HOLLAND SUPPLY COMPANY 8225 Green Meadows Drive N | Lewis Center, OH 43035 | 740.549.6550 | hollandsupplycompany.com

Sensus Model 441 Field Regulator

Model 441 Sizing & Specifications Sheet

Model 441-S

Model 441-57S

Model 441-X57

SENSUS
a xylem brand

Ref: SSS 14.1.1

SPECIFICATION SELECTION SHEET
MODEL 441-S, 441-SR, 441-57S, 441-X57
INDUSTRIAL & DISTRIBUTION PRESSURE REGULATOR

441 Models	Description	Code
441-S	Low Pressure Regulator	A1
441-57S	'Roll-out' Diaphragm Regulator	A3
441-X57	High Pressure Regulator	A4

Pipe Size	Code
2"	B1
3"	B2
4"	B3
6"	B4

Dia. Case Size	Code
10"	C1
12"	C2
14"	C3
16"	C4
18"	C5
20"	C6

Spring Color	Code
Aluminum	D1
Green	D2
Yellow	D3
Gray	D4
Blue	D5
Red	D6
Brown	D7
Black	D8
Brown/White	D9

Body Type	Working Pressure psi	Code
Screwed End 2"	250	E1
Flanged ANSI 125lb FF	175	E2
Flanged ANSI 250lb RF	575	E3
Flanged ANSI 300lb RF	720	E4
Flanged ANSI 600lb RF	1200	E5
Valve Seat	**Material**	**Code**
Single	Stainless Steel	F1
Double	Stainless Steel	F2

Valve Type	Code
Standard	G1
V-Port	G2

Valve Size	Code
1½"	J2
1¾"	J3
2 1/8"	J4
3"	J5
4 ¼"	J6

Pressure	PSIG, kPa, BAR
Inlet	
Outlet (Min)	
Outlet (Max)	

Special Instructions:

Reference specification bulletins: 441-S R 1350 441-57S R-1360 441-X57 R-1360 R5 for full specification details.
Please circle your choice in each category or include code choices on your purchase order. ANSI 49 Gray paint finish only.
Standard Construction and Testing at Manufacturer's Recommended settings will apply unless otherwise specified above.

Purchase Order No.	

R-1350
Rev. 8

Model 441-S
Low Pressure Regulators

THE GAS INDUSTRY

SENSUS

Versatile, Dependable, Accurate, Fast

The Sensus Model 441-S is a balanced valve, spring type gas pressure regulator. It is a general purpose unit that is manufactured in a selection of pipe sizes and inner valve sizes. It is extensively used and has proven itself in many different kinds of distribution and industrial applications.

Simple, basic design has been combined with sturdy construction to make it exceptionally dependable. It also includes unique features which make it easy to adjust and to service.

Large, flexible diaphragms combined with accurately calibrated springs enable this regulator to produce precise pressure control while maintaining a high level of sensitivity and stability. The various diaphragm and spring combinations are given below. The use of a large selection of springs with restricted adjustment ranges is one of the reasons for its outstanding performance.

The 441-S is a regulator which responds quickly. It is fast, and this, plus its dependability and accuracy, make it an excellent choice for monitoring as well as other applications where speed is significant.

The 441-S is designed for top performance on any of a wide variety of gases. It is used most extensively for natural gas. However, it is equally effective on air, propane, propane-air mixtures, nitrogen, dry CO and others.

This bulletin has been arranged to include information on the Model 441-S which seems to be most generally used. If other information or data is needed, or if you have an ususual regulator application of any kind, please contact your Sensus Sales Office

Spring Ranges

Spring and Diaphragm Combinations

Spring Color	Diaphragm Size—Inside Diameter					
	20″	18″	16″	14″	12″	10″
Aluminum	4½″ to 6″ w.c.	4¼″ to 4¾″ w.c.	5¼″ to 7″ w.c.	7″ to 10½″ w.c.	8½″ to 13″ w.c.	
Green	4¾″ to 7″ w.c.	4¾″ to 6½″ w.c.	7″ to 10½″ w.c.	8½″ to 12″ w.c.	10½″ to 17″ w.c.	
Yellow	5¼″ to 8½″ w.c.	6″ to 10½″ w.c.	8½″ to 15½″ w.c.	10½″ to 17″ w.c.	12″ to 23″ w.c.	
Gray	8¼″ to 13″ w.c.	10½″ to 17″ w.c.	14″ w.c. to 1 psi	17″ w.c. to 1¼ psi	21″ w.c. to 1½ psi	1¼ to 2 psi
Blue	9½″ to 20″ w.c.	16½″ to 21″ w.c.	21″ w.c. to 1¾ psi	21″ w.c. to 2 psi	1¼ to 2½ psi	1½ to 3¼ psi
Red				1½ to 3¼ psi	1¾ to 4 psi	2½ to 6 psi
			2″ Model 441-S			
		3″ Model 441-S				
	4″ Model 441-S					

Springs are colored for identification. When shipped, the regulator is equipped with the lightest spring suitable for the maximum outlet pressure specified on order.

If outlet pressure conditions change, replace spring according to above table for best operation. For best performance use the largest size diaphragm for the spring and pipe size selected.

For pressures below 4″ w.c. install the Model 441-S upside down.

Maximum Inlet Pressure—All Models

Regulator Body Type	441 Body Materials	Maximum Working Pressure of Body	Maximum Inlet Pressure
Screwed End (2″ Pipe Size Only)	CAST IRON (ASTM A126-71 Class B)	250 psi	100 psi
Flanged ANSI 125 lb. FF	CAST IRON (ASTM A126-71 Class B)	175 psi	
Flanged ANSI 250 lb. RF	DUCTILE IRON (ASTM A395-71 gr 60-40-18)	575 psi	
Flanged ANSI 300 lb. RF	CAST STEEL (ASTM A216-70a gr WCB)	720 psi	

Pipe Sizes

Model 441-S		
2″	3″	4″

Temperature Limits

The 441-S Regulator may be used for flowing gas temperatures from –20°F to 150°F.

Buried Service

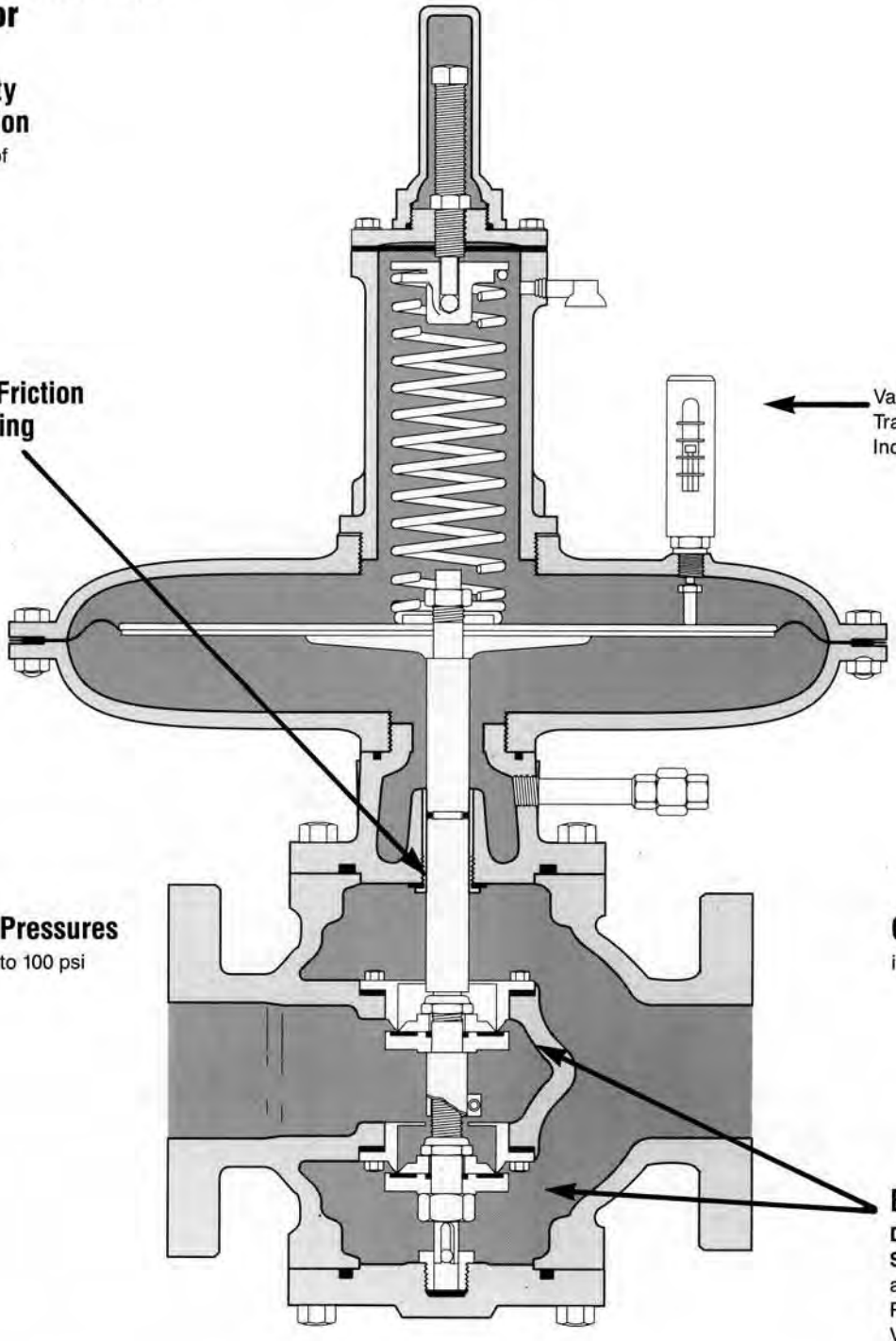
The 441-S Regulator is not recommended for buried service.

SENSUS

441-S Low Pressure Regulator

Heavy Duty Construction

Weather-proof
Watertight
For Indoor
or Outdoor
Installations



Model 441-S Low Pressure Regulators
Capacity Tables

Capacity in 1000 SCFH of Natural Gas (0.6 Specific Gravity—14.65 psia—60°F)

Inlet Pressure psi	Outlet Pressure psi	2" 441-S		3" 441-S			4" 441-S		
		1¾" Valve	1½" Reduced Valve	2⅛" Valve	1¾" Reduced Valve	1½" Reduced Valve	3" Valve	2⅛" Reduced Valve	1¾" Reduced Valve
7" w.c.	4" w.c.	6.8	5.3	11.1	8.2	5.3	22.1	11.1	6.7
14" w.c.	4" w.c.	12.3	9.7	20.1	15.0	9.7	40.2	20.1	12.3
	7" w.c.	10.3	8.1	16.8	12.6	8.1	33.7	16.8	10.3
1	4" w.c.	19.0	14.9	31.0	23.2	14.9	62.1	31.0	18.9
	7" w.c.	17.9	14.1	29.3	21.8	14.1	58.5	29.3	17.8
	14" w.c.	14.8	11.6	24.2	18.1	11.6	48.4	24.2	14.8
2	4" w.c.	28.3	22.2	46.1	34.4	22.2	92.2	46.1	28.1
	7" w.c.	27.2	21.3	44.4	33.1	21.3	88.7	44.4	27.1
	14" w.c.	25.6	20.0	41.7	31.1	20.0	83.3	41.7	25.4
	1 psi	21.2	16.6	34.6	25.8	16.6	69.1	34.6	21.1
3	4" w.c.	34.8	27.3	56.8	42.4	27.3	113	56.8	34.6
	7" w.c.	34.3	26.9	55.9	41.7	26.9	111	55.9	34.1
	14" w.c.	33.2	26.0	54.1	40.4	26.0	108	54.1	33.0
	1 psi	29.9	23.4	48.8	36.4	23.4	97.5	48.8	29.8
	2 psi	21.8	17.0	35.5	26.5	17.0	70.9	35.5	21.6
4	4" w.c.	40.8	32.0	66.6	49.7	32.0	133	66.6	40.6
	7" w.c.	40.3	31.6	65.7	49.0	31.6	131	65.7	40.1
	14" w.c.	39.2	30.7	63.9	47.7	30.7	127	63.9	39.0
	1 psi	37.0	29.0	60.3	45.0	29.0	120	60.3	36.8
	2 psi	31.0	24.3	50.6	37.8	24.3	101	50.6	30.9
	3 psi	22.9	17.9	37.3	27.8	17.9	74.5	37.3	22.7
5	4" w.c.	45.7	35.8	74.6	55.7	35.8	149	74.6	45.5
	7" w.c.	45.2	35.4	73.7	55.0	35.4	147	73.7	44.9
	14" w.c.	44.7	35.0	72.8	54.3	35.0	145	72.8	44.4
	1 psi	42.5	33.3	69.2	51.7	33.3	138	69.2	42.2
	2 psi	38.1	29.9	62.1	46.4	29.9	124	62.1	37.9
	3 psi	32.1	25.2	52.4	39.1	25.2	104	52.4	31.9
	4 psi	23.4	18.3	38.1	28.5	18.3	76.2	38.1	23.3
6	4-7" w.c.	49.6	38.8	80.8	60.3	38.8	161	80.8	49.3
	14" w.c.	49.0	38.4	79.9	59.6	38.4	159	79.9	48.7
	1 psi	47.9	37.5	78.1	58.3	37.5	156	78.1	47.7
	2 psi	44.1	34.5	71.9	53.7	34.5	143	71.9	43.9
	3 psi	39.2	30.7	63.9	47.7	30.7	127	63.9	39.0
	4 psi	33.2	26.0	54.1	40.4	26.0	108	54.1	33.0
	5 psi	23.9	18.7	39.0	29.1	18.7	78.0	39.0	23.8
8	4-7" w.c.	57.7	45.2	94.1	70.2	45.2	188	94.1	57.4
	14" w.c.	57.2	44.8	93.2	69.6	44.8	186	93.2	56.9
	1 psi	56.6	44.4	92.3	68.9	44.4	184	92.3	56.3
	2 psi	53.9	42.2	87.9	65.6	42.2	175	87.9	53.6
	3 psi	50.6	39.7	82.5	61.6	39.7	165	82.5	50.4
	4 psi	46.8	36.7	76.3	57.0	36.7	152	76.3	46.6
	5 psi	41.4	32.4	67.4	50.3	32.4	134	67.4	41.2
	6 psi	34.8	27.3	56.8	42.4	27.3	113	56.8	34.6
10	7" w.c.	64.8	50.8	105	78.9	50.8	211	105	64.5
	14" w.c.	64.3	50.3	104	78.2	50.3	209	104	63.9
	1 psi	63.7	49.9	103	77.5	49.9	207	103	63.4
	2 psi	62.6	49.1	102	76.2	49.1	204	102	62.3

Note: The performance data on pages 4 and 5 is based on normal testing at 70ºF flowing temperature. Changes in performance can occur at extreme low flowing temperatures.

Inlet Pressure psi	Outlet Pressure psi	2" 441-S		3" 441-S			4" 441-S		
		1¾" Valve	1½" Reduced Valve	2⅛" Valve	1¾" Reduced Valve	1½" Reduced Valve	3" Valve	2⅛" Reduced Valve	1¾" Reduced Valve
10	3 psi	60.5	47.4	98.5	73.6	47.4	197	98.5	60.1
	4 psi	57.2	44.8	93.2	69.6	44.8	186	93.2	56.9
	6 psi	49.0	38.4	79.9	59.6	38.4	159	79.9	48.7
12	7" w.c.	71.4	55.9	116	86.8	55.9	232	116	71.0
	14" w.c.	70.8	55.5	115	86.2	55.5	230	115	70.4
	1 psi	70.3	55.0	114	85.5	55.0	228	114	69.9
	2 psi	69.7	54.6	113	84.8	54.6	227	113	69.3
	3 psi	68.6	53.8	111	83.5	53.8	223	111	68.3
	4 psi	66.5	52.1	108	80.8	52.1	216	108	66.1
	6 psi	60.5	47.4	98.5	73.6	47.4	197	98.5	60.1
15	1 psi or less	80.1	62.7	130	97.4	62.7	260	130	79.6
	2 psi	79.5	62.3	129	96.8	62.3	259	129	79.1
	3 psi	79.0	61.9	128	96.1	61.9	257	128	78.6
	4 psi	77.9	61.0	127	94.8	61.0	253	127	77.5
	6 psi	74.1	58.0	120	90.1	58.0	241	120	73.7
20	4 psi or less	93.7	73.4	152	114	73.4	305	152	93.2
	6 psi	92.6	72.6	151	112	72.6	301	151	92.1
25	6 psi or less	108	84.5	175	131	84.5	351	175	107
30		121	94.8	197	147	94.8	393	197	120
40		148	116	241	180	116	482	241	147
50		175	137	286	213	137	571	286	174
60		202	158	330	246	158	660	330	201
80		257	201	419	313	201	837	419	255
100		311	244	508	379	244	1014	508	310
"K" Factors Standard Valves		**5450**	**4270**	**8880**	**6630**	**4270**	**17740**	**8880**	**5420**
"K" Factors V-Port Valves		**5260**	**4160**	**8440**	**6390**	**4160**	**13850**	**8440**	**5260**
For V-Port Valves— Multiply Table Values by		**.965**	**.974**	**.950**	**.964**	**.974**	**.781**	**.950**	**.970**

Size each regulator on the basis of the **minimum expected inlet pressure** and the **maximum required outlet pressure.**

Outlet pressure ranges and **diaphragm sizes** are shown in the table "Spring Ranges" on page 2.

For smaller capacities see Model 461-S (Bulletin R 1330).

Other Features

Simple Design—dependable regulation—trouble free operation—fast response.

Standard Face to Face Dimensions

Standardized "441" Bodies & Inner Valve Assemblies—easy maintenance—parts are interchangeable with other 441 models.

Simplified Valve Adjustment—easy to adjust for tight lock-up—accurate.

Molded Soft Seats—positive tight shut-off—will not blow out.

Sensitive Diaphragms—large areas give accurate regulation.

O-Ring Stem Seal—with removable anti-friction bushing.

Bushing Guided Inner Valve—accurate stem alignment and valve seating.

Side Inspection Plates—both sides of body—quickly removable.

O-Ring Body Seals—eliminate gaskets on upper and lower body openings and side inspection plates.

Self-Aligning Spring Adjustment—color coded springs.

Flanged Removable Seats (Orifices)—easily changed—no special tools needed.

Variations

Monitoring

The 441-S makes an excellent monitor; a standby regulator which provides over-pressure protection by assuming control if a failure in the operating regulator causes outlet pressure to exceed the set point.

For service of this kind the 441-S does not require any changes or modifications. It is merely installed in series with the operating regulator and set for a somewhat higher outlet pressure.

In this way it is fully connected into the system but remains open so it will not cause any obstruction or interfere with normal operation. At the same time it is fully operable and ready to take control if an emergency calls it into action.

The fast response of the 441-S means that it will take control quickly where necessary and its outstanding performance means that it will provide excellent standby regulation.

The downstream control lines for both the operating regulator and monitor are connected into the system downstream from both. However, for maximum protection, these control lines should be entirely separate from each other including their connections into the system.

The 441-S can be used to monitor another 441-S or other types of regulators. Because of its simplicity and dependability, it is often used for monitoring pilot operated regulators.

Where a 441-S is used to monitor a regulator of the same pipe size and having an identical inner valve, (another 441-S, a 441-VPC, etc.) the **total maximum capacity** through both can be figured at 70% of the capacity of one of them alone. This applies with the monitor located in either the upstream or downstream position.

Zero Governor

The Model 441-S is often used for zero governor service.

For maximum accuracy and sensitivity it is used just as it is, but installed upside down. In this position it achieves a "dead weight" operating action from the weight of the moving parts. The spring is used to counterbalance this weight and adjusted to the exact zero pressure setting required.

It can also be supplied with an extra spring for counterbalancing the moving parts and thus installed right side up. With this arrangement accuracy is reduced slightly because of the additional spring effect.

With either arrangement, the 441-S will provide excellent zero governor performance.

Differential Regulation

For differential regulation the 441-S is arranged to receive a pressure signal on each side of the diaphragm.

The differential is taken by applying one of the pressures through the regular downstream control line connection and applying the other pressure to the opposite side of the diaphragm through a ¼" NPT connection in the top housing. The difference between the two pressures is the differential which the diaphragm senses.

For differentials greater than 4" w.c. the Model 441-S is installed in the regular upright position. The spring and diaphragm are selected from the table on page 2, using the table pressures as differentials. The exact differential desired is set with the adjustment screw.

For differentials less than 4" w.c., the 441-S is installed upside down or provided with a counterbalancing spring, as described under "Zero Governor."

Relief Valves and Back Pressure Valves

For those applications which require a higher degree of accuracy and sensitivity than is possible with standard poppet type reliefs, use the Model 441-SR.

Essentially, it is a regulator arranged to provide inlet pressure control. When operating as a relief valve it limits inlet pressure to a set maximum. At pressures below this, it remains closed. If the pressure should attempt to exceed this, it opens and bleeds off the excess.

As a back pressure valve, it prevents gas from exiting from a system until the system pressure reaches the set point. At set point it begins to open and then regulates the discharge so as to hold the system at the set point.

The 441-SR is the same as the 441-S except that the inner valve is reversed, the body is turned around, and the control line is arranged for connection to the inlet side (upstream).

The Model 441-SR offers these advantages: (1) accurate setting and control at low relieving pressure because of large sensitive diaphragm; (2) tight shutoff without leakage due to soft-seat valve construction; (3) large relieving capacity due to large size double valves.

Other Large Capacity Regulators in the "441" Family

Model 441-57S "Roll-Out" diaphragm regulators for outlets of 3 to 100 psi. (Bulletin R 1360).

Model 441-X57 high pressure regulators with "roll-out" diaphragm and standby piston, for outlets from 75 to 100 psi. (Bulletin R 1361).

Model 441-VPC pilot operated regulators for low, medium, and high pressures. (Bulletin R 1370).

Caution: It is the user's responsibility to assure that all regulator vents and/or vent lines exhaust to a non-hazardous location away from **any potential** sources of ignition. **Refer to Sensus Bulletin RM-1350 for more detailed information.**

Maximum Emergency Pressure

The maximum pressure the regulator inlet may be subjected to under abnormal conditions without causing damage to the regulator is 125 psi.

The maximum pressure the regulator outlet may be subjected to without causing damage to the internal parts of the regulator is:

10″ Diaphragm	set-point + 4 psi
12″ Diaphragm	set-point + 3 psi
14″ Diaphragm	set-point + 2 psi
16″ Diaphragm	set-point + 1 psi
18″ Diaphragm	set-point + 1 psi
20″ Diaphragm	set-point + 1 psi

Set-point is defined as the outlet pressure a regulator is adjusted to deliver.

If any of the above pressure limits are exceeded, the regulator must be taken out of service and inspected. Damaged or otherwise unsatisfactory parts must be repaired or replaced.

The maximum pressure that can be safely contained by the diaphragm case is:

10″ Diaphragm	15 psi
12″ Diaphragm	10 psi
14″ Diaphragm	10 psi
16″ Diaphragm	5 psi
18″ Diaphragm	5 psi
20″ Diaphragm	5 psi

Safely contained means no leakage as well as no bursting. Before using any of the above data, make sure this entire section is clearly understood.

Overpressurization Protection

Protect the downstream piping system and the regulator's low pressure chambers against overpressurization due to possible regulator malfunction or failure to achieve complete lockup. The allowable outlet pressure is the lowest of the maximum pressures permitted by federal codes, state codes, Sensus Bulletin RDS-1498, or other applicable standards. The method of protection can be a relief valve, monitor regulator, shutoff device, or similar mechanism.

Capacities at Other Pressures

Capacity for pressure reductions not listed in the table can be calculated with the following formulae:

1. $Q = K\sqrt{P_o\ (P_1 - P_o)}$
2. $Q = \frac{K P_1}{2}$

Q = maximum capacity of the regulator (in SCFH of 0.6 specific gravity natural gas).
K = the **"K" factor**, the regulator constant (from bottom of capacity table, page 5).
P_1 = **absolute** inlet pressure (psia).
P_o = **absolute** outlet pressure (psia).

Use formula 1. when $\frac{P_1}{P_o}$ is less than 1.894.

Use formula 2. when $\frac{P_1}{P_o}$ is greater than 1.894.

Other Gases

Model 441-S Regulators are mainly used on natural gas. However, they perform equally well on LP gas, nitrogen, dry CO_2, air and others.

OTHER GASES	CORRECTION FACTOR
Air (Specific Gravity 1.0)	0.77
Propane (Specific Gravity 1.53)	0.63
1350 BTU Propane-Air Mix (1.20)	0.71
Nitrogen (Specific Gravity 0.97)	0.79
Dry Carbon Dioxide (Specific Gravity 1.52)	0.63
For other noncorrosive gases: CORRECTION FACTOR =	$\sqrt{\frac{0.6}{\text{Specific Gravity of the Gas}}}$

For use with gases not listed above, please contact your Sensus representative or Industrial Distributor for recommendations

General Information

Materials of Construction

Diaphragm Housing, Spring Cage . . . . . Cast Iron (ASTM A126-71 Class B)
Upper and Lower Diaphragm Plates . . . . . Steel
Diaphragm . . . . . Buna-N with Nylon Reinforcement
Diaphragm Connecting Stem & Anti-Friction Bushing . . . . . Stainless Steel
Removable Seats (Orifices) . . . . . Cast Iron or Stainless Steel
Valve Stems . . . . . Brass or Stainless Steel
Soft Seat Valve Material . . . . . Buna-N, molded in holder
Holder for Molded Valve . . . . . Steel
Valve Retainer . . . . . Cast Iron or Stainless Steel
Bodies and Side Inspection Plates . . . . . see table on Page 2

Price List . . . . . see RPL 1350
Installation, Maintenance and Parts . . . . . see RM 1350

Metrication

Use the following for metric conversions:

std. metres³/hr. x 35.31 = std. ft.³/hr. (SCFH) std. ft.³/hr. (SCFH) x 0.0283 = std. metres³/hr.
kilograms/centimeter² (kg/cm²) x 14.22 = psi psi x 0.0703 = kilograms/centimeter² (kg/cm²)
kilopascals (kPa) x 0.145 = psi psi x 6.90 = kilopascals (kPa)
bars x 14.50 = psi psi x .0689 = bars
millimeters water (mm H_2O) x .0394 = in. w.c. in. w.c. x 25.4 = millimeters water (mm H_2O)
millimeters mercury (mm Hg) x 1.868 = in. w.c. in. w.c x 0.535 = millimeters mercury (mm Hg)

How to Order

Specify:
1. Pipe size and **Model 441-S.**
2. Piping connections and body material (see table on Page 2)
3. Outlet pressure and spring (see table on page 2)
4. Diaphragm size
5. Inlet pressure (also maximum and minimum, if available)
6. Capacity required (SCFH)
7. Kind of gas (natural gas, propane, etc.)
8. Trim (standard or stainless steel)
9. If a reduced valve is required, specify size.

Caution: Turn gas on slowly. If an outlet stop valve is used, it should be opened first. Do not overload the diaphragm with a sudden surge of inlet pressure. Monitor the outlet pressure during start-up to prevent an outlet pressure overload. **Refer to RM-1350 for more detailed start-up procedures.**

Typical Installation

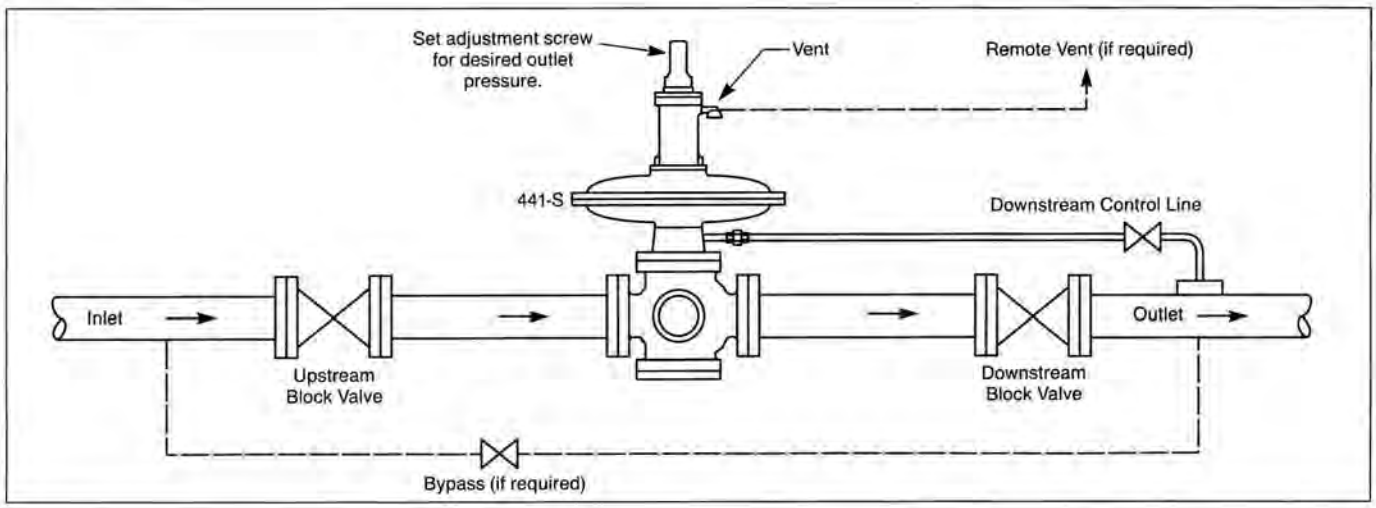
The compact arrangement of the 441-S makes it an easy regulator to install. The sketch below shows a typical arrangement.

Particular attention should be given to the downstream control line. A regulator will work to deliver the pressure, for which it is adjusted, at the point in the system where the control line is connected. The connection, generally, should be at least eight pipe diameters away from the regulator and should be clean and smooth, free of rough edges, welding icicles, etc. It should be located in as straight a run of pipe as possible to avoid excess turbulence, and where downstream piping increases in size near the regulator, it is generally preferable to locate the connection in the larger size.

Inlet piping should be adequately purged to remove dirt and debris which could damage the regulator or impair its operation. If purging is not feasible, a strainer should be installed ahead of the regulator.

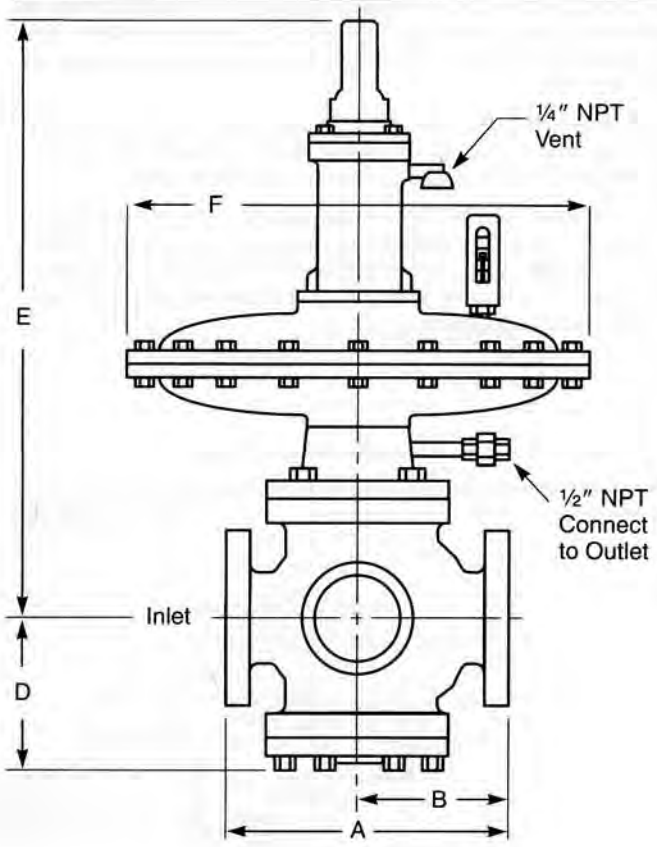
To place the regulator in service, first open the downstream control line valve, then slowly open the downstream block valve, and finally open the upstream block valve very slowly.

