of flow ranges with direct reading scales for air, gas or water. Installation, operation and maintenance are very simple and only a few common sense precautions must be observed to assure long, trouble-free service.

CAUTION

Dwyer Rate-Master(R) flowmeters are designed to provide satisfactory long term service when used with air, water or other compatible media. Refer to factory for information on questionable gases or liquids. Avoid solutions of acids, bases or salts having a pH below 5.0 or above 8.5. Caustic solutions, anti-freeze (ethylene glycol) and aromatic solvents should definitely not be used.

CALIBRATION

Each Dwyer flowmeter is calibrated at the factory. If at any time during the meter's life, you wish to recheck its calibration, do so only with devices of certified accuracy. DO NOT attempt to check the Dwyer Rate-Master® Flowmeter with a similar flowmeter as seemingly unimportant variations in piping and back pressure may cause noticeable differences in the indicated reading. If in doubt, return your Dwyer flowmeter to the factory. It will be calibration checked for you at no charge. Before proceeding with the installation of your Dwyer Rate-Master Flowmeter, check to be sure you have the model and flow range you require.

LOCATION

TEMPERATURE, PRESSURE, ATMOSPHERE, AND VIBRATION: Rate-Master Polycarbonate Flowmeters are exceptionally tough and strong. They are designed for use at pressures up to 100 PSI (RMB units 70 PSI, RMC 35 PSI) and temperatures up to 130 deg. F. **DO NOT EXCEED THESE LIMITS!** The installation should not be exposed to strong chlorine atmospheres or solvents such as benzene, acetone, carbon tetrachloride, etc. The mounting panel should be free of excessive vibration since it may prevent the unit from operating properly.

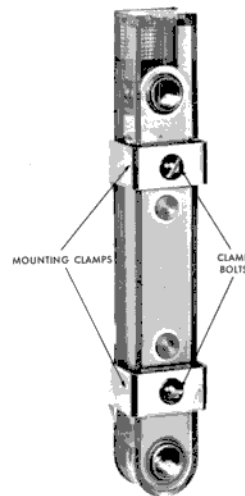


Figure 2

INLET PIPING RUN: It is good practice to approach the flowmeter inlet with as few elbows and restrictions as possible. In every case the inlet piping should be at least as large as the connection to the flowmeter i.e. 1/8" Iron Pipe Size for RMA, 1/4" IPS for RMB and 1/2" IPS for RMC. Length of inlet piping makes little difference for normal pressure fed flowmeters.

For flowmeters on vacuum air service the inlet piping should be as short and open as possible. This will allow operation near atmospheric pressure and thereby insure the accuracy of the device. (Note that for vacuum air service the flow control valve if any, should be on the discharge side of the flowmeter. Either the TMV unit or a separate in line valve may be applied.)

DISCHARGE PIPING: As on the inlet, discharge piping should be at least as large as the flowmeter connection. In addition, for pressure fed flowmeters on air or gas service the discharge piping should be as short and open as possible. This will allow operation of the flow tube at near atmospheric pressure and insure the accuracy of the device. This is of less importance on water or liquid flowmeters since the flowing medium is generally incompressible and moderate back pressure will not affect the accuracy of the instrument as calibrated.

POSITION AND MOUNTING

All Rate-Master Flowmeters must be mounted in a vertical position with the inlet connection at the bottom rear and outlet at top rear.

BEZEL OR THROUGH PANEL MOUNTING: Make the panel cutout using the appropriate dimensions from Figure 1. Flowmeter must fit into the panel freely without force or squeeze.

Insert the Rate-Master Flowmeter from the front of the panel and install the mounting clamps from the rear, insert and tighten the clamp bolts in the locations shown in Figure 2. Do not exceed 5 in./lbs. Make connections to inlet and outlet ports using small amount of RTV sealant or Teflon® thread tape to avoid leakage. Avoid excess torque which may damage flowmeter body.

RATEMASTER® FLOWMETER

Instructions

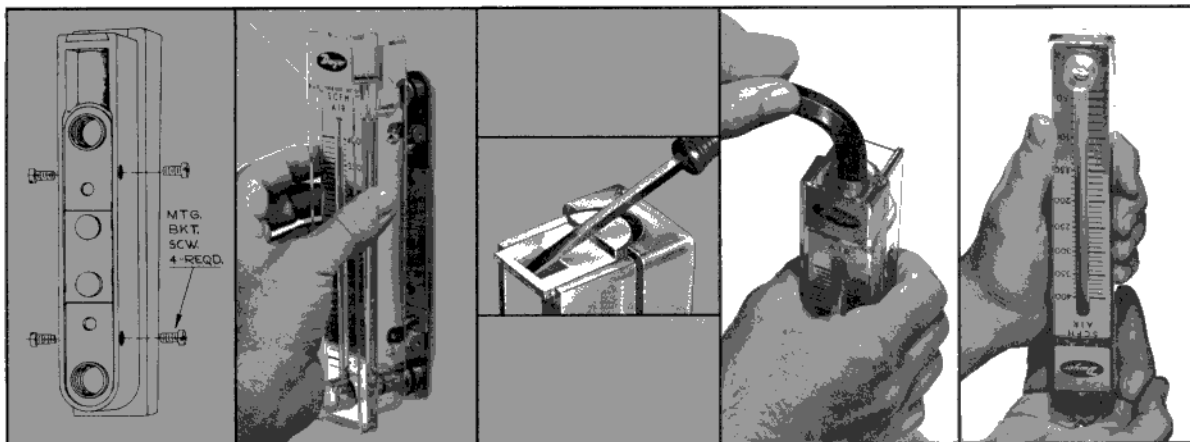


Figure 3

Figure 4

Figure 5

Figure 6

Figure 7

SURFACE MOUNTING: Drill appropriate holes in panel using the dimensions shown in Figure 1. Hold the flowmeter in position in front of the panel and install the clamp bolts through the panel from the rear. (The mounting clamps may be used as washers if desired by installing them backwards or straightening them out.) Pipe up inlet and discharge following the directions in previous sections.

SURFACE MOUNTING ON PIPING ONLY: An alternate method of surface mounting omitting the clamp bolts and supporting the Rate-Master Flowmeter on the connecting piping only is possible. For this method extra long or straight pipe threads should be used so that nuts may be run onto the pipe and later tightened against the back of the panel to retain the unit in proper position. Use the appropriate hole layout information from Figure 1, but omit the small holes.

MOUNTING ON PIPING ONLY WITHOUT PANEL: For a temporary or laboratory type installation, the panel may be omitted altogether and the flowmeter installed directly in rigid piping. Its light weight permits this without difficulty.

OPERATION

To start system, open the valve slowly to avoid possible damage. Rate of flow is read at the point of maximum horizontal width for spherical floats or at the top of the largest diameter for non-spherical floats. Control valves on BV and SSV models are turned clockwise to reduce flow, counter clockwise to increase flow. A nylon insert is provided in the threaded section of the valve stem to give a firm touch to the valve and to prevent change of setting due to vibration.

CAUTION

Do not completely unscrew valve stem unless flowmeter is unpressurized and drained of any liquid. Removal while in service will allow gas or liquid to flow out front of valve body and could result in serious personal injury. For applications involving high pressure and/or toxic gasses or fluids, special non-removable valves are available on special order. Contact factory for details.

MAINTENANCE

The only maintenance normally required is occasional cleaning to assure reliable operation and good float visibility.

DISASSEMBLY: The flowmeter can be disassembled for cleaning simply as follows:

1. Remove valve knob from RMB or RMC — BV or SSV units by pulling the knob forward. It is retained by spring pressure on the stem half-shaft so that a gentle pull will remove it. On RMA-BV or SSV models, turn the valve knob counter-clockwise until the threads are disengaged. Then withdraw the stem from the valve by gently pulling on the knob.

2. Remove the four mounting bracket screws located in the sides of the flowmeter. See Figure 3.

Pull the flowmeter body gently forward away from the back plate and pipe thread connections. Keep the body parallel with the back plate to avoid undue strain on the body. Leave the piping connections intact. There is no need to disturb them. See Figure 4.

3. Remove the slip cap with a push on a screwdriver as shown in Figure 5. Remove the plug-ball stop as shown in Figure 6 using allen wrench sizes as follows: Model RMA — 1/4", Model RMB — 1/2", and Model RMC — 3/4".

4. Take out the ball or float by inverting the body and allowing the float to fall into your hand as shown in Figure 7. (Note: It is best to cover the discharge port to avoid losing the float through that opening.)

CLEANING: The flow tube and flowmeter body can best be cleaned with a little pure soap and water. Use of a bottle brush or other soft brush will aid the cleaning. Avoid benzene, acetone, carbon tetrachloride, alkaline detergents, caustic soda, liquid soaps (which may contain chlorinated solvents), etc. and avoid prolonged immersion which may harm or loosen the scale.

REASSEMBLY: Simply reverse Steps 5A, 1 through 4 and place back in service. A little stop cock grease or petroleum jelly on the "O" rings will help maintain a good seal as well as facilitate assembly. No other special care is required.

ADDITIONAL INFORMATION

For additional flowmeter application information, conversion curves, factors and other data covering the entire line of Dwyer Rate-Master Flowmeters, send for Bulletin F-41.

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DWYER INSTRUMENTS, INC.

P.O. Box 373, Michigan City, Indiana 46360, U.S.A.

Phone: 219/879-8000 Fax: 219/872-9057

Magnehelic® Differential Pressure Gage

OPERATING INSTRUCTIONS



SPECIFICATIONS

Dimensions: 4-3/4" dia. x 2-3/16" deep.

Weight: 1 lb. 2 oz.

Finished: Baked dark gray enamel.

Connections: 1/8" NPT high and low pressure taps, duplicated, one pair side and one pair back.

Accuracy: Plus or minus 2% of full scale, at 70°F. (Model 2000-0, 3%; 2000-00, 4%).

Pressure Rating: 15 PSI (0,35 bar)

Ambient Temperature Range: 20° to 140°F (-7 to 60°C).

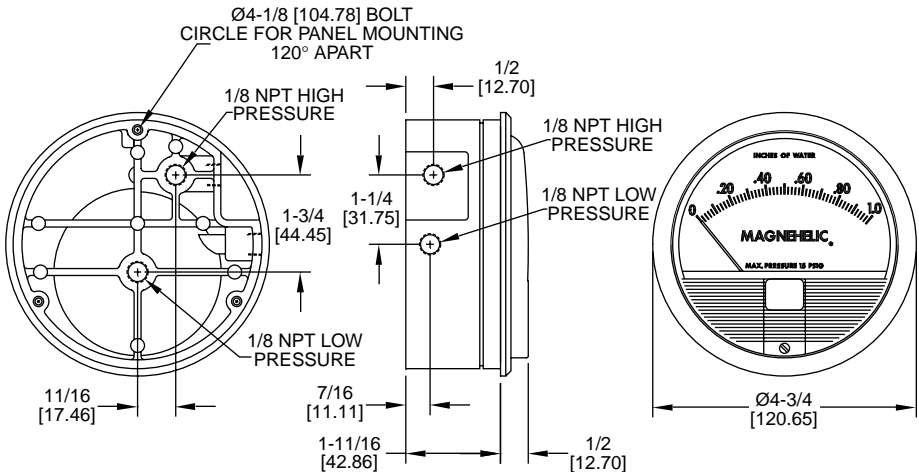
Standard gage accessories include two 1/8" NPT plugs for duplicate pressure taps, two 1/8" NPT pipe thread to rubber tubing adapters, and three flush mounting adapters with screws.



Caution: For use with air or compatible gases only.

For repeated over-ranging or high cycle rates, contact factory.

Not for use with Hydrogen gas. Dangerous reactions will occur.

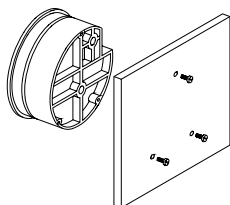


MAGNEHELIC® INSTALLATION

1. Select a location free from excessive vibration and where the ambient temperature will not exceed 140°F. Also, avoid direct sunlight which accelerates discoloration of the clear plastic cover. Sensing lines may be run any necessary distance. Long tubing lengths will not affect accuracy but will increase response time slightly. Do not restrict lines. If pulsating pressures or vibration cause excessive pointer oscillation, consult the factory for ways to provide additional damping.

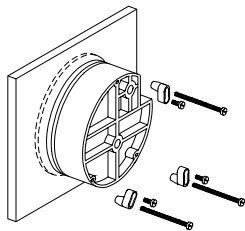
2. All standard Magnehelic gages are calibrated with the diaphragm vertical and should be used in that position for maximum accuracy. If gages are to be used in other than vertical position, this should be specified on the order. Many higher range gages will perform within tolerance in other positions with only zeroing. Low range Model 2000-00 and metric equivalents must be used in the vertical position only.

3. Surface Mounting



Locate mounting holes, 120° apart on a 4-1/8" dia. circle. Use No. 6-32 machine screws of appropriate length.

4. Flush Mounting



Provide a 4-9/16" dia. opening in panel. Insert gage and secure in place with No. 6-32 machine screws of appropriate length, with adapters, firmly secured in place. To mount gage on 1-1/4"-2" pipe, order optional A-610 pipe mounting kit.

5. To zero the gage after installation

Set the indicating pointer exactly on the zero mark, using the external zero adjust screw on the cover at the bottom. Note that the zero check or adjustment can only be made with the high and low pressure taps both open to atmosphere.

Operation

Positive Pressure: Connect tubing from source of pressure to either of the two high pressure ports. Plug the port not used. Vent one or both low pressure ports to atmosphere.

Negative Pressure: Connect tubing from source of vacuum or negative pressure to either of the two low pressure ports. Plug the port not used. Vent one or both high pressure ports to atmosphere.

Differential Pressure: Connect tubing from the greater of two pressure sources to either high pressure port and the lower to either low pressure port. Plug both unused ports.

When one side of the gage is vented in dirty, dusty atmosphere, we suggest an A-331 Filter Vent Plug be installed in the open port to keep inside of gage clean.

