

**SD40H**  
 Rev 10  
 June 2012  
 Supersedes Rev 9

## Model 40H Nullmatic Pressure Regulators

### INTRODUCTION

The Model 40 Nullmatic® Pressure Regulator, shown below, uses the null-balance principle, which holds the output pressure constant regardless of wide changes in flow or supply pressure. Each regulator is in essence a self-contained pressure controller that can deliver up to a 40 scfm flow rate.

This instruction has five major sections: Introduction, Installation, Principle of Operation, Maintenance, and Parts List.

### Model Designation

<b>Model Series</b>	40H	A	50
40H	Options		
	A	Air Loaded	
	E	Tapped Exhaust	
	-	(no letter) Standard	
	<b>Range</b>		
	50	1 to 50 psig	
	100	1.5 to 100 psig	



### General Specifications

#### Supply Pressure

##### Model 40H50

Recommended.....	120 psig
Maximum.....	150 psig
Minimum.....	10 psi above desired output

##### Model 40H100

Recommended.....	150 psig
Maximum.....	500 psig
Minimum.....	10 psi above desired output

Maximum Air Loading.....100 psig (air loaded models only)

Ambient Temperature Limits.....-40°C to 82°C (-40°F to 180°F)

Ambient Temperature Effect\*.....Approximately 1% of set pressure with standard spring  
 Approximately 0.1% of set pressure with optional isothermal range spring

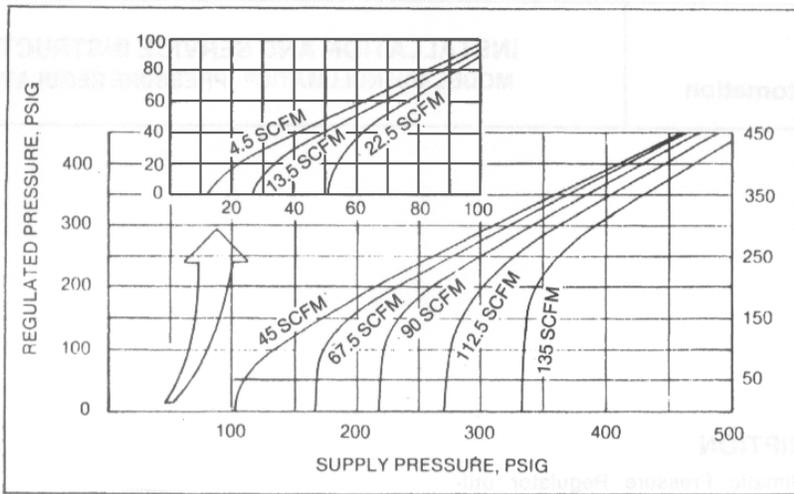
Maximum Air Flow, SCFM Delivered.....See Graph 1

Air Consumption.....See Graph 2<sup>1</sup>

Mounting.....In-line pipe mounting; bracket mounting; and flush panel mounting on panels up to 1/4" thick

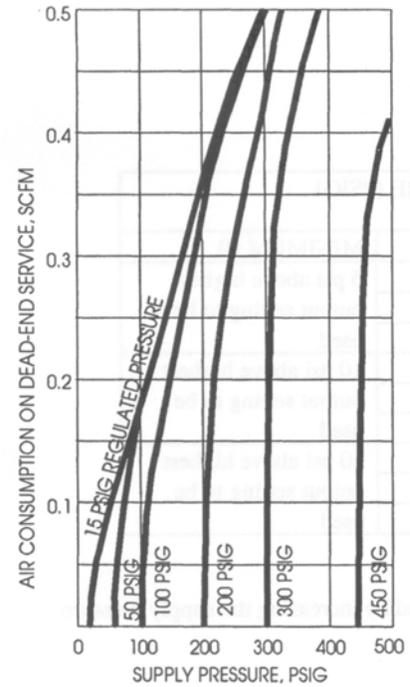
\* For a 50°F temperature change; isothermal range spring option discontinued

<sup>1</sup> The Nullmatic regulator bleeds only the amount of air which passes through the pilot nozzle when there is no demand for output flow. The exhaust port starts to close as soon as the flow of regulated air to the output is increased and it closes completely before the pilot-plunger valve opens. Full pilot flow is then delivered to the output.



The curves above show the minimum supply pressure required for a desired flow.