The outlet pressure setting is made with the adjustment screw. Clockwise rotation increases the pressure, and counterclockwise decreases it. Do not adjust when there is no flow. After adjustment is complete, the locknut should be tightened firmly and the cover cap replaced.



Periodic Inspection: Regulators are pressure control devices with numerous moving parts subject to wear that is dependent upon particular operating conditions. To assure continuous satisfactory operation, a periodic inspection schedule must be adhered to with the frequency of inspection determined by the severity of service and applicable laws and regulations. **See Bulletin RM-1350 for field service instructions.**

Dimensions



Regulator Body Type		Pipe Size			
		Screwed 2"	Flanged ANSI		
			2"	3"	4"
125 lb. Cast Iron	A	10	10	11¾	13⅞
	B	5 5/16	5 5/16	6⅛	7⅝
250 lb. Ductile Iron	A	—	10½	12½	14½
	B	—	5 9/16	6½	7 15/16
300 lb. Cast Steel	A	—	10½	12½	14½
	B	—	5 9/16	6½	7 15/16
	D	6	6	6	9½
	E	24	24	24	26
Maximum O.D.	F	19	19	21	23
Shipping Weight	Lbs.	130 to 170	135 to 175	160 to 220	250 to 340

Other Sensus Gas Pressure Regulators

Sensus produces a broad product line of Gas Pressure Regulators which are widely used throughout the natural gas industry. These regulators are also suitable for non-corrosive industrial gas applications such as propane, butane, air nitrogen, dry CO2, etc. For additional information on a particular model, please request the indicated bulletin from the local Sensus sales representative.

Multi-Purpose Service Regulators

Model 143-80
Bulletin: R-1301
¾", 1", 1¼" pipe size
Inlet pressures.....to 125 psig
Outlet pressures.....3 ½" w.c. to 6 psig
Capacity to 2000 CFH
Available with straight-through body.
Also available: internal relief valve and low-pressure cut-off.

Model 043-C
Bulletin: TD-1309
½", ¾", 1", 1¼" pipe size
Inlet pressures.....to 125 psig
Outlet pressures.....5" w.c. to 5 psig
Capacity to 4,700 CFH
Available with 90 °angle or straight-through body
Available with internal relief valve

Industrial Service Regulators

Models 243-8, 243-12,243-8HP
Bulletin: R-1306
1¼", 1½" and 2" pipe size
Inlet pressures.....to 125 psi
Outlet pressures.....3 ½" w.c. to 10 psi
Capacity to 25,000 CFH
Also available: internal relief valve, low pressure cut-off external control line, back pressure regulator, relief valve, vacuum regulator and vacuum breaker.

Industrial Field Regulators

For immediate to high pressure applications. Ideal on pipeline traps servicing plants and buildings. Appropriate for double stage reduction ahead of service regulators, and for high pressure burners and compressed air systems.

Model 046
Bulletin: R-1312
¾", 1", 1¼" pipe size
Inlet pressures.....to 1000 psi
Outlet pressures.....3 to 200 psi
Capacity to 40,000 SCFH
Available with internal relief valve.

Model 141A
Bulletin: R-1311
2" pipe size
Inlet pressures.....to 1500 psi
Outlet pressures.....5 to 400 psi

Pilot Loaded Regulators

For intermediate and high-pressure applications requiring precise pressure reduction with minimal droop. Ideal for standard and high capacity flows on burners, driers, dehydrators and compressor line. Appropriate for fixed factor billing.

Model 243-RPC
Bulletin: R-1343
1¼", 1½", and 2" pipe size
Inlet pressures . . . to 150 psi
Outlet pressures . . 3½" w.c. to 35 psi
Capacity to 76,000 SCFH

Model 1100
Bulletin: R-1341
Pipe size: 2"
(screwed or flanged)
Inlet pressures . . . . to 400 psi
Outlet pressures . . . . . 3" w.c. to 100 psi
Capacity to 414,000 SCFH

Model 1200
Bulletin: R-1342
Pipe size: 2" (flanged)
Inlet pressures . . . . . to 1200 psi
Outlet pressures . . . . . 20 to 600 psi
Capacity to 789,000 SCFH

Sensus also produces Industrial and Combustion Regulators; High Pressure, High Capacity Regulators; and Safety Relief Valves. Detailed information available upon request.

805 Liberty Boulevard
P.O. Box 528
DuBois, PA 15801
814-375-8875
Fax 814-375-8460

Authorized Distributor

Model 441-S Regulator

Installation and Maintenance Instructions

Introduction

Maximum Inlet Pressures

Regulator Body Type	441 Body Materials	Max. Working Pressure Of Body	Max. Inlet Pressure
Screwed End (2" Pipe Size Only)	Cast Iron (ASTM A126-71 Class B)	250 psi	100 psi
Flanged ANSI 125 FF	Cast Iron (ASTM A126-71 Class B)	175 psi	
Flanged ANSI 250 RF	Ductile Iron (ASTM A395-71 gr 60-40-18)	575 psi	
Flanged ANSI 300 RF	Cast Steel (ASTM A126-70a gr WCB)	720 psi	

Installation and Start-Up

Note: Do not install sideways.
The diaphragm should be horizontal.

1. Thoroughly purge inlet piping to remove dirt and debris which could damage the regulator or impair its operation. If this cannot be done, a filter or strainer should be installed ahead of the regulator.

   Make certain regulator is free of any dirt or foreign matter that might have collected.
2. Place regulator in the line with high pressure connected to the inlet side (be sure shipping screens or covers, if used, are removed from the inlet and outlet).

   Tighten bolts on flanges evenly.

   Where required, the regulator may be inverted.

CAUTION

It is the user's responsibility to ensure that all regulator vents and/or vent lines exhaust to a non-hazardous location away from ANY POTENTIAL sources of ignition. Where vent lines are used, it is the user's responsibility to ensure that each regulator is individually vented and that common vent lines ARE NOT used.

3. From the ½" union **60** extend pipe or tubing to the control connection into the outlet piping. This control piping should not be less than ½" in size and should be adequately protected against breakage (regulators go wide open if the control line is broken).

   The regulator will work to deliver the pressure, for which it is adjusted, at that point in the outlet piping where the control connection is located.

   In general, the control connection should be at least 8 pipe diameters from the regulator and should be in as straight a run of pipe as possible.

   The control connection should be clean and smooth, free of rough edges, welding “icicles”. etc.
4. Where outlet piping increases in size near the regulator, it is generally preferable to locate the control connection in the larger size.

   The ½" union **60** contains a small orifice, approximately 1/16" diameter. This orifice should not be removed. Also, make certain this orifice is open and free of foreign material.

   Check all connections for leaks.

CAUTION

Turn gas on very slowly. If an outlet stop valve is used, it should be opened first. Do not overload the diaphragm with a sudden surge of inlet pressure. Monitor the outlet pressure during start-up to prevent an outlet pressure overload.

5. Put the regulator into operation as follows: (refer to page 6)
   a. Slowly open the downstream control line valve (A).
   b. Slowly open the downstream block valve (B).
   c. Very slowly open the upstream block valve (C).
   d. Set the adjusting screw **10** for the required outlet pressure. Turn it clockwise to increase the pressure counterclockwise to decrease it. Only make this adjustment when gas is actually flowing through the regulator.
   e. After adjustment is complete, the lock nut **11** should be tightened firmly and the seal cap **1** replaced.
6. To shut down, carefully close valves **C**, **B**, and **A** in that order.

CAUTION

The diaphragm case vent must be positioned to protect against flooding, drain water, ice formation, traffic, tampering, etc. The vent must be protected against nest building animals, bees, insects, etc. to prevent vent blockage and minimize the chances of foreign material collecting in the vent side of the regulator diaphragm.

7. The vent connection is an escape path for flammable gas and it must be located and/or piped so that potential discharge occurs in a safe area away from buildings, open flames, collection areas, arcing devices, etc.

   Regulators installed indoors or in a non-vented area must be vented to the outside. Simply run vent piping from the regulator vent connection to a non-hazardous location on the outside away from ANY POTENTIAL sources of ignition. The vent piping must be connection size or larger and piped to a safe area. The vent discharge must be protected against the potentials outlined in instructions #2 and #10.
8. **For outdoor installations, it is recommended the regulator be installed so the regulator vent faces downward to avoid the potential for water or other foreign matter entering the regulator and interfering with the proper operation of the regulator.**

Servicing and Adjustment

General Notes

1. Make sure the regulator is entirely depressured before servicing.
2. A quick visual inspection of the valve can be made by removing inspection plates **38** from the sides of the body.

   They also provide greatly improved access to the valve when servicing or adjusting.
3. The valve and body parts are interchangeable with other 441 Regulators (441-57S, 441-X57, 441-VPC, 441-2100, etc.).

*This document replaces RM-1350-R7

4. Use lubricants sparingly and with care to avoid exposing tacky surfaces to the gas stream. Such surfaces could cause accumulation of dirt on close clearance parts.

   Use moly or silicone-type lubricants. Avoid the use of petroleum base types.

   Lubricate stem **24**, guide **50h**, and stem O-ring **23** with dry silicone lubricant to help ensure free movement and a tight seal.

   An application of lubricant to the other O-rings and the tetraseals in the regulator will help ensure their tightness.

To Remove Valves

1. Remove seal cap **1**, back off adjusting screw **10**, remove housing cover **5**, and spring **14**.
2. Remove bottom plate **33**, and side plates **38**.
3. Insert an Allen wrench through side inspection opening and loosen Allen screw **50h**.
4. Unscrew lower valve assembly and remove through bottom opening (**50h** unscrews from **24**).
5. Unscrew upper valve assembly and remove through side opening (**50e** or **50j** unscrews from **24**).

   NOTE:
   - **a.** If upper valve assembly is too large to remove through side opening, remove it through bottom opening by also removing outlet orifice **29**, (remove cap screws **26** to remove orifice, and, if tight, jack out using cap screws in jacking holes).
   - **b.** Entire valve assembly may be removed intact through bottom opening by also removing orifice **29**. This method leaves the lock-up adjustment undisturbed.
   - **c.** Use care with orifice gasket **27**.
6. To disassemble upper and/or lower valve assembly, remove nuts **50a**.

To Replace and Adjust Valves

1. Assemble upper valve assembly (parts **50a**, **50b**, **50c**, **50d**, **50e**, **50f**, **50g**, **50j**), and lower valve assembly (parts **50a**, **50b**, **50c**, **50d**, **50h**). Firmly tighten nuts **50a**. (Also, **50i** should be firmly tightened against **50a**.)
2. Insert upper valve assembly and screw into place by a few turns (**50e** or **50i** screws into **24 but should be loosened by one-half to one turn**).
3. If orifice **29** was removed, reinstall it.
4. Inset lower valve assembly and screw into place by a few turns (**50h** screws into **50e**).
5. Turn upper valve assembly so Allen screw **50g** is accessible through side inspection opening.
6. Make the valve lock-up adjustment as follows:
   - **a**. Hold upper valve against its seat. This can be done by hand, reaching through side inspection opening.
   - **b**. While holding the upper valve against its seat, screw lower valve assembly upwards until the lower valve also touches its seat. When both upper and lower valves are touching their seats they are correctly adjusted for tight lock-up.
   - **c.** Firmly tighten Allen screw **50g**. This locks the adjustment by evenly and tightly locking **50h** and **50e** together. **NOTE:** If the entire valve assembly was removed intact and Allen screw **50g** has not been loosened, the assembly may be reinstalled without making the lock-up adjustment.
7. Screw entire valve assembly up (**50e** or **50i** screws into **24**) until it bottoms. Then **back off one-half to one full turn – this is important**.
8. Replace side plates **38**.
9. Replace bottom plate **33**. Match bottom end of **50h** into **31** and/or **32** and then turn bottom plate either way to first matching bolt hole position.

To Remove Orifices

1. Remove outlet orifice **29** per applicable steps 1 through 5 under section “To Remove Valves”.
2. Remove inlet orifice **28** as follows:
   - **a.** Remove seal cap **1**, back off adjusting screw **10**, remove housing cover **5** and spring **14**.
   - **b.** Remove bottom plate **33** and then unscrew valve assembly by grasping **50h** and turning (**50e** or **50i** unscrews from **24**).
   - **c.** Remove diaphragm case assembly by first opening union **60** and removing cap screws **34**.
   - **d.** Remove cap screws **26** and remove inlet orifice **28**. If orifice is tight, jack out cap screws in jacking holes. Use care with gasket **27**.
   - **e.** When replacing diaphragm assembly, the threaded connection between **24** and **50e** or **50i** should be screwed together until it bottoms and then **backed off one-half to one turn – this is important**.

CAUTION

Regulators are pressure control devices with numerous moving parts subject to wear that is dependent upon particular operating conditions. To ensure continuous satisfactory operation, adhere to a periodic inspection schedule with the frequency of inspection determined by the severity of service and applicable laws and regulations.

To Change Spring

1. Remove seal cap **1**, back off adjusting screw **10**, remove housing cover **5**, and remove spring **14**.
2. Insert the new spring. Be sure it nests correctly onto part **15**.
3. Complete as per steps 7, 8 and 9 under “To Assemble 441-S”.

To Service Diaphragm

1. Remove seal cap **1**, back off adjusting screw **10**, remove housing cover **5**, and remove spring 14.
2. Remove bolts **42** and then carefully remove upper diaphragm case **43**.
3. Turn diaphragm assembly counterclockwise until **24** unscrews from **50e** or **50i**, then remove assembly and inspect diaphragm.
4. If a new diaphragm **20** is required, remove nut **16** and disassemble.
5. Reassemble diaphragm assembly (parts **16**, **17**, **18**, **19**, **20**, **21**, **22**, **23**, **24**).
6. Screw diaphragm assembly back into place (**24** screws into **50e** or **50i** until it bottoms) then **back off one-half to one full turn – this is important**.
7. Carefully reinstall upper diaphragm case **43**. Diaphragm must not be pinched between upper and lower cases, **43** and **40**.

   Tighten bolts **42** evenly.
8. Replace spring, etc., per steps 6 through 9 under “To Assemble 441-S”.

To Assemble 441-S

1. Install orifice **28** through top opening.
2. Install valve assembly and orifice **29** per applicable steps 1 through 6 under “To Replace and Adjust Valves” (except that **50e** or **50i** does not yet screw into **24**).
3. Install centerpiece and lower diaphragm case, **36** and **40**.
4. Install diaphragm assembly and upper case **43** per steps 5 through 7 under “To Service Diaphragm”.
5. Replace bottom plate **33**. Match bottom end of **50h** into **31** and/or **32**, and then rotate bottom plate either way to first matching bolt hole position.
6. Insert the spring. Be sure it nests correctly onto part **15**.
7. Insert top spring button **12**. Be sure it is nested correctly on the spring.
8. Install housing cover **5**. Be sure ball **13** is in place and the lower end of adjusting screw **10** goes in the hole in button **12**.
9. Set adjusting screw **10** for desired outlet pressure, firmly tighten nut **11** and replace seal cap **1**.

Over-pressurization Protection

Protection must be provided for the downstream piping system and the regulator's low pressure chambers to ensure against the potential over-pressurization due to a regulator malfunction or a failure of the regulator to lock-up. The allowable over-pressurization is the lowest of the maximum pressures permitted by federal codes, state codes, Bulletin RDS-1498, or other applicable standards. The method of providing over-pressure protection could be a relief valve, a monitor regulator, a shut-off device or any similar device.

Temperature Limits

The Model 441-S Regulator can be used for flowing temperatures from -20°F to 150°F.

Buried Service

The Model 441-S Regulator is not recommended for buried service.

Condensed Parts List

For complete parts list and list prices please refer to RP 1350. When ordering parts for a 441-S regulator, include pipe size, model number, inner valve size, and serial number if possible.

Maximum Emergency Pressure

NOTE: Before using any of the following data, make sure this entire section is clearly understood.

The maximum pressure the Model 441-S regulator inlet may be subjected to under abnormal conditions without causing damage to the regulator is 125 psi.

The Maximum pressure the regulator outlet may be subjected to without causing damage to the internal part of the regulator is:

10" Diaphragm	set-point + 4 psi
12" Diaphragm	set-point + 3 psi
14" Diaphragm	set-point + 2 psi
16" Diaphragm	set-point + 1 psi
18" Diaphragm	set-point + 1 psi
20" Diaphragm	set-point + 1 psi

The set-point is defined as the outlet pressure a regulator is adjusted to deliver.

If any of the above pressure limits are exceeded, the regulator must be taken out of service and inspected. Damaged or otherwise unsatisfactory parts must be repaired or replaced.

The maximum pressure that can be safely contained by the diaphragm case is:

10" Diaphragm	15 psi
12" Diaphragm	10 psi
14" Diaphragm	10 psi
16" Diaphragm	5 psi
18" Diaphragm	5 psi
20" Diaphragm	5 psi

Safely contained means no leakage as well as no bursting.

Other Gases

The Model 441-S is mainly used with natural gas services; however, this regulator will perform equally as well with other gases. When using the Model 441-S Regulator with other gases, the regulator capacities must be adjusted using the following correction factors.

Type of Gas	Correction Factor
Air (Specific Gravity 1.0)	0.77
Propane (Specific Gravity 1.53)	0.63
1350 BTU Propane-Air Mixture (Specific Gravity 1.20)	0.71
Nitrogen (Specific Gravity 0.97)	0.79
Dry Carbon Dioxide (Specific Gravity 1.52)	0.63

For other non-corrosive gases use the following formula:

$$\text{CORRECTION FACTOR} = \sqrt{\frac{0.60}{\text{Specific gravity of the gas}}}$$

For use with gases not listed above, please contact your Sensus Metering Systems representative or distributor for recommendations.

All Models 441-S

Illustration Number	Description	Part Number
1a	Tetraseal (or O-Ring) 1¾" x 2"	904092
4	Hex Cap Screw, 5/16" – 18 x ¾"	910028
6	Spring Cage Cover Gasket	090-16-066-30
7	Vent Cap, ¼" NPT	137-02-505-02
9	Spring Cage Gasket	090-16-066-60
13	Thrust Bearing, ⅜" diameter stainless steel ball	930510
16	Hex Steel Nut, ⅝" – 18	905993
18	Seal Gasket, 2 used	014-76-179-03
20	7" Diaphragm 10" Diaphragm 12" Diaphragm 14" Diaphragm 16" Diaphragm 18" Diaphragm 20" Diaphragm	090-78-150-21 090-70-150-20 090-71-150-20 090-72-150-20 090-73-150-20 090-74-150-20 090-75-150-20

All Models 441-S (Continued)

Illustration Number	Description	Part Number
23	O-Ring, 11/16" I.D. 7/8" O.D.	934013
24	Diaphragm Connecting Stem, stainless steel	090-16-058-00
41	Hex Steel Nut, 3/8" – 16	920853
42	Hex Cap Screw, 3/8" – 16 x 1 3/8" Lg.	903568
45	Travel Indicator Assembly	

2" Model 441-S

Illustration Number	Description	Part Number
26	Hex Cap Screw, 1-4"–20 x ½" Lg., 120,000 tensile	910001
27	O-Ring, for Orifices	904832
28	1¾" Inlet Orifice, plated steel 1¾" Inlet Orifice, stainless steel 1½" Inlet Orifice, plated steel 1½" Inlet Orifice, stainless steel	090-16-028-00 090-16-028-50 090-16-028-01 090-16-028-51
29	1¾" Outlet Orifice, plated steel 1¾" Outlet Orifice, stainless steel 1½" Outlet Orifice, plated steel 1½" Outlet Orifice, stainless steel	090-16-029-00 090-16-029-50 090-16-029-01 090-16-029-51

Monitoring

The Model 441-S Regulator makes an excellent monitor. It can act as a standby regulator installed in series, which assumes control if a failure in the operating regulator permits the outlet pressure to exceed the set-point. It can be located in either the upstream or the downstream position.

When a Model 441-S Regulator is used to monitor a regulator with an identical inner valve (another 441 Regulator), the total maximum capacity through both regulators can be figured at 70% of the capacity of one regulator alone. This applies with the monitor located either up or downstream.

3" Model 441-S

Illustration Number	Description	Part Number
26	Hex Cap Screw, ¼"–20 x ½" Lg., 120,000 tensile	910001
27	O-Ring, for Orifices	950818
28	2⅛" Inlet Orifice, plated steel 2⅛" Inlet Orifice, stainless steel 1¾" Inlet Orifice, plated steel 1¾" Inlet Orifice, stainless steel 1½" Inlet Orifice, plated steel 1½" Inlet Orifice, stainless steel	090-20-028-00 090-20-028-50 090-20-028-02 090-20-028-52 090-20-028-03 090-20-028-53
29	2⅛" Outlet Orifice, plated steel 2⅛" Outlet Orifice, stainless steel 1¾" Outlet Orifice, plated steel 1¾" Outlet Orifice, stainless steel 1½" Outlet Orifice, plated steel 1½" Outlet Orifice, stainless steel	090-20-029-00 090-20-029-50 090-20-029-02 090-20-029-52 090-20-029-03 090-20-029-53

3" Model 441-S (Continued)

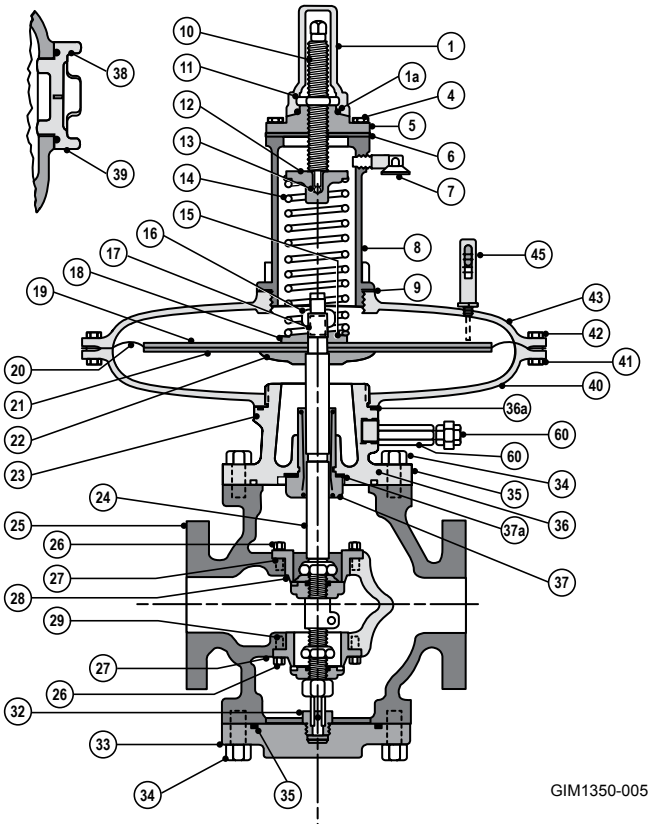
Illustration Number	Description	Part Number
50	Valve Assembly, 2⅛", brass trim, Buna-N (Black, 50-55 Duro) Valve Assembly, 2⅛", stainless steel trim, Buna-N (Black, 50-55 Duro) Valve Assembly, 2⅛", brass trim, Polyurethane (Red, 65-75 Duro) Valve Assembly, 2⅛", stainless steel trim, Polyurethane (Red 65-75 Duro)	090-20-515-30 090-20-515-50 090-20-515-40 090-20-515-60
50b	Valve Retainer, standard, stainless steel, 2⅛" Valve Retainer, v-port wings, stainless steel, 2⅛"	090-20-018-30 090-20-012-51
50d	Molded Valve, 2⅛", Buna-N (Black, 50-55 Duro) all trim Molded Valve, 2⅛", Polyurethane (Red, 65-75 Duro) all trim	090-20-315-00 090-20-315-02

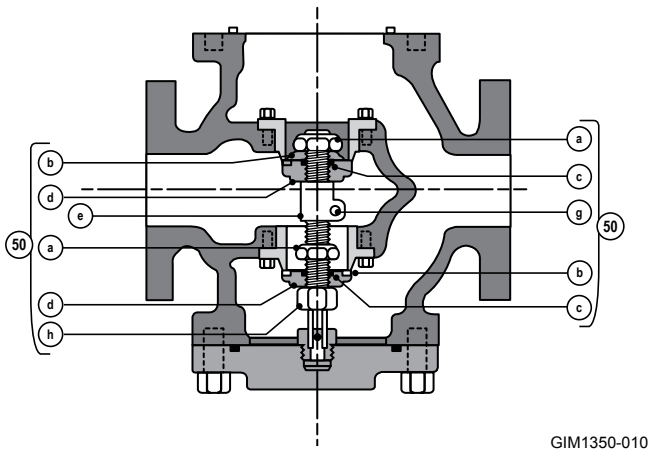
2" and 3" Model 441-S

Illustration Number	Description	Part Number
32	Guide Bushing with Pin, brass Guide Bushing with Pin, stainless steel	090-16-385-01 090-16-385-03
34	Hex Cap Screw, ½" – 13 x 1¼"	910106
35	Tetraseal (or O-Ring), 4⅜" x 4⅝"	904085
36a	Tetraseal, 4" x 4¼"	904084
37	Centerpiece, Stem Bushing	090-16-373-00
37a	Aluminum Seal Ring	090-26-178-00
39	Tetraseal (or O-Ring), 3¼" x 3½"	904078
50	Valve Assembly, 1¾", brass trim, Buna-N (Black, 50-55 Duro) Valve Assembly, 1¾", stainless steel trim, Buna-N (Black, 50-55 Duro) Valve Assembly, 1½", brass trim, Buna-N (Black, 50-55 Duro) Valve Assembly, 1½", stainless steel trim, Buna-N (Black, 50-55 Duro)	090-16-515-27 090-16-515-50 090-16-515-31 090-16-515-51
50a	Valve Retaining Nut, ⅝" – 18	905564
50b	Valve Retainer, standard, steel,1¾" Valve Retainer, standard, stainless steel, 1¾" Valve Retainer, v-port wings, stainless steel, 1¾" Valve Retainer, standard, steel, 1½" Valve Retainer, standard, stainless steel, 1½" Valve Retainer, v-port wings, steel, 1½" Valve Retainer, v-port wings, stainless steel, 1½"	090-16-018-00 090-16-018-30 090-16-012-53 090-16-018-01 090-16-018-31 090-16-012-52 090-16-012-55
50c	O-Ring, ⅝" x 13/16"	934012
50d	Molded Valve, 1¾", Buna-N (Black, 50-55 Duro) all trim Molded Valve, 1½", Buna-N (Black, 50-55 Duro) all trim Molded Valve, 1¾", Polyurethane (Red, 65-75 Duro) all trim Molded Valve, 1½", Polyurethane (Red, 65-75 Duro) all trim	090-16-315-00 090-16-315-01 090-16-315-02 090-16-315-03

2" and 3" Model 441-S (Continued)

Illustration Number	Description	Part Number
50e	Female Valve Stem, brass Female Valve Stem, stainless steel	090-16-116-00 090-16-116-01
50g	Adjustment Clamp Screw, Soc. Hd. Screw, 10–24 x ½" Lg. Adjustment Clamp Screw, for 1½" valve only	903486 090-16-046-01
50h	Male Valve Stem, brass Male Valve Stem, stainless steel	090-16-016-01 090-16-016-02





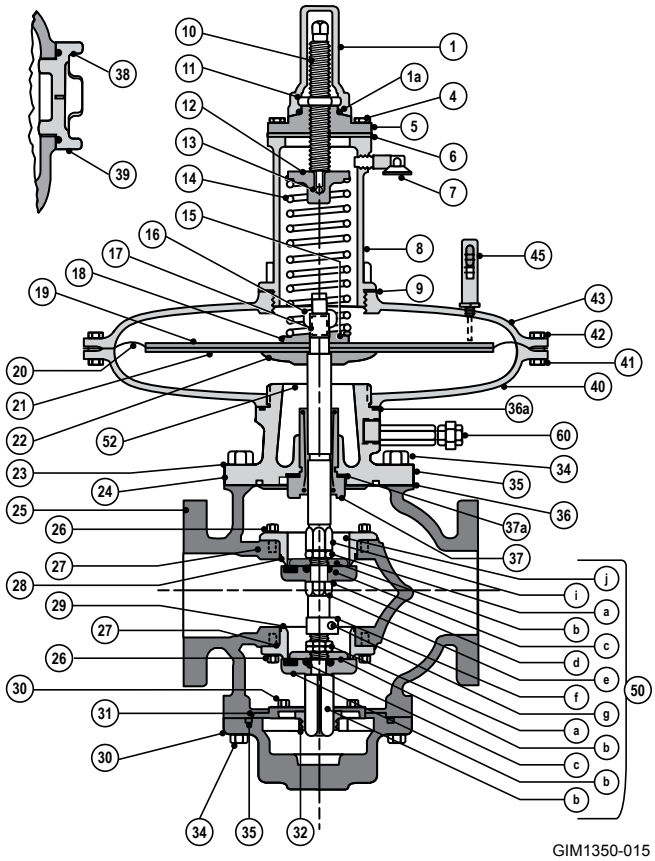
2" AND 3" MODEL 441-S

4" Model 441-S

Illustration Number	Description	Part Number
26	Hex Cap Screw, ⅜"–16 x ¾" Lg., 120,000 tensile	910053
27	O-Ring, for orifices	905583
28	3" Inlet Orifice, plated steel 3" Inlet Orifice, stainless steel 2⅛" Inlet Orifice, plated steel 2⅛" Inlet Orifice, stainless steel 1¾" Inlet Orifice, plated steel 1¾" Inlet Orifice, stainless steel	090-22-028-00 090-22-028-50 090-22-028-02 090-22-028-52 090-22-028-01 090-22-028-51
29	3" Outlet Orifice, plated steel 3" Outlet Orifice, stainless steel 2⅛" Outlet Orifice, plated steel 2⅛" Outlet Orifice, stainless steel 1¾" Outlet Orifice, plated steel 1¾" Outlet Orifice, stainless steel	090-22-029-00 090-22-029-50 090-22-029-02 090-22-029-52 090-22-029-01 090-22-029-51
30	Hex Cap Screw, ⅜" – 16 x 1" Lg.	910055
31	Spin Stop Plate	090-22-040-01
32	Guide Bushing, brass Guide Bushing, stainless steel	090-22-074-00 090-22-074-01
34	Hex Cap Screw, ⅝" – 11 x 1½" Hex Cap Screw, ⅝" – 11 x 1¾" for ductile bottom plate	910157 910158
35	Tetraseal (or O-Ring), 6¼" x 6½"	904080
36a	Tetraseal (or O-Ring), 4" x 4¼"	904084
37	Centerpiece Stem Bushing	090-16-373-02
37a	Aluminum Seal Ring	090-26-178-00
39	Tetraseal (or O-Ring), 4-1/4" x 4-1/2"	904083
50	Valve Assembly, 3", brass trim, Buna-N (Black, 50-55 Duro) Valve Assembly, 3", stainless steel, trim, Buna-N (Black, 50-55 Duro) **Note: For other Valve Assemblies see RP 1350**	090-22-515-30 090-22-515-50
50a	Valve Retaining Nut, 3/4" – 16	090-22-034-00
50b	Valve Retainer, standard, iron, 3" Valve Retainer, standard, stainless steel, 3" Valve Retainer, v-port wings, iron, 3" Valve Retainer, v-port wings, stainless steel, 3" Valve Retainer, standard, iron, 2⅛" Valve Retainer, standard, stainless steel, 2⅛" Valve Retainer, v-port wings, stainless steel, 2⅛" Valve Retainer, standard, stainless steel, 1¾"	090-22-018-03 090-22-018-00 090-22-012-20 090-22-012-40 090-22-018-01 090-22-018-31 090-22-012-51 090-22-018-34
50c	O-Ring, 13/16" x 1"	904173
50d	Molded Valve, 3", Buna-N (Black, 50-55 Duro) all trim Molded Valve, 2⅛", Buna-N (Black, 50-55 Duro) all trim Molded Valve, 1¾", Buna-N (Black, 50-55 Duro) all trim Molded Valve, 3", Polyurethane (Red, 65-75 Duro) all trim Molded Valve, 2⅛", Polyurethane (Red, 65-75 Duro) all trim Molded Valve, 1¾", Polyurethane (Red, 65-75 Duro) all trim	090-22-315-00 090-22-315-01 090-22-315-04 090-22-315-02 090-22-315-03 090-22-315-05
50e	Female Valve Stem, brass Female Valve Stem, stainless steel	090-22-016-40 090-22-016-41
50f	Adjustment Clamp Ring, stainless steel	090-22-043-02

4" Model 441-S (Continued)

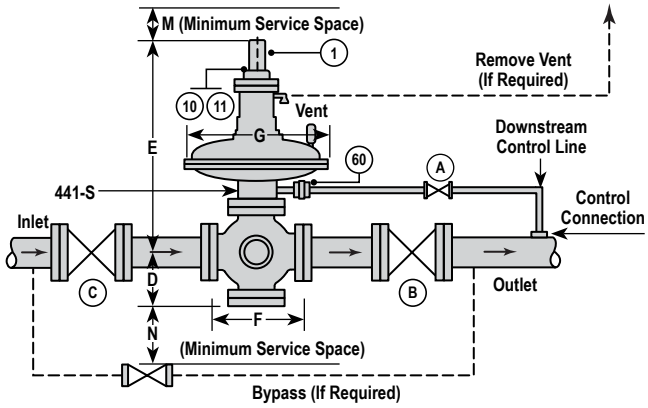
Illustration Number	Description	Part Number
50g	Adjustment Clamp Screw, Soc. Hd. Screw, ¼" – 20 x 3/4" Lg.	903494
50h	Male Valve Stem, stainless steel	090-22-116-01
50i	Stem Extension, stainless, for 20" diaphragm only	090-22-058-40
	Stem Extension, stainless, for 18" and smaller diaphragms	090-22-058-41
52	Travel Stop, for 3" valves	090-22-040-51
	Travel Stop, for 2⅛" and 1¾" valves	090-22-040-55



4" MODEL 441-S

Typical Arrangement And Dimensions

(Indoor or Outdoor Installation)



The 441-S should not be used for inlet exceeding 100 psig.