A. For portable use of temporary installation use 1/8" pipe thread to rubber tubing adapter and connect to source of pressure with rubber or Tygon tubing.

B. For permanent installation, 1/4" O.D., or larger, copper or aluminum tubing is recommended. See accessory bulletin S-101 for fittings.

Ordering Instructions:

When corresponding with the factory regarding Magnehelic® gage problems, be sure to include model number, pressure range, and any special options. Field repair is not recommended; contact the factory for repair service.

MAINTENANCE

Maintenance: No lubrication or periodic servicing is required. Keep case exterior and cover clean. Occasionally disconnect pressure lines to vent both sides of gage to atmosphere and re-zero. Optional vent valves, (bulletin S-101), should be used in permanent installations.

Calibration Check: Select a second gage or manometer of known accuracy and in an appropriate range. Using short lengths of rubber or vinyl tubing, connect the high pressure side of the Magnehelic gage and the test gage to two legs of a tee. Very slowly apply pressure through the third leg. Allow a few seconds for pressure to equalize, fluid to drain, etc., and compare readings. If accuracy unacceptable, gage may be returned to factory for recalibration. To calibrate in the field, use the following procedure.

Calibration:

1. With gage case, held firmly, loosen bezel, by turning counterclockwise. To avoid damage, a canvas strap wrench or similar tool should be used.
2. Lift out plastic cover and "O" ring.
3. Remove scale screws and scale assembly. Be careful not to damage pointer.
4. The calibration is changed by moving the clamp. Loosen the clamp screw(s) and move slightly toward the helix if gage is reading high, and away if reading low. Tighten clamp screw and install scale assembly.
5. Place cover and O-ring in position. Make sure the hex shaft on inside of cover is properly engaged in zero adjust screw.
6. Secure cover in place by screwing bezel down snug. Note that the area under the cover is pressurized in operation and therefore gage will leak if not properly tightened.
7. Zero gage and compare to test instrument. Make further adjustments as necessary.

Caution: If bezel binds when installing, lubricate threads sparingly with light oil or molybdenum disulphide compound.

Warning: Attempted field repair may void your warranty. Recalibration or repair by the user is not recommended. For best results, return gage to the factory. Ship prepaid to:

Dwyer Instruments, Inc.
Attn: Repair Dept.
102 Indiana Highway 212
Michigan City, IN 46360

Trouble Shooting Tips:

•*Gage won't indicate or is sluggish.*

1. Duplicate pressure port not plugged.
2. Diaphragm ruptured due to overpressure.
3. Fittings or sensing lines blocked, pinched, or leaking.
4. Cover loose or "O" ring damaged, missing.
5. Pressure sensor, (static tips, Pitot tube, etc.) improperly located.
6. Ambient temperature too low. For operation below 20°F, order gage with low temperature, (LT) option.

•*Pointer stuck-gage can't be zeroed.*

1. Scale touching pointer.
2. Spring/magnet assembly shifted and touching helix.

3. Metallic particles clinging to magnet and interfering with helix movement.

4. Cover zero adjust shaft broken or not properly engaged in adjusting screw.

We generally recommend that gages needing repair be returned to the factory. Parts used in various sub-assemblies vary from one range of gage to another, and use of incorrect components may cause improper operation. After receipt and inspection, we will be happy to quote repair costs before proceeding.

Consult factory for assistance on unusual applications or conditions.

Use with air or compatible gases only.

MAINTENANCE

Maintenance: No lubrication or periodic servicing is required. Keep case exterior and cover clean. Occasionally disconnect pressure lines to vent both sides of gage to atmosphere and re-zero. Optional vent valves, (bulletin S-101), should be used in permanent installations.

Calibration Check: Select a second gage or manometer of known accuracy and in an appropriate range. Using short lengths of rubber or vinyl tubing, connect the high pressure side of the Magnehelic gage and the test gage to two legs of a tee. Very slowly apply pressure through the third leg. Allow a few seconds for pressure to equalize, fluid to drain, etc., and compare readings. If accuracy unacceptable, gage may be returned to factory for recalibration. To calibrate in the field, use the following procedure.

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2. Lift out plastic cover and "O" ring.
3. Remove scale screws and scale assembly. Be careful not to damage pointer.
4. The calibration is changed by moving the clamp. Loosen the clamp screw(s) and move slightly toward the helix if gage is reading high, and away if reading low. Tighten clamp screw and install scale assembly.
5. Place cover and O-ring in position. Make sure the hex shaft on inside of cover is properly engaged in zero adjust screw.
6. Secure cover in place by screwing bezel down snug. Note that the area under the cover is pressurized in operation and therefore gage will leak if not properly tightened.
7. Zero gage and compare to test instrument. Make further adjustments as necessary.

Caution: If bezel binds when installing, lubricate threads sparingly with light oil or molybdenum disulphide compound.

Warning: Attempted field repair may void your warranty. Recalibration or repair by the user is not recommended. For best results, return gage to the factory. Ship prepaid to:

Dwyer Instruments, Inc.
Attn: Repair Dept.
102 Indiana Highway 212
Michigan City, IN 46360

Trouble Shooting Tips:

•*Gage won't indicate or is sluggish.*

1. Duplicate pressure port not plugged.
2. Diaphragm ruptured due to overpressure.
3. Fittings or sensing lines blocked, pinched, or leaking.
4. Cover loose or "O" ring damaged, missing.
5. Pressure sensor, (static tips, Pitot tube, etc.) improperly located.
6. Ambient temperature too low. For operation below 20°F, order gage with low temperature, (LT) option.

•*Pointer stuck-gage can't be zeroed.*

1. Scale touching pointer.
2. Spring/magnet assembly shifted and touching helix.

3. Metallic particles clinging to magnet and interfering with helix movement.

4. Cover zero adjust shaft broken or not properly engaged in adjusting screw.

We generally recommend that gages needing repair be returned to the factory. Parts used in various sub-assemblies vary from one range of gage to another, and use of incorrect components may cause improper operation. After receipt and inspection, we will be happy to quote repair costs before proceeding.

Consult factory for assistance on unusual applications or conditions.

Use with air or compatible gases only.



EUROTHERM
CHESSELL

- Red or green 5 digit display
- Universal analog input
- Second analog input
- Four Alarm set-points
- Relay and logic alarm outputs
- Front panel configuration
- IP54 panel sealing
- 85-264Vac universal power supply or 20-29V ac/dc
- Serial communications
- Analog retransmission
- 1/8 DIN size



The 2408*i* is a sophisticated, modular 1/8 DIN process indicator providing a large, accurate display of temperature or other process variables. Standard features include large display, 4 alarm set-points, change-over relay output, alarm acknowledge inputs.

Options include Modbus® communications, analog retransmission, 24V dc transmitter power supply, strain gauge bridge supply and relays, contact input/outputs.

Display

The 2408*i* display utilizes five large (15.9mm), high visibility LED characters in either red or green. A resolution of up to three decimal places is selectable on configuration. Alarm indication is clearly visible.

Inputs

Use of the very latest in Application Specific Integrated Circuit (ASIC) and surface mount technology gives the input circuit high accuracy and stability. The universal analog input allows selection between nine internally stored thermocouple types, Pt100 resistance thermometer or linear voltage measurements. Linear inputs can be scaled to the desired display range.

The 2408*i* also has logic inputs that can be used, among other functions, for external alarm acknowledgement and to disable all front panel keys to prevent operator access. Sensor break detection can be configured to detect open circuit inputs.

Configuration

Input configuration is carried out in the factory prior to dispatch, this configuration may be modified at any time via the front panel keys by following menu driven prompts. Configuration data is stored in non-volatile EEPROM memory, protecting user entered data during power loss. Access to configuration mode is via password to ensure security.

Alarm Features

The internal 'soft' alarm features include 4 set-points. Each alarm is configured as high, low, rate of change or deviation and latched or non-latching. There is an additional mode called alarm blocking. Alarm blocking ensures that after power up, the process value must first enter a good state before the alarm becomes active. This is particularly useful for low alarms which can be 'blocked' while the process is warming up.

An alarm acknowledge button is provided as standard on the front panel for easy acknowledgement of alarms.

Outputs

The 2408*i* is fitted as standard with a single fail safe relay output. Further relays are available if required.

User Calibration

User calibration can be applied to correct for sensor errors and to match existing instrumentation. A zero offset and/or two point calibration can be applied in engineering units.

**Model 2408i
Indicator
Specification
Sheet**

Warranty

Warranty is 3 years, return to factory, from purchase date.

Option modules

The 2408*i* has 3 option module slots where option modules can be fitted. These option modules can be selected from:

- Additional single or double output relay
- DC retransmission
- Triple contact input or output
- 20mA transmitter power supply
- Strain gauge transducer supply
- Second analog input
- PDS signal from series 2000 controller

Relay module

The relay module can be specified either as a single relay, single pole change-over module or as a twin relay, single pole module.

DC retransmission module

DC retransmission can be specified to retransmit either PV, set-point or error between primary and secondary input. This retransmission can be configured as 0-20mA, 4-20mA or 0-5V, 1-5V, or 0-10V dc.

Triple contact input module

Each of the triple contact inputs can be configured for the following:

- Alarm acknowledge
- Keylock to prevent operator access
- Select primary or secondary input for display
- Initial tare correction on strain gauge input.

These inputs are isolated from power and signal inputs.

Triple contact output module

Each of the triple logic outputs can be configured as an alarm output to drive external circuits. These outputs are isolated from power and signal inputs.

Transmitter power supply module

The transmitter power supply module is designed to power a 0 or 4-20mA transmitter in a stand alone application. Capable of driving 20mA at 24V dc.

Strain gauge bridge supply module

The strain gauge bridge supply can be software configured as either a 5V or 10V module for a bridge resistance between 300 Ω and 10k Ω . This module isolated from power and signal inputs.

Secondary analog input module

A second analog input can be fitted (module 3 only) to enable display of a secondary parameter. The second input can also be used to monitor the analog output of a set-point value from a controller set-point generator giving a valuable independent monitor on a process.

Communications

Communications can be fitted using either RS232, RS485 4-wire or RS485 2-wire utilizing either Modbus[®], EI Bisynch (ASCII) or ProfiBus-DP protocol for communications with host PC, PLC or DCS systems.

Pulse Density Signal (PDS)

This option allows the monitoring of a set-point generated from a series 2000 controller from Eurotherm Controls for alarm independent alarm monitoring of the process from the controller set-point.

Standard Accessories

The 2408*i* is supplied as standard with two panel retaining clips, a 2.49W, 1%, shunt resistor suitable for 0 or 4-20mA input signals, a relay snubber device to reduce wear to the relay contacts, an engineering units label set and a user instruction leaflet.

TECHNICAL SPECIFICATION

General

Display	5 digit, red or green with up to 3 decimal places. 15.9mm high characters
Supply voltage	100 to 240Vac -15%, +10%, 48 to 62Hz or 24Vac/dc -15%, +20%. Maximum consumption 5watts
Operating ambients	0 to 55°C, 5 to 95%RH, non-condensing
Storage temperature	-30°C to +75°C.
Panel sealing	IP54

Analog inputs

Low level input range	-100 to +100mV
High level input range	0 to 20mA and 0 to 10Vdc
Resolution	<2 μ V for low level inputs, <0.2mV for high level inputs.
Sample rate	9hz
Input types	Thermocouple: J, K, T, L, N, R, S, B, Patinell II Resistance thermometer: 100 Ω Platinum Process: 0-20mA and 0-10Vdc Factory downloadable inputs: Contact Eurotherm Chessel for a full list
Input linearization	Better than 0.2°C for thermocouple inputs. 8-point customer fit and square root extraction available
Calibration accuracy	\pm 0.25% of reading, or \pm 1°C, or \pm 1 LSD whichever is the greater
Cold junction compensation	>30 to 1 rejection of ambient temperature change
Input filtering	Adjustable OFF to 999.9 seconds

Fixed Digital inputs 1 & 2

Rating	Contact closure or open collector inputs powered from the controller. Open circuit voltage: 22 volts (nominal). Short circuit current: 20mA (nominal). OFF state resistance:>28k Ω . ON state resistance:<100 Ω . Non-isolated from PV input.
Digital input functions (Note: Also applies to the triple contact and digital inputs.)	Alarm acknowledge, keylock, remote setpoint select, second process value select, tare correction, automatic span and zero calibration initiation, or purely as a telemetry input.