**Graph 1 Maximum Air Flow, SCFM Delivered**



**Graph 2 Air Consumption**

## INSTALLATION

### Mounting Considerations

Refer to Figure 1 for mounting dimensions, connections, and mounting configurations. The regulator may be mounted in any position in a reasonably vibration-free location.

#### CAUTION

Exceeding the ambient air temperature limits can adversely affect performance and may cause damage.

### Pneumatic Connections

Connections are 1/4 NPT; the optional tapped exhaust connection is 1/8 NPT. Recommended piping to the regulator is 1/4" O.D. tubing, although any scale free piping may be used.

1. Blow out all piping before any connections are made to prevent dirt or chips from entering the regulator.
2. Use pipe sealant sparingly, and then only on the male threads. A non-hardening sealant is strongly recommended.
3. Connect the regulator to a source of clean, dry, oil-free instrument air. See Instrument Air Requirements.

#### CAUTION

Pressure in excess of the maximum value, listed in General Specifications, to the supply or air loading connection may cause damage.

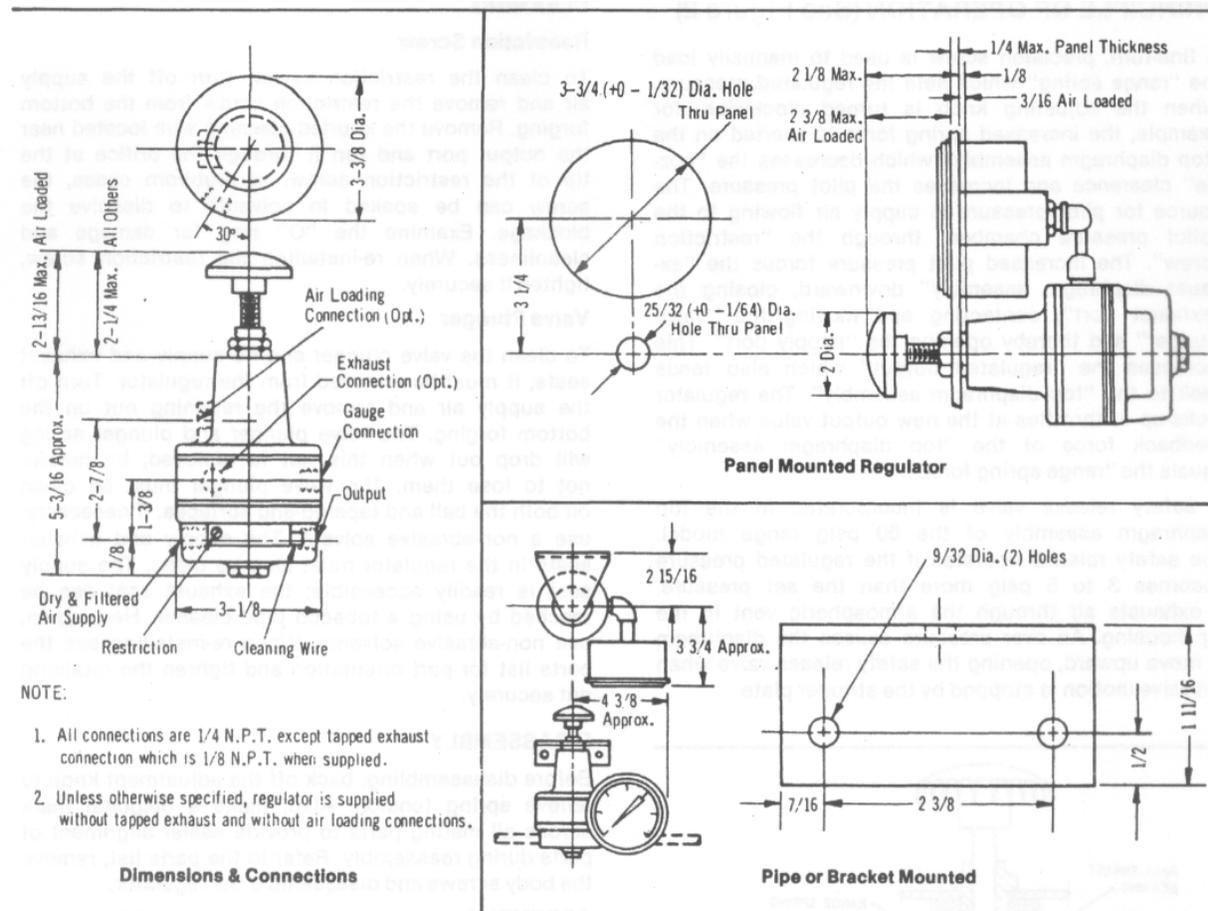


Figure 1 Dimensions and Mounting

## INSTRUMENT AIR REQUIREMENTS

Connect the regulator to a source of clean, dry, oil-free instrument air. Failure to do so will increase the possibility of a malfunction or deviation from specified performance.