Regulator Body Type	F (Face to Face)		
	2" Pipe	3" Pipe	4" Pipe
Screwed	10"	—	—
Flanged ANSI 125	10"	11¾"	13⅞"
Flanged ANSI 250	10½"	12½"	14½"
Flanged ANSI 300	10½"	12½"	14½"

Pipe Size of 441-S	D	E	G	M	N
2"	6"	24"	See Table Below	5"	7"
3"	6"	24"		5"	7"
4"	9½"	26"		5"	8"

Springs are colored for identification. When shipped, the regulator is equipped with the lightest spring suitable for the maximum outlet pressure specified on order. If outlet pressure conditions change, replace spring accordingly to table below for best operation. For best performance use the largest diaphragm for the spring and pipe size selected.

For pressures below 4" w.c. install the Model 441-S upside down.

Outlet Pressure Ranges – Spring and Diaphragm Combinations

Spring Part Number	Spring Color	Diaphragm Size – Nominal Inside Diameter (Outside Diameter in Parenthesis, Dim. "G" above)					
		20"(23⅛")	18"(20⅝")	16"(18⅝")	14"(16⅜")	12"(14¾")	10"(13⅛")
090-70-021-00	Aluminum	4¼" to 6" w.c.	4¼" to 4¾" w.c.	5¼" to 7" w.c.	7" to 10½" w.c.	8½" to 13" w.c.	
090-70-021-01	Green	4¾" to 7" w.c.	4¾" to 6½" w.c.	7" to 10½" w.c.	8½" to 12" w.c.	10½" to 17" w.c.	
090-70-021-02	Yellow	5¼" to 8½" w.c.	6" to 10½" w.c.	8½" to 15½" w.c.	10½" to 17" w.c.	12" to 23" w.c.	
090-70-021-03	Gray	8¼" to 13" w.c.	10½" to 17" w.c.	14" w.c. to 1 psi	17" w.c. to 1¼ psi	21" w.c. to 1½ psi	1¼ to 2 psi
090-70-021-04	Blue	9½" to 20" w.c.	16½" to 21" w.c.	21" w.c. to 1¾ psi	21" w.c. to 2 psi	1¼ to 2½ psi	1½ to 3¼ psi
090-70-021-05	Red				1½ to 3¾ psi	1¾ to 4 psi	2½ to 6 psi

2" Model 441-S
3" Model 441-S
4" Model 441-S

Notes:

Authorized Distributor:

805 Liberty Boulevard
DuBois, PA 15801
1-800-375-8875

For more information, visit us at www.sensus.com/gas

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Model 441-S Regulator Parts List

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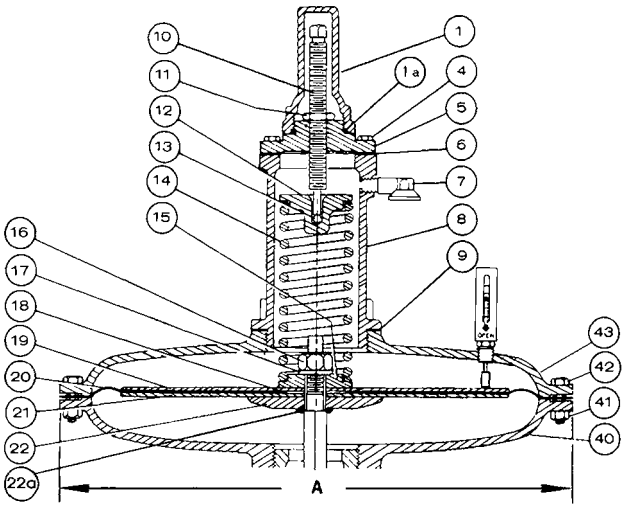
All Models 441-S



DIAPHRAGM SIZE

Nominal Inside Diameter	A
7" Diaphragm	9 3/4"
10" Diaphragm	13 1/8"
12" Diaphragm	14 1/4"
14" Diaphragm	16 3/8"
16" Diaphragm	18 3/8"
18" Diaphragm	20 3/8"
20" Diaphragm	23 1/8"

All Models 441-S

ILL. NO.	PART DESCRIPTION	PART NUMBER
1	Seal Cap	090-00-005-02
1a	Tetraseal (or O-Ring) 1 3/4" x 2"	904092
4	Hex. Cap Screw 5/16"-18 x 7/8"	910029
5	Spring Cage Cover	091-16-080-53
6	Spring Cage Cover Gasket	090-16-066-30
7	Vent Cap, 1/4" NPT	137-02-505-02
8	Spring Cage	090-16-006-21
9	Spring Cage Gasket	090-16-066-60
10	Spring Adjusting Screw	090-16-007-02
11	Hex. Steel Jam Nut, 5/8"-11	921407
12	Top Spring Button	091-16-009-00
13	Thrust Bearing, 3/8" dia. stainless steel ball	930510
14	Spring, Aluminum color	090-70-021-00
	Spring, Green	090-70-021-01
	Spring, Yellow	090-70-021-02
	Spring, Gray	090-70-021-03
	Spring, Blue	090-70-021-04
	Spring, Red	090-70-021-05
15	Bottom Spring Button	090-16-009-00
16	Hex. Steel Nut, 5/8"-18	905993
17	Split Lockwasher, 5/8"	932531
18	Buna-N Washer, 2 used	090-16-179-03
19	Upper Diaphragm Plate, 10" diaphragm	090-70-010-01
	Upper Diaphragm Plate, 12" diaphragm	090-71-010-01
	Upper Diaphragm Plate, 14" diaphragm	090-72-010-01
	Upper Diaphragm Plate, 16" diaphragm	090-73-010-21
	Upper Diaphragm Plate, 18" diaphragm	090-74-010-01
	Upper Diaphragm Plate, 20" diaphragm	090-75-010-01

All Models 441-S

ILL. NO.	PART DESCRIPTION	PART NUMBER
20	7" Diaphragm	090-78-150-21
	10" Diaphragm	090-70-150-20
	12" Diaphragm	090-71-150-20
	14" Diaphragm	090-72-150-20
	16" Diaphragm	090-73-150-20
	18" Diaphragm	090-74-150-20
	20" Diaphragm	090-75-150-20
21	Lower Diaphragm Plate, 10" diaphragm	090-70-060-00
	Lower Diaphragm Plate, 12" diaphragm	090-71-060-00
	Lower Diaphragm Plate, 14" diaphragm	090-72-060-00
	Lower Diaphragm Plate, 16" diaphragm	090-73-060-00
	Lower Diaphragm Plate, 18" diaphragm	090-74-060-00
	Lower Diaphragm Plate, 20" diaphragm	090-75-060-00
22	Lower Diaphragm Clamping Ring	091-00-022-01
22a	O-Ring (5/8" x 3/4")	902922
40	10" Lower Diaphragm Case, 441-S	090-70-003-10
	12" Lower Diaphragm Case, 441-S	090-71-003-00
	14" Lower Diaphragm Case, 441-S	090-72-003-00
	16" Lower Diaphragm Case, 441-S	090-73-003-00
	18" Lower Diaphragm Case, 441-S	090-74-002-10
	20" Lower Diaphragm Case, 441-S	090-75-002-10
41	Hex. Steel Nut, 3/8"-16	920053
42	Hex. Steel Bolt, 3/8"-16 x 1 3/8" lg.	903568
43	10" Upper Diaphragm Case	090-70-003-10
	12" Upper Diaphragm Case	090-71-003-00
	14" Upper Diaphragm Case	090-72-003-00
	16" Upper Diaphragm Case	090-73-003-00
	18" Upper Diaphragm Case	090-74-002-10
	20" Upper Diaphragm Case	090-75-002-10
45*	10" Diaphragm Case Assembly, for 2" & 3" 441-S	090-70-302-00
	12" Diaphragm Case Assembly, for 2" & 3" 441-S	090-71-302-00
	14" Diaphragm Case Assembly, for 2" & 3" 441-S	090-72-302-00
	16" Diaphragm Case Assembly, for 2" & 3" 441-S	090-73-302-00
	18" Diaphragm Case Assembly, for 2" & 3" 441-S	090-74-302-00
	10" Diaphragm Case Assembly, for 4" 441-S	090-70-302-01
	12" Diaphragm Case Assembly, for 4" 441-S	090-71-302-01
	14" Diaphragm Case Assembly, for 4" 441-S	090-72-302-01
	16" Diaphragm Case Assembly, for 4" 441-S	090-73-302-01
	18" Diaphragm Case Assembly, for 4" 441-S	090-74-302-01
	20" Diaphragm Case Assembly, for 4" 441-S	090-75-302-00

***Diaphragm Case Assembly** consists of Ill. Nos. 18, 19, 20, 21, 22, 40, 41, 42, and 43.

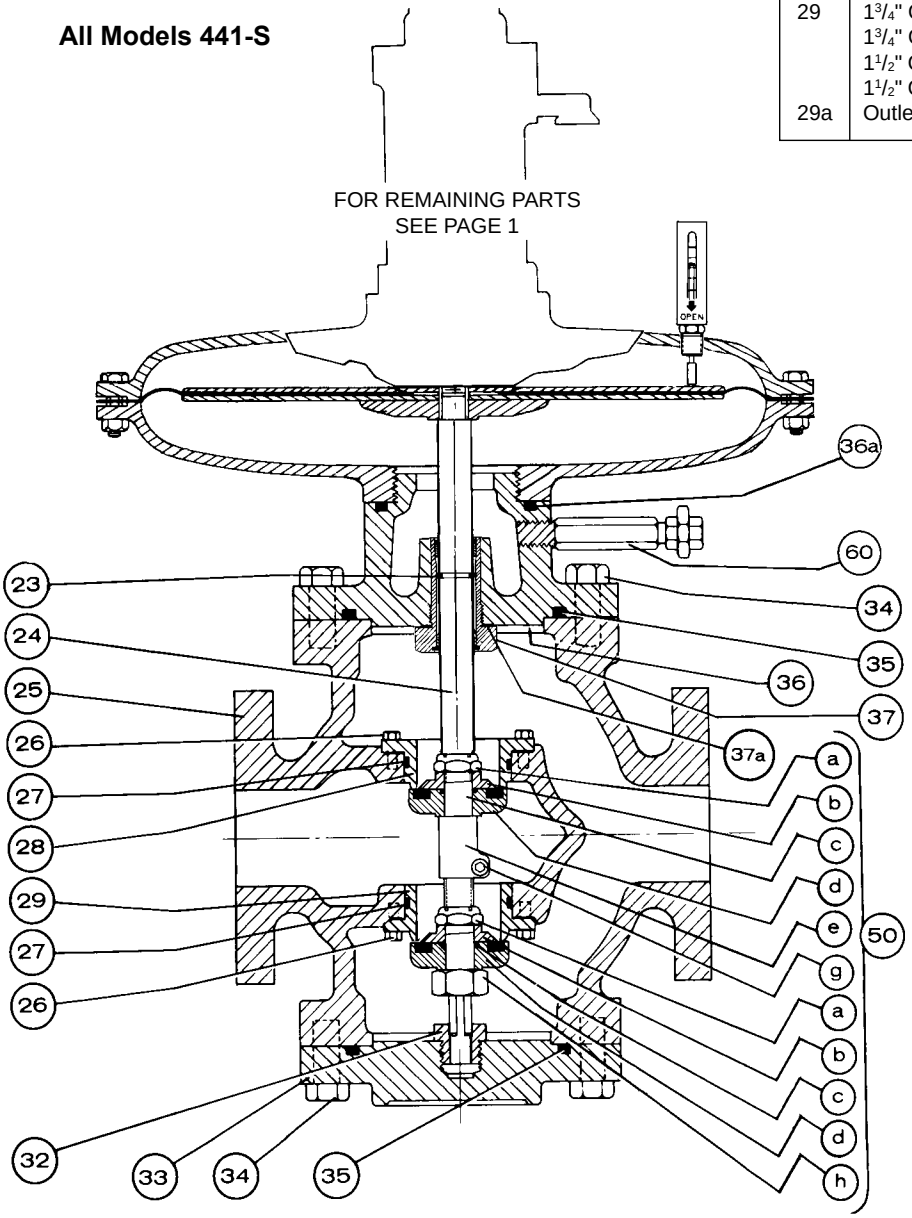
SENSUS

All Models 441-S		
ILL. NO.	PART DESCRIPTION	PART NUMBER
45	Travel Indicator Assembly (1/4" scale)	091-00-365-61
	Travel Indicator Assembly (5/16" scale)	091-00-365-63
	Travel Indicator Assembly (5/8" scale)	091-00-365-65
	Travel Indicator Assembly (1" scale)	091-00-365-67
	Travel Indicator Assembly (1 1/4" scale)	091-00-365-69
	Travel Indicator Assembly (1 1/2" scale)	091-00-365-71
60	1/2" NPT Nipple, Orifice Plug, and Steel Union Assembly	090-16-361-00
91	Nameplate, round (not shown)	090-16-086-00
93	Rd. Hd. Machine Screw, 6"-32 x 1/4" lg. for rd. nameplate (not shown)	914402

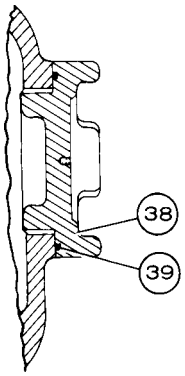
When ordering parts for a 441-S regulator, include pipe size, model number, inner valve size, and serial number if possible.

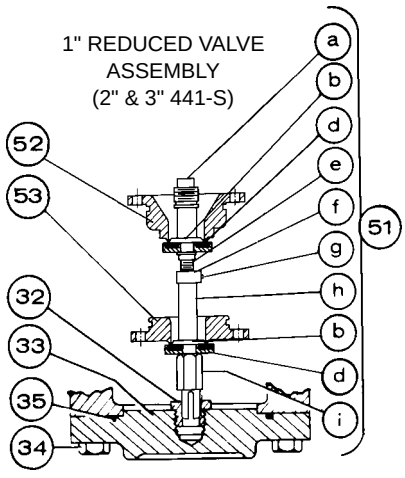
2" Models 441-S		
ILL. NO.	PART DESCRIPTION	PART NUMBER
25	2" 441 Body, screwed, 250 lb. cast iron	090-16-001-00
	2" 441 Body, flanged, ANSI 125 lb. FF, cast iron	090-16-001-01
	2" 441 Body, flanged, ANSI 250 lb. RF ductile iron	090-16-001-02
	2" 441 Body, flanged, ANSI 300 lb. RF, cast iron	090-16-001-03
26	Hex. Cap Screw, 1/4"-20 x 1/2" lg., 120,000 tensile	910001
27	O-Ring, for orifices	904832
28	1 3/4" Inlet Orifice, CRS	090-16-028-00
	1 3/4" Inlet Orifice, stainless steel	090-16-028-50
	1 1/2" Inlet Orifice, CRS	090-16-028-01
	1 1/2" Inlet Orifice, stainless steel	090-16-028-51
	Inlet Orifice, 1" valve CRS	090-16-028-02
29	1 3/4" Outlet Orifice, CRS	090-16-029-00
	1 3/4" Outlet Orifice, stainless steel	090-16-029-50
	1 1/2" Outlet Orifice, CRS	090-16-029-01
	1 1/2" Outlet Orifice, stainless steel	090-16-029-51
29a	Outlet Orifice, 1" valve CRS	090-16-029-02

All Models 441-S



SIDE INSPECTION PLATE





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3" Models 441-S

ILL. NO.	PART DESCRIPTION	PART NUMBER
25	3" 441 Body, flanged, ANSI 125 lb. FF, cast iron	090-20-001-00
	3" 441 Body, flanged, ANSI 250 lb. RF ductile iron	090-20-001-01
	3" 441 Body, flanged, ANSI 300 lb. RF, cast steel	090-20-001-04
26	Hex. Cap Screw, 1/4"-20 x 1/2" lg., 120,000 tensile	910001
27	O-Ring, for orifices	950818
28	2 1/8" Inlet Orifice, CRS	090-20-028-00
	2 1/8" Inlet Orifice, stainless steel	090-20-028-50
	1 3/4" Inlet Orifice, CRS	090-20-028-02
	1 3/4" Inlet Orifice, stainless steel	090-20-028-52
	1 1/2" Inlet Orifice, CRS	090-20-028-03
	1 1/2" Inlet Orifice, stainless steel	090-20-028-53
	Inlet Orifice, 1" valve CRS	090-20-028-04
29	2 1/8" Outlet Orifice, CRS	090-20-029-00
	2 1/8" Outlet Orifice, stainless steel	090-20-029-50
	1 3/4" Outlet Orifice, CRS	090-20-029-02
	1 3/4" Outlet Orifice, stainless steel	090-20-029-52
	1 1/2" Outlet Orifice, CRS	090-20-029-03
	1 1/2" Outlet Orifice, stainless steel	090-20-029-53
	Outlet Orifice, 1" valve CRS	090-20-029-04
50	Valve Assembly, 2 1/8", brass trim, Buna-N (Black, 50 to 55 Duro)	090-20-515-30
	Valve Assembly, 2 1/8", stainless steel trim, Buna-N (Black, 50 to 55 Duro)	090-20-515-50
	Valve Assembly, 2 1/8", brass trim, Polyurethane (Red, 65 to 75 Duro)	090-20-515-40
	Valve Assembly, 2 1/8", stainless steel trim, Polyurethane (Red, 65 to 75 Duro)	090-20-515-60
50b	Valve Retainer, standard, steel, 2 1/8"	090-20-018-00
	Valve Retainer, standard, stainless steel, 2 1/8"	090-20-018-30
	Valve Retainer, v-port wings, steel, 2 1/8"	090-20-012-50
	Valve Retainer, v-port wings, stainless steel, 2 1/8"	090-20-012-51
50d	Molded Valve, 2 1/8", Buna-N (Black, 50 to 55 Duro) all trim	090-20-315-00
	Molded Valve, 2 1/8", Polyurethane (Red, 65 to 75 Duro) all trim	090-20-315-02

2" and 3" Models 441-S

ILL. NO.	PART DESCRIPTION	PART NUMBER
23	O-Ring, 11/16" x 7/8"	934013
24	Diaphragm Connecting Stem, stainless steel	090-16-058-00
32	Guide Bushing with Pin, brass	090-16-385-01
	Guide Bushing with Pin, stainless steel	090-16-385-03
33	Bottom Plate, 8 bolt, for screwed & flanged 125 & 250 lb. bodies	090-16-004-01
	Bottom Plate, 8 bolt, for screwed & flanged 300 & 600 lb. steel bodies	090-16-004-06
34	Hex. Cap Screw, 1/2"-13 x 1 1/4"	910106
35	Tetraseal (or O-Ring), 4 3/8" x 4 5/8"	904085
36	Centerpiece, 4 bolt, for flanged 125 lb. bodies (Iron)	090-16-275-60
	Centerpiece, 8 bolt, for screwed & flanged bodies (Steel)	090-16-275-61
36a	Tetraseal (or O-Ring), 4" x 4 1/4"	904084

2" and 3" Models 441-S

ILL. NO.	PART DESCRIPTION	PART NUMBER
37	Stem Bushing Assembly	090-16-373-00
37a	Seal Washer	090-26-178-00
38	Side Plate, iron, for 2" & 3" cast iron bodies	090-16-072-06
	Side Plate, ductile, for 2" & 3" ductile bodies	090-16-072-00
	Side Plate, steel, for 2" & 3" steel bodies	090-16-072-01
39	Tetraseal (or O-Ring), 3 1/4" x 3 1/2"	904078
50	Valve Assembly, 1 3/4", Std trim, Buna-N (Black, 50 to 55 Duro)	090-16-515-27
	Valve Assembly, 1 3/4", stainless steel trim, Buna-N (Black, 50 to 55 Duro)	090-16-515-50
	Valve Assembly, 1 1/2", Std trim, Buna-N (Black, 50 to 55 Duro)	090-16-515-31
	Valve Assembly, 1 1/2", stainless steel trim, Buna-N (Black, 50 to 55 Duro)	090-16-515-51
50a	Valve Retaining Nut, 5/8"-18	905564
50b	Valve Retainer, std., steel, 1 3/4"	090-16-018-00
	Valve Retainer, std., stainless steel, 1 3/4"	090-16-018-30
	Valve Retainer, v-port wings, steel, 1 3/4"	090-16-012-50
	Valve Retainer, v-port wings, stainless steel, 1 3/4"	090-16-012-53
	Valve Retainer, std., steel, 1 1/2"	090-16-018-01
	Valve Retainer, std., stainless steel, 1 1/2"	090-16-018-31
	Valve Retainer, v-port wings, steel, 1 1/2"	090-16-012-52
	Valve Retainer, v-port wings, stainless steel, 1 1/2"	090-16-012-55
50c	O-Ring, 5/8" x 13/16"	934012
50d	Molded Valve, 1 3/4", Buna-N (Black, 50 to 55 Duro), all trim	090-16-315-00
	Molded Valve, 1 1/2", Buna-N (Black, 50 to 55 Duro), all trim	090-16-315-01
	Molded Valve, 1 3/4", Polyurethane (Red, 65 to 75 Duro), all trim	090-16-315-02
	Molded Valve, 1 1/2", Polyurethane (Red, 65 to 75 Duro), all trim	090-16-315-03
50e	Female Valve, Stem, brass	090-16-116-00
	Female Valve, Stem, stainless steel	090-16-116-01
50g	Adjustment Clamp Screw, Soc. Hd. Screw, 10-24 x 1/2" lg.	903486
	Adjustment Clamp Screw, for 1 1/2" valve only	090-16-046-01
50h	Male Valve Stem, brass	090-16-016-01
	Male Valve Stem, stainless steel	090-16-016-02
51	Valve Assembly	
51a	Stem Extension, stainless steel, 1" valve	090-16-125-01
51b	Valve Retainer, stainless steel, 1" valve	091-16-018-01
51d	Molded Valve, 1", Buna-N (Black, 50 to 55 Duro), all trim	091-16-315-01
	Molded Valve, 1", Polyurethane (Red, 65 to 75 Duro), all trim	091-16-315-11
	Molded Valve, 1", Viton (stamped V, 65 to 75 Duro), all trim	091-16-315-13
51e	Male Valve Stem, stainless steel, 1" valve	090-16-016-21
51f	Valve Stem Locking Ring, stainless steel, 1" valve	091-16-043-01
51g	Set Screw, Hex. Soc. Cup Pt.,#12-24 x 1/4" lg.	907694
51h	Female Valve Stem, stainless steel, 1" valve	090-16-116-21
51i	Valve Guide, stainless steel, 1"	090-16-012-31
52	Inlet Orifice, 1", CRS	090-16-028-02
	Inlet Orifice, 1", stainless steel	090-16-028-55
53	Outlet Orifice, 1", CRS	090-16-029-02
	Outlet Orifice, 1", stainless steel	090-16-029-55

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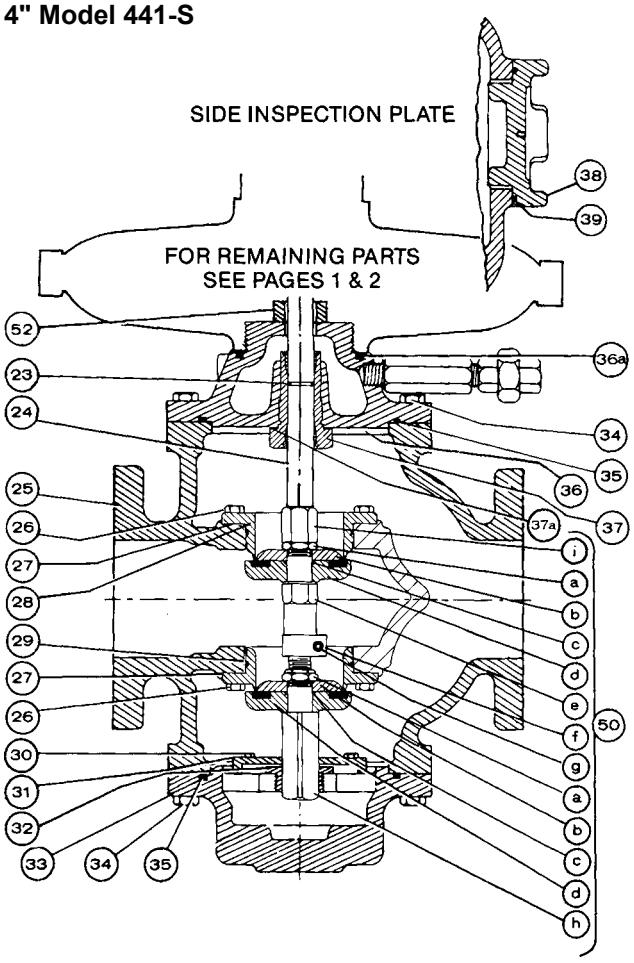
4" Model 441-S



4" Model 441-S		
ILL. NO.	PART DESCRIPTION	PART NUMBER
23	O-Ring, $^{11}/_{16}$" x $^{7}/_{8}$" O.D.	934013
24	Diaphragm Connecting Stem, stainless steel	090-16-058-00
25	4" 441 Body, flanged ANSI 125 lb. FF, cast iron	090-22-001-00
	4" 441 Body, flanged ANSI 250 lb. RF, ductile iron	090-22-001-01
	4" 441 Body, flanged ANSI 300 lb. RF, cast steel	090-22-001-04
26	Hex. Cap Screw, $^{3}/_{8}$"-16 x $^{3}/_{4}$" lg., 120,000 tensile	910053
27	O-Ring, for orifices	905583
28	3" Inlet Orifice, CRS	090-22-028-00
	3" Inlet Orifice, stainless steel	090-22-028-50
	$2^{1}/_{8}$" Inlet Orifice, CRS	090-22-028-02
	$2^{1}/_{8}$" Inlet Orifice, stainless steel	090-22-028-52
	$1^{3}/_{4}$" Inlet Orifice, CRS	090-22-028-01
	$1^{3}/_{4}$" Inlet Orifice, stainless steel	090-22-028-51
29	3" Outlet Orifice, CRS	090-22-029-00
	3" Outlet Orifice, stainless steel	090-22-029-50
	$2^{1}/_{8}$" Outlet Orifice, CRS	090-22-029-02
	$2^{1}/_{8}$" Outlet Orifice, stainless steel	090-22-029-52
	$1^{3}/_{4}$" Outlet Orifice, CRS	090-22-029-01
	$1^{3}/_{4}$" Outlet Orifice, stainless steel	090-22-029-51
30	Hex. Cap Screw, $^{3}/_{8}$"-16 x 1" lg.	910055
31	Spin Stop Plate	090-22-040-01
32	Guide Bushing, brass	090-22-074-00
	Guide Bushing, stainless steel	090-22-074-01