Plug-in Module ratings

Single and dual relays	Maximum: 264Vac, 2A resistive. Minimum operating voltage and current: 12Vdc, 100mA
DC retransmission	Scalable between 0-20mA and 0-10Vdc. Resolution 1 part in 10,000
Transmitter supply	Isolated 20mA, 24Vdc
Strain gauge bridge supply	Isolated. Software selectable 5V or 10Vdc. Bridge resistance 300 Ω to 10K Ω
Triple contact (or open collector) input	Isolated. Contact closure or open collector input powered from the controller. Open circuit voltage: 22volts (nominal). Short circuit current: 8mA (nominal). OFF state resistance:>28K Ω . ON state resistance:<100 Ω .
Triple digital input	Isolated. Externally powered input. OFF state: -3 to 5vdc. ON state 10.8 to 30Vdc. Input impedance: approx 6K Ω .
Triple digital output	Isolated. Current sourcing outputs 8mA, 12Vdc per channel

Digital communications

Module types	RS232, RS422 (4-wire), RS485 (2-wire) up to 10.2Kbaud. High speed RS485 for Profibus-DP
Protocols	Modbus, EI-Bisynch (ASCII) and Profibus-DP

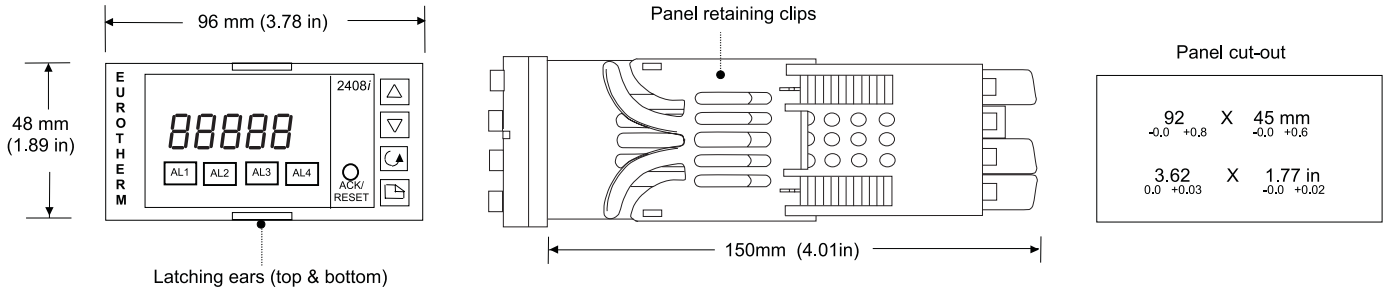
PDS module

Function	Remote set-point input from master series 2000 controller
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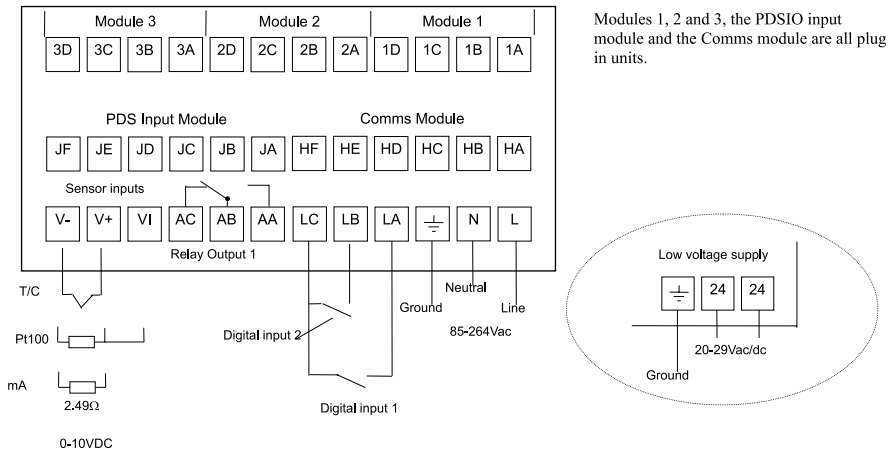
Safety Standards

EMC standards	EN 61010 and EN50082-2 generic standard for industrial environments
Safety standard	EN 61010, installation category II. Pollution degree 2. All isolated inputs and outpus have reinforced insulation to protect against electric shock.
Atmosphere	Not suitable for use above 2000m or in explosive or corrosive atmospheres

DIMENSIONS



ELECTRICAL CONNECTIONS



Modules 1, 2 and 3, the PDSIO input module and the Comms module are all plug in units.

PLUG-IN MODULES 1, 2, AND 3-CONNECTIONS

The module number precedes the terminal identity letter given in the table below.

Module Type	Terminal identity				Possible Functions
	A	B	C	D	
Relay, changeover					Alarm or Event
Dual relay					Alarm or Events
DC retransmission	+	-			Retrans. of PC
Transmitter supply	+	-			To power transmitters
Strain Gauge Bridge supply (see note 1 below)	+	-	See wiring diagram		To power strain gauges
					Thermocouple
					PRT
					mA (2.49 sense resistor)
		+	-		
	+	-			millivolts
	+	-			0 - 10Vdc
Triple contact input	ip1	lp2	lp3	Com	
Triple digital input	ip1	lp2	lp3	Com	
Triple digital output	op 1	op 2	op 3	Com	

COMMS MODULE

Module type	Terminal identity					
	HA	HB	HC	HD	HE	HF
RS232	-	-	-	Com	Rx	Tx
RS485 (2-wire)	-	-	-	Com	A (+)	B (-)
RS422 (4-wire)	-	Rx+	Rx-	Com	Tx+	Tx-

PDS INPUT MODULE

	Terminal identity		
	JD	JE	JF
Setpoint Input	-	Signal	Common

GENERAL INFORMATION

MODEL 30 SERIES MIDGET PRECISION REGULATOR

APPLICATIONS

The Model 30 Series Midget Precision Regulator is designed for use in systems which require precision pressure control.

The combination of high capacity and compact size make the Model 30 Series an excellent choice for a wide range of precision applications including: Precise Control of Paper Machinery Felt Guides, Supply of a Precise Repeatable Signal to a Pneumatic Clutch, or Control of Cylinder Supply Pressure.

FEATURES

Performance

- The Model 30 Series is sensitive to 1/4" Water Column variation which permits use in precision processes.
- A Compensating Diaphragm allows the regulator to remain unaffected by supply pressure changes.

Functional

- Flow of up to 40 SCFM with 100 psig Supply allow use in applications with high flow requirements.

Physical

- A Separate Control Chamber and Aspirator Tube isolates the diaphragm from the main flow eliminating hunting and buzzing.
- Construction with Standard Removable Components allows in-line servicing.

OUTLINE DIMENSIONS

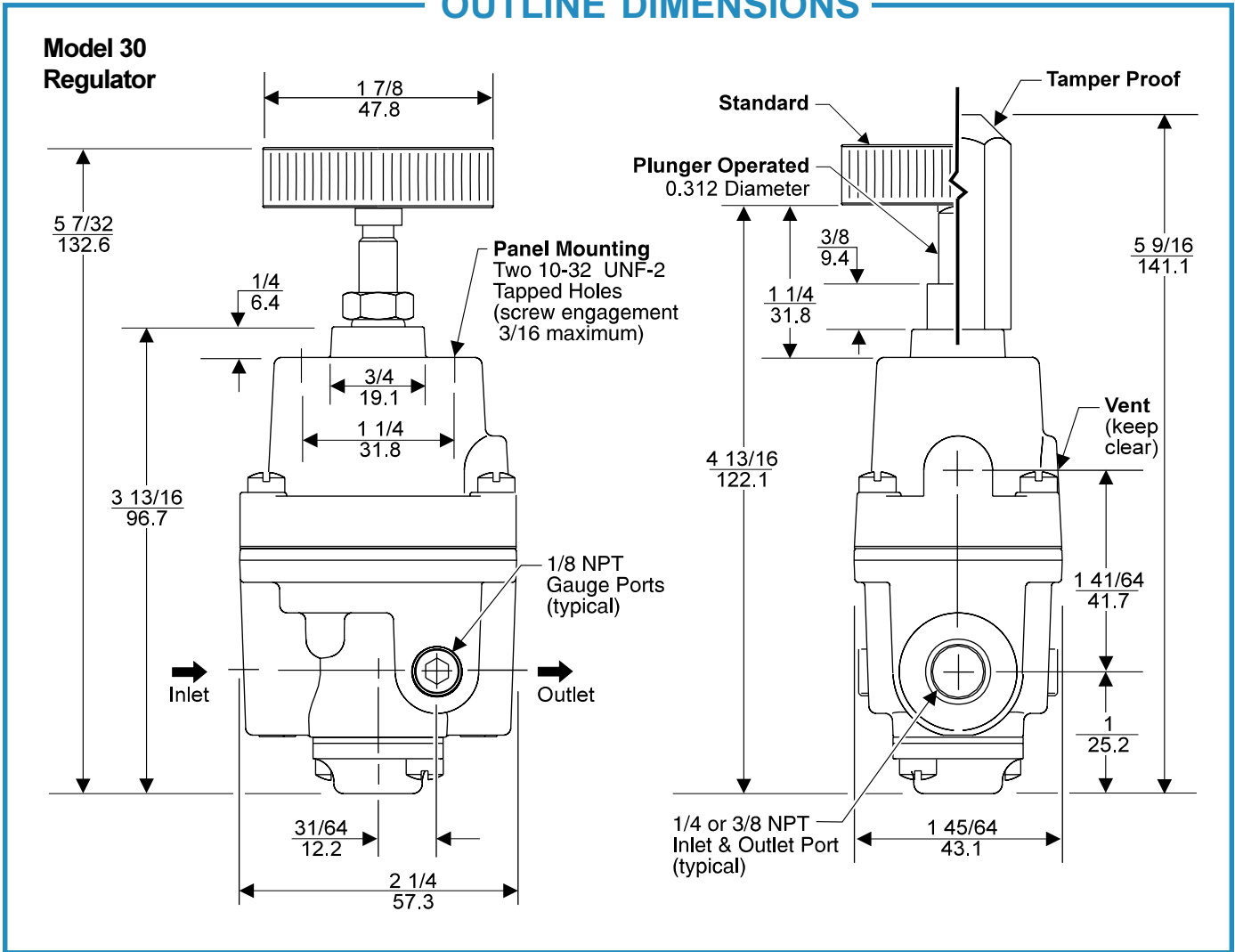


Figure 1. Outline Dimensions.

SPECIFICATIONS

FUNCTIONAL SPECIFICATIONS

Supply Pressure	250 psig, [17.0 BAR] (1700 kPa) Maximum
Flow Capacity (SCFM)	40 (68 m ³ /HR) @ 100 psig, [7.0 BAR], (700 kPa) supply & 20 psig, [1.5 BAR], (150 kPa) setpoint.
Exhaust Capacity (SCFM)	2.0 (3.4 m ³ /HR) where downstream pressure is 5 psig, [.35 BAR], (35 kPa) above 20 psig, [1.5 BAR], (150 kPa) setpt.
Ambient Temperature	-40° F to +200° F (-40° C to +93° C)

PERFORMANCE SPECIFICATIONS

Sensitivity	1/4" (.63 cm) Water Column.
Supply Pressure Effect	Less than 0.2 psig, [.014 BAR], (1.4 kPa) for 100 psig, [7.0 BAR], (700 kPa) change in supply pressure.
Materials of Construction	Body and Housing Aluminum Trim Brass Diaphragms Nitrile on Dacron

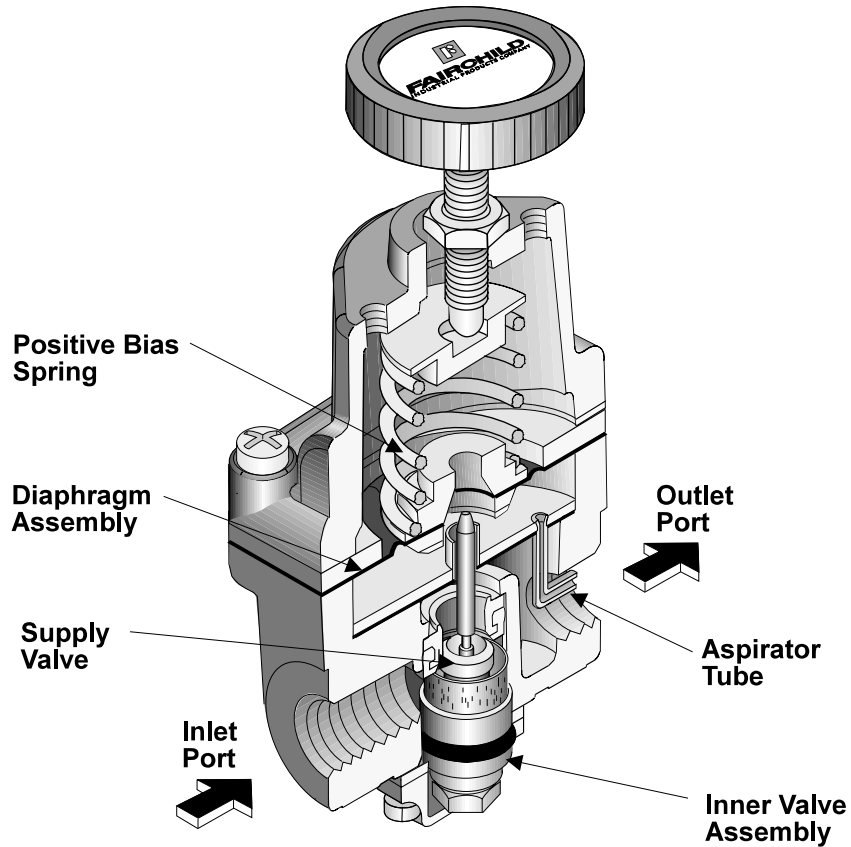


Figure 3. Model 30 Detail Drawing.

OPERATING PRINCIPLES

The Model 30 Regulator uses the force balance principal to control the movement of the valve assembly which in turn controls the output pressure. When the regulator is adjusted for a specific set point, the downward force of the Positive Bias Spring causes the Diaphragm Assembly to move downward. The Supply Valve opens and allows air to pass to the Outlet Port. As the set point is reached, the downward force exerted by the Positive Bias Spring is balanced by the upward force of the downstream pressure acting on the bottom of the Diaphragm Assembly. The resultant force moves the Supply Valve upward to reduce the flow of air to the Outlet Port.

Outlet pressure is maintained as a result of balance between forces acting on the top and bottom of the Diaphragm Assembly. For more information, see Figure 3. "Model 30 Detail Drawing" above.

INSTALLATION

For Installation Instructions refer to the *Fairchild Model 30 Midget Precision Regulator IOM, IS-10000030*.