### CAUTION



Use of process fluids other than instrument air is not recommended. No claim is made as to the suitability of this product for use with other process fluids, such as hazardous gases, except as listed on the appropriate certificate. Non-approved instruments are suitable for use with instrument air only. Optional features and modifications such as tapped exhaust do not imply suitability for use with hazardous gases except as listed on the approval certificate.

### CAUTION

Synthetic compressor lubricants in the air stream may cause the regulator to fail.

There are many types of synthetic lubricants. Some may not be compatible with the materials used in construction of the regulator. Wetting of these materials by such an oil mist or vapor may cause them to deteriorate. This may ultimately result in failure of the regulator. The following materials are in contact with instrument air: Aluminum, Brass, Buna-N, Delrin®, Neoprene, Stainless Steel, and Teflon®.

The requirements for a quality instrument air supply can be found in the Instrument Society of America's "Quality Standard for Instrument Air" (ISA-S7.3). Basically this standard calls for the following:

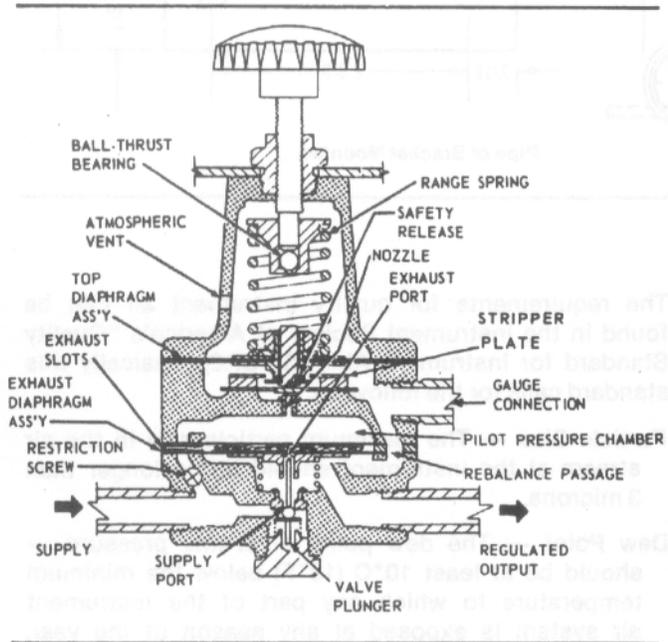
**Particle Size** - The maximum particle size in the air stream at the instrument should be no larger than 3 microns.

**Dew Point** - The dew point, at line pressure, should be at least 10° C (18° F) below the minimum temperature to which any part of the instrument air system is exposed at any season of the year. Under no circumstances should the dew point, at line pressure, exceed 2° C (35.6° F).

**Oil Content** - The maximum total oil or hydrocarbon content, exclusive of non-condensables, should not exceed 1 ppm under normal operating conditions.

## PRINCIPLE OF OPERATION

A fine-turn, precision screw is used to manually load the "range spring" which sets the regulated pressure. When the adjusting knob is turned clockwise, for example, the increased spring force is exerted on the "top diaphragm assembly" which decreases the "nozzle" clearance and increases the pilot pressure. The source for pilot pressure is supply air flowing to the "pilot pressure chamber" through the "restriction screw". The increased pilot pressure forces the "exhaust diaphragm assembly" downward, closing the "exhaust port", contacting and moving the "valve plunger" and thereby opening the "supply port". This increases the "regulated output" which also feeds back to the "top diaphragm assembly". The regulator locks-up or throttles at the new output value when the feedback force of the "top diaphragm assembly" equals the "range spring force".



**Figure 2 Schematic**

A safety release valve is incorporated in the top diaphragm assembly of the 50 psig range model. The safety release operates if the regulated pressure becomes 3 to 5 psig more than the set pressure. It exhausts air through the atmospheric vent in the top housing. An over-pressure causes the diaphragm to move upward, opening the safety release valve when the valve motion is stopped by the stripper plate.