4" Model 441-S		
ILL. NO.	PART DESCRIPTION	PART NUMBER
33	Bottom Plate, iron, 8 bolt	090-22-004-30
	Bottom Plate, ductile iron, 8 bolt	090-22-004-51
	Bottom Plate, steel, 8 bolt	090-22-004-71
34	Hex. Cap Screw, $^{5}/_{8}$"-11 x $1^{1}/_{2}$"	910157
	Hex. Cap Screw, $^{5}/_{8}$"-11 x $1^{3}/_{4}$" for ductile bottom plate	910158
35	Tetraseal (or O-Ring), $6^{1}/_{4}$" x $6^{1}/_{2}$"	904080
36	Centerpiece, 8 bolt	090-22-275-00
	Centerpiece, steel, 8 bolt	090-22-275-03
36a	Tetraseal (or O-Ring), 4" x $4^{1}/_{4}$"	904084
37	Stem Bushing Assembly	090-16-373-02
37a	Seal Washer	090-26-178-00
38	Side Plate, ductile, for 4" cast and ductile bodies	090-22-072-00
	Side Plate, steel, for 4" steel bodies	090-22-072-01
39	Tetraseal (or O-Ring), $4^{1}/_{4}$" x $4^{1}/_{2}$"	904083
50	Valve Assembly, 3", Std trim, Buna-N (Black, 50 to 55 Duro)	090-22-515-30
	NOTE: For other Valve Assemblies see RP-1360	
50a	Valve Retaining Nut, $^{3}/_{4}$"-16	090-22-034-00
50b	Valve Retainer, standard, 3"	090-22-018-03
	Valve Retainer, stainless steel, 3"	090-22-018-00
	Valve Retainer, v-port wings, standard, 3"	090-22-012-20
	Valve Retainer, v-port wings, stainless stl, 3"	090-22-012-40
	Valve Retainer, standard, $2^{1}/_{8}$"	090-22-018-01
	Valve Retainer, stainless steel, $2^{1}/_{8}$"	090-22-018-31
	Valve Retainer, v-port wings, standard, $2^{1}/_{8}$"	090-22-012-50
	Valve Retainer, v-port wings, stainless steel, $2^{1}/_{8}$"	090-22-012-51
	Valve Retainer, stainless steel, $1^{3}/_{4}$"	090-22-018-34
50c	O-Ring, $^{13}/_{16}$" x 1"	904173
50d	Molded Valve, 3", Buna-N (Black, 50 to 55 Duro), all trim	090-22-315-00
	Molded Valve, $2^{1}/_{8}$", Buna-N (Black, 50 to 55 Duro), all trim	090-22-315-01
	Molded Valve, $1^{3}/_{4}$", Buna-N (Black, 50 to 55 Duro), all trim	090-22-315-04
	Molded Valve, 3", Polyurethane (Red, 65 to 75 Duro), all trim	090-22-315-02
	Molded Valve, $2^{1}/_{8}$", Polyurethane (Red, 65 to 75 Duro), all trim	090-22-315-03
	Molded Valve, $1^{3}/_{4}$", Polyurethane (Red, 65 to 75 Duro), all trim	090-22-315-05
50e	Female Valve Stem, brass	090-22-016-40
	Female Valve Stem, stainless steel	090-22-016-41
50f	Adjustment Clamp Ring, stainless steel	090-22-043-02
50g	Adjustment Clamp Screw, soc. hd. screw, $^{1}/_{4}$"-20 x $^{3}/_{4}$" lg.	903494
50h	Male Valve Stem, stainless steel	090-22-116-01
50i	Stem Extension, stainless, for 20" diaphragm only	090-22-058-40
	Stem Extension, stainless, for 18" and smaller diaphragms	090-22-058-41
50j	Locknut (314-16)	903958
52	Travel Stop, for 3" valves	090-22-040-51
	Travel Stop, for $2^{1}/_{8}$" and $1^{3}/_{4}$" valves (20" Case Only)	090-22-040-55

805 Liberty Boulevard
P.O. Box 528
DuBois, PA 15801
814-375-8875
Fax 814-375-8460

Authorized Distributor

R-1360 R9

Model 441-57S

sensus

Basic Types

Regulator Body Type	441 Body Material	Maximum Working Pressure of Body
Screwed End (2" Pipe size only)	CAST IRON (ASTM A126-71 Class B)	250 psi
Flanged ANSI 125 lb. FF	CAST IRON (ASTM A126-71 Class B)	175 psi
Flanged ANSI 250 lb. RF	DUCTILE IRON (ASTM A395-71 GR 60-40-18)	575 psi
Flanged ANSI 300 lb. RF	CAST STEEL (ASTM A2 16-70A GR WCB)	720 psi
Flanged ANSI 600 lb. RF*	CAST STEEL (ASTM A216-70A GR WCB)	1200 psi

*2" and 3" pipe size only

Spring Ranges

Outlet Pressure Min. to Max	Color of Spring	Nominal Diaphragm Size (I.D.)
3 to 6 psi	Yellow	5" All Ranges
5 to 9 psi	Gray	
7½ to 15 psi	Blue	
12½ to 30 psi	Red	
25 to 55 psi	Brown	
50 to 75 psi	Black	
70 to 100 psi	Brown plus White*	

*White colored spring is nested within brown

Maximum Inlet Pressures

Regulator Body Type	Body Materials	Maximum Inlet Pressure
2" Screwed Only	Cast Iron	250 psi
Flanged ANSI 125 lb.	Cast Iron	175 psi*
Flanged ANSI 250 lb.	Ductile Iron	575 psi*
Flanged ANSI 300 lb.	Cast Steel	720 psi*
Flanged ANSI 600 lb.	Cast Steel	1000 psi*

*Please not the following exceptions to the above, based on valve size.

Body Size	Valve	Maximum Inlet Pressure
6"	4¼"	150 psi
6"	3" reduced	} 300 psi
4"	3"	
6"	2⅛" reduced	} 500 psi
4"	2⅛" reduced	
3"	2⅛"	

Valve material selection is limited by inlet pressure and differential:

Valve Material	Maximum Inlet Pressure	Maximum Pressure Differential
Buna-N	575 psi	250 psi
Poly-U Red	720 psi	400 psi
Poly-U Tan	1200 psi	600 psi

Maximum Pressure Differential and Maximum Inlet Pressure for Various Soft-Seated Valve Materials*

Valve Material	Maximum Pressure Differential	Maximum Inlet Pressure
Buna-N (black, 50 to 55 duro)	250 psi	575 psi
Polyurethane (red, 65 to 75 duro)	400 psi	720 psi
Polyurethane (tan, 85 to 95 duro)	600 psi	1200 psi

*The differential and inlet pressure given are only to be used as general guidelines. In all cases, pressures must always remain within the ranges specified in Sensus literature. For any given regulator, do not exceed the specified maximum pressures.

The maximum temperature for the above materials is 150º F.

Viton valve material has a maximum temperature rating of 300ºF and maximum pressure differential of 250 psi.

Pipe Size

Model 441-57S			
2"	3"	4"	6"

Temperature Limits

The 441-57S "Roll-Out" Diaphragm Regulators may be used for flowing gas temperatures from -20ºF to 150ºF.

Buried Service

The 441-57S "Roll-Out" Diaphragm Regulator is ***not*** recommended for buried service.

The "Roll-Out" Diaphragm

SENSUS
The Measure of the Future

The heart of the Model 441-57S is the "Roll-Out" diaphragm. The 441-57S is a spring regulator with performance which approximates that of a pilot operated regulator. The "Roll-out" Diaphragm makes this exceptional performance possible because its action reduces "droop" to a minimum ("droop" being fall off in outlet pressure as a spring regulator opens to increase flow.)

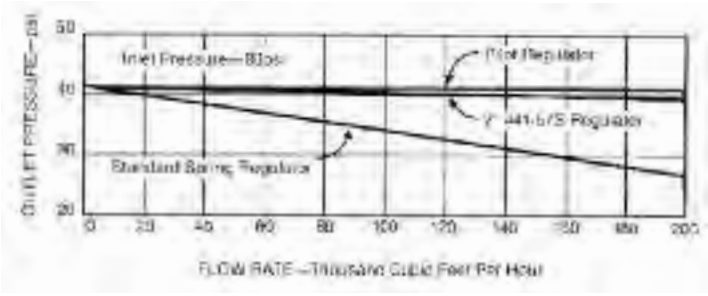
The action of the "Roll-Out" diaphragm differs from that of the conventional diaphragm in the manner in which the change in effective area occurs. Where the effective area of a conventional diaphragm would increase as the regulator opens, the "Roll-Out" area decreases. Conversely, where the area of the conventional diaphragm decreases during closing, the "Roll-Out" area increases. The following explanation and the illustrations below show how this affects regular performance.

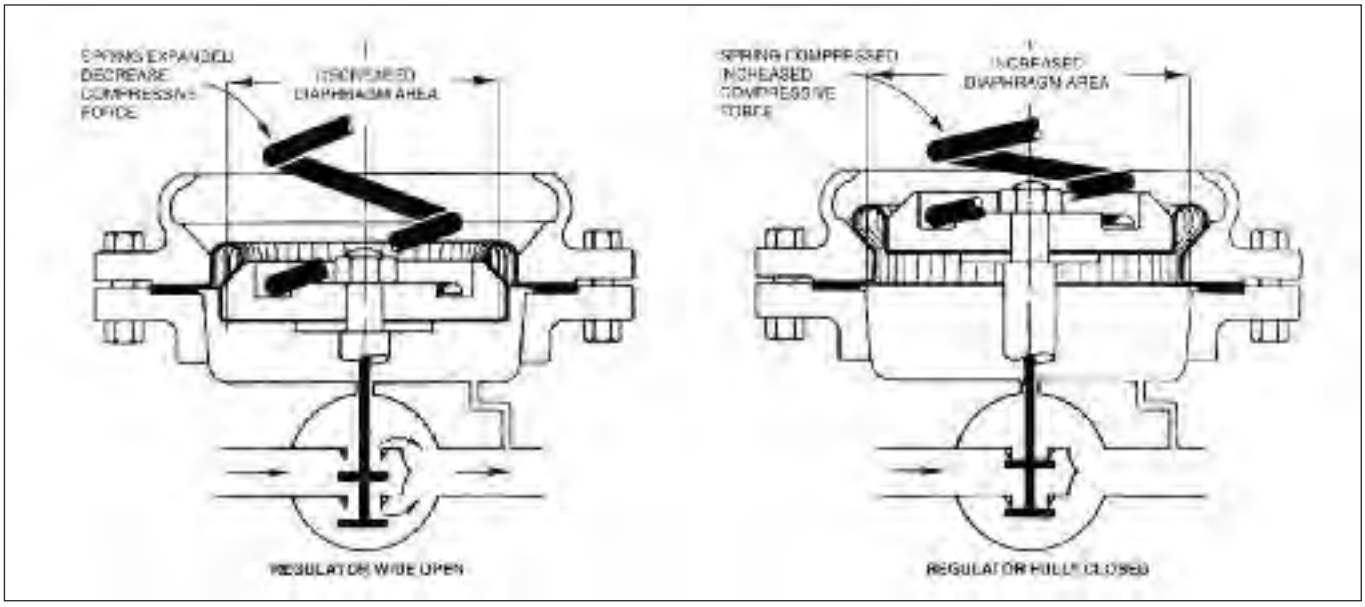
Spring type regulators are operated by the inter-action between spring and diaphragm. The compressive force of the spring works to open the regulator and is balanced by the opposing force of outlet pressure on the diaphragm which provides the closing force.

As the regulator opens, the compressive force of the spring decreases. However, as this spring force decreases, there must be a corresponding decrease in the opposing force from the diaphragm. For this opposing diaphragm force to decrease, either the effective area or the outlet pressure must decrease. Herein is the essential difference; with a conventional diaphragm the outlet pressure must decrease, where as with the "Roll-Out" diaphragm it is the effective area that decreases, permitting the outlet pressure to remain constant.

The operation actually is quite simple, yet the action of the "Roll-Out" diaphragm is so effective that "droop" is practically eliminated.

The Model 441-57S provides constant pressure regulation not previously possible in a "pounds to pounds" spring regulator. It approaches pilot performance, and, in addition, offers the further advantages of simplicity, dependability, freedom from freeze-up, and exceptionally fast response.





Other Features

Simple Design–dependable regulation–trouble free operation–fast response–no pilot –no pilot freezing–no pilot maintenance.

Standard Face to Face Dimensions

Standardized "441" Bodies & Inner Valve Assemblies–easy maintenance–parts are interchangeable with other 441 models.

Simplified Valve Adjustment–easy to adjust for tight lock-up–accurate.

Molded Polyurethane Soft Seats–positive tight shut-off high erosion resistance–reduces potential of blow out.

O-Ring Stem Seal–with removable anti-friction bushing.

Bushing Guided Inner Valve–accurate stem alignment and valve seating.

Side Inspection Plates–both sides of body–quickly removable.

O-Ring Orifice Seal–eliminates gaskets.

O-Ring Body Seal–eliminate gaskets on upper and lower body openings and side inspection plates.

Self-Aligning Spring Adjustment–color coded springs.

Flanged Removable Seats (Orifices)–easily changed–no special tools needed

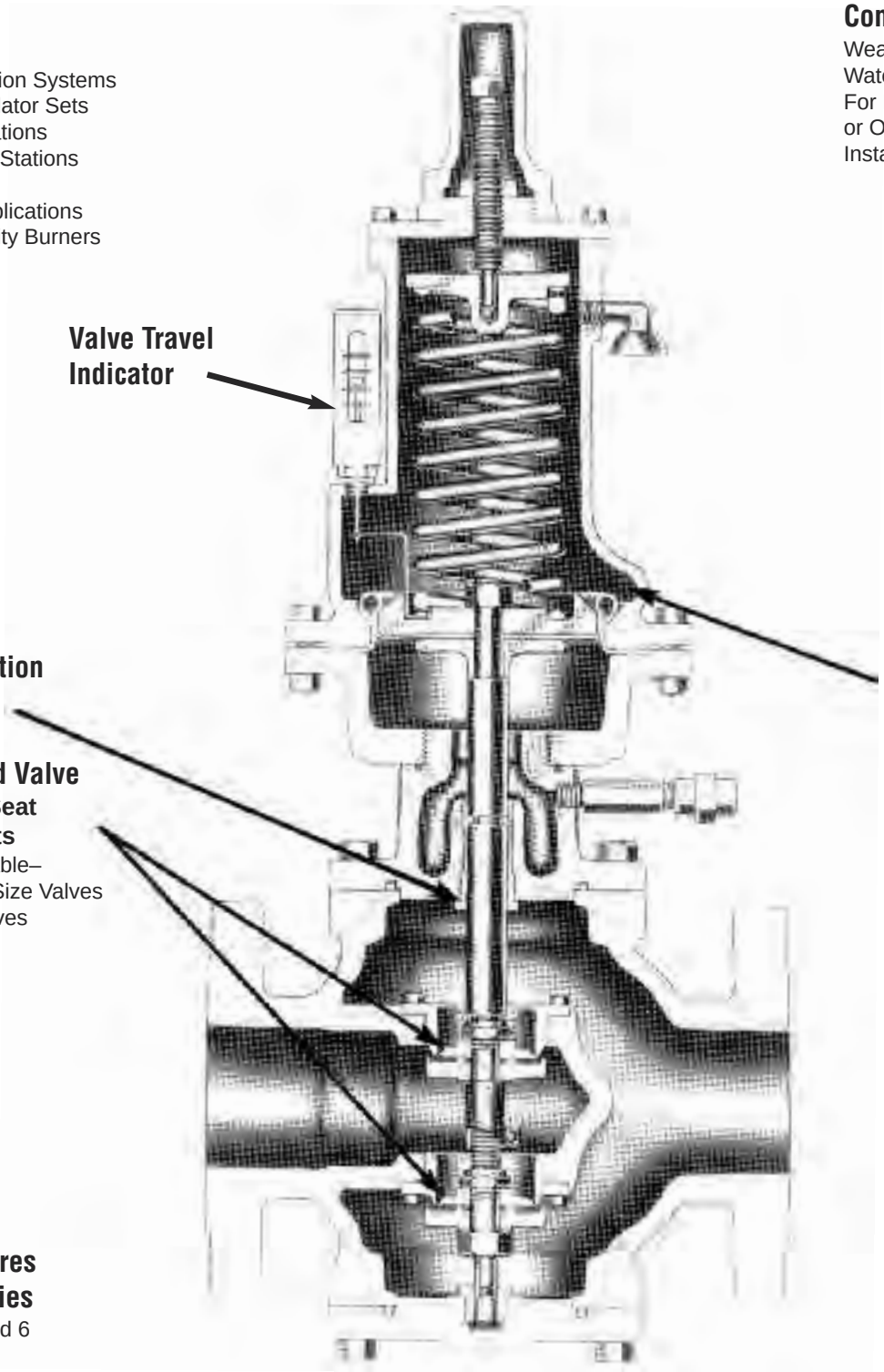
V-Port Orifice Restrictors–increase high flow to low flow turndown performance.

441-57S
"Roll-Out" Diaphragm Regulators

Large
for
- Gas Distribution Systems
- District Regulator Sets
- City Gate Stations
- Town Border Stations
- Monitoring
- Industrial Applications
- Large Capacity Burners
- Boilers

Heavy-Duty Construction
Weather-proof
Watertight
For Indoor
or Outdoor
Installations

Valve Travel Indicator



Anti-Friction Bushing

Balanced Valve
Double Seat
Soft Seats
also available–
Reduced Size Valves
V-Port Valves

"Roll-Out" Diaphragm
(Patented)

Outlet Pressure Range
3 to 100 psi
Note: For outlets up to 250 psi, see Model 441-X57.(Bulletin R-1361)

For outlets below 3 psi, see Model 441-S. (Bulletin R-1350)

Inlet Pressures and Capacities
See page 5 and 6

SENSUS
The Measure of the Future

Capacity in 1000 SCFH of Natural Gas (0.6 Specific Gravity–14.65 psia–60ºF)

Inlet Pressure psi	Outlet Pressure psi	2" 441-57S		3" 441-57S			4" 441-57S			6" 441-57S		
		1¾" Valve	1½" Reduced Valve	2⅛" Valve	1¾" Reduced Valve	1½" Reduced Valve	3" Valve	2⅛" Reduced Valve	1¾" Reduced Valve	4¼" Valve	3" Reduced Valve	2⅛" Reduced Valve
4	3	22.9	17.9	37.3	27.8	17.9	74.5	37.3	22.7	138	77.7	37.3
5	3	32.1	25.2	52.4	39.1	25.2	104	52.4	31.9	194	109	52.4
	4	23.4	18.3	38.1	28.5	18.3	76.2	38.1	23.3	142	79.5	38.1
6	3	39.2	30.7	63.9	47.7	30.7	127	63.9	39.0	237	133	63.9
	4	33.2	26.0	54.1	40.4	26.0	108	54.1	33.0	201	112	54.1
	5	23.9	18.7	39.0	29.1	18.7	78.0	39.0	23.8	145	81.4	39.0
8	3	50.6	39.7	82.5	61.6	39.7	165	82.5	50.4	307	172	82.5
	4	46.8	36.7	76.3	57.0	36.7	152	76.3	46.6	283	159	76.3
	5	41.4	32.4	67.4	50.3	32.4	134	67.4	41.2	250	140	67.4
	6	34.8	27.3	56.8	42.4	27.3	113	56.8	34.6	211	118	56.8
10	3	60.5	47.4	98.5	73.6	47.4	197	98.5	60.1	366	205	98.5
	4	57.2	44.8	93.2	69.6	44.8	186	93.5	56.9	346	194	93.2
	5	53.9	42.2	87.9	65.6	42.2	175	87.9	53.6	326	183	87.9
	6	49.0	38.4	79.9	59.6	38.4	159	79.9	48.7	297	166	79.9
	8	36.5	28.6	59.5	44.4	28.6	118	59.5	36.3	221	124	59.5
12	3	68.6	53.8	111	83.5	53.8	223	111	68.3	415	233	111
	4	66.5	52.1	108	80.8	52.1	216	108	66.1	402	225	108
	5	63.7	49.9	103	77.5	49.9	207	103	63.4	386	216	103
	6	60.5	47.4	98.5	73.6	47.4	197	98.5	60.1	366	205	98.5
	8	51.7	40.5	84.3	62.9	40.5	168	84.3	51.5	313	175	84.3
	10	38.1	29.9	62.1	46.4	29.9	124	62.1	37.9	231	129	62.1
15	3	79.0	61.9	128	96.1	61.9	257	128	78.6	478	268	128
	4	77.9	61.0	127	94.8	61.0	253	127	77.5	472	264	127
	5	76.3	59.7	124	92.8	59.7	248	124	75.8	462	259	124
	6	74.1	58.0	120	90.1	58.0	241	120	73.7	448	251	120
	8	68.1	53.3	111	82.8	53.3	221	111	67.7	412	231	111
	10	60.5	47.4	98.5	73.6	47.4	197	98.5	60.1	366	205	98.5
	12	48.5	38.0	79.0	59.0	38.0	157	79.0	48.2	293	164	79.0
20	3	94.2	73.8	153	115	73.8	307	153	93.7	571	320	153
	4	93.7	73.4	152	114	73.4	305	152	93.2	567	318	152
	6	92.6	72.6	150	112	72.6	301	150	92.1	561	314	150
	8	89.3	70.0	145	108	70.0	291	145	88.8	541	303	145
	10	85.5	67.0	139	104	67.0	278	139	85.1	518	290	139
	12	79.5	62.3	129	96.8	62.3	259	129	79.1	481	270	129
	15	65.9	51.6	107	80.2	51.6	214	107	65.5	399	223	107
25	6 & less	108	84.5	175	131	84.5	351	175	107	653	366	175
	8	106	83.7	174	130	83.7	347	174	106	646	362	174
	10	104	81.9	170	127	81.9	340	170	104	633	355	170
	12	101	79.4	165	123	79.4	330	165	100	613	344	165
	15	93.7	73.4	152	114	73.4	305	152	93.2	567	318	152
	20	71.4	55.9	116	86.8	55.9	232	116	71.0	432	242	116
30	9 & less	121	94.8	197	147	94.8	393	197	120	732	410	197
	12	119	93.5	194	145	93.5	388	194	118	722	405	194
	15	114	89.6	186	139	89.6	372	186	113	693	388	186
	20	101	79.4	165	123	79.4	330	165	100	613	344	165
	25	76.3	59.7	124	92.8	59.7	248	124	75.8	462	259	124
40	14 & less	148	116	241	180	116	482	241	147	897	503	241
	20	143	112	233	174	112	466	233	142	868	486	233
	25	132	103	215	161	103	431	215	131	802	449	215
	30	115	90.0	187	139	90.0	374	187	114	696	390	187
	35	85.5	67.0	139	104	67.0	278	139	85.1	518	290	139
50	20 & less	175	137	286	213	137	571	286	174	1062	595	286
	25	171	134	278	208	134	557	278	170	1036	581	278
	30	162	127	264	197	127	528	264	161	983	551	264

441-57S Capacity Tables

Inlet Pressure psi	Outlet Pressure psi	2" 441-57S		3" 441-57S			4" 441-57S			6" 441-57S		
		1¾" Valve	1½" Reduced Valve	2⅛" Valve	1¾" Reduced Valve	1½" Reduced Valve	3" Valve	2⅛" Reduced Valve	1¾" Reduced Valve	4¼" Valve	3" Reduced Valve	2⅛" Reduced Valve
50	40	127	99	206	154	99	413	206	126	769	431	206
60	25 & less	202	158	330	246	158	660	330	201	1227	688	330
	30	199	156	325	242	156	649	325	198	1207	677	325
	40	179	140	293	218	140	585	293	178	1089	610	293
	50	138	108	225	168	108	450	225	137	838	470	225
80	35 & less	256	201	418	312	201	835	418	255	1554	871	418
	40	254	199	413	309	199	826	413	252	1537	862	413
	50	239	187	389	291	187	778	389	238	1448	812	389
	60	210	164	342	256	164	684	342	209	1273	714	342
	70	158	123	257	192	123	514	257	157	957	536	257
100	45 & less	311	244	508	379	244	1014	508	310	1887	1058	508
	50	309	242	504	376	242	1007	504	307	1837	1050	504
	60	297	233	484	362	233	968	484	296	1801	1010	484
	70	274	214	446	333	214	892	446	272	1660	930	446
	80	236	185	385	287	185	770	385	235	1432	803	385
125	60& less	379	297	618	461	297	1234	618	377	2296	1287	618
	70	371	291	605	452	291	1209	605	369	2250	1261	605
	80	355	278	579	432	278	1156	579	353	2151	1206	579
	100	291	228	475	354	228	949	475	290	1765	989	475
150	73 & less	446	350	728	543	350	1454	728	444	2706	1517	728
	80	443	347	722	539	347	1442	722	440	2683	1504	722
	100	412	323	672	502	323	1343	672	410	**2478**	1400	672
175	85 & less	515	404	840	627	404	1678	840	512	––	1750	840
	100	505	395	823	614	395	1644	823	502	––	1715	823
200		584	457	952	710	457	1901	952	579	––	1983	952
250		720	564	1174	876	564	2345	1174	716	––	2445	1174
300	100	856	671	1396	1042	671	**2788**	1396	852	––	**2908**	1396
400	&	1129	884	1840	1373	884	––	1840	1132	––	––	1840
500	less	1401	1098	**2284**	1705	1098	––	2284	1394	––	––	**2284**
600		1674	1311	––	2036	1311	––	––	1655	––	––	––
1000		**2764**	**2165**	––	**3362**	**2165**	––	––	**3343**	––	––	––
"K" Factors Standard Values		**5450**	**4270**	**8880**	**6630**	**4270**	**17740**	**8880**	**5420**	**33000**	**18500**	**8880**
"K" Factors V-Port Values		**5260**	**4160**	**8440**	**6390**	**4160**	**13850**	**8440**	**5260**	**25500**	**14430**	**8440**
For V-Port Valves– Multiply Table Values by		**.965**	**.974**	**.950**	**.964**	**.974**	**.781**	**.950**	**.970**	**.773**	**.780**	**.950**

1. Last capacity figure **(bold type)** for each column is capacity at **maximum inlet pressure.**
2. Size each regulator on the basis of the **minimum expected inlet pressure** and the **maximum required outlet pressure.**
3. For **best performance** of the Model 441-57S, use full table capacity values.
4. For **smaller capacities** see Model 461-57S (Bulletin R-1331).

Note: The above performance data and data on page 5 is based on normal testing at 70ºF flowing temperature. Changes in performance can occur at extreme low flowing temperatures.

Where inlet pressure control is required, as with a back pressure valve or relief valve, use the Model 441-57SR.

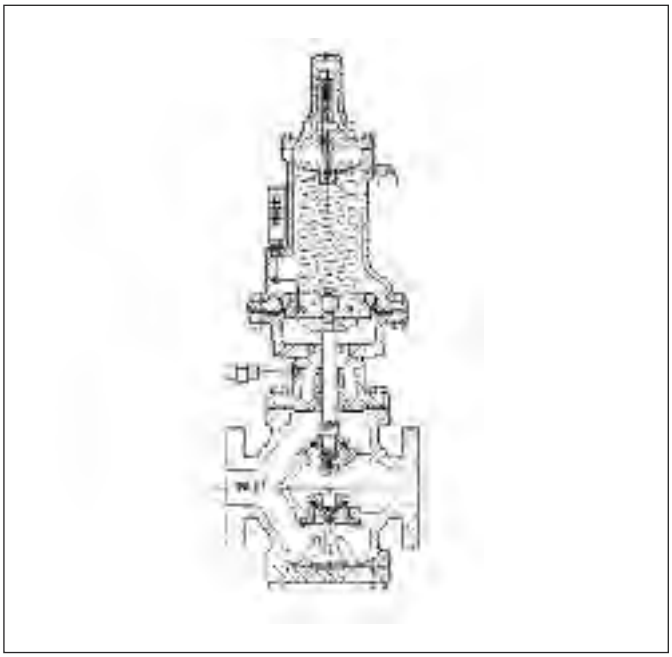
The 441-57SR is the same as the 441-57S except that the inner valve is reversed, the body is turned around, and the control line is arranged for connection to the inlet side (upstream)

The adjustment is 3 to 90 psi.

Use the table on Pages 5 and 6 for capacities.

Pipe sizes and bodies are given on Page 2.

For additional information on the Model 441-57SR, please contact your Sensus sales representative.



Maximum Emergency Pressures

The following are the maximum pressures which the regulator body may be subjected to under abnormal conditions without causing internal damage (take Maximum Inlet Pressure from page 2):

Cast Iron Body . . . . . Maximum Inlet Pressure +25 psi
Ductile Iron Body . . . . . Maximum Inlet Pressure +60 psi
Cast Steel Body . . . . . Maximum Inlet Pressure +100 psi

If pressure exceeds the above values the regulator must be removed from service and inspected. Damaged or otherwise unsatisfactory parts must be repaired or replaced before returning the regulator to service.

The maximum pressure which the diaphragm may be subjected to under abnormal conditions without causing internal damage is set-point plus 25 psi. If the pressure on the diaphragm exceeds set-point by more than 25 psi, the regulator must be removed from service and inspected. Damaged or otherwise unsatisfactory parts must be repaired or replaced before returning the regulator to service. The set-point is the outlet pressure the regulator is adjusted to deliver.

The maximum pressure that can be safely contained by the diaphragm case is 175 psi. Safely contained means so leakage and no bursting.

Before using any of the above data, make sure this entire section is clearly understood.

Overpressurization Protection

Protect the downstream piping system and the regulator's low pressure chambers against overpressurization due to possible regulator malfunction or failure to achieve positive lockup. The allowable outlet pressure is the lowest of the maximum pressures permitted by federal codes, state codes, Bulletin RDS-1498 or other applicable standards. The method of protection can be a relief valve, monitor regulator, shut-off device or similar mechanism.

Periodic Inspection: Regulators are pressure control devices with numerous moving parts subject to wear that is dependent upon particular operating conditions. To assure continuous satisfactory operation, a periodic inspection schedule must be adhered to with the frequency of inspection determined by the severity of service and applicable laws and regulations. **See bulletin RM-1360 for field service instructions.**

Monitoring

The Model 441-57S is also excellent for use as a monitor; a stand-by regulator mounted in series which assumes control if a failure in the operating regulator permits the outlet pressure to rise above its set point.

The 441-57S has a fast rate of response and, therefore, will take control quickly in case of an emergency. It requires no changes or modifications when used for monitoring. Its simple design and rugged construction make it an exceptionally dependable regulator, and its control accuracy and freedom from "droop" means that it will provide excellent regulation if an emergency calls it into operation.

Two monitor set arrangements are shown in the sketches below. The first shows a set in which the operating regulator and the monitor are both Model 441-57S. This makes an unusually neat and compact installation.

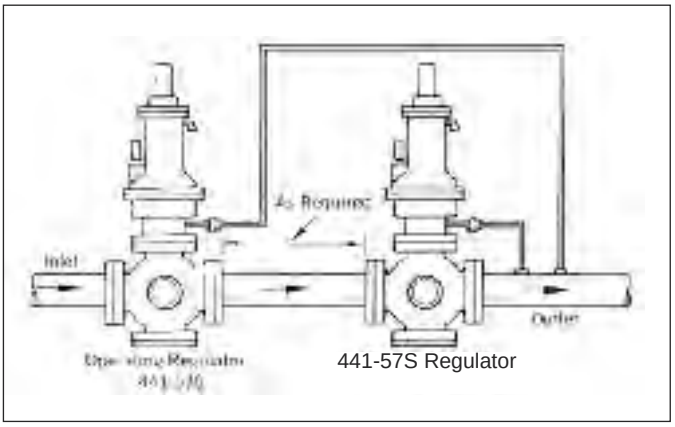
The 441-57S is also used for monitoring other types of regulators. This is shown in the second sketch. It is excellent for monitoring pilot operated regulators.