TYPICAL APPLICATIONS

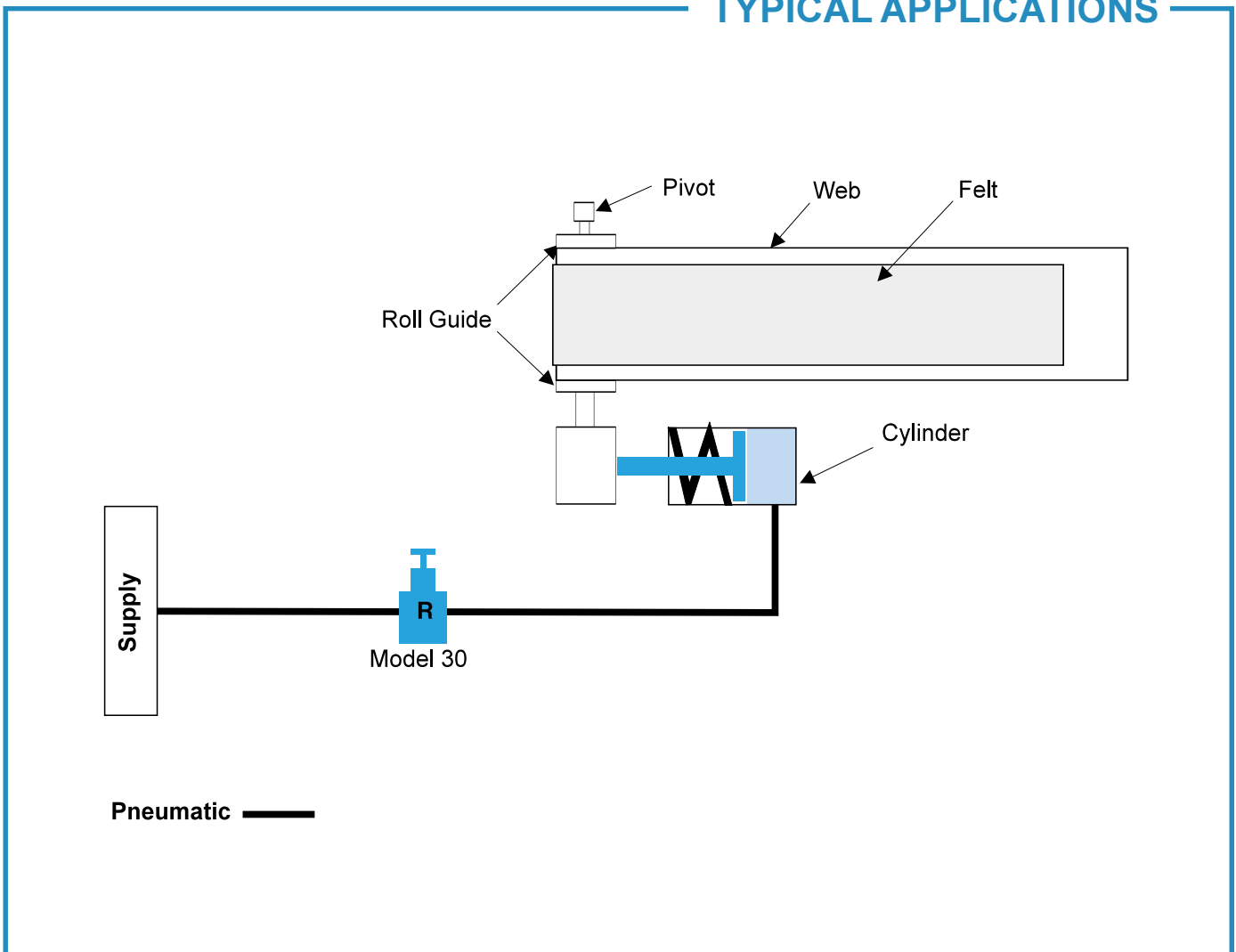


Figure 4. Paper Machinery Felt Guide Application for the Model 30 Regulator.

TYPICAL APPLICATIONS

The Model 30 Regulator is used to precisely control the position of a paper machinery felt guide. The roll guide on which the felt travels is attached to a pivot at the opposite end. Air is supplied to the inlet port of the Model 30 and the range screw is adjusted for a specific pressure input to the air cylinders.

The air cylinder piston is attached to a rod which exerts pressure against the roll guide axle. As the roll guide axle turns around the pivot, the web will move along the roll guide toward one side or the other as the air cylinder rod extends or retracts. Precise corrections are made by adjusting the regulator range screw. For more information, see Figure 4. "Paper Machinery Felt Guide Application for the Model 30 Regulator" above.

GENERAL INFORMATION

MODEL 1000

Pneumatic Precision Regulator

APPLICATIONS

The Model 1000 Pneumatic Precision Regulator is capable of precision control of high forward and exhaust flows.

FEATURES

Performance

- The Model 1000 is sensitive to 1/2" Water Column which permits use in precision applications.
- A Balanced Supply Valve minimizes the effect of supply pressure variation.
- Aspirator Tube minimizes downstream pressure droop under flow conditions.
- Soft Supply and Exhaust Seats minimize air consumption.

Functional

- Flow of up to 50 SCFM with 100 psig Supply allows use in applications requiring high flow.

Physical

- A separate Control Chamber isolates the diaphragm from the main flow, eliminating hunting and buzzing.
- Unit Construction permits servicing without removing from line.

NOTE:

The information for this catalog sheet is being upgraded to electronic format and will be available soon. Please go to the Information Request section of this web site to order the latest printed revision.

Fisher Controls

Instruction Manual

Type 67, 67H, 67HR, 67R, 67SS, and 67SSR Regulators Without Filters



Form 5040

Introduction

Scope of Manual

This manual describes and provides instructions and parts lists for the Type 67, 67H, 67HR, 67R, 67SS, and 67SSR regulators without filters. These regulators usually are shipped separately for line or panel mounting, although sometimes they are shipped installed on other equipment. Instructions and parts lists for other equipment, as well as for other 67 Series regulators not covered in this manual, are found in separate manuals.

Product Description

Type 67, 67H, 67HR, 67R, 67SS, and 67SSR self-operated, small-volume regulators (figure 1) provide constant reduced pressures in a variety of applications. Although most of these regulators may be used only with air or other

gases, or certain liquefied gases, those with brass or stainless steel bodies additionally may be used for water and similar liquid service.

A Type 67HR, 67R, or 67SSR regulator has an integral low-capacity internal relief valve. In these constructions, the stem seats against a soft-seated orifice in the diaphragm assembly. A downstream pressure increase above the outlet pressure setting moves the diaphragm assembly off the stem, venting the excess pressure through a hole drilled or tapped in the spring case.

Specifications

Table 1 gives some general Type 67, 67H, 67HR, 67R, 67SS, and 67SSR regulator ratings and other specifications. A label on the spring case gives the recommended and actual control spring range for a given regulator as it comes from the factory.



W1996

**TYPE 67 OR 67R REGULATOR
WITH HANDWHEEL AND SPRING
CASE FOR 3-HOLE PANEL MOUNTING**



W2000

**STANDARD TYPE 67H OR 67HR
REGULATOR WITH PRESSURE GAUGE**



W4620-1

**TYPE 67SS OR 67SSR REGULATOR
WITH CLOSING CAP**

Figure 1. Type 67, 67H, 67HR, 67R, 67SS, and 67SSR Regulators Without Filters



Table 1. Specifications

TYPE NUMBER DESCRIPTION	Type 67: Regulator with aluminum body and spring case Type 67R: Type 67 with internal relief Type 67H: Regulator with brass body and spring case Type 67HR: Type 67H with internal relief Type 67SS: Regulator with stainless steel body and 1/4-inch NPT tapped stainless steel spring case Type 67SSR: Type 67SS with internal relief	OUTLET PRESSURE RANGES	3 to 100 psig (0.21 to 6.9 bar) with the springs shown in parts list key 9
BODY SIZE AND END CONNECTION STYLE	1/4-inch NPT screwed	MAXIMUM EMERGENCY OUTLET PRESSURE⁽¹⁾	50 psig (3.4 bar) over outlet pressure setting, or 100 psig (7.6 bar), whichever is greater
MAXIMUM ALLOWABLE INLET PRESSURE⁽¹⁾	Type 67 or 67R Regulator: 250 psig (17 bar) Type 67H, 67HR, 67SS, or 67SSR Regulator: 400 psig (28 bar)	INTERNAL RELIEF PERFORMANCE (TYPE 67HR, 67R, OR 67SSR REGULATOR ONLY)	Low capacity for seat leakage only; external relief valve must be provided if inlet pressure can exceed maximum emergency outlet pressure
		TEMPERATURE CAPABILITIES⁽¹⁾	Nitrile Parts: -20°F to 150°F (-29°C to 66°C) Fluoroelastomer Parts: 0°F to 350°F (-18°C to 177°C)
		PRESSURE REGISTRATION	Internal

1. The pressure/temperature limits in this manual and any applicable code or standard limitation, must not be exceeded.

Installation



WARNING

Personal injury, property damage, equipment damage, or leakage due to escaping gas or bursting of pressure-containing parts may result if this regulator is over-pressured or is installed where service conditions could exceed the limits given in table 1, or where conditions exceed any ratings of the adjacent piping or piping connections. To avoid such injury or damage, provide pressure-relieving or pressure-limiting devices (as required by the appropriate code, regulation, or standard) to prevent service conditions from exceeding those limits. A Type 67HR, 67R, or 67SSR regulator, because of its low-capacity internal relief, does provide very limited downstream overpressure protection, but it should not be considered complete protection against overpressure.

Additionally, physical damage to the regulator could cause personal injury or property damage due to escaping gas. To avoid such injury or damage, install the regulator in a safe location.

Regulator operation within ratings does not preclude the possibility of damage from debris in the lines or from external sources. A regulator should be inspected for damage periodically and after any overpressure condition.

Note

If the regulator is shipped mounted on another unit, install that unit according to the appropriate instruction manual.

1. Only personnel qualified through training and experience should install, operate, and maintain a regulator. For a regulator that is shipped separately, make sure that there is no damage to, or foreign material in, the regulator. Also ensure that all tubing and piping have been blown free.

2. Install the regulator so that flow through it is from IN to OUT as marked on the regulator body. Panel-mounting cutout dimensions are shown in figure 2 for a Type 67, 67H, 67HR, or 67R regulator and in figure 3 for a Type 67SS or 67SSR regulator.

WARNING

A regulator may vent some gas to the atmosphere. In hazardous or flammable gas service, vented gas may accumulate and cause personal injury, death, or property damage due to fire or explosion. Vent a regulator in hazardous gas service to a remote, safe location away from air intakes or any hazardous area. The vent line or stack opening must be protected against condensation or clogging.

3. A clogged spring case vent hole may cause the regulator to function improperly. To keep this vent hole from being plugged (and to keep the spring case from collecting moisture, corrosive chemicals, and other foreign material) orient the vent to the lowest possible point on the spring case or otherwise protect it. Inspect the vent hole regularly to make sure it has not been plugged. Spring case vent hole orientation may be changed by rotating the spring case with respect to the regulator body. A Type 67, 67H, 67HR, 67R, 67SS, or 67SSR regulator with a tapped spring case may be remotely vented by first removing the vent screen if used (key 47, figure 3) and installing obstruction-free tubing or piping into the 1/4-inch NPT vent tapping. Provide protection on a remote vent by installing a screened vent cap into the remote end of the vent pipe.

4. For use in regulator shutdown, install upstream and downstream vent valves or provide some other suitable means of properly venting the regulator inlet and outlet pressures.

5. If using pipe, apply a good grade of pipe compound to the pipe threads before making the connections.

6. Install tubing or piping into the 1/4-inch NPT inlet connection on the body assembly (key 1, figure 2 or 3) and also into the 1/4-inch NPT outlet connection, unless this connection already has been factory-piped to another unit.

Startup and Adjustment

Key numbers are referenced in figure 2 for a Type 67, 67H, 67HR, or 67R regulator and in figure 3 for a Type 67SS or 67SSR regulator.

1. With proper installation completed and downstream equipment properly adjusted, slowly open the upstream and downstream shutoff valves while using pressure gauges to monitor pressure.

2. Regulator outlet pressure may be monitored on a gauge installed at some point downstream from the regulator. Or, outlet pressure may be monitored on a gauge (key 21, not shown) installed on the body of a regulator with a tapped side outlet. If the regulator has no gauge but the side outlet is tapped and plugged, the pipe plug (key 21, figure 3) may be removed and a gauge temporarily installed for monitoring.

WARNING

To avoid personal injury, property damage, or equipment damage caused by bursting of pressure containing parts or explosion of accumulated gas, never adjust the control spring to produce an outlet pressure higher than the upper limit of the outlet pressure range for that particular spring. If the desired outlet pressure is not within the range of the control spring, install a spring of the proper range according to the diaphragm parts maintenance procedure.

Note

Each regulator is factory-set for the pressure setting specified on the order. If no setting was specified, outlet pressure was factory-set at the midrange of the control spring.

3. If outlet pressure adjustment is necessary, monitor outlet pressure with a gauge during the adjustment procedure. A standard Type 67, 67H, 67HR, 67R, 67SS, or 67SSR regulator is adjusted by loosening the locknut (key 11, if used) and turning the adjusting screw or handwheel (key 10) clockwise to increase, or counterclockwise to decrease, the outlet pressure setting. Then tighten the locknut (if used) to maintain the adjustment position. On some regulators, a closing cap (key 28, figure 3) must be removed before adjustment and replaced afterward.

Shutdown

First close the nearest upstream shutoff valve and then close the nearest downstream shutoff valve to vent the regulator properly. Next, open the vent valve between the regulator and the downstream shutoff valve nearest to it. All pressure between these shutoff valves will be released through the open vent valve, since a Type 67, 67H, 67HR, 67R, 67SS, or 67SSR regulator remains open in response to the decreasing downstream pressure.

Maintenance

Regulator parts are subject to normal wear and must be inspected and replaced as necessary. The frequency of inspection and replacement of parts depends upon the severity of service conditions and upon applicable codes and government regulations.

If used, the inlet screen assembly (key 24, figure 3) may need to be cleaned periodically.



WARNING

To avoid personal injury, property damage, or equipment damage caused by sudden release of pressure or explosion of accumulated gas, do not attempt any maintenance or disassembly without first isolating the regulator from system pressure and relieving all internal pressure from the regulator.

Note

If sufficient clearance exists, the body assembly (key 1) may remain mounted in a line or panel or on other equipment unless the inlet screen assembly (key 24 if used, figure 3) needs to be cleaned or replaced or the entire regulator will be replaced.

Unless otherwise noted, key numbers are referenced in figure 2 for a Type 67, 67H, 67HR, or 67R regulator and in figure 3 for a Type 67SS or 67SSR regulator.

Trim Parts

1. Remove the body plug (key 3) to let the plug spring (key 6), plug spring seat (key 5), and plug/stem assembly (key 4) drop freely from the body.
2. Inspect the removed parts and body plug gasket (key 23, figure 2) or body plug O-ring (key 23, figure 3), replace as necessary, and make sure the plug seating surfaces are free from debris.
3. Install the body plug gasket (key 23, figure 2) or body plug O-ring (key 23, figure 3) over the body plug (key 3).
4. Stack the plug spring (key 6), plug spring seat (key 5), and plug/stem assembly on the body plug (key 3), and install the body plug with stacked parts into the body assembly (key 1).