## MAINTENANCE

Most problems associated with pneumatic instruments can be prevented by providing clean, dry, oil-free instrument quality air as described in Installation, Instrument Air Requirements. No routine maintenance procedures are recommended if these requirements are observed.

### Lubricating the Adjusting Screw

An occasional application of light grease to the adjusting screw threads will facilitate easy turning of the adjusting knob, especially in the high-pressure models.

### Cleaning the Restriction Screw

1. Turn off supply air.
2. Remove restriction screw from bottom forging.
3. Remove the knurled cleaning wire located near the output port and run it through the orifice at the tip of the restriction screw. In stubborn cases, the screw can be soaked in solvent to dissolve the blockage. Examine the O-ring for damage and cleanliness.

4. Re-install the screw and tighten it securely.

### Cleaning the Valve Plunger

1. Turn off supply air.
2. Carefully remove retaining nut on bottom forging. The valve plunger and plunger spring will drop out when this nut is removed; be careful not to lose them. The valve plunger must be clean on both the ball and tapered-end surfaces. If necessary, use a non-abrasive solvent.
3. Clean supply and exhaust seats in the regulator. The supply seat is readily accessible; the exhaust seat can be reached using a tobacco pipe cleaner. Here again, use non-abrasive solvents.
4. Re-install parts. See the parts list for part orientation. Tighten the retaining nut securely.

### Troubleshooting

Refer to the Trouble Analysis table to troubleshoot the regulator.

#### Trouble Analysis

SYMPTOM	CAUSE	REMEDY
No output	No air supply	Turn on supply air
	Clogged restriction screw	Remove and clean
Output cannot be increased to full value	Supply air setting too low	Raise to recommended value
	Valve plunger being held open on exhaust seat by a chip (pipe scale, etc.) usually detected by a heavy exhaust	Remove valve plunger and clean its seats.
Sluggish output response to increased setting	Output flow excessive for air supply setting	Raise supply pressure
	Output flow exceeds specification	Consult factory
Output at full valve, or more, and cannot be decreased	Regulator piped backwards. Detected by an excessively heavy exhaust.	Re-pipe the regulator. Direction of flow is shown by arrow on bottom forging.
	Loose restriction screw	Tighten securely
	External exhaust port blocked	Remove obstruction
	Internal exhaust port clogged	Remove valve plunger and clean exhaust seat port.
Output cannot be decreased to minimum value	Supply pressure too high	Reduce to recommended value
	Loose restriction screw	Tighten securely
	Valve plunger being held open on exhaust seat by a chip (pipe dope, Teflon tape, thread shaving, pipe scale, etc.)	Remove valve plunger and clean its seats.
	Damaged supply seat	Install new bottom forging

### Disassembling the Regulator

Before disassembling, back-off the adjusting knob to relieve spring tension. Also, make a diagonal mark across all mating parts to provide easier alignment of parts during reassembly. To disassemble the regulator, refer to the parts list drawings for part location and remove the body screws.

## Assembling the Regulator

The exhaust diaphragm assembly and exhaust ring must be positioned so that none of the holes on the bottom forging are blocked. The three external holes on the exhaust ring line up under the gauge connection – see Figure 1 for orientation with respect to the supply and output ports.

The center housing must be positioned to allow pilot and rebalance air to flow to the proper chambers: pilot air to the bottom cavity of the center housing, and rebalance air to the top cavity. See Figure 1 for orientation of the gauge connection with respect to the supply and output ports.

The nozzle seat assembly must be installed with its smooth finish seat facing down to the nozzle. The safety release valve (where applicable) must be positioned on the nozzle seat assembly before the stripper plate is installed. Center the nozzle seat assembly over the nozzle before tightening its retaining screws.

The top diaphragm assembly and the top casting can be located in any position. Generally, the nameplate on the casting lines up over the gauge connection.

## Changing the Range

The range of any Model 40 series regulator may be changed by replacing the range spring, differential spring, the upper diaphragm assembly, and other parts as noted in the parts list.

## Replacing Parts

Refer to the parts list(s) at the back of this instruction when performing maintenance. A parts list provides a list of replacement parts and an exploded view of the regulator.

Service kits containing spare and replacement parts are available from Siemens. See the Customer/Product Support section to contact Siemens. Refer to the Parts List section for kits and recommended on-hand spare parts.

## Customer/Product Support

Support is available through an online Support Request service; a link is provided in the table at the end of this section.