Both sketches show the monitor in the downstream position. When installed this way, the 441-57S is usually set for an outlet pressure 2 to 4 psi higher than the operating regulator and thus is wide open during normal operation.

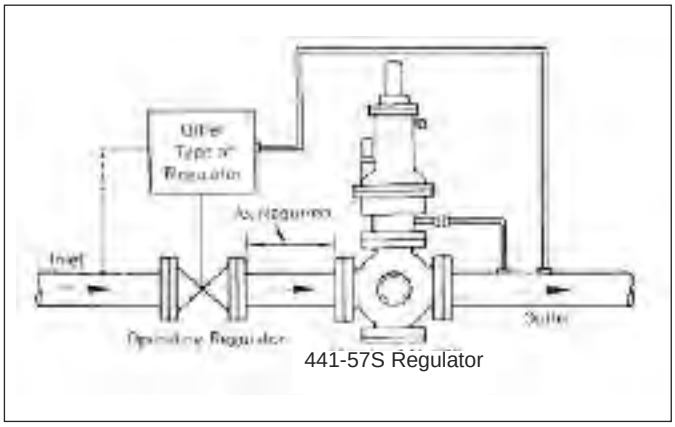
The monitor can also be located upstream, and with this arrangement the 441-57S is usually set for an outlet somewhat higher than the above.

Shutoff and bypass valving varies with individual practices and requirements. In general, however, the sketch below "Typical Installation" in RM-1360 can be used as a guide for the arrangement of these valves.

When identical 441-57S regulators are used for both the operating regulator and the monitor, the **total maximum capacity** through both may be figured as 70 percent of the capacity of one of them alone. This applies with the monitor located either downstream or upstream.



441-57S Regulator



441-57S Regulator

Metrication

Use the following for Metric conversions:

Std. metres^3/hr. x 35.31= std. ft.^{3}/hr. (SCFH) std. ft.^{3}/hr. (SCFH) x 0.0283 = std. metres^3/hr.
kilograms/centimeter^2 (kg/cm^2) x 14.22 = psi psi x 0.0703=kilograms/centimeter^2(kg/cm^2)
kilopascals (kPa) x 0.145 = psi psi x 6.90 - kilopascals (kPa)
bars x 14.50 = psi psi x 0.069 = bars

Caution: It is the user's responsibility to assure that all regulator vents and/or vent lines exhaust to a non-hazardous location away from any potential sources of ignition. **Refer to Sensus Bulletin RM-1360 for more detailed information.**

Materials of Construction

Diaphragm Housing, Spring Cage . . . . . Cast Iron (ASTM) A126-71 Class B)
Housing Cover (Spring Cage Cap) . . . . . Ductile Iron (ASTM A395-71 gr 60-40-18)
Upper Diaphragm Plate . . . . . Die Cast Aluminum
Lower Diaphragm Plate . . . . . Cast Iron
Diaphragm . . . . . Buna-N with Dacron Reinforcement
Diaphragm Connecting Stem & Anti-Friction Bushing . . . . . Stainless Steel
Removable Seats (Orifices) . . . . . Cast Iron or Stainless Steel
Valve Stems . . . . . Brass or Stainless Steel
Soft Seat Valve Material . . . . . Molded Polyurethane
Holder for Valve Material . . . . . Steel
Valve Retainer . . . . . Cast Iron or Stainless Steel
Side Inspection Plates . . . . . Ductile Iron
Bodies . . . . . see table on Page 2

Full Open Capacity

Capacity for pressure reductions not listed in the table can be calculated with the following formulae:

1. $Q = K\sqrt{Po(P_1-P_0)}$ . . . . . (for $\frac{P_1}{P_0}$ less than 1.894)

2. $Q = \frac{KP_1}{2}$ . . . . . (for $\frac{P_1}{P_0}$ greater than 1.894)

Q = maximum capacity of the regulator (in SCFH of 0.6 specific gravity natural gas).
K = the **"K" factor**, the regulator constant (from the table)
P_1 = **absolute** inlet pressure (psia).
P_0 = **absolute** outlet pressure (psia).

Use formula 1 when $\frac{P_1}{P_0}$ is less than 1.894.

Use formula 2 when $\frac{P_1}{P_0}$ is greater than 1.894.

Other Gases

Model 441-57S Regulators are mainly used on natural gas. However, they perform equally as well on LP gas, nitrogen, dry CO_2, air and others.

OTHER GASES	CORRECTION FACTOR
Air (Specific Gravity 1.0)	0.77
Propane (Specific Gravity 1.53)	0.63
1350 BTU Propane-Air Mix (1.20)	0.71
Nitrogen (Specific Gravity 0.97)	0.79
Dry Carbon Dioxide (Specific Gravity 1.52)	0.63
For other noncorrosive gases: CORRECTION FACTOR =	$\sqrt{\frac{0.6}{\text{Specific Gravity of the Gas}}}$

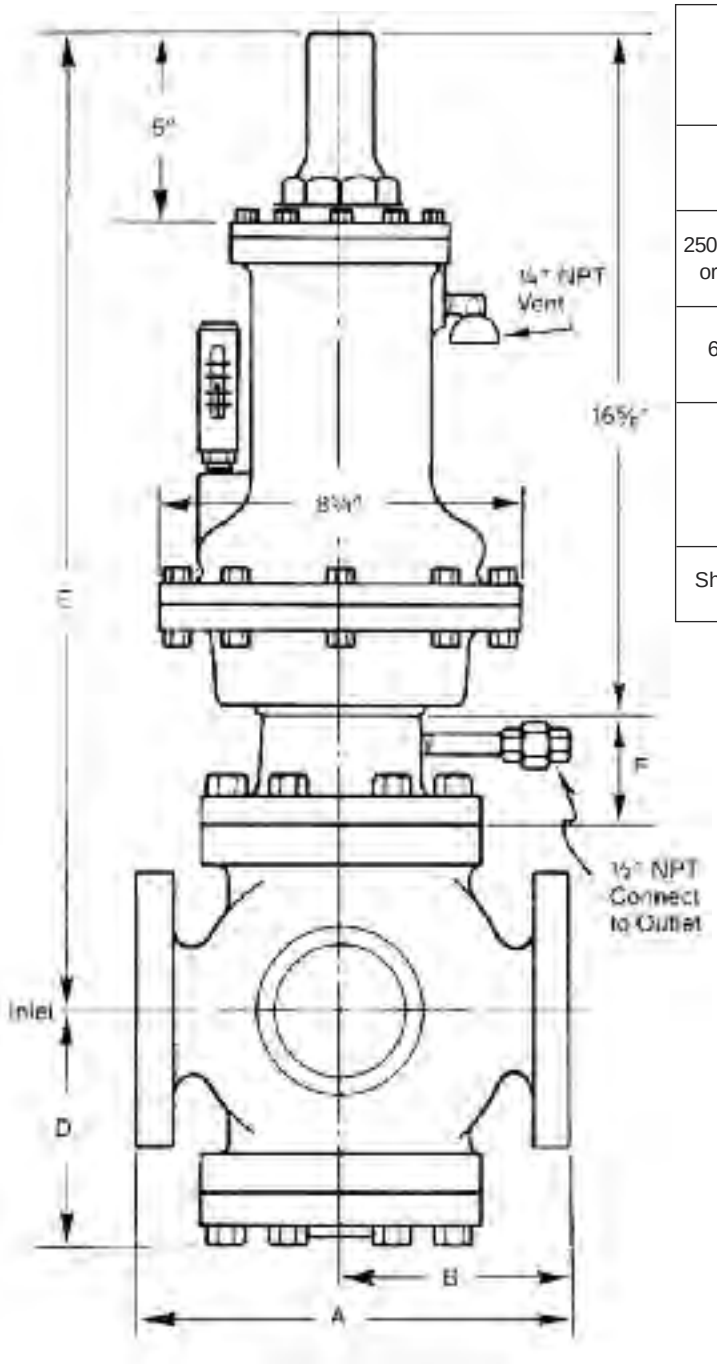
For use with other gases not listed above, please contact your Sensus representative or Distributor for recommendations.

How to Order

Specify:
1. Pipe size and Model 441-57S.
2. Piping connections and body material (Page 2)
3. Trim (standard or stainless steel)
4. Inlet pressure (also maximum and minimum, if available)
5. Outlet pressure set-point
6. Capacity required (SCFH)
7. Type of gas (natural gas, propane, etc.)
8. Spring part number

Caution: Turn gas on slowly. If an outlet stop valve is used, it should be opened first. Do not overload the diaphragm with a sudden surge of inlet pressure. Monitor the outlet pressure during start-up to prevent an outlet pressure overload. **Refer to RM-160 for more detailed start-up procedures.**

Dimensions



Regulator Body Type		Pipe Size				
		Screwed	Flanged ANSI			
		2"	2"	3"	4"	6"
125 lb. Cast Iron	A	10	10	11¼	13⅜	17¾
	B	5⁵⁄₁₆	5⁵⁄₁₆	6⅛	7⅝	9⁷⁄₁₆
250 lb. Ductile Iron or 300 lb. Steel	A	––	10½	12½	14½	18⅝
	B	––	5⁹⁄₁₆	6½	7¹⁵⁄₁₆	9⅞
600 lb. Steel	A	––	11¼	13¼	15½	20
	B	––	5¹⁵⁄₁₆	6⅞	8⁷⁄₁₆	10⁹⁄₁₆
	D	6	6	6	9½	12
	E	24	24	24	25	28½
	F	2¹¹⁄₁₆	2¹¹⁄₁₆	2¹¹⁄₁₆	2⅜	4³⁄₁₆
Shipping Weight Lbs.		115	125 to 140	140 to 180	240 to 300	445 to 520

Other Sensus Gas Pressure Regulators

SENSUS
The Measure of the Future

Sensus produces a broad product line of Gas Pressure Regulators which are widely used throughout the natural gas industry. These regulators are also suitable for non-corrosive industrial gas applications such as propane, butane, air, nitrogen, dry CO_2, etc. For additional detailed information on a particular model, please request the indicated bulletin Sensus customer service, or visit our web catalog at www.sensus.com/gas

Multi-Purpose Service Regulators

Models 496, 61R2, 143-80
Bulletin: TD-1301, TD-1307, TD-1308
½",¾", 1", and 1¼" pipe size
Inlet pressures . . . . . .to 125 psi
Outlet pressures . . . . . .3½" w.c. to 6 psi
Capacity to 2250 CFH
Available with straight through body.
Also available: internal relief valve and low pressure cut-off.

Industrial Service Regulators

Models 243-8, 234-12, 243-8HP
Bulletin: R-1306
1¼", 1½", and 2" pipe size
Inlet pressures . . . . . .to 125 psi
Outlet pressures . . . . . .3½" w.c. to 10 psi
Capacity to 25,000 CFH
Also available: internal relief valve, low pressure cut-off external control line, back pressure regulator, relief valve, vacuum regulator and vacuum breaker.

Industrial Field Regulators

For intermediate to high pressure applications. Ideal on pipeline taps servicing plants and buildings. Appropriate for double stage reduction ahead of service regulators, and for high pressure burners and compressed air systems.

Model 046
Bulletin: R-1312
¾", 1", and 1¼" pipe size
Inlet pressures . . . . . .to 1000 psi
Outlet pressures . . . . . .3 to 200 psi
Capacity to 40,000 SCFH
Monitor and pressure loaded version, and internal relief valve also available.

Model 141A
Bulletin: R-1311
2" pipe size
Inlet pressures . . . . . .to 1500 psi
Outlet pressures . . . . . .5 to 400 psi
Capacity to 55,000 SCFH

Pilot Loaded Regulators

For intermediate and high-pressure applications requiring precise pressure reduction with minimal droop. Ideal for standard and high capacity flows on burners, driers, dehydrators and compressor line. Appropriate for fixed factor billing.

Models 243-RPC
Bulletin: R-1343
1¼", 1½" and 2" pipe size
Inlet pressures . . . . . .to 150 psi
Outlet pressures . . . . . .3½" w.c. to 35 psi
Capacity to 76,000 SCFH

Model 1100
Bulletin: R-1341
2" pipe size (screwed or flanged)
Inlet pressures . . . . . to 400 psi
Outlet pressures . . . . . .3½" w.c. to 100 psi
Capacity to 414,000 SCFH

Model 1200
Bulletin: R-1342
2" pipe size (flanged)
Inlet pressures . . . . . to 1200 psi
Outlet pressures. . . . . 20 to 600 psi
Capacity to 789,000 SCFH

Sensus also produces Industrial and Combustion Regulators; High Pressure, High Capacity Regulators; and Safety Relief Valves. Detailed information available upon request.

www.sensus.com/gas
805 Liberty Boulevard
DuBois, PA 15801
800-375-8875
Fax: (814) 375-8460

Models 441-57S
Regulator

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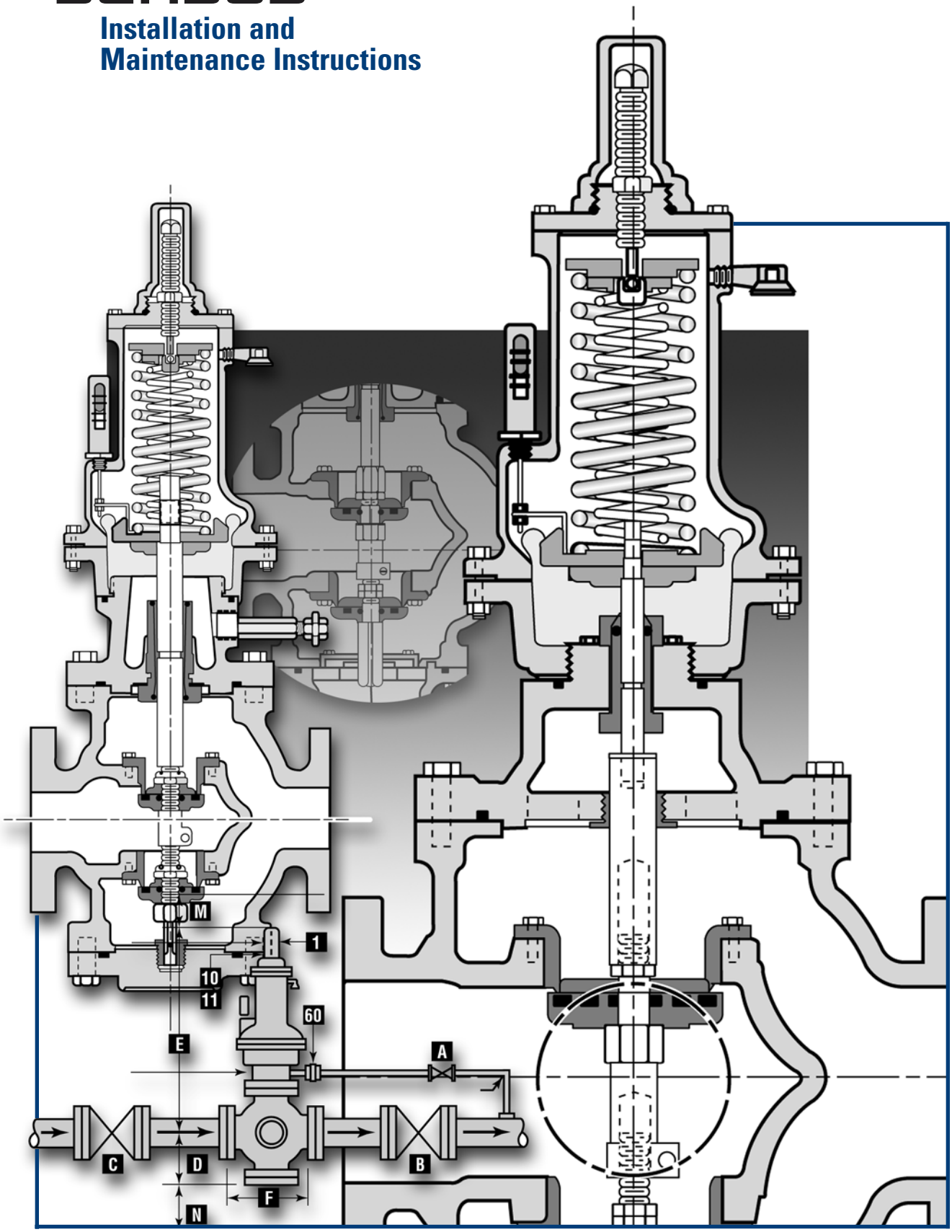
Installation and Maintenance Instructions



The Model 441-57S Regulator is an excellent general purpose gas pressure regulator for larger loads. Use it for natural gas, air, dry CO_2, propane, butane, and other gases.

Installation and Start-Up

1. Thoroughly purge inlet piping to remove dirt and debris that could damage the regulator or impair its operation. If this cannot be done, a filter or strainer should be installed ahead of the regulator (see Catalog RDS 1498, Regulator Pressure Ratings). Make certain that inside of regulator and piping are free of dirt, foreign matter, and other debris.
2. Install the regulator. Make certain flow through the regulator is in the correct direction. High pressure connects to the inlet side. Be sure that shipping screens or covers, if used, are removed.

   On flanges, tighten bolts evenly. On screwed connections, apply pipe dope to male threads only.

   Where required, the regulator may be inverted.

CAUTION

It is the user's responsibility to assure that all regulator vents and/or vent lines exhaust to a non-hazardous location away from ANY POTENTIAL sources of ignition. Where vent lines are used, it is the user's responsibility to assure that each regulator is individually vented and that common vent lines ARE NOT used.

3. The vent connection is an escape path for flammable gas and it must be located and/or piped so that potential discharge occurs in a safe area away from buildings, open flames, collection areas, arcing devices, etc.

   Regulators that are installed indoors or in a non-vented area must be vented to the outside. Simply run vent piping from the regulator vent connection to a non-hazardous location on the outside away from any potential sources of ignition. The vent piping must be connection size or larger and piped to a safe area.

   The outlet of the vent piping must allow for the free and unobstructed passage of air and gas and must be protected against the potentials listed in the instructions.
4. **For outdoor installations, it is recommended that the regulator be installed so that the regulator vent faces downward to avoid the potential for water or other foreign matter entering the regulator and interfering with proper operation of the regulator.**
5. Install the control line. Run it from the Union shown at **60** on the regulator to the control connection in the outlet piping. The control line should be no less than 1/2" in size. It should be sturdy with adequate protection against breakage (regulators go wide open if the control line is broken). Pitch it to drain away from the regulator, free of moisture pockets. The regulator will work to deliver the pressure (for which it is adjusted) at that point in the piping where the control connection is located.

   In general, the control connection should be at least eight pipe diameters downstream from the regulator and should be in as straight a run of pipe as possible where turbulence is at a minimum. Keep clear of elbows, valves, and other causes of excessive turbulence.

   The control connection should be clean and smooth inside the pipe to minimize turbulence. It should be free of rough edges, welding "icicles", etc. It should be located on the top or side of the pipe, not on the bottom. Where outlet piping increases in size near the regulator, it is generally preferable to locate the connection to the larger size piping.
   The Union **60** contains a small orifice (approximately 1/16" diameter). This orifice should not be removed. Also, make certain it is open and free of foreign material.
6. Check all connections for leaks.

Maximum Inlet Pressures

Regulator Body Type	Body Materials	Maximum Inlet Pressure
2" Screwed	Cast Iron	250 psi
Flanged ANSI 125	Cast Iron	175 psi*
Flanged ANSI 250	Ductile Iron	575 psi*
Flanged ANSI 300	Cast Steel	720 psi *
Flanged ANSI 600	Cast Steel	1000 psi*

*Carefully note the following exceptions to the above, based on valve size:

Body Size	Valve	Maximum Inlet Pressure
6"	4-1/4"	150 psi
6"	3" reduced	300 psi
4"	3"	
6"	2-1/8" reduced	500 psi
4"	2-1/8" reduced	
3"	2-1/8"	

Valve material selection is limited by inlet pressure and differential.

Valve Material	Maximum Inlet Pressure	Maximum Pressure Differential
Buna-N	575 psi	250 psi
Poly-U Red	720 psi	400 psi
Poly-U Tan	1200 psi	600 psi

CAUTION

Turn gas on very slowly. If an outlet stop valve is used, it should be opened first. Do not overload the diaphragm with a sudden surge of inlet pressure. Monitor the outlet pressure during start-up to prevent an outlet pressure overload.

7. Put the regulator into operation as follows:
   a. Slowly open downstream control line valve (A).
   b. Slowly open downstream block valve (B).
   c. Very slowly open upstream block valve (C).
8. Set adjusting screw **10** for the required outlet pressure. Turn it clockwise to increase the pressure and counterclockwise to decrease it. Only make this adjustment when gas is actually flowing through the regulator. After adjustment is complete, locknut **11** should be tightened firmly and seal cap **1** replaced.
9. To shut down, carefully close valves (C), (B), and (A) in that order.

CAUTION

1. **Keep pipe dope and all other foreign substances out of the control line.**
2. **Never install any type of automatic shut-off device, which closes completely, between the regulator outlet and the downstream control line connections.**
3. **The vent must be positioned to protect against flooding, drain water, ice formation, traffic, tampering, etc. The vent must be protected against nest building animals, bees, insects, etc. to prevent vent blockage and minimize the chances for foreign material from collecting in the vent side of the regulator diaphragm.**

Servicing and Adjustment

General Notes (See illustration on pages 5 – 7)

1. Make sure the regulator is entirely depressurized before servicing.
2. A quick visual inspection of the valve can be made by removing inspection plates **38** from the sides of the body. These also provide greatly improved access to the valve when servicing or adjusting.
3. Carefully note location and position of disassembled parts to be certain reassembly is correct. Inspect each one carefully and replace those that are worn or damaged or otherwise unsatisfactory.
4. The diaphragm **20**, the springs **14**, and all other parts from the diaphragm up (except the **24** stem) are fully interchangeable with the Model 461-57S Regulator.
   Valve and body parts are interchangeable with other 441 Regulators (441-S, 441-X57, 441-VPC.).
5. Use lubricants sparingly and with care to avoid exposing tacky surfaces to the gas stream. Such surfaces could cause dirt accumulation on close clearance parts.
   Use moly or silicone type lubricants.
   Avoid the use of petroleum base types.
   Lubricate the stem **24**, the guide **50h** and stem O-ring **23** with dry silicone lubricant to help assure free movement and a tight seal.
   An application of silicone base lubricant to the other O-rings and the tetraseals in the regulator will also help assure their tightness.
6. There is **one screwed connection that must be loose**.
   Carefully note which one it is. All other connections must be firm and tight.
   On 2" and 3" regulators, the loose connection is between parts **50e** and **24**.
   On 4" and 6" regulators, the loose connection is between parts **50i** and **24**.
   This loose connection should be screwed together until it bottoms, then be **backed off 1/2 to 1 full turn.**
7. When replacing orifices, tighten cap screws **26** evenly and carefully to avoid stripping female threads in body casting.
8. When changing to different size valve in 4" and 6" regulators, be sure to use the correct travel stop (Ill. No. 54). For identification, last digit of part number is recessed into one end of travel stop.

CAUTION

Regulators are pressure control devices with numerous moving parts subject to wear which is dependent upon particular operating conditions. To assure continuous satisfactory operation, a periodic inspection schedule must be adhered to with the frequency of inspection determined by the severity of service and applicable laws and regulations.

To Remove Valves

1. Remove seal cap **1**, back off adjusting screw **10**, remove housing cover **5** and spring **14** (also, **14a** and **14b** if used).
2. Remove bottom plate **33**, and side plates **38**.
3. Insert an Allen wrench through side inspection opening and loosen Allen screw **50g**.
4. Unscrew lower valve assembly and remove through bottom opening. (**50h** unscrews from **50e**).
5. Unscrew upper valve assembly and remove through side opening. (**50e** or **50i** unscrews from **24**).

Note:

a. If upper valve assembly is too large to remove through side opening, then remove it through bottom opening by also removing outlet orifice **29**, (remove cap screws **26** to remove orifice, and if tight, jack out using cap screws in jacking holes).

b. Entire valve assembly may be removed intact through bottom opening by also removing orifice **29**. This method leaves the lock-up adjustment undisturbed.

c. Use care with orifice O-ring **27**.

6. To disassemble upper and/or lower valve assembly, remove nuts **50a**.

To Replace and Adjust Valves

1. Assemble upper valve assembly (parts **50a**, **50b**, **50c**, **50d**, **50e**, **50f**, **50g**, **50i**), and lower valve assembly (parts **50a**, **50b**, **50c**, **50d**, **50h**). Firmly tighten nuts **50a**. Also, **50i** should be firmly tightened against **50a**.
2. Insert upper valve assembly and screw into place. Screw **50e** or **50i** into **24** until it bottoms. **Then back off 1/2 to 1 turn - this is important.**
3. If orifice **29** was removed, reinstall it.
4. Insert lower valve assembly and screw into place by a few turns (**50h** screws into **50e**).
5. Turn upper valve assembly so Allen screw **50g** is accessible through side inspection opening.
6. Make the valve lock-up adjustment as follows:
   a. Hold upper valve against its seat. This can be done by hand, reaching through side inspection opening.
   b. While holding the upper valve against its seat, screw lower valve assembly upwards until the lower valve also touches its seat. When both upper and lower valves are touching their seats, they are correctly adjusted for tight lock-up.
   c. Firmly tighten Allen screw **50g**. This locks the adjustment by evenly and tightly locking **50h** and **50e** together.

   Note: If the entire valve assembly was removed intact and Allen screw **50g** has not been loosened, the assembly may be reinstalled without making the lock-up adjustment.
7. Screw entire valve assembly up (**50e** or **50i** screws into **24** until it bottoms). Then **back off 1/2 to 1 turn – this is important.**
8. Replace side plates **38**.
9. Replace bottom plate **33**. Match bottom end of **50h** into **31** and/or **32**, then turn bottom plate either way to first matching bolt hole position.

To Remove Orifices

1. Remove orifice **29** per applicable steps 1 through 5 under section "To Remove Valves".
2. Remove inlet orifice **28** as follows:
   a. Remove seal cap **1**, back off adjusting screw **10**, remove housing cover **5**, and remove spring.
   b. Remove bottom plate **33** and then unscrew valve assembly by grasping **50h** and turning. (**50e** or **50i** unscrews from **24**).
   c. Remove diaphragm case assembly by first opening union **60** and removing cap screws **34**.
   d. Remove cap screws **26** and remove inlet orifice **28**. If orifice is tight, jack out cap screws in jacking holes. Use care with O-ring **27**.
   e. When replacing diaphragm assembly, the threaded connection between **24** and **50e** or **50i** should be screwed together until it bottoms. Then **backed off 1/2 to 1 turn - this is important.**

To Change Spring

1. Remove seal cap **1**, back off adjusting screw **10**, remove housing cover **5**, and remove spring.
2. Insert the new spring. Be sure it nests correctly into part **19** and travel indicator bracket **45k** is in place. Also, make a visual inspection of diaphragm **20** before inserting the spring to be sure the roll-out is uniform and in place. (Use a flashlight if necessary).
3. Complete steps 7, 8, and 9 under "To Assemble 441-57S".

To Service Diaphragm

1. Remove seal cap **1**, back off adjusting screw **10**, remove housing cover **5**, and remove spring **14**. If used, also remove spring **14a** and **14b**.
2. Remove bolts **42**. Then carefully remove upper diaphragm case **8**.
3. Turn diaphragm assembly counterclockwise until **24** unscrews from **50e** or **50i**, then remove assembly and inspect diaphragm.
4. If a new diaphragm **20** is required, remove nut **16** and disassemble.
5. When reassembling, **be sure that fabric side of diaphragm 20 will be toward the vent side of the regulator and the rubber side of diaphragm toward the pressure side. The gasket is always placed on the spring side of the diaphragm.**
6. Screw diaphragm assembly back into place (**24** screws into **50e** or **50i** until it bottoms). Then **back off 1/2 to 1 turn – this is important**.
7. Fold roll into roll-out diaphragm and then carefully reinstall upper diaphragm case **8**. Diaphragm must not be pinched between upper and lower cases **8** and **40** or **40a**. Also, roll-out loop must be uniformly full and even. It should be in place as shown on the cross-section drawing. Tighten bolts **42** evenly.
8. Replace spring, etc., per steps 6 thru 9 under "To Assemble 441-57S".

To Assemble 441-57S

1. Install orifice **28** through top opening.
2. Install valve assembly and orifice **29** per applicable steps 1 through 6 under "To Replace and Adjust Valves" (except that **50e** or **50i** does not yet screw into **24**).
3. Install centerpiece and lower diaphragm case **36** and **40** or **40a**.
4. Install diaphragm assembly and case per steps 5 through 7 under "To Service Diaphragm".
5. Replace bottom plate **33**. Match bottom end of **50h** into **31** and/or **32**, then rotate bottom plate either way to the first matching bolt hole position.
6. Inset the spring. Be sure it nests correctly onto part **19** and travel indicator bracket **45k** is in place. Also, make a visual inspection of diaphragm **20** before inserting the spring to be sure the roll-out is uniform and in place (use a flashlight if necessary).
7. Insert top spring button **12**. Be sure it is nested correctly on the spring. Also, make sure that ball **13** is in place.
8. Install housing cover **5**. Be sure the lower end of adjusting screw **10** fits into the hole in button **12**.
9. Set adjusting screw **10** for desired outlet pressure. Firmly tighten nut **11** and replace seal cap **1**.

Over Pressurization Protection

Protection must be provided for the downstream piping system and the regulator's low pressure chambers to assure against the potential over pressurization due to a regulator malfunction or a failure of the regulator to lock-up. The allowable over pressurization is the lowest of the maximum pressures permitted by federal codes, state codes, Sensus bulletin RDS-1498, or other applicable standards. The Method of providing over pressure protection could be a relief valve, a monitor regulator, a shut-off device or any similar device.

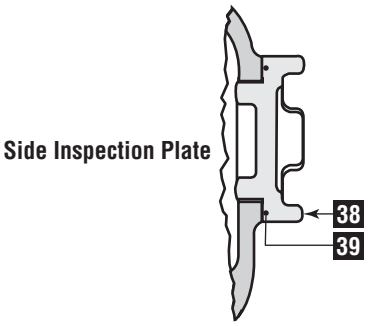
Temperature Limits

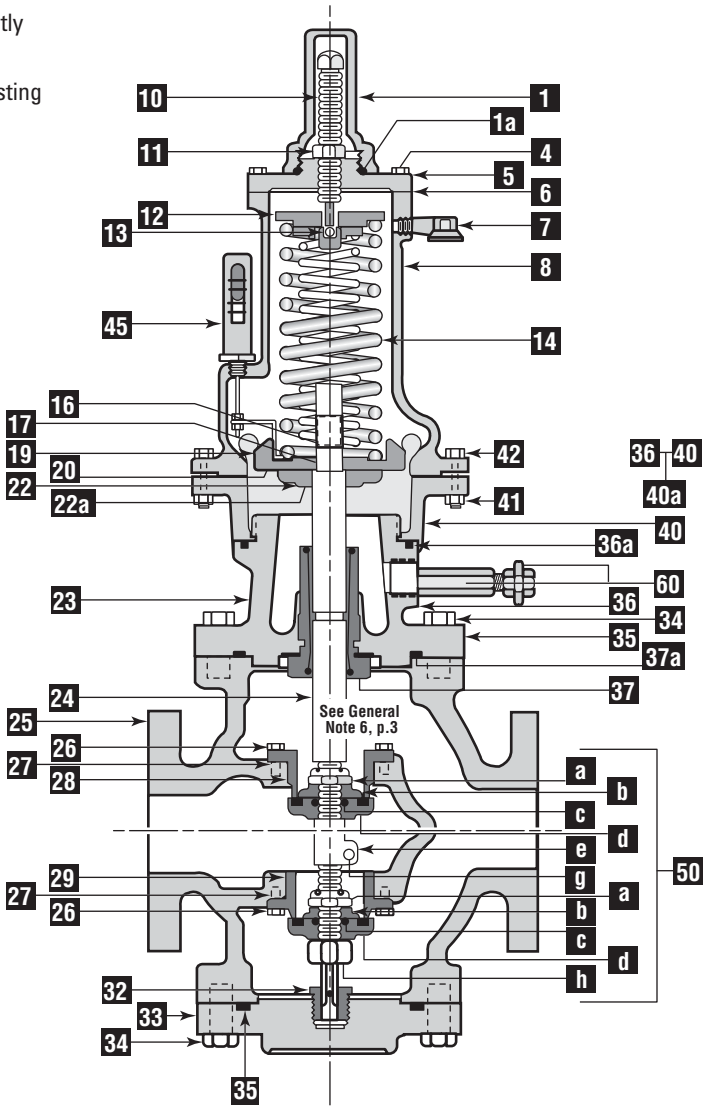
The Model 441-57S Regulator can be used for flowing temperatures from -20°F to 150°F.