Diaphragm Parts

1. Remove the closing cap if used (key 28, figure 3), loosen the locknut if used (key 11), and back out the adjusting screw or handwheel (key 10) until compression is removed from the control spring (key 9).
2. Remove the machine screws (key 12) and separate the spring case (key 2) from the body assembly (key 1). Remove the control spring seat and control spring (keys 8 and 9).
3. Remove the diaphragm assembly (key 7) and inspect the diaphragm.
4. Install the diaphragm assembly (key 7) and push down on it to see if the plug/stem assembly (key 4) strokes smoothly and approximately 1/16 inch (2 mm).

Note

In step 5, if installing a control spring of a different range from the one that was removed, be sure to delete the spring range originally appearing on the control spring label (key 20, not shown) and indicate the new spring range.

5. Sparingly apply Never-Seez⁽¹⁾ lubricant (key 46, figure 3) or equivalent to the control spring seat (key 8). Stack the control spring and control spring seat (keys 9 and 8) onto the diaphragm assembly (key 7).
6. Install the spring case (key 2) on the body assembly (key 1) with the vent hole oriented to prevent clogging or entrance of moisture. Install the machine screws (key 12) and torque to 5 to 7 foot-pounds (7 to 9 N•m).
7. When all maintenance is complete, refer to the startup and adjustment section to put the regulator back into operation and adjust the pressure setting. Tighten the locknut if used (key 11).
8. With a Type 67SS or 67SSR regulator, install a replacement closing cap gasket (key 32, figure 3) if necessary.
9. Install the closing cap if used (key 28, figure 3).

Parts Ordering

When corresponding with the Fisher sales office or sales representative about this regulator, include the type number and all other pertinent information stamped on the bottom of the body and on the control spring label. Specify the eleven-character part number when ordering new parts from the following parts list.

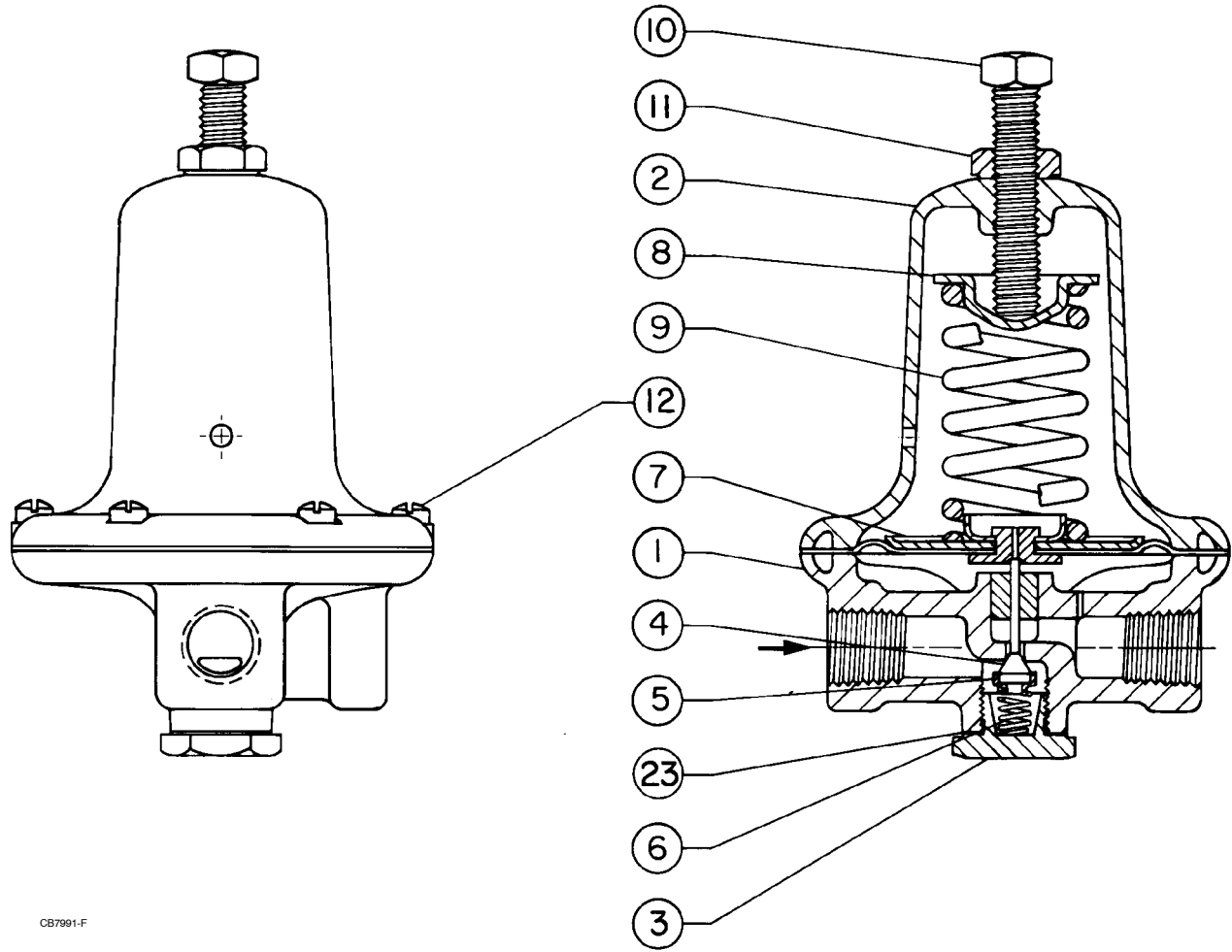
Parts List (figure 2 and 3)

Key	Description	Part Number	Key	Description	Part Number		
	Parts Kits (included are keys 4, 5, 6, 7, and 23) W/nitrile & nonbrass parts to provide sour gas corrosion resistance capability ⁽¹⁾ For Type 67 regulator w/o internal relief R67 X0000N12 For Type 67R regulator w/ internal relief R67R X000N12 W/nitrile & nonbrass parts for other than sour gas corrosion resistance applications For Type 67SS regulator w/o internal relief R67SS X00012 For Type 67SSR regulator w/ internal relief R67SSR X0012 W/nitrile & brass parts for other than sour gas corrosion resistance applications For Type 67 or 67H regulator w/o internal relief R67 X0000012 For Type 67HR or 67R regulator w/internal relief R67R X000012		2	Spring Case (Continued) For 1-hole panel mtg. aluminum 20B0667 X012 For 3-hole panel mounting Prepainted zinc w/stainless steel bushing Right-hand thread 3B9855 T0022 Left-handed thread 3L2230 000A2 Brass w/o bushing 11A4695 X012 For Type 67H or 67HR W/drilled-hole vent, brass 1D5205 13012 W/1/4-inch NPT vent tapping, brass 1E1674 000A2 For 1-hole panel mtg, aluminum 20B0667 X012 For 3-hole panel mtg, zinc w/ stainless steel bushing 3B9855 T0022 For Type 67SS or 67SSR stainless steel 28A9277 X012 aluminum 25A6220 X012	6	Plug Spring For Type 67 or 67R To provide sour gas corrosion resistance capability, Inconel ⁽²⁾ 19A2860 X012 For other than sour gas corrosion resistance applications, stainless steel For use w/nitrile or fluoroelastomer plug 1B7979 37022 For use w/metal plug 1E7013 37022 For Type 67H, 67HR, 67SS, or 67SSR, stainless steel 1B7979 37022	
1	Body Assembly For Type 67 or 67R To provide sour gas corrosion resistance capability, aluminum w/316 stainless steel bushing One outlet 1B7971 X0212 Two outlets 1B7971 X0202 For other than sour gas corrosion resistance applications Aluminum w/brass bushing One outlet 1B7971 000C2 Two outlets 1B7971 000E2 Aluminum w/stainless steel bushing One outlet 1B7971 000D2 Two outlets 1B7971 000F2 For Type 67H or 67HR, brass w/brass bushing One outlet 1B7971 000A2 Two outlets 1B7971 000B2 For Type 67SS or 67SSR, stainless steel with stainless steel bushing 1B7971 X0222		3	Body Plug For Type 67 or 67R, aluminum 1B7975 09032 For Type 67H or 67HR, brass 1B7975 14012 For Type 67SS or 67SSR, 316 stainless steel 1B7975 35072	7*	Diaphragm Assembly For Type 67 regulator w/o internal relief To provide sour gas corrosion resistance capability, nitrile diaphragm w/pl steel diaphragm plate and pusher post 1B7980 000B2 For other than sour gas corrosion resistance applications Nitrile diaphragm w/pl steel diaphragm plate and pusher post 1B7980 000B2 Nitrile diaphragm w/pl steel diaphragm plate and stainless steel pusher post 1B7980 X00A2 Fluoroelastomer diaphragm w/pl steel diaphragm plate and pusher post 1B7980 000C2 For Type 67H regulator w/o internal relief, nitrile diaphragm w/pl steel diaphragm plate and brass pusher post 1J3628 000A2 For Type 67HR regulator w/internal relief, nitrile diaphragm w/brass relief valve seat and soft molded insert 19A7667 X012 For Type 67R regulator w/internal relief To provide sour gas corrosion resistance capability, nitrile diaphragm w/aluminum relief valve seat and soft molded insert 19A7667 X032	
2	Spring Case For Type 67 or 67R W/drilled-hole vent, aluminum 2B7974 08012 W/1/4-inch NPT vent tapping To provide sour gas corrosion resistance capability, aluminum 25A6220 X012 For other than sour gas corrosion resistance applications, brass W/o closing cap 1E1674 000A2 W/closing cap 10A3075 X012		4*	Plug/Stem Assembly To provide sour gas corrosion resistance capability (for Type 67 or 67R only), nitrile plug w/stainless steel stem 1D5604 000B2 For other than sour gas corrosion resistance applications Nitrile plug w/brass stem 1D5604 000A2 Nitrile plug w/stainless steel stem 1D5604 000B2 Fluoroelastomer plug w/brass stem 1N3798 71662 Fluoroelastomer plug w/stainless steel stem 1N3798 000C2 All-brass plug and stem 1C7503 14012 All-stainless steel plug and stem 1C7503 35032		5	Plug Spring Seat For Type 67 or 67R For use w/stainless steel stem and to provide sour gas corrosion resistance capability, 316 stainless steel 1L2511 35072 For use w/brass stem and for other than sour gas corrosion resistance applications, aluminum 1E5322 11052 For Type 67H or 67HR, 1. 1. brass 1J3630 14012 For Type 67SS or 67SSR, 316 stainless steel 1L2511 35072

*Recommended spare part.

1. As detailed in National Association of Corrosion Engineers (NACE) standard MR-01-75.

2. Trademark of International Nickel Co.

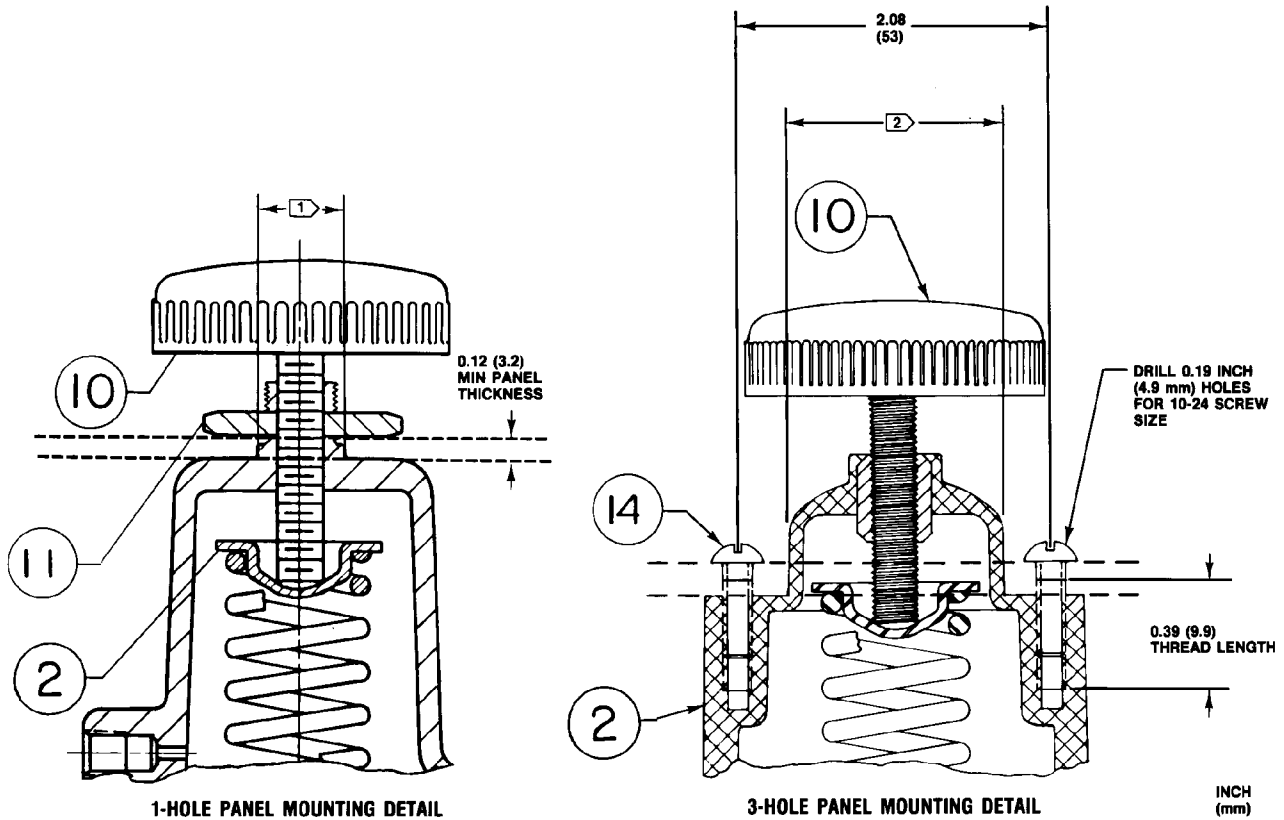


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COMPLETE REGULATOR WITHOUT CLOSING CAP