When contacting Siemens for support:

- Please provide complete product information:
  - For hardware, this information is provided on the product nameplate (part number or model number, serial number, and/or version).
  - For most software, this information is given in the Help > About screen.
- If there is a problem with product operation:
  - Is the problem intermittent or repeatable? What symptoms have been observed?
  - What steps, configuration changes, loop modifications, etc. were performed before the problem occurred?
  - What status messages, error messages, or LED indications are displayed?
  - What troubleshooting steps have been performed?
  - Is the installation environment (e.g. temperature, humidity) within the product's specified operating parameters? For software, does the PC meet or exceed the minimum requirements (e.g. processor, memory, operating system)?
- A copy of the product Service Instruction, User's Manual, or other technical publication should be at hand. The Siemens public Internet site (see the table) has current revisions of technical literature, in Portable Document Format, for downloading.

- To send an instrument to Siemens for warranty or non-warranty service, call Repair Service and request a Return Material Authorization (RMA).

### IMPORTANT

An instrument must be thoroughly cleaned (decontaminated) to remove any process materials, hazardous materials, or blood-borne pathogens prior to return for repair. Read and complete the Siemens RMA form(s).

For support and the location of your local Siemens representative, refer to the table below for the URL of the Process Instrumentation (PI) portion of the Siemens public Internet site. Once at the site, click **Support** in the right column and then **Product Support**. Next select the type of support desired: sales, technical (see the table below), documentation, or software.

Online Support Request	<a href="http://www.siemens.com/automation/support-request">http://www.siemens.com/automation/support-request</a>
Technical Support	1-800-333-7421; 8 a.m. to 4:45 p.m. eastern time, Monday through Friday (except holidays)
Customer Service & Returns	1-800-365-8766 (warranty and non-warranty)
Public Internet Site	<a href="http://www.usa.siemens.com/pi">http://www.usa.siemens.com/pi</a>
Technical Publications in PDF	Click the above link to go to the Siemens Internet site and then click <b>Process Instrumentation</b> . In the column to the right, click <b>Support &gt; Manuals</b> . In the column to the left, select the product line (e.g. Pressure or Temperature or Controllers) to open navigation and search panes. Note: Navigation may change as the site evolves.

### Warranty

The sales contract contains the entire obligation of Siemens. The warranty contained in the contract between the parties is the sole warranty of Siemens. Any statements continued herein do not create new warranties or modify the existing warranty.

*Nullmatic is a registered trademark of Siemens Industry, Inc. All product designations may be trademarks or product names of Siemens Industry, Inc. or other supplier companies whose use by third parties for their own purposes could violate the rights of the owners.*