Buried Service

The 441-57S Regulators ARE NOT recommended for buried service.

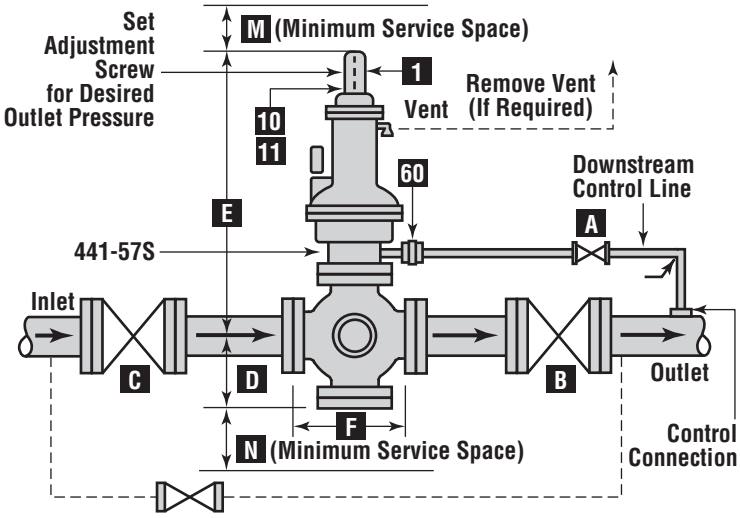
Model 441-57S
General Assembly 2" and 3" Models



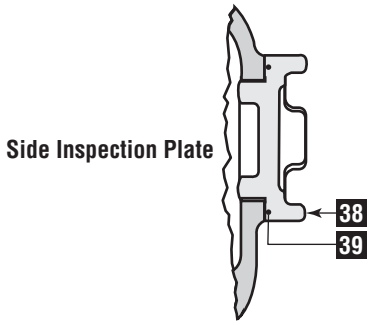


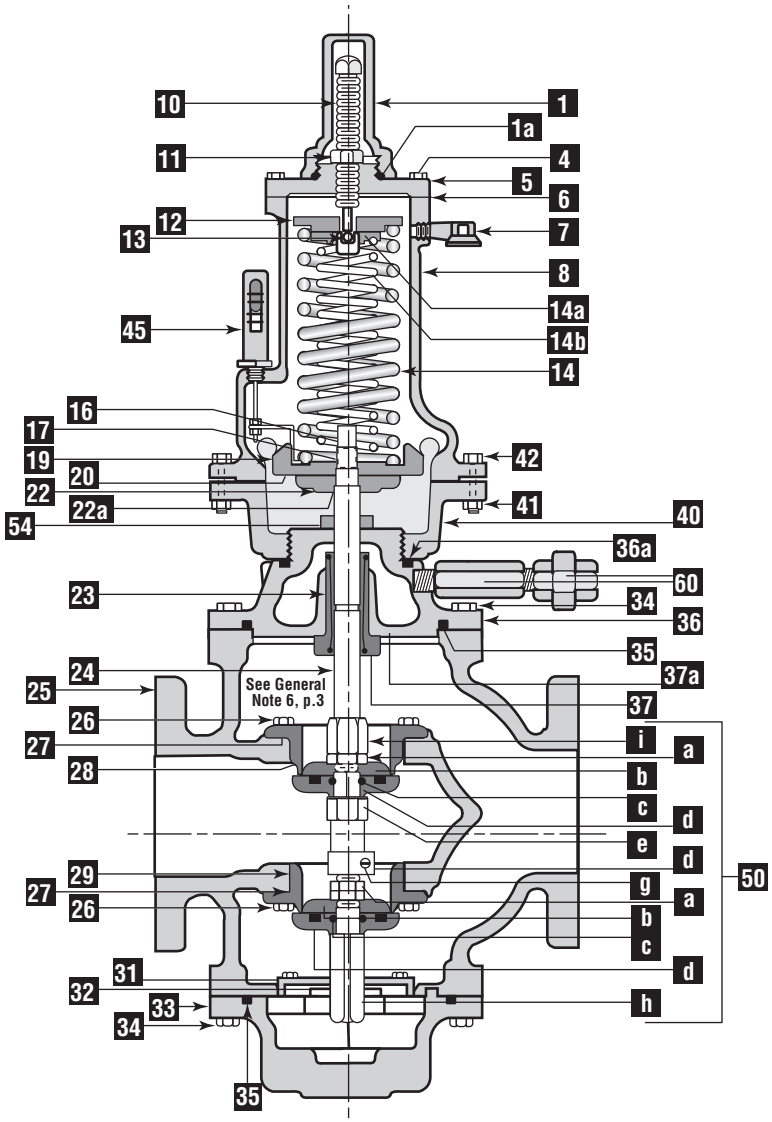
Typical Arrangements and Dimensions Model (Indoor or Outdoor Installation)

Regulator Body Type	F (Face to Face, in.) 2" Pipe	3" Pipe	4" Pipe	6" Pipe
Screwed	10	–	–	–
Flanged ANSI 125	10	11 3/4	13 7/8	17 3/4
Flanged ANSI 250	10 1/2	12 1/2	14 1/2	18 5/8
Flanged ANSI 300	10 1/2	12 1/2	14 1/2	18 5/8
Flanged ANSI 600	11 1/4	13 1/4	15 1/2	20



Model 441-57S General Assembly 4" Model





Dimensions in Inches

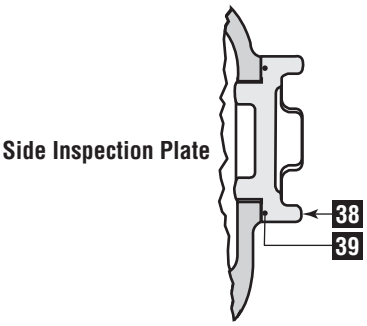
	D	E	M	N
2" Pipe	6	24	5	7
3" Pipe	6	24	5	7
4" Pipe	9½	25	5	8
6" Pipe	12	28½	5	14

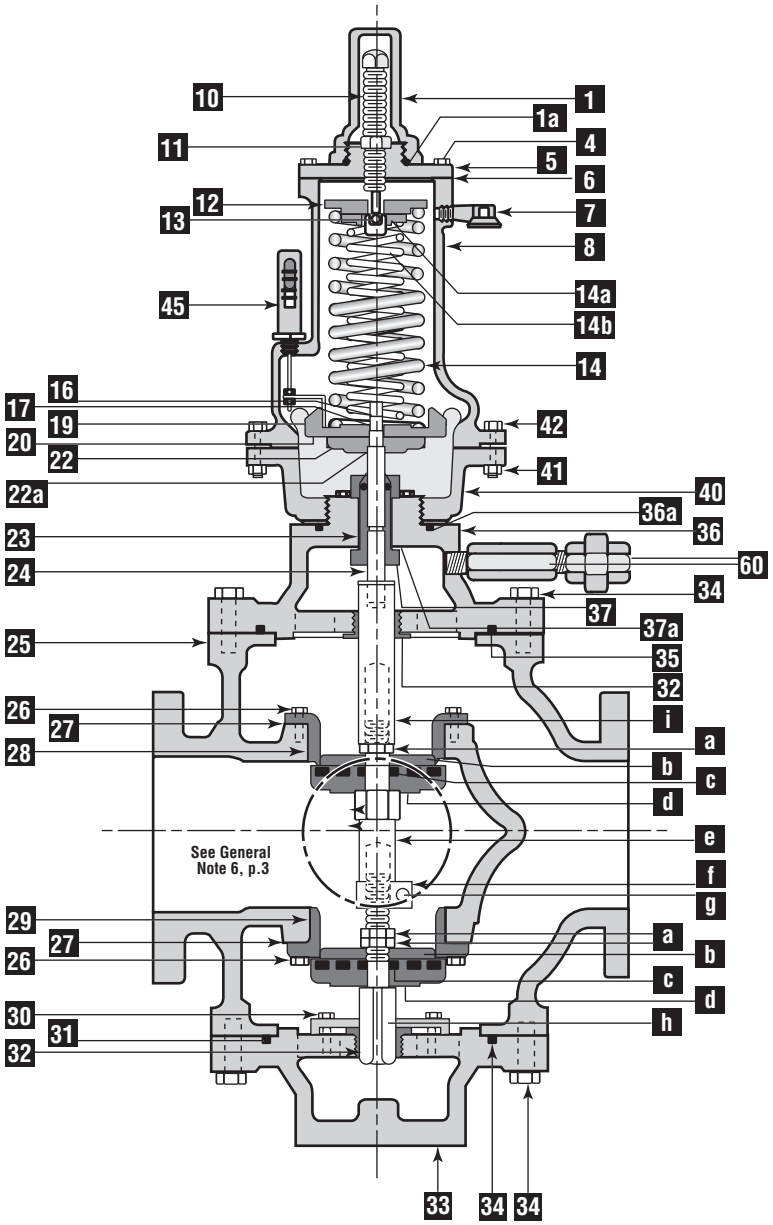
Spring Ranges

Outlet Pressure Min. to Max	Spring Color	Nominal Diaphragm Size (I.D.)
3 to 6 psi	Yellow	
5 to 9 psi	Gray	
7-1/2 to 15 psi	Blue	
12-1/2 to 30 psi	Red	5" all ranges
25 to 55 psi	Brown	
50 to 75 psi	Black	
70 to 100 psi	Brown plus White*	

* White colored spring is nested within brown

Model 441-57S
General Assembly 6" Model





Model 441-57S Condensed Parts List

2", 3", 4", and 6" Models

Illustration Number	Description	Part Number
1a	Tetraseal (or O-Ring), 1-3/4" x 2"	904092
4	Hex Cap Screw, 5/16" – 18 x 1", 120,000 tensile, 8 used	910030
6	Housing Cover Gasket	091-00-066-30
7	Vent Cap, 1/4 NPT	137-02-505-02
10	Spring Adjustment Screw	090-16-007-02
11	Hex Steel Jam Nut, 5/8" – 11	921407
13	Thrust Bearing, 3/8" dia. stainless steel ball	930510
14	Spring, Yellow 3 to 6 psi	091-00-021-05
	Spring, Gray 5 to 9 psi	091-00-021-04
	Spring, Blue 7-1/2 to 15 psi	091-00-021-03
	Spring, Red 12-1/2 to 30 psi	091-00-021-02
	Spring, Brown 25 to 55 psi	091-00-021-01
	Spring, Black 50 to 75 psi	091-00-021-00
	Spring, Brown plus White 70 to 100 psi	
	Brown outer spring	091-00-021-01
	White inner spring	091-00-021-08
16	Hex Steel Nut 5/8"	905993
17	Split Lockwasher 5/8"	932531
19	Diaphragm Plate, upper	091-00-010-00
20	Diaphragm, 5" Roll-Out	091-00-350-00
41	Hex Steel Nut, 3/8" – 16, 8 used	920853
42	Hex Steel Bolt, 3/8" – 16 x 1-3/4" Lg., 8 used	910058
45	Travel Indicator Assembly 5/8" scale	
	(1-1/2", 1-3/4", 2-1/8" valves)	091-00-365-75
	1" scale (3" valves)	091-00-365-77
	1-1/4" scale (4-1/4" valves)	091-00-365-79
60	1/2" NPT Nipple, Orifice Plug and Steel Union Assembly	090-16-361-01
90	Nameplate	090-00-086-05
91	Nameplate, round	090-16-086-00
92	Rd. Hd. Type U Drive Screw, #4 x 3/16" Lg.	903004
93	Rd. Hd. Machine Screw, 6-32 x 1/4" Lg.	914402

2" and 3" Models

Illustration Number	Description	Part Number
22	Lower Diaphragm Plate	091-00-022-00
22a	O-Ring, 5/8" x 3/4"	902922
23	O-Ring, 11/16" x 7/8"	934013
24	Diaphragm Connecting Screw, stainless steel	090-16-058-00

2" Models

Illustration Number	Description	Part Number
26	Hex Cap Screw, 1/4" – 20 x 1/2" Lg., 120,00 tensile	910001
27	O-Ring for Orifices	904832
28	1-3/4" Inlet Orifice, plated steel	090-16-028-00
	1-3/4" Inlet Orifice, stainless steel	090-16-028-50
	1-1/2 Inlet Orifice, plated steel	090-16-028-01
	1-1/2" Inlet Orifice, stainless steel	090-16-028-51
26	1-3/4" Outlet Orifice, plated steel	090-16-029-00
	1-3/4" Outlet Orifice, stainless steel	090-16-029-50
	1-3/4" Outlet Orifice, plated steel	090-16-029-01
	1-3/4" Outlet Orifice, stainless steel	090-16-029-51

3" Models

Illustration Number	Description	Part Number
26	Hex Cap Screw, 1/4" – 20 x 1/2" Lg., 120,00 tensile	910001
27	O-Ring for Orifices	950818
28	2-1/8" Inlet Orifice, plated steel	090-20-028-00
	2-1/8" Inlet Orifice, stainless steel	090-20-028-50
	1-3/4" Inlet Orifice, plated steel	090-20-028-02
	1-3/4" Inlet Orifice, stainless steel	090-20-028-52
	1-1/2" Inlet Orifice, plated steel	090-20-028-03
	1-1/2" Inlet Orifice, stainless steel	090-20-028-53
29	2-1/8" Outlet Orifice, plated steel	090-20-029-00
	2-1/8" Outlet Orifice, stainless steel	090-20-029-50
	1-3/4" Outlet Orifice, plated steel	090-20-029-02
	1-3/4" Outlet Orifice, stainless steel	090-20-029-52
	1-1/2" Outlet Orifice, plated steel	090-20-029-03
	1-1/2" Outlet Orifice, stainless steel	090-20-029-53

2" and 3" Models

Illustration Number	Description	Part Number
32	Guide Bushing with Pin, brass	090-16-385-01
	Guide Bushing with Pin, stainless steel	090-16-385-03
34	Hex Cap Screw, 1/2" – 13 x 1-1/4"	910106
35	Tetraseal (or O-Ring), 4-3/8" x 4-5/8"	904085
36	Tetraseal (or O-Ring), 3" x 3-1/4"	904084
37	Centerpiece Stem Bushing	090-16-373-00
37a	Aluminum Seal Ring	090-26-178-00
39	Tetraseal (or O-Ring), 3-1/4" x 3-1/2"	904078

4" Models

Illustration Number	Description	Part Number
22	Lower Diaphragm Plate	091-00-022-01
22a	O-Ring, 5/8" x 3/4"	902922
23	O-Ring, 11/16" x 7/8"	934013
24	Diaphragm Connecting Screw, stainless steel	090-16-058-00
26	Hex Cap Screw, 3/8" – 16 x 3/4" Lg., 120,000 tensile	910053
27	O-Ring for Orifices	905583
28	3" Inlet Orifice, plated steel	090-22-028-00
	3" Inlet Orifice, stainless steel	090-22-028-50
	2-1/8" Inlet Orifice, plated steel	090-22-028-02
	2-1/8" Inlet Orifice, stainless steel	090-22-028-52
	1-3/4" Inlet Orifice, plated steel	090-22-028-01
	1-3/4" Inlet Orifice, stainless steel	090-22-028-51
29	3" Outlet Orifice, plated steel	090-22-029-00
	3" Outlet Orifice, stainless steel	090-22-029-50
	2-1/8" Outlet Orifice, plated steel	090-22-029-02
	2-1/8" Outlet Orifice, stainless steel	090-22-029-52
	1-3/4" Outlet Orifice, plated steel	090-22-029-01
	1-3/4" Outlet Orifice, stainless steel	090-22-029-51
30	Hex Cap Screw, 3/8" – 16 x 1" Lg.	910055
31	Spin Stop Plate	090-22-040-01
32	Guide Bushing, brass	090-22-074-00
	Guide Bushing, stainless steel	090-22-074-01
34	Hex Cap Screw, 5/8" – 11 x 1-1/2"	910157
	Hex Cap Screw, 5/8" – 11 x 1-3/4" for ductile bottom plate	910158
35	Tetraseal (or O-Ring), 6-1/4" x 6-1/2"	904080
36a	Tetraseal (or O-Ring), 4" x 4-1/4"	904084
37	Centerpiece Stem Bushing	090-16-373-00
37a	Aluminum Seal Ring	090-26-178-00
39	Tetraseal (or O-Ring), 4-1/4" x 4-1/2"	904083

6" Models

Illustration Number	Description	Part Number
22	Lower Diaphragm Plate	091-00-022-02
22a	O-Ring, 5/8" x 3/4"	902922
23	O-Ring, 11/16" x 7/8"	934013
24	Diaphragm Connecting Stem, stainless steel	090-22-058-00
26	Hex Cap Screw, 3/8" – 16 x 1" Lg., 120,000 tensile	910055
27	O-Ring for Orifice	906301
28	4-1/4 Inlet Orifice, plated steel	090-24-028-00
	4-1/4" Inlet Orifice, stainless steel	090-24-028-02
	3" Inlet Orifice, plated steel	090-24-028-10
	3" Inlet Orifice, stainless steel	090-24-028-12
	2-1/8" Inlet Orifice, plated steel	090-24-028-22
	2-1/8" Inlet Orifice, stainless steel	090-24-028-24
29	4-1/4" Outlet Orifice, plated steel	090-24-029-00
	4-14" Outlet Orifice, stainless steel	090-24-029-02
	3" Outlet Orifice, plated steel	090-24-029-10
	3" Outlet Orifice, stainless steel	090-24-029-12
	2-1/8" Outlet Orifice, plated steel	090-24-029-22
	2-1/8" Outlet Orifice, stainless steel	090-24-029-24
30	Hex Cap Screw, 3/8" –16 x 1" Lg.	910055
31	Spin Stop Plate	090-24-040-01
32	Guide Bushing, stainless steel	090-24-074-01
34	Hex Cap Screw, 5/8" – 11 x 2"	910159
35	Tetraseal (or O-Ring), 7-3/4" x 8"	904088
36	Tetraseal (or O-Ring), 4" x 4-1/4"	904084
37	Centerpiece Stem Bushing	090-16-373-02
37a	Aluminum Seal Ring	090-26-178-00
39	Tetraseal (or O-Ring), 6" x 6-1/4"	904089

2" and 3" Models

Illustration Number	Description	Part Number
50	Valve Assembly, 1-3/4", brass trim, Polyurethane (Red, 65-75 Duro)	090-16-515-32
	Valve Assembly, 1-3/4", stainless steel trim, Polyurethane (Red, 65-75 Duro)	090-16-515-52
	Valve Assembly, 1-1/2", brass trim, Polyurethane (Red, 65-75 Duro)	090-16-515-33
	Valve Assembly, 1-1/2" stainless steel trim, Polyurethane (Red, 65-75 Duro)	090-16-515-53

Model 441-57S Condensed Parts List

3" Models

Illustration Number	Description	Part Number
50	Valve Assembly, 2-1/8", brass trim, Polyurethane (Red, 65-75 Duro)	090-20-515-40
	Valve Assembly, 2-1/8", stainless steel trim, Polyurethane (Red, 65-75 Duro)	090-20-515-60
50b	Valve Retainer, standard, stainless steel, 2-1/8"	090-20-018-30
	Valve Retainer, v-port wings, stainless steel, 2-1/8"	090-20-012-51
50d	Molded Valve, 2-1/8", Buna-N (Black, 50-55 Duro) all trim	090-20-315-00
	Molded Valve, 2-1/8", Polyurethane (Red, 65-76 Duro) all trim	090-20-315-02
	Molded Valve, 2-1/8", Polyurethane (Tan 85-95 Duro) all trim	090-20-315-03

2" and 3" Models

Illustration Number	Description	Part Number
50a	Valve Lock Nut, 5/8" – 18	090-16-034-00
50b	Valve Retainer, standard, steel, 1-3/4"	090-16-018-00
	Valve Retainer, standard, stainless steel, 1-3/4"	090-16-018-30
	Valve Retainer, v-port wings, stainless steel, 1-3/4"	090-16-012-53
	Valve Retainer, standard, steel, 1-1/2"	090-16-018-01
	Valve Retainer, standard, stainless steel, 1-1/2"	090-16-018-31
	Valve Retainer, v-port wings, steel, 1-1/2"	090-16-012-52
	Valve Retainer, v-port wings, stainless steel, 1-1/2"	090-16-012-55
50c	O-Ring, 5/8" x 13/16"	934012
50d	Molded Valve, 1-3/4", Buna-N (Black, 50-55 Duro) all trim	090-16-315-00
	Molded Valve, 1-1/2", Buna-N (Black, 50-55 Duro) all trim	090-16-315-01
	Molded Valve, 1-3/4", Polyurethane (Red, 65-75 Duro) all trim	090-16-315-02
	Molded Valve, 1-1/2", Polyurethane (Red, 65-75 Duro) all trim	090-16-315-03
	Molded Valve, 1-3/4", Polyurethane (Tan, 85-95 Duro)	090-16-315-05
	Molded Valve, 1-1/2", Polyurethane (Tan, 85-95 Duro) all trim	090-16-315-04
50e	Female Valve Stem, brass	090-16-116-00
	Female Valve Stem, stainless steel	090-16-116-01
50g	Adjustment Clamp Screw, Soc. Hd. Screw, 10 – 24 x 1/2" Lg.	903486
	Adjustment Clamp Screw, for 1-1/2" valve only	090-16-046-01
50h	Male Valve Stem, brass	090-16-016-01
	Male Valve Stem, stainless steel	090-16-016-02

4" Models

Illustration Number	Description	Part Number
50	Valve Assembly, 3", brass trim Polyurethane (Red, 65-75 Duro)	090-22-515-40
	Valve Assembly, 3", stainless steel trim, Polyurethane (Red, 65-75 Duro)	090-22-515-60
	Valve Assembly, 2-1/8", brass trim, Polyurethane (Red, 65-75 Duro)	090-22-515-41
	Valve Assembly, 2-1/8", stainless steel trim, Polyurethane (Red, 65-75 Duro)	090-22-515-61
	Valve Assembly, 1-3/4", brass trim, Polyurethane (Red, 65-75 Duro)	090-22-515-42
	Valve Assembly, 1-3/4", stainless steel trim, Polyurethane (Red, 65-75 Duro)	090-22-515-62
50a	Valve Lock Nut, 3/4" – 16	090-22-034-00
50b	Valve Retainer, standard, iron, 3"	090-22-018-03
	Valve Retainer, standard, stainless steel, 3"	090-22-018-00
	Valve Retainer, v-port wings, iron, 3"	090-22-012-20
	Valve Retainer, v-port wings, stainless steel, 3"	090-22-012-40
	Valve Retainer, standard, iron, 2-1/8"	090-22-018-01
	Valve Retainer, standard, stainless steel, 2-1/8"	090-22-018-31
	Valve Retainer, v-port wings, iron, 2-1/8"	090-22-012-50
	Valve Retainer, v-port wings, stainless steel, 2-1/8"	090-22-012-51
	Valve Retainer, standard, stainless steel, 1-3/4"	090-22-018-34
50c	O-Ring, 13/16" x 1"	904173
50d	Molded Valve, 3", Buna-N (Black, 50-55 Duro) all trim	090-22-315-00
	Molded Valve, 2-1/8", Buna-N (Black, 50-55 Duro) all trim	090-22-315-01
	Molded Valve, 1-3/4", Buna-N (Black, 50-55 Duro) all trim	090-22-315-04
	Molded Valve, 3", Polyurethane (Red, 65-75 Duro) all trim	090-22-315-02
	Molded Valve, 2-1/8", Polyurethane (Red, 65-75 Duro) all trim	090-22-315-03
	Molded Valve, 1-3/4", Polyurethane (Red, 65-75 Duro) all trim	090-22-315-05
	Molded Valve, 3", Polyurethane (Tan, 85-95 Duro) all trim	090-22-315-08
	Molded Valve, 2-1/8", Polyurethane (Tan, 85-95 Duro) all trim	090-22-315-07
	Molded Valve, 1-3/4", Polyurethane (Tan, 85-95 Duro) all trim	090-22-315-06

4" Models (continued)

Illustration Number	Description	Part Number
50e	Female Valve Stem, brass	090-22-016-40
	Female Valve Stem, stainless steel	090-22-016-41
50f	Adjustment Clamp Ring, brass	090-22-043-00
	Adjustment Clamp, Ring, stainless steel	090-22-043-02
50g	Adjustment Clamp Screw, Soc. Hd. Screw, 1/4" – 20 x 3/4" Lg.	903494
50h	Male Valve Stem, stainless steel	090-22-116-01
50i	Stem Extension, stainless	090-22-058-40
54	Travel Stop, for 3" valves	090-22-040-51
	Travel Stop, for 2-1/8" and 1-3/4" valves	090-22-040-55

6" Models

Illustration Number	Description	Part Number
50	Valve Assembly, 4-1/4", brass trim, Polyurethane (Red, 65-75 Duro)	090-24-515-40
	Valve Assembly, 4-1/4", stainless steel trim, Polyurethane (Red, 65-75 Duro)	090-24-515-60
	Valve Assembly, 3", brass trim, Polyurethane (Red, 65-75 Duro)	090-24-515-41
	Valve Assembly, 2-1/8", brass trim, Polyurethane (Red 65-75 Duro)	090-24-515-42
	Valve Assembly, 2-1/8", stainless steel trim, Polyurethane (Red, 65-75 Duro)	090-24-515-62
50a	Valve Lock Nut	015-31-034-70
	Valve Lock Nut, 5/8" – 18, for 2-1/8" reduced valve only	090-16-034-00
50b	Valve Retainer, standard, iron, 4-1/4"	090-24-018-00
	Valve Retainer, standard, stainless steel, 4-1/4"	090-24-018-02
	Valve Retainer, v-port wings, stainless steel, 4-1/4"	090-24-012-40
	Valve Retainer, standard, iron, 3"	090-24-018-21
	Valve Retainer, standard, stainless steel, 3"	090-24-018-22
	Valve Retainer, standard, stainless steel, 2-1/8"	090-20-018-30
	Valve Retainer, v-port wings, stainless steel, 2-1/8"	090-20-012-51
50c	O-Ring, 1-3/16" x 1-3/8"	904174
	O-Ring, 5/8" x 13/16" for 2-1/8" reduced valve only	934012

6" Models (continued)

Illustration Number	Description	Part Number
50d	Molded Valve, 4-1/4", Buna-N (Black, 50-55 Duro) all trim	090-24-315-00
	Molded Valve, 3", Buna-N (Black, 50-55 Duro) all trim	090-24-315-01
	Molded Valve, 2-1/8", Buna-N (Black, 50-55 Duro) all trim	090-20-315-00
	Molded Valve, 4-1/4", Polyurethane (Red, 65-75 Duro) all trim	090-24-315-02
	Molded Valve, 3", Polyurethane (Red, 65-75 Duro) all trim	090-24-315-03
	Molded Valve, 2-1/8", Polyurethane (Red 65-75 Duro) all trim	090-20-315-02
	Molded Valve, 4-1/4", Polyurethane (Tan, 85-95 Duro) all trim	090-24-315-05
	Molded Valve, 3", Polyurethane (Tan, 85-95 Duro) all trim	090-24-315-04
	Molded Valve, 2-1/8", Polyurethane (Tan, 85-95 Duro) all trim	
50e	Female Valve Stem, stainless steel	090-24-016-01
	Female Valve Stem, stainless steel for 2-1/8" reduced valve only	090-24-016-11
50f	Adjustment Clamp Ring, stainless steel	090-24-043-02
	Adjustment Clamp Ring, stainless steel for 2-1/8" reduced valve only	090-16-043-03
50g	Adjustment Clamp Screw, Soc. Hd. Screw, 5/16" – 18 x 1" Lg.	903498
	Adjustment Clamp Screw, for 2-1/8" reduced valve only	903494
50h	Male Valve Stem, stainless steel	090-24-116-01
	Male Valve Stem, brass for 2-1/8" reduced valve only	090-24-116-10
50i	Stem Extension, stainless	090-24-062-04
	Valve Stem Hex Extension, stainless, for 2-1/8" reduced valve only	090-16-062-11
54	Travel Stop, for 4-1/4" valves	090-22-040-50
	Travel Stop, for 3" valves	090-22-040-52
	Travel Stop, for 2-1/8" valves	090-22-040-56

Models 441-57S Regulator
Installation and Maintenance Instructions

805 Liberty Boulevard
DuBois, PA 15801
800-375-8875
Fax: (814) 375-8460
www.sensus.com/gas

Maximum Emergency Pressure

The Maximum emergency pressure that the inlet side of the Model 441-57S Regulator may be subjected to under abnormal conditions without causing damage to the regulator is:

Cast Iron Body Maximum Inlet Pressure + 25 psi
Ductile Iron Body Maximum Inlet Pressure + 60 psi
Cast Steel Body Maximum Inlet Pressure + 100 psi

If pressure exceeds the above values the regulator must be removed from service and inspected. Damaged or otherwise unsatisfactory parts must be repaired or replaced before returning the regulator to service.

The maximum pressure which the diaphragm may be subjected to under abnormal conditions without causing internal damage is the set-point + 25 psi. If the pressure on the diaphragm exceeds set-point by more than + 25 psi, the regulator must be removed from service and inspected. Damaged or otherwise unsatisfactory parts must be repaired or replaced before returning the regulator to service. The set-point is the outlet pressure the regulator is adjusted to deliver.

The maximum pressure that can be safely contained by the diaphragm case is 175 psi. Safely contained means no leakage as well as no bursting.

Before using any of the above data, make sure this entire section is clearly understood.