Figure 2. Type 67 and 67R Regulator Assemblies (Also Typical of Types 67H and 67HR)

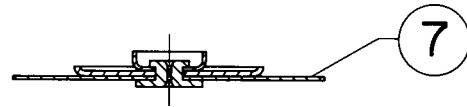
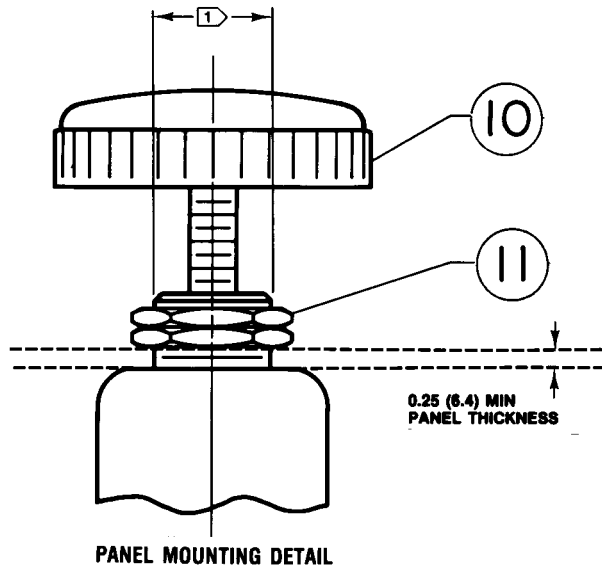
Key	Description	Part Number	Key	Description	Part Number	Key	Description	Part Number
7*	Diaphragm Assembly (Cont'd) For Type 67SS regulator w/o internal relief Nitrile diaphragm w/pl steel diaphragm plate and stainless steel pusher post Fluoroelastomer diaphragm w/pl steel diaphragm plate and stainless steel pusher post For Type 67SSR regulator w/internal relief Nitrile diaphragm w/stainless steel relief valve seat and soft molded insert Fluoroelastomer diaphragm w/stainless steel relief valve seat and soft molded insert	1B7980 X00A2 1B7980 X0022 19A7667 X022 19A7667 X052	8	Control Spring Seat To provide sour gas corrosion resistance capability (for Type 67 or 67R only), heat-treated AISI steel For other than sour gas corrosion resistance applications, Zn pl steel	1B7985 X0012 1B7985 25062	10	Handwheel (not used w/Type 67SS or 67SSR) For Type 67 or 67R For 1-hole panel mtg, Zn pl steel For 3-hole panel mtg w/right-hand thread Zinc Chrome pl steel For 3-hole panel mtg w/left-hand thread, zinc For 67H or 67HR For 1-hole panel mtg, Zn pl steel For 3-hole panel mtg w/right-hand thread Zinc Chrome pl steel	20B2830 X012 1B7992 000A2 1U1715 000C2 1L2232 44012 20B2830 X012 1B7992 T0022 1U1715 000C2
			9	Control Spring, Zn pl steel spring wire	See following table			
			10	Adjusting Screw, pl steel For Type 67 or 67R For spring case w/o closing cap For spring case w/closing cap For Type 67H or 67HR For Type 67SS or 67SSR	1B7986 28982 1H3050 28982 1B7986 28982 1H3050 28982			



NOTE:
 ① 0.72 (18.3) SPRING CASE PANEL BOSS.
 ② 1.47 TO 1.48 (37.4 TO 37.7) SPRING CASE PANEL BOSS.

Figure 2. Type 67 and 67R Regulator Assemblies (Also Typical of Types 67H and 67HR) (Continued)

Key	Description	Part Number	Key	Description	Part Number	Key	Description	Part Number
11	Locknut (not used w/3-hole panel mtg spring case), pl steel	1A9463 24122	12	Machine Screw (Continued) For Type 67SS or 67SSR For stainless steel spring case	1H4217 38992	21	Pipe Plug (Continued) For other than sour gas corrosion resistance applications	
11	Mounting Nut (for use only w/1-hole panel mtg spring case), 303 stainless steel	10B2657 X012		For aluminum spring case	1H4217 28992		Square head, brass	1A5726 14012
12	Machine Screw, pl steel (6 req'd) For Type 67 or 67R For use w/spring case 2B7974 08012 or 3L2230 000A2	1B7839 28982	14	Mounting Screw (for use only w/yoke mtg or 3-hole panel mtg spring case), steel (2 req'd) For yoke mtg spring case (not shown)	1A3816 24052		Socket head, steel	1C3335 28992
	For use w/all other spring cases	1B2752 28982		For 3-hole panel mtg spring case	1C2760 28992		Hex head, Cd pl steel	1D7548 28982
	For Type 67H or 67HR For 3-hole panel mtg (6 req'd)	1B7839 28982	20	Control Spring Label (not shown), paper	See following table		For Type 67H or 67HR Square head, brass	1A5726 14012
	For yoke mtg 3 req'd	1B2752 28982					Socket head, steel	1C3335 28992
	3 req'd	1C8969 28982	21	Pipe Plug (for use only w/2-outlet body—not shown) For Type 67 or 67R			Hex head, Cd pl steel	1D7548 28982
	For 1-hole panel mtg & all other constructions (6 req'd)	1B2752 28982		Hex head to provide sour gas corrosion resistance capability, CD pl steel	1D7548 28982	21	For Type 67SS or 67SSR, 316 stainless steel	1A7675 35072
							Pressure Gauge (for use only w/2-outlet body—not shown)	
							0 to 30 psig ⁽³⁾	1J9460 99012
							0 to 60 psig ⁽³⁾	1J9752 99012
							0 to 100 psig ⁽³⁾	1J9753 99012
							0 to 160 psig ⁽³⁾	1J9754 99012
						23*	Body Plug Gasket (for use only w/Type 67, 67H, 67HR, or 67R), composition	1C4957 04022



NOTE:
 1 0.72 (18.3) SPRING CASE PANEL BOSS.

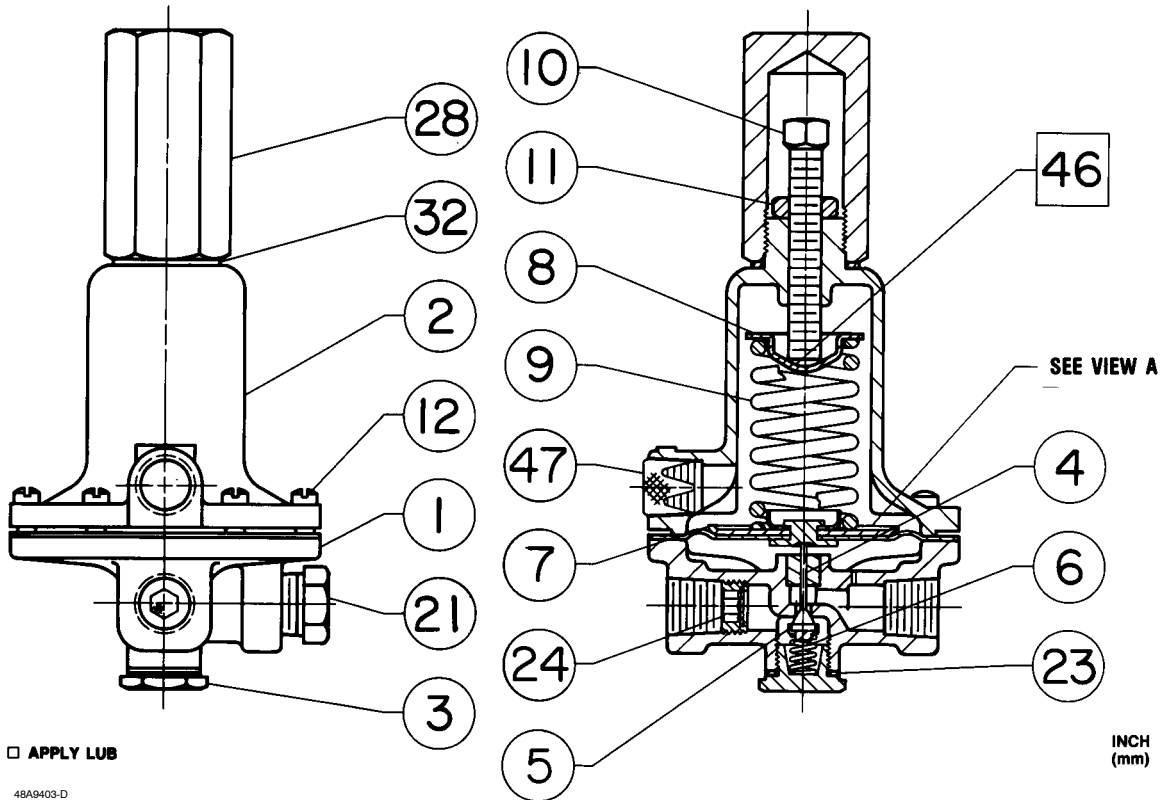


Figure 3. Type 67SS and 67SSR Regulator Assemblies

Types 67, 67H, 67HR, 67R, 67SS, and 67SSR

Key	Description	Part Number	Key	Description	Part Number	Key	Description	Part Number
23*	Body Plug O-Ring (for use only w/Type 67SS or 67SSR) For use w/composition diaphragm, composition For use w/fluoroelastomer diaphragm, fluoroelastomer	1F1139 06992 1N4639 06382	28	Closing Cap For use only w/Type 67 or 67R tapped spring case For use only w/Type 67SS or 67SSR spring case	10A3075 X012, brass 1H2369 14012 Aluminum 1H2369 X0012	44	NACE Tag (for use only w/Type 67 or 67R w/sour gas corrosion resistance capability—not shown), 18-8 stainless steel	19A6034 X012
24	Inlet Screen Assembly (for use only when specified) For Type 67 or 67R Brass and stainless steel Steel and stainless steel For Type 67H or 67HR, brass and stainless steel For Type 67SS or 67SSR, steel and stainless steel	1C7712 000A2 1C7712 000B2 1C7712 000A2 1C7712 000B2	32*	Closing Cap Gasket, (for use only w/Type 67SS or 67SSR), composition	15A6218 X012	45	Tag Wire (for use only w/NACE tag key 44—not shown), 304 stainless steel	1U7851 X0012
			38	Spacer (for yoke mtg only—not shown), steel (3 req'd)	11A8146 X012	46	Never-Seez Lubricant, 8-pound (4 kg) can (not furnished with regulator)	1M5239 06992
			39	Mounting Bracket (for yoke mtg only—not shown), steel	21A8145 X012	47	Vent Screen (for use only w/Type 67SS or 67SSR spring case 28A9277 X012), Monel ⁽²⁾	0L0783 43062

Keys 9 and 20 Type 67 and 67R Control Spring and Control Spring Label

SER VICE, MATERIAL	OUTLET PRESSURE RANGE				CONTROL SPRING KEY 9		CONTROL SPRING LABEL KEY 20
	U.S. Units, Psig		Metric Units, Bar		Part Number	Color Code	
	With Panel-Mtg Spring Case	With All Other Spring Cases	With Panel-Mtg Spring Case	With All Other Spring Cases			
For sour gas corrosion resistance capability, Inconel	---	5 to 35 30 to 60	---	0.34 to 3.4 2.1 to 4.1	19A2852 X012 19A2854 X012	Cad plated Blue	1C3764 06032 1C3766 06032
For other than sour gas corrosion resistance applications, pl steel	3 to 18 5 to 30 30 to 50 35 to 80	3 to 20 5 to 35 30 to 60 35 to 100	0.21 to 1.2 0.34 to 2.1 2.1 to 3.4 2.4 to 5.5	0.21 to 1.4 0.34 to 3.4 2.1 to 4.1 2.4 to 6.9	1B9860 27212 1B7883 27022 1B7884 27022 1K7485 27202	Green Cad plated Blue Red	1C3763 06032 1C3764 06032 1C3766 06032 1C3765 06032

Keys 9 and 20 Type 67, 67H, 67HR, 67SS, and 67SSR Control Spring and Control Spring Label

SER VICE, MATERIAL	OUTLET PRESSURE RANGE				CONTROL SPRING KEY 9		CONTROL SPRING LABEL KEY 20
	U.S. Units, Psig		Metric Units, Bar		Part Number	Color Code	
	With Panel-Mtg Spring Case	With All Other Spring Cases	With Panel-Mtg Spring Case	With All Other Spring Cases			
All, pl steel	3 to 18 5 to 30 30 to 50 35 to 80	3 to 20 5 to 35 30 to 60 35 to 100	0.21 to 1.2 0.34 to 2.1 2.1 to 3.4 2.4 to 5.5	0.21 to 1.4 0.34 to 3.4 2.1 to 4.1 2.4 to 6.9	1B9860 27212 1B788. 27022 1B7884 27022 1K7485 27202	Green Cad plated Blue Red	1C3763 06032 1C3764 06032 1C3766 06032 1C3765 06032

*Recommended spare parts
2. Trademark of International Nickel Co.



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SAFETY WARNING INSTRUCTIONS


FOR MAXITROL GAS PRESSURE REGULATORS

NOTE: GAS PRESSURE REGULATORS WILL **NOT** TURN OFF THE FLOW OF GAS.

 SPECIAL WARNINGS
IF YOU DO NOT FOLLOW THESE INSTRUCTIONS EXACTLY, A FIRE OR EXPLOSION MAY RESULT CAUSING PROPERTY DAMAGE, PERSONAL INJURY OR LOSS OF LIFE. NO UNTRAINED PERSON SHOULD ATTEMPT TO INSTALL, MAINTAIN OR SERVICE GAS PRESSURE REGULATORS.