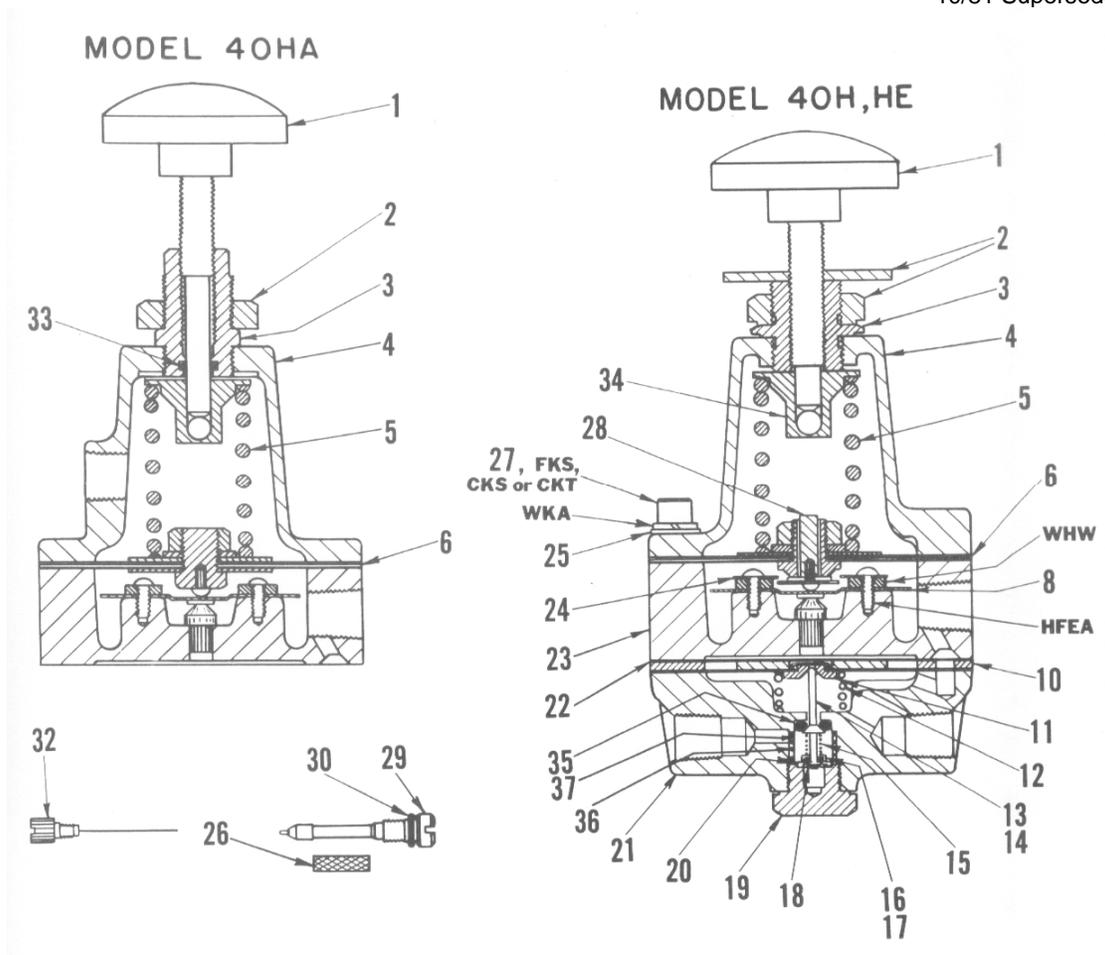
*Siemens Industry, Inc. assumes no liability for errors or omissions in this document or for the application and use of information in this document. The information herein is subject to change without notice.*

*Procedures in this document have been reviewed for compliance with applicable approval agency requirements and are considered sound practice. Neither Siemens Industry, Inc. nor these agencies are responsible for product uses not included in the approval certification(s) or for repairs or modifications made by the user.*

**PARTS LIST**

**Siemens Nullmatic® Pressure Regulator, Models 40, 40A, and 40X**

Drawing 7298PL  
10/81 Supersedes 8/80



**IMPORTANT**

Service Parts Kits are available for servicing the instrument. See the Service Parts Kits section of this instruction. Contact Siemens for currently available kits; refer to the Customer/Product Support section of this instruction. Some parts in this Parts List may not be available for separate purchase.



## SERVICE PARTS KITS

Listed below are the kits available at the time of publication of this instruction. Order the kit(s) needed to service the regulator model at hand. In addition to the parts listed, some kits include a parts list drawing or other instructions.

For Model(s), Kit Name, Part Number	Kit Contents	Quantity
Model 40H50, Diaphragm/Misc. Parts Kit, 7298-100	Diaphragm	1
	Top Diaphragm Assembly	1
	O-ring	1
	Diaphragm Assembly 40H-	1
	Plunger Assembly	1
Model 40H100, Diaphragm/Misc. Parts Kit, 7298-101	Diaphragm	1
	Top Diaphragm Assembly	1
	O-ring	1
	Diaphragm Assembly 40H-	1
	Plunger Assembly	1
Range Spring Kit (2, 7, 15, 30, and 50 psi), 7298-112	Range Spring (Qty 3 of each)	15
Range Spring Kit (100 psi and greater), 7298-113	Range Spring (Qty 4 of each)	8
Model 40H100, Minimum Overhaul Kit, 7298-114	Restriction Screw	1
	Diaphragm	1
	Top Diaphragm Assembly	1
	O-ring	1
	O-ring	1
	Diaphragm Spacer	1
	Diaphragm Assembly, Model 40H-	1
Adjusting Knob Assembly: Models 40HA and HAE, 3179-4 Models 40H and HE, 1447-22	---	1
Top Casting, 4557-11	---	1
Bushing: Models 40HA and HAE, 3494-4 Models 40H and HE, 2155-165	---	1
Bottom Forging, 10803-36	---	1
Range Spring: White, 2 psi, 1938-1 Gray, 7 psi, 2155-67 Blue, 15 psi, 572-37 Red, 30 psi, 572-36 Brown, 50 psi, 2155-22 Green, 100, 300, and 450 psi, 2155-23 Black, 200 psi, 2155-90	---	1