Other Gases

The Model 441-57S Regulator is mainly used on natural gas services; however, this regulator will perform equally as well on other gases. When using the Model 441-57S Regulator on other gases, the regulator capacities must be adjusted using the following correction factors:

Type of Gas	Correction Factor
Air (specific gravity 1.0)	0.77
Propane (specific gravity 1.53)	0.63
1350 BTU Propane-Air Mixture (specific gravity 1.20)	0.71
Nitrogen (specific gravity 0.97)	0.79
Dry CO_2 (specific gravity 1.52)	0.63

For other non-corrosive gases use the following formula:

$$\text{Correction Factor} = \sqrt{\frac{0.60}{\text{Specific gravity of the gas}}}$$

For use with gases not listed above, please contact your Sensus representative or Industrial Distributor for recommendations.

Monitoring

The Model 441-57S Regulator makes an excellent monitor. It can act as a standby regulator installed in series which assumes control if a failure in the operating regulator permits the outlet pressure to exceed the set-point. It can be located in either the upstream or the downstream position.

When a Model 441-57S Regulator is used to monitor a regulator with an identical inner valve (another 441-57S Regulator), the **total maximum capacity** through both regulators can be figured at 70% of the capacity of one regulator alone. This applies with the monitor located either upstream or downstream.

Authorized Distributor:

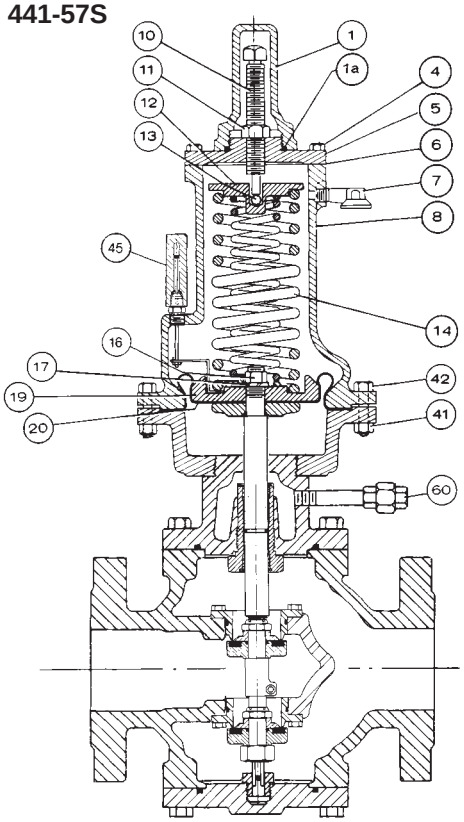
Regulator Parts List

Model 441-57S

Parts List
Model 441-57S
Regulators

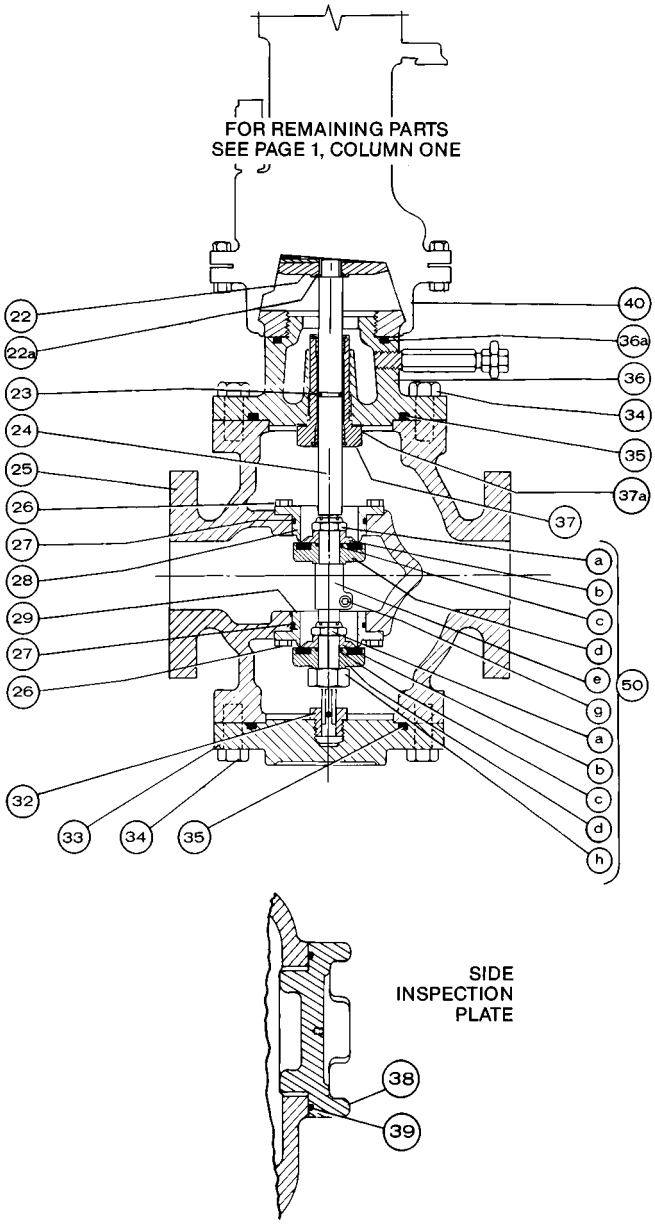
SENSUS

Model 441-57S



2″, 3″, 4″, 6″ Model 441-57S		
ILL. NO.	DESCRIPTION	PART NUMBER
1	Seal Cap	090-00-005-02
1a	Tetraseal (or O-Ring) 1 3/4″ x 2″	904092
4	Hex. Cap Screw 5/16″-18 x 1″, 120,000 tensile, 8 used	910030
5	Housing Cover, ductile	091-16-380-00
6	Housing Cover Gasket	091-00-066-30
7	Vent Cap, 1/4″ NPT	137-02-505-02
8	Upper Diaphragm Case	091-00-003-00
10	Spring Adjusting Screw	090-16-007-02
11	Hex. Steel Jam Nut, 5/8″-11	921007
12	Top Spring Button	091-00-009-00
13	Thrust Bearing, 3/8″ dia. stainless steel ball	930510
14	Spring, Yellow 3 to 6 psi	091-00-021-05
	Spring, Gray 5 to 9 psi	091-00-021-04
	Spring, Blue 7 1/2 to 15 psi	091-00-021-03
	Spring, Red 12 1/2 to 30 psi	091-00-021-02
	Spring, Brown 25 to 55 psi	091-00-021-01
	Spring, Black 50 to 75 psi	091-00-021-00
	Spring, Brown plus White 70 to 100 psi, Brown outer spring	091-00-021-01
	White inner spring	091-00-021-08
16	Hex. Steel Nut 5/8″-18	905993
17	Split Lockwasher 5/8″,	932531
19	Diaphragm Plate, upper	091-00-010-00
20	Diaphragm, 5″ Roll-Out	091-00-350-00
41	Hex. Steel Nut, 3/8″-16, 8 used	920053
42	Hex. Steel Bolt, 3/8″-16 x 1 3/4″ lg., 8 used	910058
45	Travel Indicator Assembly	
	5/8″ Scale (1 1/2″, 1 3/4″, 2 1/8″ valve)	091-00-365-75
	1″ Scale (3″ valves)	091-00-365-77
	1 1/4″ Scale (4 1/4″ valves)	091-00-365-79
60	1/2″ NPT Nipple, Orifice Plug and Steel Union Assembly	090-16-361-01
90	Nameplate	090-00-086-05
91	Nameplate, round	090-16-086-00
92	Rd. Hd. Type U Drive Screw, #4 x 3/16″ lg.	903004
93	Rd. Hd. Machine Screw, 6-32 x 1/4″ lg.	914402

2″ and 3″ Model 441-57S



2″ Model 441-57S		
ILL. NO.	DESCRIPTION	PART NUMBER
26	Hex. Cap Screw, 1/4″-20 x 1/2″ lg., 120,000 tensile	910001
27	O-Ring, 2 1/16″ x 2 1/4″	904832
28	1 3/4″ Inlet Orifice, CRS	090-16-028-00
	1 3/4″ Inlet Orifice, stainless steel	090-16-028-50
	1 1/2″ Inlet Orifice, CRS	090-16-028-01
	1 1/2″ Inlet Orifice, stainless steel	090-16-028-51
28a	1″ Inlet Orifice, CRS	090-16-028-02
29	1 3/4″ Outlet Orifice, iron	090-16-029-00
	1 3/4″ Outlet Orifice, stainless steel	090-16-029-50
	1 1/2″ Oultet Orifice, CRS	090-16-029-01
	1 1/2″ Outlet Orifice, stainless steel	090-16-029-51
29a	1″ Outlet Orifice, CRS	090-16-029-02

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3″ Model 441-57S

ILL. NO.	DESCRIPTION	PART NUMBER
26	Hex. Cap Screw, 1/4″ - 20 x 1/2″ lg., 120,000 tensile	910001
27	O-Ring, 2 7/16″ x 2 5/8	904832
28	2 1/8″ Inlet Orifice, CRS	090-20-028-00
	2 1/8″ Inlet Orifice, stainless steel	090-20-028-50
	1 3/4″ Inlet Orifice, CRS	090-20-028-02
	1 3/4″ Inlet Orifice, stainless steel	090-20-028-52
	1 1/2″ Inlet Orifice, CRS	090-20-028-03
	1 1/2″ Inlet Orifice, stainless steel	090-20-028-53
28a	1″ Inlet Orifice, CRS	090-20-028-04
29	2 1/8″ Outlet Orifice, CRS	090-20-029-00
	2 1/8″ Outlet Orifice, stainless steel	090-20-029-50
	1 3/4″ Outlet Orifice, CRS	090-20-029-02
	1 3/4″ Outlet Orifice, stainless steel	090-20-029-52
	1 1/2″ Outlet Orifice, CRS	090-20-029-03
	1 1/2″ Outlet Orifice, stainless steel	090-20-029-53
29a	1″ Outlet Orifice, CRS	090-20-029-04

2″ and 3″ Model 441-57S

ILL. NO.	DESCRIPTION	PART NUMBER
22	Lower Diaphragm Plate	091-00-022-00
22a	O-Ring, 5/8″ x 3/4″	902922
23	O-Ring, 11/16″ x 7/8″	934013
24	Diaphragm Connecting Stem, S.S.	090-16-058-00
25	2″ 441 Body, screwed 125 lb. cast iron	090-16-001-00
	2″ 441 Body, flanged ANSI 125 lb. FF, cast iron	090-16-001-01
	2″ 441 Body, flanged ANSI 250 lb. RF, ductile iron	090-16-001-02
	2″ 441 Body, flanged ANSI 300 lb. RF, cast steel	090-16-001-03
	2″ 441 Body, flanged ANSI 600 lb. RF, cast steel	090-16-001-04
25	3″ 441 Body, flanged ANSI 125 lb. FF, cast iron	090-20-001-00
	3″ 441 Body, flanged ANSI 250 lb. RF, ductile iron	090-20-001-01
	3″ 441 Body, flanged ANSI 300 lb. RF, cast steel	090-20-001-04
	3″ 441 Body, flanged ANSI 600 lb. RF, cast steel	090-20-001-02
32	Guide Bushing with Pin, brass	090-16-385-01
	Guide Bushing with Pin, stainless steel	090-16-385-03
33	Bottom Plate, 8 bolt, for screwed & flanged bodies CRS	090-16-004-01
34	Hex. Cap Screw, 1/2″ - 13 x 1 1/4″	910106
35	Tetraseal (or O-Ring), 4 3/8″ x 4 5/8″	904085
36	Centerpiece, 125 lb. & 250 lb. bodies	090-16-275-60
	Centerpiece, 300 lb. & 600 lb. bodies	090-16-275-61
36a	Tetraseal (or O-Ring), 4″ x 4 1/4″	904084
37	Centerpiece Stem Bushing Assem.	090-16-373-00
37a	Seal Washer	090-26-178-00
38	Side Plate, ductile, for 2″ & 3″ ductile bodies	090-16-072-00
	Side Plate, steel, for 2″ & 3″ steel bodies	090-16-072-01
39	Tetraseal (or O-Ring), 3 1/4″ x 3 1/2″	904078
40	Lower Diaphragm Case	090-22-002-00
50	Valve Assembly, 1 3/4″, brass trim, Polyurethane (red, 65-75 Duro)	090-16-515-32
	Valve Assembly, 1 3/4″, stainless steel trim, Polyurethane (red, 65-75 Duro)	090-16-515-52
	Valve Assembly, 1 1/2″, brass trim, Polyurethane (red, 65-75 Duro)	090-16-515-33

3″ Model 441-57S

ILL. NO.	DESCRIPTION	PART NUMBER
50	Valve Assembly, 2 1/8″, brass trim, Polyurethane (red 65-75 Duro)	090-20-515-40
	Valve Assembly, 2 1/8″, stainless steel trim, Polyurethane (red 65-75 Duro)	090-20-515-60
50b	Valve Retainer, standard, CRS, 2 1/8″	090-20-018-00
	Valve Retainer, standard, stainless steel, 2 1/8″	090-20-018-30
	Valve Retainer, V-port wings, iron, 2 1/8″	090-20-012-50
	Valve Retainer,V-port wings, stainless steel, 2 1/8″	090-20-012-51

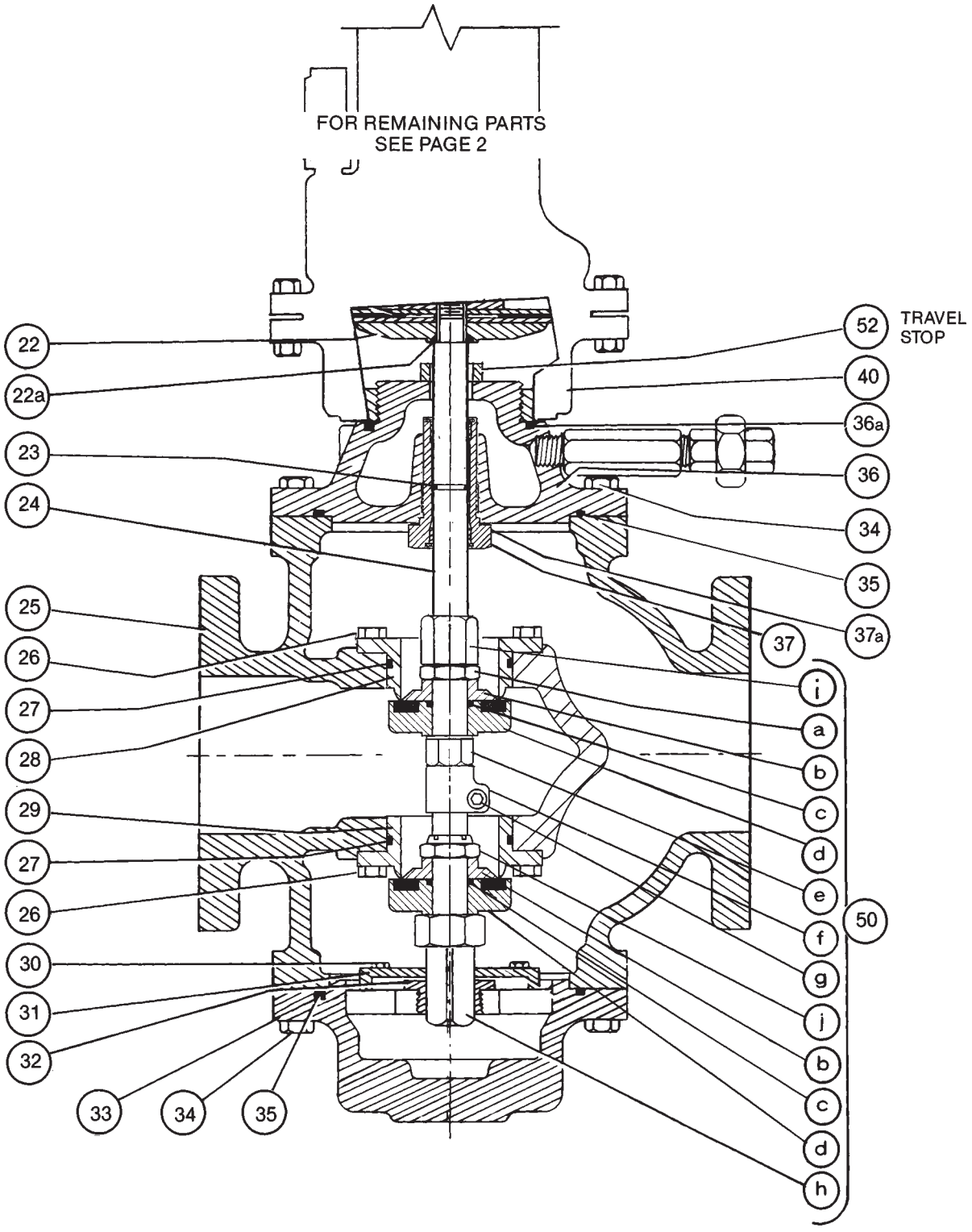
3″ Model 441-57S (cont.)

ILL. NO.	DESCRIPTION	PART NUMBER
50d	Molded Valve, 2 1/8″, Buna-N (black 50-55 Duro) all trim	090-20-315-00
	Molded Valve, 2 1/8″, Polyurethane (red, 65-75 Duro) all trim	090-20-315-02
	Molded Valve, 2 1/8″, Polyurethane (tan, 85-95 Duro) all trim	090-20-315-03

2″ and 3″ Model 441-57S

ILL. NO.	DESCRIPTION	PART NUMBER
50	Valve Assembly, 1 1/2″, stainless steel trim, Polyurethane (red, 65-75 Duro)	090-16-515-53
50a	Valve Lock Nut, 5/8″ - 18	905564
50b	Valve Retainer, standard, steel, 1 3/4″	090-16-018-00
	Valve Retainer, standard, stainless steel, 1 3/4″	090-16-018-30
	Valve Retainer, V-port wings, steel, 1 3/4″ valve	090-16-012-50
	Valve Retainer, V-port wings, stainless steel, 1 3/4″ valve	090-16-012-53
	Valve Retainer, standard, steel, 1 1/2″	090-16-018-01
	Valve Retainer, standard, stainless steel, 1 1/2″	090-16-018-31
	Valve Retainer, V-port wings, steel, 1 1/2″	090-16-012-52
	Valve Retainer, V-port wings, stainless steel, 1 1/2″	090-16-012-55
50c	O-Ring, 5/8″ x 13/16″	934012
50d	Molded Valve, 1 3/4″, Buna-N (black, 50-55 Duro) all trim	090-16-315-00
	Molded Valve, 1 1/2″, Buna-N (black, 50-55 Duro) all trim	090-16-315-01
	Molded Valve, 1 3/4″, Polyurethane (red, 65-75 Duro) all trim	090-16-315-02
	Molded Valve, 1 1/2″, Polyurethane (red, 65-75 Duro) all trim	090-16-315-03
	Molded Valve, 1 3/4″, Polyurethane (tan, 85-95 Duro) all trim	090-16-315-05
	Molded Valve, 1 1/2″, Polyurethane (tan, 85-95 Duro) all trim	090-16-315-04
50e	Female Valve, Stem, brass	090-16-116-00
	Female Valve, Stem, stainless steel	090-16-116-01
50g	Adjustment Clamp Screw, Soc. Hd. Screw, 10-24 x 1/2″ lg.	903486
	Adjustment Clamp Screw, for 1 1/2″ valve only	090-16-046-01
50h	Male Valve Stem, brass	090-16-016-01
	Male Valve Stem, stainless steel	090-16-016-02
51	Valve Assembly, 1″, brass trim, Polyurethane soft seats	090-16-515-42
	Valve Assembly, 1″, stainless steel trim, Polyurethane soft seats	090-16-515-62
51a	Stem Extension, stainless steel, 1″ valve	090-16-125-01
51b	Valve Retainer, brass, 1″ valve	090-16-018-03
	Valve Retainer, stainless steel, 1″ valve	090-16-018-01
51d	Molded Valve, 1″, Buna-N (black 50-55 Duro) all trim	091-16-315-01
	Molded Valve, 1″, Polyurethane (red, 65-75 Duro), all trim	091-16-315-11
	Molded Valve, 1″, Polyurethane (tan, 85-95 Duro) all trim	091-16-315-15
	Molded Valve, 1″, Viton (stamped V, 65-75 Duro) all trim	091-16-315-13
51e	Male Valve Stem, stainless, 1″ valve	090-16-016-21
51f	Valve Stem Locking Ring, stainless steel, 1″ valve	091-16-043-01
51g	Set Screw, Hex. Soc. Cup Pt., #12-24 x 1/4″ lg.	907694
51h	Female Valve Stem, stainless steel, 1″ valve	090-16-116-21
51i	Valve Guide, stainless steel, 1″ valve	090-16-012-31

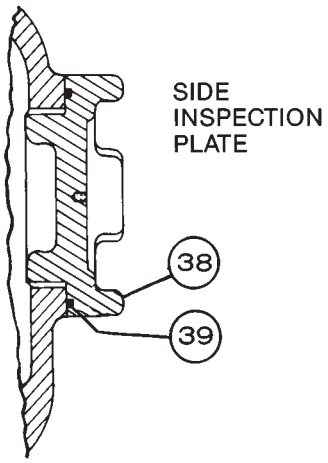
4″ Model 441-57S



SENSUS

4″ Model 441-57S

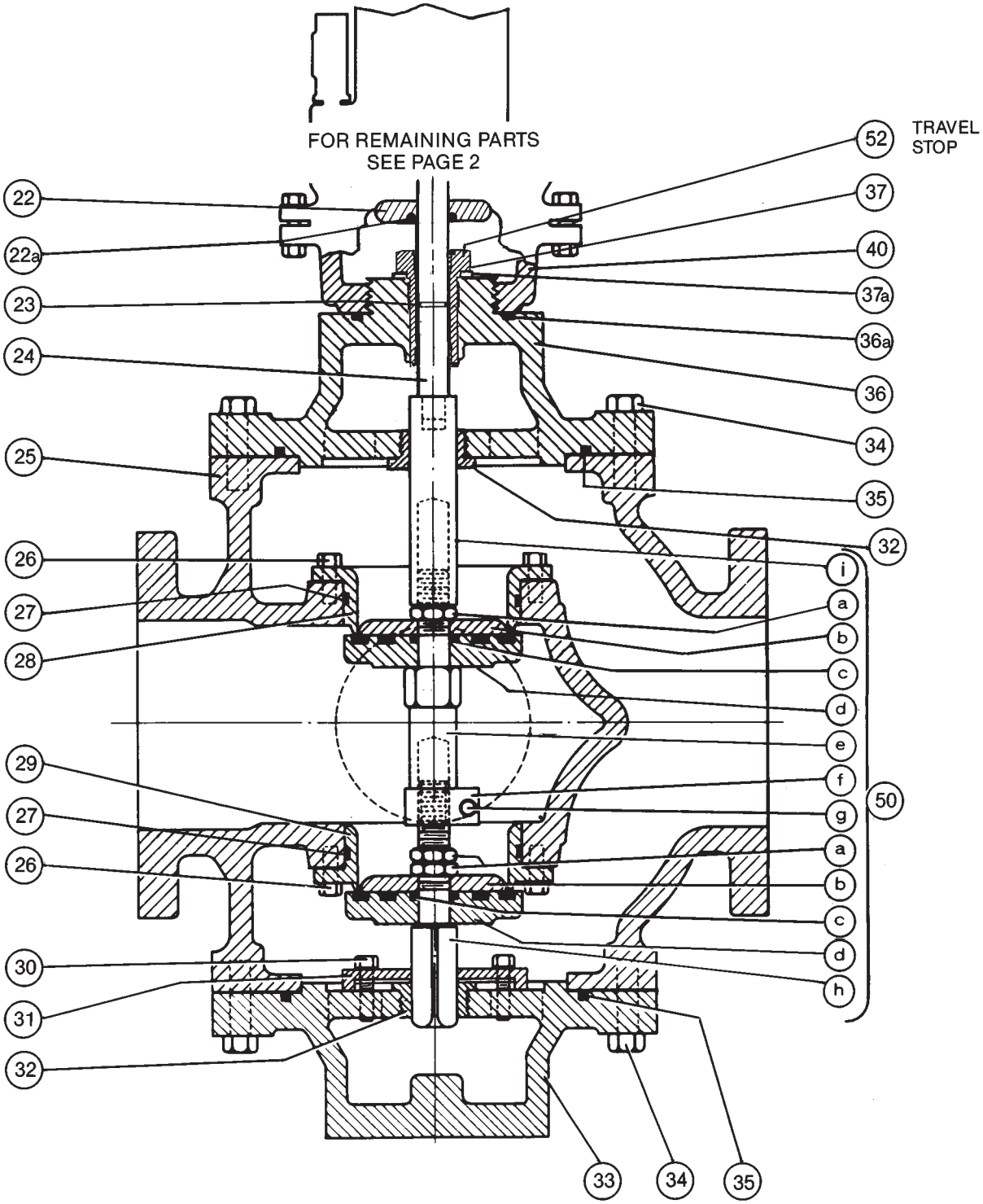
ILL. NO.	DESCRIPTION	PART NUMBER
22	Lower Diaphragm Plate	091-00-022-01
22a	O-Ring, 5/8″ x 3/4″	902922
23	O-Ring, 11/16″ x 7/8″	934013
24	Diaphragm Connecting Stem, S.S.	090-16-058-00
25	4″ 441 Body, flanged ANSI 125 lb. FF, cast iron	090-22-001-00
	4″ 441 Body, flanged ANSI 250 lb. RF, ductile iron	090-22-001-01
	4″ 441 Body, flanged ANSI 300 lb. RF, cast steel	090-22-001-04
	4″ 441 Body, flanged ANSI 600 lb. RF, cast steel	090-22-001-02
26	Hex. Cap Screw, 3/8″ - 16 x 3/4″ lg., 120,000 tensile	910053
27	O-Ring, 3 1/2″ x 3 11/16″	905583
28	3″ Inlet Orifice, CRS	090-22-028-00
	3″ Inlet Orifice, stainless steel	090-22-028-50
	2 1/8″ Inlet Orifice, CRS	090-22-028-02
	2 1/8″ Inlet Orifice, stainless steel	090-22-028-52
	1 3/4″ Inlet Orifice, CRS	090-22-028-01
	1 3/4″ Inlet Orifice, stainless steel	090-22-028-51
29	3″ Outlet Orifice, CRS	090-22-029-00
	3″ Outlet Orifice, stainless steel	090-22-029-50
	2 1/8″ Outlet Orifice, CRS	090-22-029-02
	2 1/8″ Outlet Orifice, stainless steel	090-22-029-52
	1 3/4″ Outlet Orifice, CRS	090-22-029-01
	1 3/4″ Outlet Orifice, stainless steel	090-22-029-51
30	Hex. Cap Screw, 3/8″ - 16 x 1″ lg.	910055
31	Spin Stop Plate	090-22-040-01
32	Guide Bushing, brass	090-22-074-00
	Guide Bushing, stainless steel	090-22-074-01
33	Bottom Plate, iron, 8 bolt	090-22-004-30
	Bottom Plate, ductile iron, 8 bolt	090-22-004-51
	Bottom Plate, steel, 8 bolt	090-22-004-71
34	Hex. Cap Screw, 5/8″ - 11 x 1 1/2″	910157
	Hex. Cap Screw, 5/8″ - 11 x 1 3/4″ for ductile bottom plate	910158
35	Tetraseal (or O-Ring), 6 1/4″ x 6 1/2″	904080
36	Centerpiece, 8 bolt	090-22-275-00
	Centerpiece, steel, 8 bolt	090-22-275-03
36a	Tetraseal (or O-Ring), 4″ x 4 1/2″	904084
37	Centerpiece stem bushing, assemb.	090-16-373-00
37a	Seal Washer	090-26-178-00
38	Side Plate, Ductile, for 4″ ductile body & iron body	090-22-072-00
	Side Plate, Steel, for 4″ steel bodies	090-22-072-01



4″ Model 441-57S

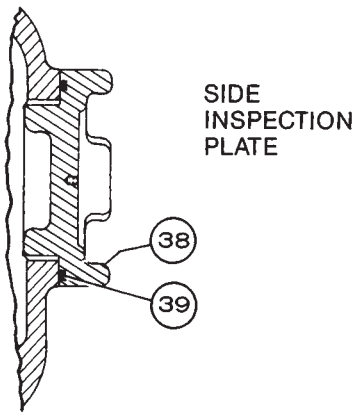
ILL. NO.	DESCRIPTION	PART NUMBER
39	Tetraseal (or O-Ring), 4 1/4″ x 4 1/2″	904083
40	Lower Diaphragm Case	090-22-002-00
50	Valve Assembly, 3″, brass trim Polyurethane (red, 65-75 Duro)	090-22-515-40
	Valve Assembly, 3″, stainless steel trim, Polyurethane (red, 65-75 Duro)	090-22-515-60
	Valve Assembly, 2 1/8″, brass trim, Polyurethane (red, 65-75 Duro)	090-22-515-41
	Valve Assembly, 2 1/8″, stainless steel trim, Polyurethane (red, 65-75 Duro)	090-22-515-61
	Valve Assembly, 1 3/4″, brass trim, Polyurethane (red, 65-75 Duro)	090-22-515-42
	Valve Assembly, 1 3/4″, stainless steel trim, Polyurethane (red, 65-75 Duro)	090-22-515-62
50a	Valve Lock Nut, 3/4″ - 16	090-22-034-00
50b	Valve Retainer, standard, CRS, 3″	090-22-018-03
	Valve Retainer, standard, stainless steel, 3″	090-22-018-00
	Valve Retainer, V-port wings, iron, 3″	090-11-012-20
	Valve Retainer, V-port wings, stainless steel, 3″	090-22-012-40
	Valve Retainer, standard, CRS, 2 1/8″	090-22-018-01
	Valve Retainer, standard, stainless steel, 2 1/8″	090-22-018-31
	Valve Retainer, V-port wings, iron, 2 1/8″	090-22-012-50
	Valve Retainer,V-port wings, stainless steel, 2 1/8″	090-22-012-51
	Valve Retainer, standard, stainless steel, 1 3/4″	090-22-018-34
50c	O-Ring, 13/16″ x 1″	904173
50d	Molded Valve, 3″, Buna-N (black 50-55 Duro) all trim	090-22-315-00
	Molded Valve, 2 1/8″, Buna-N (black, 50-55 Duro) all trim	090-22-315-01
	Molded Valve, 1 3/4″, Buna-N (black, 50-55 Duro) all trim	090-22-315-04
	Molded Valve, 3″, Polyurethane (red, 65-75 Duro) all trim	090-22-315-02
	Molded Valve, 2 1/8″, Polyurethane (red, 65-75 Duro) all trim	090-22-315-03
	Molded Valve, 1 3/4″, Polyurethane (red, 65-75 Duro) all trim	090-22-315-05
	Molded Valve, 3″, Polyurethane, (tan, 85-95 Duro) all trim	090-22-315-08
	Molded Valve, 2 1/8″, Polyurethane, (tan, 85-95 Duro) all trim	090-22-315-07
	Molded Valve, 1 3/4″, Polyurethane, (tan, 85-95 Duro) all trim	090-22-315-06
50e	Female Valve Stem, brass	090-22-016-40
	Female Valve Stem, stainless steel	090-22-016-41
50f	Adjustment Clamp Ring, stainless steel	090-22-043-02
50g	Adjustment Clamp Screw, soc. hd. screw, 1/4″ - 20 x 3/4″ lg.	903494
50h	Male Valve Stem, stainless steel	090-22-116-01
50i	Stem Extension, stainless	090-22-058-40
50j	Valve Locknut (lower)	903958
52	Travel Stop, for 3″ valves	090-22-040-51
	Travel Stop, for 2 1/8″ and 1 3/4″ valves	090-22-040-55