To minimize the possibility of FIRE, EXPLOSION, and OTHER HAZARDS:

1. All products, including gas pressure regulators, used with combustible gas **must** be installed and used **strictly** in accordance with the instructions of the manufacturer, with government codes and regulations, and plumbing codes and practices.
2. Do **not** use a gas pressure regulator if it appears to have been subjected to high temperatures, damaged in any way, or to have been taken apart or tampered with. Any of these may be signs of possible leakage or other damage that may affect proper operation and cause potentially dangerous combustion problems
3.
 - a. Install the regulator properly with gas flowing as indicated by the arrow on the casting.
 - b. Use pipe compound or thread sealant, properly threaded pipes and careful assembly procedure so that there is no cross threading, etc., which might cause damage or leakage.
 - c. Apply wrench or vise pressure only to the flat areas around the pipe tappings at the end being threaded to the pipe to avoid possible fracture of the regulator body which could result in leakage
 - d. Make sure markings or wording on regulator are not painted over or obliterated.
4. Check carefully for gas leaks immediately after the regulator has been installed and the gas turned on. **Do this before attempting to operate the appliance or other gas burning device.** Use a rich soap solution (or other accepted leak tester) around the diaphragm flanges, bottom plate, vent opening, seal cap, pipe connections, and all other joints. Wipe clean with a damp rag. It is a good practice to periodically check for leakage during use of the appliance. **Absolutely no leakage should occur, otherwise there is a danger of fire or explosion depending upon conditions. Never use if leakage is detected.**

 CAUTION
NEVER CONNECT REGULATOR DIRECTLY TO THE PROPANE SUPPLY SOURCE. MAXITROL REGULATORS REQUIRE AN EXTERNAL REGULATOR (NOT SUPPLIED). INSTALL THE EXTERNAL REGULATOR BETWEEN THE PROPANE SUPPLY SOURCE AND MAXITROL REGULATOR.


5. Very high pressure surges in the gas supply line (or as a result of exposing the system to high pressure) may result in serious internal damage and cause leakage or affect regulator operation. If you suspect that a Maxitrol regulator has been exposed to more than twice the maximum operating inlet pressure, as shown in the following chart, turn off the gas and have the system checked by an expert.

(over)

INSTRUCCIONES PARA PRECAUCIONES DE SEGURIDAD


PARA REGULADORES DE PRESION DE GAS MAXITROL

NOTA: LOS REGULADORES DE PRESION DE GAS **NO** CORTAN EL FLUJO DE GAS

 ¡PRECAUCIONES ESPECIALES!
SI USTED NO SIGUE ESTAS INSTRUCCIONES EXACTAMENTE, PUEDE OCURRIR UN INCENDIO O UNA EXPLOSION, CAUSANDO DAÑOS A LA PROPIEDAD, LESIONES PERSONALES O PERDIDA DE VIDAS. NADIE QUE NO HAYA SIDO ENTRENADO DEBERA DE TRATAR DE INSTALAR, DAR SERVICIO O DAR MANTENIMIENTO A LOS REGULADORES DE PRESION DE GAS

Para reducir la posibilidad de INCENDIO, EXPLOSION Y OTROS RIESGOS:

1. Todos los productos, incluyendo los reguladores de presión de gas, que se usan con gases combustibles **deberán** instalarse y usarse **estrictamente** de acuerdo con las instrucciones del fabricante, usando los códigos y reglamentos gubernamentales así como los códigos y prácticas de plomería.
2. **No** usar un regulador de presión de gas si parece haber estado expuesto a altas temperaturas, dañado en alguna forma o que se haya desmantelado o maltratado. Cualquiera de éstas pueden ser señales de posibles fugas u otros daños que pueden afectar el funcionamiento correcto y causar problemas de combustión potencialmente peligrosos.
3.
 - a. Instalar el regulador correctamente con el gas fluyendo como se indica en la flecha en la carcasa de fundición.
 - b. Usar un compuesto sellador de tubería o hilo sellador de rosca, tuberías correctamente roscadas y procedimientos de ensamble cuidadoso, asegurándose de que no haya trasroscados, lo cual podría causar daños o fugas.
 - c. Aplicar únicamente la presión de una llave o tornillo de banco en las áreas planas alrededor de las roscas de la tubería del extremo a enroscar para evitar la posible rotura del cuerpo del regulador que podría resultar en fugas.
 - d. Asegurarse de que no se pinten o tachen las marcas o escritura en el regulador.
4. Verificar inmediatamente que no haya fugas de gas después de que el regulador haya sido instalado y se haya abierto el paso del gas. **Esto deberá hacerse antes de tratar de operar el aparato electrodoméstico o cualquier otro dispositivo quemador de gas.** Usar una solución espesa de jabón (u otro probador de fugas aceptado) alrededor de las bridas del diafragma, el fondo del plato, la apertura de ventilación, la tapa selladora y las conexiones de la tubería y todas las demás juntas. Limpiar con un trapo húmedo. Es una buena práctica verificar periódicamente que no haya fugas durante el uso del aparato electrodoméstico. **Absolutamente no deberá haber ninguna fuga. De otra forma hay peligro de incendio o explosión dependiendo de las condiciones. Nunca deberá usarse si se detectan fugas.**

 ¡PRECAUCION!
NUNCA CONECTAR EL REGULADOR DIRECTAMENTE AL SUMINISTRO DE PROPANO. LOS REGULADORES MAXITROL REQUIEREN UN REGULADOR EXTERNO (NO PROVISTO). INSTALAR EL REGULADOR EXTERNO ENTRE EL SUMINISTRO DE PROPANO Y EL REGULADOR MAXITROL

5. Aumentos grandes de presión en la línea de suministro de gas (o como resultado de exponer el sistema a alta presión) pueden resultar en daños internos y causar fugas o afectar el funcionamiento del regulador. Si usted sospecha que un regulador Maxitrol ha sido expuesto a más del doble de la presión máxima de entrada, como se muestra en la tabla siguiente, cierre el paso del gas y haga que el sistema sea verificado por un experto.

(a la vuelta)



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248/356-1400 • FAX 248/356-0829

6. Venting **must** be controlled in accordance with government and plumbing codes and regulations to avoid the danger of escaping gas should there be internal leakage. Vent pipes **must** be open and the open end protected against entry of foreign matter, including water.

7. The outlet pressure of the regulator **must** be measured to make sure it is in accordance with intended usage. If a spring change is required to develop the required outlet pressure, the spring **must be one specified by MAXITROL**

8. Caution should be used to guarantee that there is sufficient inlet pressure to achieve the desired outlet pressure and no readjustment of the outlet pressure setting should be made unless the inlet pressure is within the proper limits for the regulator. Failure to follow this may result in overfiring of the appliance or other gas burning device. **The MAXITROL bulletin for the regulator should be consulted for specific inlet and outlet pressure relationships**

9. A MAXITROL regulator **must be used** within the temperature range and not in excess of the maximum inlet pressure shown in the following table and should be in the mounting position indicated. Maxitrol regulators can be used with all fuel gases.

10. In case of any doubt, please contact the Service Manager, Maxitrol Company, Southfield, MI USA. Phone: 248/356-1400.

6. La ventilación **deberá** estar controlada de acuerdo con los códigos y reglamentos gubernamentales de plomería para evitar el peligro de que se escape el gas en caso de una fuga interna. Los tubos de ventilación **deberán** estar abiertos y el extremo abierto **deberá** estar protegido contra cualquier materia extraña, incluyendo el agua.

7. La presión de salida del regulador **deberá** medirse para asegurarse que está de acuerdo para el uso que se pretende. Si se necesita cambiar un resorte para desarrollar la presión de salida requerida, el resorte **deberá ser especificado por MAXITROL** y la nueva presión de salida **deberá** anotarse en el regulador.

8. Deberá usarse precaución para garantizar que hay suficiente presión interna para alcanzar la presión de salida deseada y no **deberá** hacerse ningún reajuste en la presión de salida a menos que la presión interna esté dentro de los límites correctos para el regulador. Si esto no se lleva a cabo podría resultar en una llama excesiva del aparato electrodoméstico u otro dispositivo quemador de gas. **Deberá consultarse el boletín MAXITROL para el regulador** para ver la relación específica entre la presión de entrada y la de salida.

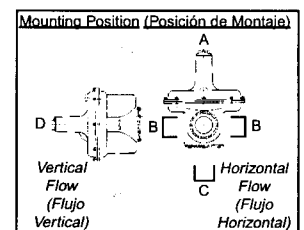
9. Un regulador MAXITROL **deberá usarse** dentro del rango de temperatura y no **deberá** excederse la presión máxima de entrada que se muestra en la tabla siguiente y **deberá** estar en la posición indicada de montaje. Los reguladores MAXITROL pueden usarse con todo tipo de gases combustibles.

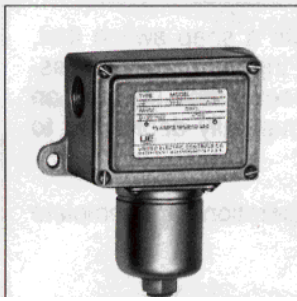
10. En caso de dudas, favor de comunicarse con el Service Manager (Gerente de Servicio), Maxitrol Company, Southfield, MI USA. Teléfono: 248-356-1400.

Model Number (Número de Modelo)	Maximum Operating Inlet Pressure (Presión Máxima de Entrada para Operación)	Ambient Temperature Range (Rango de Temperatura Ambiente)	Mounting Position [see below] (Posición de Montaje) [ver abajo]
RV12LT, RV20LT	1/2 psi (34 mbar)	-40 to 275 F (-40 to 135 C)	A, B, C, D
RV20L	2 psi (138 mbar)	-40 to 225 F (-40 to 107 C)	A, B, C, D
RV47, RV48 (*1)	1/2 psi (34 mbar)	32 to 225 F (0 to 107 C)	A, B, C, D, (*1)
RV48T (*1)	1/2 psi (34 mbar)	32 to 275 F (0 to 135 C)	A, B, C, D, (*1)
RV52, RV53, (*1)	1/2 psi (34 mbar)	-40 to 205 F (-40 to 96 C)	A, B, C, D, (*1)
RV61, (*1)	1 psi (69 mbar)	-40 to 205 F (-40 to 96 C)	A, B, C, D, (*1)
RV81, RV91	1 psi (69 mbar)	-40 to 205 F (-40 to 96 C)	A only (únicamente)
RV111	1 psi (69 mbar)	-40 to 205 F (-40 to 96 C)	A only (únicamente)
RV131	2 psi (138 mbar)	-40 to 125 F (-40 to 52 C)	A only (únicamente)
R400, R500, R600, (*1)	1 psi (69 mbar)	-40 to 205 F (-40 to 96 C)	A, B, C, D, (*1)
R400S, R500S, R600S, (*1)	5 psi (345 mbar)	-40 to 205 F (-40 to 96 C)	A, B, C, D, (*1)
R400Z, R500Z, R600Z	1psi (69 mbar)	-40 to 205 F (-40 to 96 C)	A, B, C, D, (*1)
210D, E, G, J	10 psi (690 mbar)	-40 to 205 F (-40 to 96 C)	A only (únicamente)
210DZ, EZ, GZ, JZ	5 psi (345 mbar)	-40 to 205 F (-40 to 96 C)	A only (únicamente)
220D, E, G, J	10 psi (690 mbar)	-40 to 205 F (-40 to 96 C)	A only (únicamente)
325-3 (*1), 325-5A (*1), 325-7	10 psi (690 mbar) (*1)	-40 to 205 F (-40 to 96 C)	A, B, C, D, (*1)

(*1) When equipped with a ball-check type automatic vent limiting device (12A04, 12A09, 12A39), regulators **must** be in upright position (A) with non-integral vent limiter installed directly into vent threads. **Any other mounting position may interfere with lockup or cause pilot outage, where applicable.** Maximum inlet pressure for regulators with 12A09 or 12A39 is 2 psi (LP) or 5 psi (natural). Inlet pressures exceeding 2 psi (LP) or 5 psi (natural) require a vent line.

(*1) Para estar seguro que el regulador responde con rapidez cuando está equipado con un dispositivo limitador de ventilación automático tipo bola (12A04, 12A09, 12A39), los reguladores **deberán** estar en posición vertical (A) con el limitador de ventilación instalado directamente a las roscas del tubo de ventilación. **Si se usa cualquier otra posición durante su instalación, esto podrá interferir con el cierre o causar que el piloto se apague.** La presión máxima de admisión para reguladores con los dispositivos 12A09 o 12A39 es de 2 psi (gas licuado) o 5 psi (gas natural). Las presiones de admisión que excedan 2 psi (gas licuado) o 5 psi (gas natural) requerirán una línea de ventilación.





6 Series Pressure Controls



UNITED ELECTRIC CONTROLS Installation and Maintenance Instructions

Please read all instructional literature carefully and thoroughly before starting. Refer to the final page for the listing of Recommended Practices, Liabilities and Warranties.

GENERAL

J6 pressure controls are activated when a bellows, diaphragm or piston sensor responds to a pressure change. This response actuates a single snap-action switch, converting the pressure signal into an electrical signal.

Control set point may be varied by turning the internal adjustment screw (or dial) according to procedures outlined below.

On models supplied with an external manual reset button, be sure to leave sufficient finger space over the reset button for the operator to reset the control.

WIRING

Remove the four screws retaining the cover and cover gasket. A 1/2" NPT conduit connection is provided on the upper left hand side of the enclosure. The three switch terminals are clearly labeled common, normally open and normally closed.

If lead wires are supplied, color coding is as follows:

	SPIDT	DPDT (Option 1010)	
		SWT1	SWT2
Common	Violet	Violet	Yellow
Normally Open	Blue	Blue	Orange
Normally Closed	Black	Black	Red

A threaded grounding boss, tapped #10-32, is provided in the lower left corner of the enclosure. Keep the wires as short as possible to prevent interference with the plunger, manual reset button and, when provided, the adjustable differential switch wheel.



WIRE IN ACCORDANCE WITH LOCAL OR NATIONAL CODES. BE SURE ALL LIVE SUPPLY CIRCUITS ARE DISCONNECTED BEFORE WIRING THE CONTROL. MAXIMUM WIRE SIZE #14 AWG.

Part I - Installation

Tools Needed

- Adjustable wrench
- Flatblade screwdriver

MOUNTING

J6 controls may be mounted and operated in any position. They may be surface mounted via the two mounting ears on either side of the enclosure, or the controls may be mounted directly to a rigid pipe by using the pressure connection.



LOCATE THE UNIT WHERE VIBRATION, SHOCK AND AMBIENT TEMPERATURE CHANGES ARE MINIMAL. SHOULD THE CONTROL BE INSTALLED WHERE CONDENSATION IS EXPECTED, VERTICAL MOUNTING IS RECOMMENDED.



NEVER USE THE ENCLOSURE FOR LEVERAGE TO HAND TIGHTEN THE PRESSURE CONNECTION. ALWAYS USE A WRENCH TO TIGHTEN THE PRESSURE CONNECTION TO THE PIPE. TO PREVENT DAMAGING THE PRESSURE SENSOR, USE A BACK-UP WRENCH TO HOLD THE HEX CONNECTION IN PLACE WHEN SURFACE MOUNTING.

Part 11 - Adjustments

Tools Needed

Models 126,134, S1 26, S1 34, S1261B, S1341B:
3/16" & 1/4" open end wrenches. Use 3/16" wrench to keep item C from turning. See Figure 2.

Models 136-160, S1 36-SI 60, S1361B-S1 601B, 50-55, and 680: 5/8" open end wrench

Models 258-274 and 354-364:

11/16" open end wrench

Models 218-230: 1/4" open end wrench

Models 610-614: 3/16" open end wrench

Non-Calibrated Models, type

Remove cover and gasketing. The right hand adjusting screw, label "A" Figures 1- and 2, is located beneath the switch and is turned to adjust the control setpoint. On pressure controls, turning this screw clockwise will increase the setpoint; for vacuum ranges, this screw is turned counterclockwise to raise the setpoint.

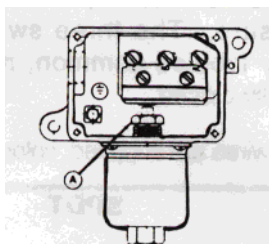


Figure 1: Models 50-55,136-160, S136-S160, S136B-S160B, 258-274, and 354-364, 680

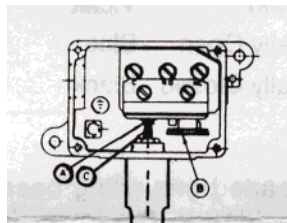


Figure 2: Models 126, 134, S 126, S 134, S 126B, S134B, 218-230, 610-614

NOTE: Models 50-55 have 3/16" hex head screw directly beneath the switch plunger. This is a factory set adjustment and is not to be disturbed.

Adjustable Differential Switches, Options 1520 & 1521

These controls are equipped with a special snap switch that allows the control differential to be manually varied by turning the wheel on the underside of the switch, and using the switch mounting screw on the right as an index. As the letters advance, the differential widens.

Manual Reset Switches, 1530 Option

These controls incorporate a snap switch that, when activated, remains tripped until the pressure changes and the reset button (located on top of the controller) is manually depressed to reset the switch.

Replace cover when all operations are complete and before using.

Part III - Replacements

Tools Needed

- Adjustable wrench
- Flat blade screwdriver

Replace electrical switch according to the following procedures.



ALWAYS DISCONNECT SUPPLY CIRCUITS BEFORE ATTEMPTING TO REPLACE PARTS.

Switch Replacement (All Models)

1. Remove cover.
2. Disconnect lead wires from the terminals.
3. Note position of switch plunger before removing switch. Remove two switch mounting screws and take out the switch and insulator.
4. Insert insulator and replacement switch. Position switch plunger over the adjusting screw; tighten switch mounting screws securely. On models 50-55, verify that gapping is correct.

Gapping

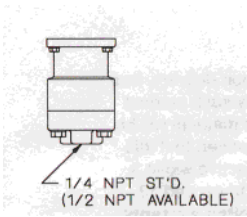
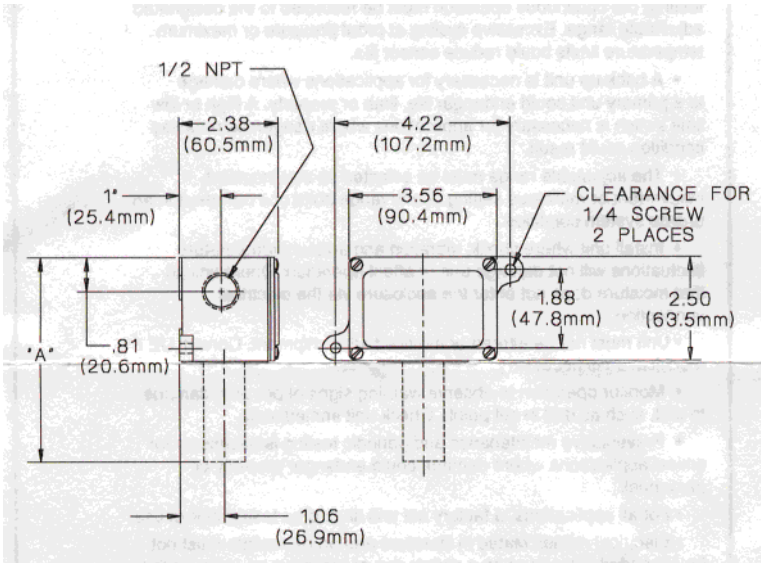
Turn 5/8" hex adjustment screw in approximately mid range. This puts a load on the sensor. Using a 1/4" wrench on the plunger and a 3/16" wrench on the plunger hex screw, turn hex screw out from plunger until switch actuates. (If switch is already actuated proceed to the next step.) Turn plunger hex screw in until switch just transfers. Turn hex screw in an additional 2 - 2/12 flats from this point (approximately 1/3 turn). This will provide a 9 - 11 Mil gap. Follow set point adjustment procedure.

5. Check set point and readjust, if necessary.
6. Re-connect wires.
7. Replace cover.

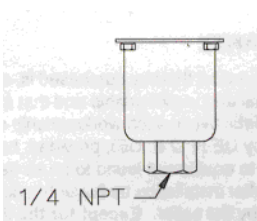
Dimensions

J6 Series
 General Purpose
 Service; NEMA 4

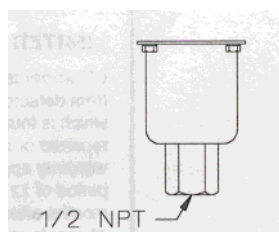
Models	Dimension A		NPT
	Inches	mm	
50-55	5.75	146.1	1/4
S50B-S55B	5.75	146.1	1/2
126,160	5.06	128.5	1/4
S126B-S160B	5.40	137.2	1/2
218-230	4.31	109.5	1/4
258-274	4.75	120.7	1/4
354-364	4.75	120.7	1/4
610-614	5.69	144.5	1/4
680	4.5	114.3	1/4



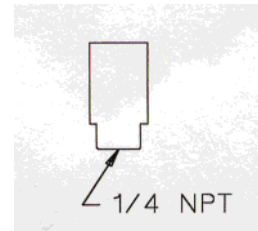
**Models 50-55,
S50B-S55B**



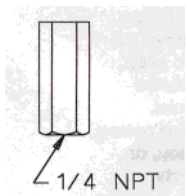
Models 126-160



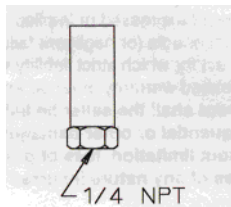
Models S1261B-S160B



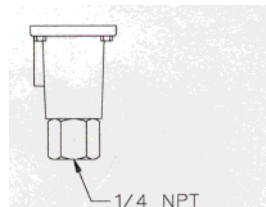
Models 218-230



Models 258-274



Models 354-364, 680



Models 610-

RECOMMENDED PRACTICES AND WARNINGS

United Electric Controls Company recommends careful consideration of the following factors when specifying and installing UE pressure and temperature units. Before installing a unit, the Installation and Maintenance instructions provided with unit must be read and understood.

- To avoid damaging unit, proof pressure and max temperature limits stated in literature and on nameplates must never be exceeded, even by surges in the system. Operation of the unit up to proof pressure or max temperature is acceptable on a limited basis (i.e. start-up, testing) but continuous operation must be restricted to the designated adjustable range. Excessive cycling at proof pressure or maximum temperature limits could reduce sensor life.

- A back-up unit is necessary for applications where damage to a primary unit could endanger life, limb or property. A high or low limit switch is necessary for applications where dangerous runaway condition could result.

- The adjustable range must be selected so that incorrect, inadvertent or malicious setting at any range point can not result in an unsafe system condition.

- Install unit where shock, vibration and ambient temperature fluctuations will not damage unit or affect operation. Orient unit so that moisture does not enter the enclosure via the electrical connection.

- Unit must not be altered or modified after shipment. Consult UE if modification is necessary.

- Monitor operation to observe warning signs of possible damage to unit, such as drift in set point. Check unit immediately.

- Preventative maintenance and periodic testing is necessary for critical applications where damage could endanger property or personnel.

For all applications, a factory set unit should be tested before use.

Electrical ratings stated in literature and on nameplate must not be exceeded. Overload on a switch can cause damage, even on the first cycle. Wire unit according to local and national electrical codes, using wire size recommended in installation sheet.

Use only factory authorized replacement parts and procedures.

Do not mount unit in ambient temp. exceeding published limits.

For remote mounted temperature units, capillary lengths beyond 10 feet can increase chance of error, and may require re-calibration of set point and indication.

LIMITED WARRANTY

UE warrants that the product thereby purchased is, upon delivery, free from defects in material and workmanship and that any such product which is found to be defective in such workmanship or material will be repaired or replaced by UE (F.O.B. UE); provided, however, that this warranty applies only to equipment found to be so defective within a period of 12 months after installation by buyer but not to exceed 18 months after delivery by the seller. **Except for the limited warranty of repair and replacement stated above, UE disclaims all warranties whatsoever with respect to the product, including all implied warranties of merchantability or fitness for any particular purpose.**

LIABILITY LIMITATION

The sole and exclusive remedy of buyer for any liability or seller for any claim, including incurred in connection with (1) breach of any warranty whatsoever expressed or implied, (11) a breach of contract, (111) a negligent act or acts (or negligent failure to act) committed by seller, or (IV) an act for which strict liability will be imputed to seller, is limited to the limited warranty or repair and replacement stated herein. **In no event shall the seller be liable for any special, indirect, consequential or other damages of a like general nature, including, without limitation, loss of profits or production, or loss or expenses of any nature incurred by any third party.**



UNITED ELECTRIC
CONTROLS

180 Dexter Avenue, P.O. Box 9143 Watertown,

1. Mounting Sparklite Unit
 - a. Mount the Sparklite unit convenient to pilot, so that cable will reach electrode. Be sure location is such that Sparklite unit ambient temperature will not exceed 175° F. Mount with screws provided.
2. Mounting Electrode
 - a. Position and securely fasten electrode so that tip of electrode is in pilot flame path and tip is approximately 5/32" from grounded pilot burner head or thermocouple tip. Use round plastic gage provided to obtain correct spark gap. Gage should touch but slide through easily. (See above Figure 1, 2 and 3 for easy mounting methods.)

CAUTION

Ceramic part of electrode and high voltage ignition wire must be kept out of fire.

- b. Connect high voltage ignition lead wire from Sparklite unit to ignition electrode. Terminal at electrode should be covered with insulation boot provided.
- 3; Wiring 24 Volt or 120 Volt
 - a. Connect input leads to Sparklite unit ahead of all controls or switches. Power source may be 24 volt or 120

volt. If 24 volt application is used, connection can be made to existing transformer. No additional transformer is needed due to low current draw of the Sparklite unit.

- b. Be sure ground terminal is connected to a good ground, such as a water pipe or ground wire in the house wiring. It is recommended that a switch be installed in the power line to control the Sparklite unit.

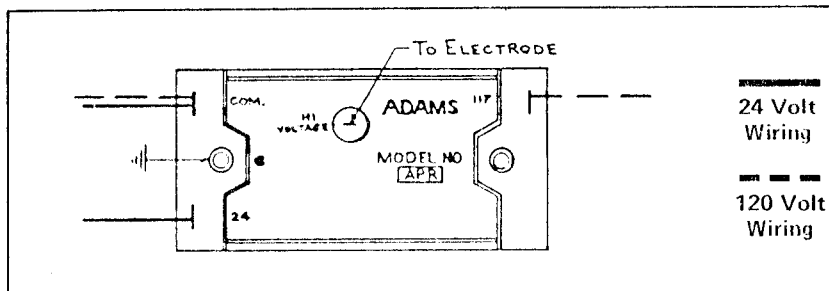
CAUTION

If 120 volt is erroneously connected to 24 volt terminal, Sparklite unit will suffer permanent electrical damage not covered under our warranty and must be replaced.

CHECK OUT PROCEDURE:

- A. Be sure all gas is shut off.
- B. Apply power to unit and observe spark.
- C. Open pilot valve. Pilot should light.
- D. Sparking should stop.
- E. If sparking does not stop:
 - (a) Electrode tip must be readjusted in the fire.
 - (b) Ground connection to Sparklite unit must be checked.
 - (c) Pilot burner must be checked for grounding through appliance.
- F. Turn pilot on and off several times to be sure it lights properly.

WIRING SCHEMATIC



LIMITED WARRANTY

Adams ("Manufacturer") warrants that all Sparklite Pilot relight systems are manufactured free from defects in material and workmanship and will remain in such condition for a period of 12 months from date of installation, but not to exceed 18 months from date of manufacture. Defects arising from damage in shipment, installation, misuse or negligence by others are not covered by this warranty. The exclusive remedy for such defects is the repair or replacement of products or parts which, upon inspection by Manufacturer, appear to be so defective. Any defective parts must be returned to Manufacturer's plant at buyer's cost. MANUFACTURER WILL IN NO EVENT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND WHATSOEVER. ALL WARRANTIES IMPLIED BY LAW ARE LIMITED IN DURATION TO 18 MONTHS. This warranty extends only to the original owner.