6″ Model 441-57S



SENSUS

6″ Model 441-57S		
ILL. NO.	DESCRIPTION	PART NUMBER
22	Lower Diaphragm Plate	091-00-022-02
22a	O-Ring, 5/8″ x 3/4″	902922
23	O-Ring, 11/16″ x 7/8″	934013
24	Diaphragm Connecting Stem, S.S.	090-22-058-00
25	6″ 441 Body, flanged ANSI 125 lb. FF, cast iron	090-24-001-00
	6″ 441 Body, flanged ANSI 250 lb. RF, ductile iron	090-24-001-01
	6″ 441 Body, flanged ANSI 300 lb. RF, cast steel	090-24-001-03
	6″ 441 Body, flanged ANSI 600 lb. RF, cast steel	090-24-001-02
26	Hex. Cap Screw, 3/8″ - 16 x 1″ lg., 120,000 tensile	910055
27	O-Ring 4 3/4″ x 4 15/16″	906301
28	4 1/4″ Inlet Orifice, CRS	090-24-028-00
	4 1/4″ Inlet Orifice, stainless steel	090-24-028-02
	3″ Inlet Orifice, CRS	090-24-028-10
	3″ Inlet Orifice, stainless steel	090-24-028-12
	2 1/8″ Inlet Orifice, CRS	090-24-028-22
	2 1/8″ Inlet Orifice, stainless steel	090-24-028-24
29	4 1/4″ Outlet Orifice, CRS	090-24-029-00
	4 1/4″ Outlet Orifice, stainless steel	090-24-029-02
	3″ Outlet Orifice, CRS	090-24-029-10
	3″ Outlet Orifice, stainless steel	090-24-029-12
	2 1/8″ Outlet Orifice, CRS	090-24-029-22
	2 1/8″ Outlet Orifice, stainless steel	090-24-029-24
30	Hex. Cap Screw, 3/8″ - 16 x 1″ lg.	910055
31	Spin Stop Plate	090-24-040-01
32	Guide Bushing, stainless steel	090-24-074-01
33	Bottom Plate, iron, 8 bolt	090-24-004-01
	Bottom Plate, ductile iron, 16 bolt	090-24-004-53
	Bottom Plate, steel, 16 bolt	090-24-004-73
34	Hex. Cap Screw, 5/8″ - 11 x 2	910159
35	Tetraseal (or O-Ring) 7 3/4″ x 8″	904088
36	Centerpiece, iron, 8 bolt	090-24-275-00
	Centerpiece, ductile iron, 16 bolt	090-24-275-50
	Centerpiece, steel, 16 bolt	090-24-275-70
36a	Tetraseal (or O-Ring), 4″ x 4 1/4″	904084
37	Centerpiece Stem Bushing, Assembly	090-16-373-02
37a	Seal Washer	090-26-178-00
38	Side Plate, Ductile, for 6″ ductile body	090-24-072-00
	Side Plate, Steel, for 6″ steel bodies	090-24-072-01
39	Tetraseal (or O-Ring), 6″ x 6 1/4″	904089
40	Lower Diaphragm Case	090-22-022-00
50	Valve Assembly, 4 1/4″, brass trim, Polyurethane (red, 65-75 Duro)	090-24-515-40
	Valve Assembly, 4 1/4″, stainless steel trim, Polyurethane (red, 65-75 Duro)	090-24-515-60
	Valve Assembly, 3″ brass trim, Polyurethane (red, 65-75 Duro)	090-24-515-41
	Valve Assembly, 3″, stainless steel trim, Polyurethane (red, 65-75 Duro)	090-24-515-61
	Valve Assembly, 2 1/8″, brass trim, Polyurethane (red, 65-75 Duro)	090-24-515-42



6″ Model 441-57S		
ILL. NO.	DESCRIPTION	PART NUMBER
50a	Valve Lock Nut	015-31-034-70
	Valve Lock Nut, 5/8″ - 18, for 2 1/8″ reduced valve only	905564
50b	Valve Retainer, standard, CRS, 4 1/4″	090-24-018-00
	Valve Retainer, standard, stainless steel, 4 1/4″	090-24-018-02
	Valve Retainer, V-port wings, CRS, 4 1/4″	090-24-012-20
	Valve Retainer, V-port wings, stainless steel, 4 1/4″	090-24-012-40
	Valve Retainer, standard, CRS, 3″	090-24-018-21
	Valve Retainer, standard, stainless steel, 3″	090-24-018-22
	Valve Retainer, standard, CRS, 2 1/8″	090-20-018-00
	Valve Retainer, standard, stainless steel, 2 1/8″	090-20-018-30
	Valve Retainer, V-port wings, CRS, 2 1/8″	090-20-012-50
	Valve Retainer, V-port wings, stainless steel, 2 1/8″	090-20-012-51
50c	O-Ring, 1 3/16″ x 1 3/8″	904174
	O-Ring, 5/8″ x 13/16″ for 2 1/8″ reduced valve only	934012
50d	Molded Valve, 4 1/4″, Buna-N, (black, 50-55 Duro) all trim	090-24-315-00
	Molded Valve, 3″, Buna-N, (black, 50-55 Duro) all trim	090-24-315-01
	Molded Valve, 2 1/8″, Buna-N, (black, 50-55 Duro) all trim	090-20-315-00
	Molded Valve, 4 1/4″, Polyurethane, (red, 65-75 Duro) all trim	090-24-315-02
	Molded Valve, 3″ , Polyurethane, (red, 65-75 Duro) all trim	090-24-315-03
	Molded Valve, 2 1/8″, Polyurethane, (red, 65-75 Duro) all trim	090-20-315-02
	Molded Valve, 4 1/4″, Polyurethane, (tan, 85-95 Duro) all trim	090-24-315-05
	Molded Valve, 3″, Polyurethane, (tan, 85-95 Duro) all trim	090-24-315-04
	Molded Valve, 2 1/8″, Polyurethane, (tan, 85-95 Duro) all trim	090-20-315-03
50e	Female Valve Stem, stainless steel	090-24-016-01
	Female Valve Stem, stainless steel for 2 1/8″ reduced valve only	090-24-016-11
50f	Adjustment Clamp Ring, stainless steel	090-24-043-02
	Adjustment Clamp Ring, stainless steel, for 2 1/8″ reduced valve only	090-16-043-03
50g	Adjustment Clamp Screw, soc. hd. screw, 5/16″ - 18 x 1″ lg.	903498
	Adjustment Clamp Screw, for 2 1/8″ reduced valve only	903494
50h	Male Valve Stem, stainless steel	090-24-116-01
	Male Valve Stem, stainless steel, for 2 1/8″ reduced valve only	090-24-116-11
50i	Stem Extension, stainless	090-24-062-04
	Valve Stem Hex. Extension, for 2 1/8″ reduced valve only, stainless	090-16-062-11
52	Travel Stop, for 4 1/4″ valves	090-22-040-50
	Travel Stop, for 3″ valves	090-22-040-52
	Travel Stop, for 2 1/8″ valves	090-22-040-56

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Authorized Distributor

R-1360
REV. 5

Model 441-X57
High Pressure Regulators with Roll-out Diaphragm

SENSUS

441-X57
High Pressure Regulators

Features

Simple Design --assures you dependable regulation, trouble free operation, fast response, no pilot freezing, no pilot maintenance.

Standard Face to Face Dimensions

Standardized "441" Bodies & Inner Valve Assemblies--easy maintenance--parts are interchangeable with other 441 models.

Simplified Valve Adjustment--easy to adjust for tight lock-up --accurate.

Molded Polyurethane Soft Seats--positive tight shut-off--high erosion resistance--will not blow out.

O-Ring Stem Seal--with removable anti-friction bushing.

Bushing Guided Inner Valve--accurate stem alignment and valve seating

Side Inspection Plates--both sides of body--quickly removable.

O-Ring Body Seals--eliminates gaskets on upper and lower body openings and side inspection plates.

Self-Aligning Spring Adjustment--color coded springs.

Flanged Removable Seats (Orifices)--easily changed--no special tools needed.

Spring Ranges

Outlet Pressure Min. Max.	Color of Spring	Nominal Diaphragm Size (I.D.)
75 to 100 psi 100 to 175 psi 150 to 250 psi	Red Brown Black	2 1/2" Diaphragm All Ranges

Maximum Inlet Pressure-All Types

Regulator Body Type	441 Body Materials	Maximum Working Pressure of Body	Maximum Inlet Pressure
Flanged ANSI 250 lb. RF	DUCTILE IRON (ASTM A395-71 gr 60-40-18)	575 psi	575 psi*
Flanged ANSI 300 lb. RF	CAST STEEL (ASTM A216-70a gr WCB)	720 psi	
Flanged ANSI 600 lb. RF	CAST STEEL (ASTM A216-70a gr WCB)	1200 psi	

*Maximum Inlet Pressure for 2" and 3" 441-X57 with 1 1/2" reduced valve is 1000 psi (Flanged ANSI 600 lb. only) (See pages 5 and 6)
*Maximum Inlet Pressure for 3" 441-X57 with 2 1/8" valve is 400 psi (All Body Types) (See pages 5 and 6)

Maximum Pressure Differential and Maximum Inlet Pressure for Various Soft-Seated Valve Materials*

Valve Material	Maximum Pressure Differential	Maximum Inlet Pressure
Buna-N (black, 50 to 55 duro)	250 psi	575 psig
Polyurethane (red, 65 to 75 duro)	400 psi	720 psig
Polyurethane (tan, 85 to 95 duro)	600 psi	1200 psig

*The differential and inlet pressures given are only to be used as general guidelines. In all cases, pressures must always remain within the ranges specified in Equimeter literature. For any given regulator, do not exceed the specified maximum pressures.

The maximum temperature for the above materials is 150° F

Viton valve material has a maximum temperature rating of 300° F and a maximum pressure differential of 250 psi.

Pipe Sizes

441-X57 High Pressure Regulators	
2"	3"

Temperature Limits

The 441-X57 High Pressure Regulators may be used for flowing gas temperatures from -20° F to 150° F.

Buried Service

The 441-X57 High Pressure Regulator is *not* recommended for buried service.

Periodic Inspection: Regulators are pressure control devices with numerous moving parts subject to wear that is dependent upon particular operating conditions. To assure continuous satisfactory operation, a periodic inspection schedule must be adhered to with the frequency of inspection determined by the severity of service and applicable laws and regulations. **See bulletin RM-1361 for field service instructions.**

The “Roll-Out” Diaphragm

The **441-X57** is unique in a high pressure regulator. It features the same **“Roll-Out” diaphragm** principle that has achieved such remarkable success in the widely used 441-57S and 461-57S Regulators.

The **441-X57** offers pilot performance with spring regulator simplicity. The **“Roll-Out” diaphragm** makes this outstanding performance possible by eliminating that old gremlin-- “Droop.”

“Droop” means rough regulation, wide fluctuation in pressure control as flow varies. It is the result of spring effect plus diaphragm effect.

The “Roll-Out” diaphragm changes this. By eliminating diaphragm effect and neutralizing spring effect, “droop” is reduced to insignificance. The result--smooth, constant pressure regulation. It comes amazingly close to the control performance of the pilot operated regulator.

Figure 1 shows how the “Roll-Out diaphragm works. **Figure 2** shows how close performance comes to that of a pilot operated regulator. And the cutaway picture on page 4 shows how simple it is.

Speed of response is fast. Installation, adjustment and servicing are surprisingly easy. The hazard of shutoff from pilot freeze-up is eliminated. And, to top it off, the ingenious ball-check diaphragm sentry (**Figure 3**, this page) adds yet another feature to a list that makes the **441-X57** truly a remarkable high pressure regulator.

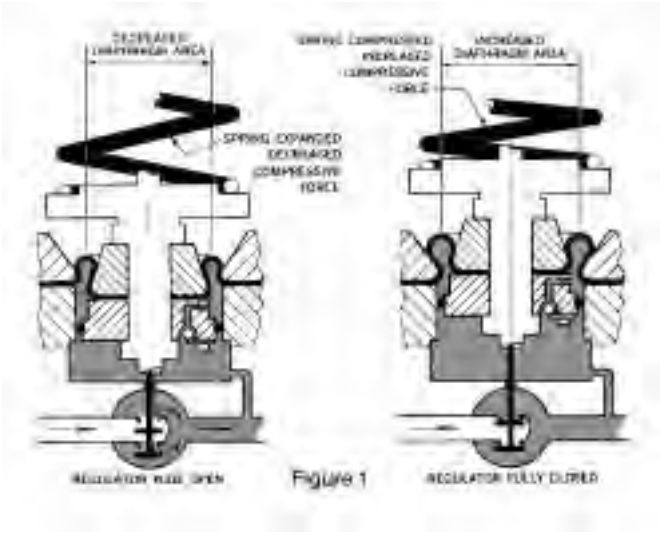


Figure 1

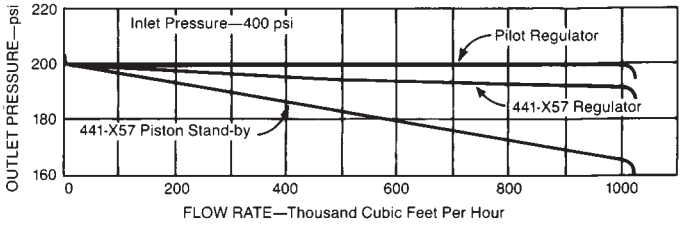


Figure 2

Ball-Check Diaphragm Sentry

The **ball-check diaphragm sentry** is a safety device for keeping the regulator in operation in case of diaphragm failure.

Referring to **Figure 3**, this is how it works:

1. O-ring piston **A** holds the Roll-Out diaphragm in correct alignment during normal operation.
2. Ball-check **B** is normally open to put outlet pressure against the Roll-Out diaphragm.
3. If a break should occur in the diaphragm, outlet pressure gas instantly begins to escape through the break and out the vent to atmosphere. This escaping gas flow immediately closes **B**. With **B** closed, outlet pressure is trapped beneath O-ring piston **A**, which then becomes a substitute for the diaphragm. With **A** as a substitute for the diaphragm, the regulator continues to operate.
4. The closing of **B** also prevents the diaphragm break from allowing gas to escape through the vent.
5. Regulation with the O-ring piston will show increased deviation from set point. This deviation is the warning that a failure has occurred.

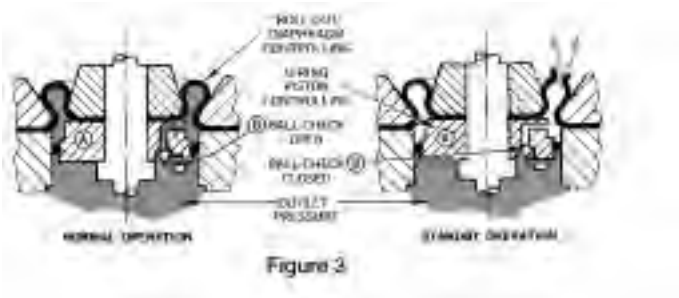


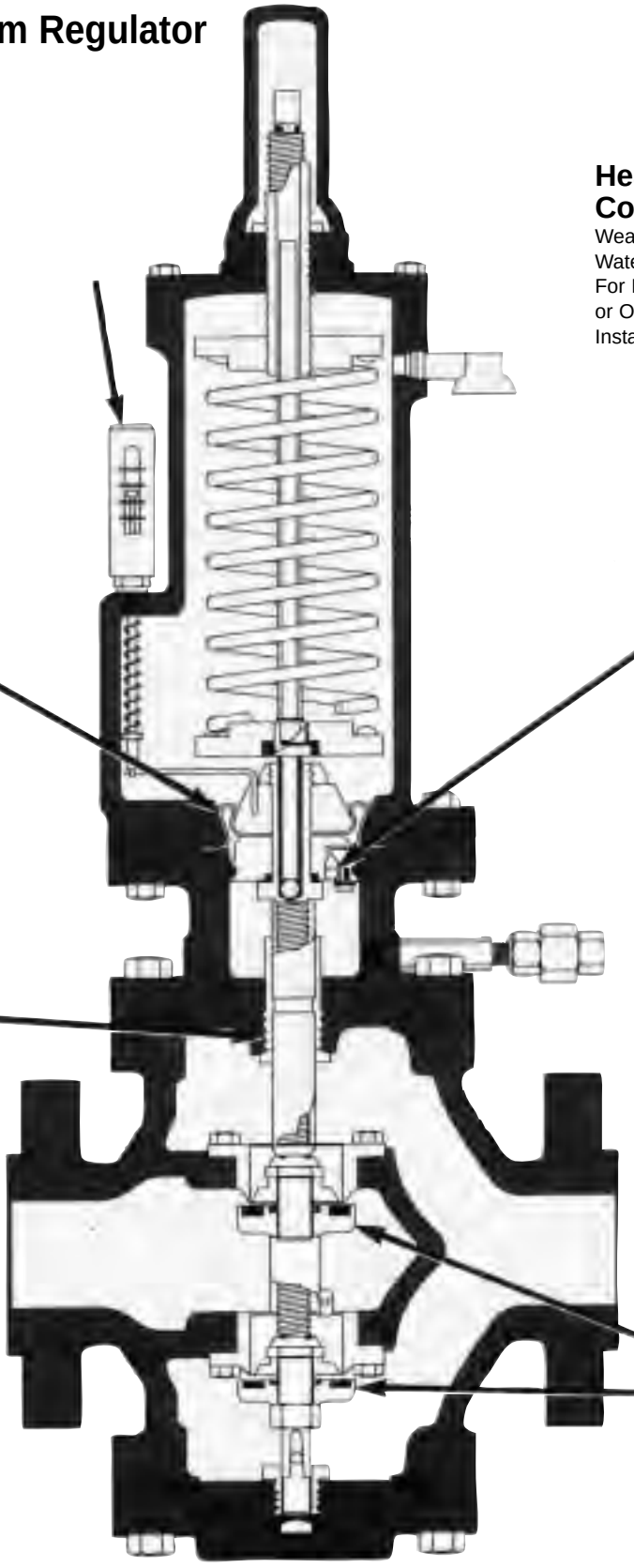
Figure 3

Construction and Design Features

441-X57
"Roll-Out" Diaphragm Regulator

Large Capacity
for
- High Pressure Regulator Sets
- Gas Distribution Systems
- Town Border Stations
- Transmission Systems
- Monitoring
- High Pressure Industrial Applications

Heavy-Duty Construction
Weather-proof
Watertight
For Indoor
or Outdoor
Installations



X57 "Roll-Out" Diaphragm
(Patented)
See Page 3

Ball-Check Diaphragm Sentry
(Patented)
See Page 3

Inspection Plates
On both sides of the body
Quickly removable
provide easy inspection and servicing of the inner valve.

Anti-Friction Bushing

Outlet Pressure Range
75 to 250 psi
Note: For outlets of 3 to 100 psi, see Model 441-57S. (Bulletin R 1360)

Inlet Pressures and Capacities
See Pages 5 & 6

Balanced Valve
Double Seat
Soft Seats
also available--
Reduced Size Valves
V-Port Valves
Hard Seats

441-X57 Capacity Tables

Capacity 441-X57 in 1000 SCFH of Natural Gas (0.6 Specific Gravity--14.65 psia--60° F)

INLET PRESSURE psi	OUTLET PRESSURE psi	2" 441-X57		3" 441-X57		
		1 3/4" Valve	1 1/2" Reduced Valve	2 1/8" Valve	1 3/4" Reduced Valve	1 1/2" Reduced Valve
80	75	115	90.3	187	140	90.3
85	75	163	127	265	198	127
	80	118	92.8	193	144	92.8
90	75	200	156	325	243	156
	80	167	131	273	203	131
	85	121	95.3	198	147	95.3
100	75	258	202	420	313	202
	80	237	185	386	288	185
	85	210	165	343	256	165
	90	176	138	287	214	138
110	75	305	239	497	371	239
	80	290	227	473	353	227
	90	249	195	406	303	195
	100	184	144	300	224	144
120	75	346	271	563	421	271
	80	335	262	546	407	262
	90	305	239	497	371	239
	100	260	204	425	317	204
	110	192	150	313	234	150
140	75	415	325	677	506	325
	80	410	321	669	500	321
	90	394	308	642	480	308
	100	369	289	601	448	289
	120	282	221	460	344	221
160	80 & Less	474	371	772	576	371
	90	466	365	760	567	365
	100	451	354	736	549	354
	120	400	313	651	486	313
	140	303	237	493	368	237
180	90 & Less	528	414	862	643	414
	100	521	408	850	634	408
	120	489	383	798	595	383
	140	428	335	698	521	335
	160	322	252	524	391	252
200	100 & Less	583	457	950	710	457
	120	565	443	921	688	443
	140	524	411	855	638	411
	160	455	356	742	554	356
	180	340	266	554	413	266
225	110 & Less	653	511	1064	794	511
	120	648	507	1055	788	507
	140	624	489	1018	760	489
	160	580	454	946	706	454
	180	510	400	831	620	400
	200	399	312	650	485	312
250	125 & Less	721	565	1175	877	565
	140	710	556	1158	864	556
	160	683	535	1113	831	535
	180	636	498	1036	773	498
	200	564	442	920	686	442
	225	421	330	687	513	330

NOTE: The above performance data is based on normal testing at 70° F flowing temperature. Changes in performance can occur at extreme low flowing temperatures.

441-X57 Capacity Tables

INLET PRESSURE psi	OUTLET PRESSURE psi	2" 441-X57		3" 441-X57		
		1 3/4" Valve	1 1/2" Reduced Valve	2 1/8" Valve	1 3/4" Reduced Valve	1 1/2" Reduced Valve
275	140 & Less	787	616	1283	957	616
	160	772	605	1258	940	605
	180	741	580	1207	901	580
	200	691	541	1126	841	541
	225	596	467	972	725	467
	250	443	347	722	539	347
300	150 & Less	857	671	1397	1043	671
	175	839	657	1367	1020	657
	200	798	625	1300	971	625
	225	730	572	1190	888	572
	250	626	491	1021	762	491
325	165 & Less	923	723	1505	1124	723
	180	915	717	1491	1113	717
	200	892	699	1454	1085	699
	225	843	660	1374	1026	660
	250	767	601	1251	934	601
350	180 & Less	991	776	1615	1205	776
	200	977	766	1593	1189	766
	225	943	739	1536	1147	739
	250	886	694	1444	1078	694
375	190 & Less	1061	831	1730	1291	831
	225	1033	809	1683	1256	809
	250	991	776	1615	1205	776
400	200 & Less	1130	885	1841	1374	885
	225	1116	874	1818	1357	874
	250	1085	850	1769	1320	850
425	215 & Less	1198	938	--	1457	938
	250	1172	918	--	1426	918
450	230 & Less	1266	992	--	1540	992
	250	1253	982	--	1525	982
475	250 & Less	1330	1041	--	1617	1041
500	250 & Less	1402	1098	--	1706	1098
575	250 & Less	1606	1258	--	1954	1258
800	250 & Less	--	1738	--	--	1738
1000	250 & Less	--	**2165**	--	--	2165
"K" Factors Standard Valves		5450	4270	8880	6630	4270
"K" Factors V-Port Valves		5260	4160	8440	6390	4160
For V-Port Valves Multiply Table Values By		.965	.974	.950	.964	.974

1. Last capacity figure **(bold type)** for each column is capacity at **maximum inlet pressure**.
2. Size each regulator on the basis of the **minimum expected inlet pressure** and the **maximum required outlet pressure**.
3. For **best performance** of the Model 441-X57, use full table capacity values.
4. For **smaller capacities** see Model 461-X57 (Bulletin R 1332).

NOTE: The above performance data is based on normal testing at 70° F flowing temperature. Changes in performance can occur at extreme low flowing temperatures.

Where inlet pressure control is required, as with a back pressure valve or relief valve, use the Model 441-X57R.

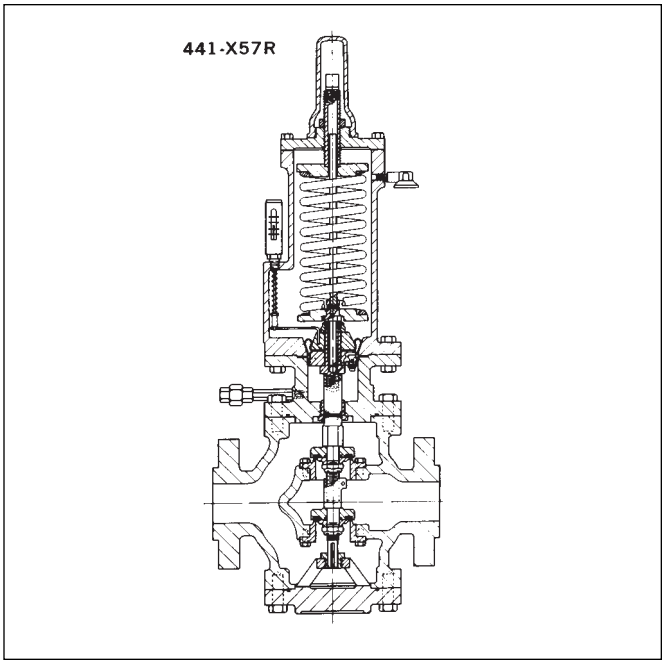
The 441-X57R is the same as the 441-X57 except that the inner valve is reversed, the body is turned around, and the control line is arranged for connection to the inlet side (upstream).

The adjustment range is 75 to 250 psi.

Use the table on pages 5 and 6 for capacities.

Pipe sizes and bodies are those given on page 2.

For additional information on the Model 441-X57R, please contact your Equimeter Sales Office.



Maximum Emergency Pressures

The following are the maximum pressures which the regulator body may be subjected to under abnormal conditions without causing internal damage:

Ductile Iron Body . . . . . Maximum Inlet Pressure + 60 psi
Cast Steel Body . . . . . .Maximum Inlet Pressure + 100 psi

If body pressure exceeds the above values the regulator must be removed from service and inspected. Damaged or otherwise unsatisfactory parts must be repaired or replaced before returning the regulator to service.

The maximum pressure which the diaphragm may be subjected to under abnormal conditions without causing internal damage is set-point plus 50 psi. If the pressure on the diaphragm exceeds set-point by more than 50 psi, the regulator must be removed from service and inspected. Damaged or otherwise unsatisfactory parts must be repaired or replaced before returning the regulator to service. The set-point is the outlet pressure the regulator is adjusted to deliver.

The maximum pressure that can be safely contained by the diaphragm case is 350 psi. Safely contained means no leakage and no bursting.

Before using any of the above data, make sure this entire section is clearly understood.

Overpressurization Protection

Protect the downstream piping system and the regulator's low pressure chambers against overpressurization due to possible regulator malfunction or failure to achieve complete lockup. The allowable outlet pressure is the lowest of the maximum pressures permitted by federal codes, state codes, Equimeter Bulletin RDS-1498, or other applicable standards. The method of protection can be a relief valve, monitor regulator, shutoff device, or similar mechanism.

Caution: It is the user's responsibility to assure that all regulator vents and/or vent lines exhaust to a non-hazardous location away from **any potential** sources of ignition. **Refer to Equimeter Bulletin RM-1361 for more detailed information.**

Monitoring

The Model 441-X57 is also excellent for use as a monitor: a stand-by regulator mounted in series which assumes control if a failure in the operating regulator permits the outlet pressure to rise above its set point.

The 411-X57 has a fast rate of response and, therefore, will take control quickly in case of emergency. It requires no changes or modifications when used for monitoring. Its simple design and rugged construction make it an exceptionally dependable regulator, and its control accuracy and freedom from "droop" mean that it will provide excellent regulation if an emergency calls it into operation.

Two monitor set arrangements are shown in the sketches below. The first shows a set in which the operating regulator and the monitor are both Model 441-X57. This makes an unusually neat and compact installation.

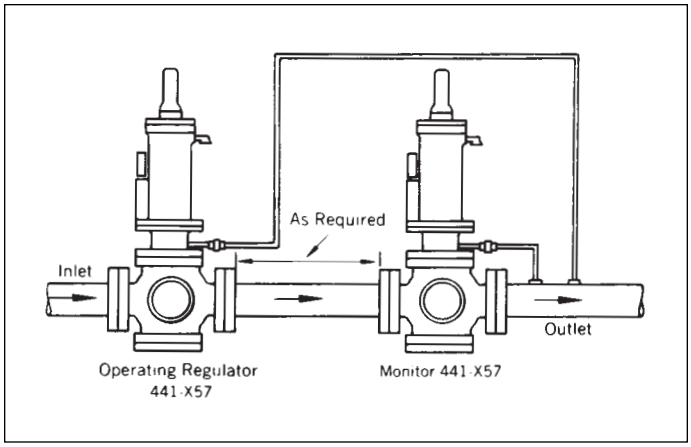
The 441-X57 is also used for monitoring other types of regulators. This is shown in the second sketch. It is excellent for monitoring pilot operated regulators.

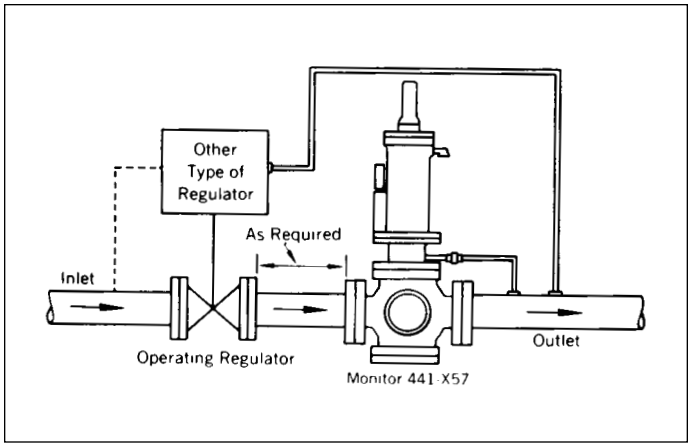
Both sketches show the monitor in the downstream position. When installed this way, the 441-X57 is usually set for an outlet pressure 4 to 6 psi higher than the operating regulator and thus is wide open during normal operation.

The monitor can also be located upstream, and with this arrangement the 441-X57 is usually set for an outlet somewhat higher than the above.

Shutoff and bypass valving varies with individual practices and requirements. In general, however, the sketch "Typical Installations" (on page 10) can be used as a guide for the arrangement of these valves.

When identical 441-X57 Regulators are used for both the operating regulator and the monitor, **the total maximum capacity** through both may be figured as 70 percent of the capacity of one of them alone. This applies with the monitor located either downstream or upstream.





Other Large Capacity Regulators in the "441" Family

Model 441-S low pressure regulators (Bulletin R 1350).
Model 441-57S "Roll-Out" diaphragm regulators for outlets of 3 to 100 psi. (Bulletin R 1360)
Model 441-VPC pilot operated regulators for low, medium, and high pressures (Bulletin R 1370)

Metrication

Use the following for metric conversions:

Std. Meters^3/Hr. x 35.31 = Std. Ft.^{3}/Hr. (SCFH) Std. Ft.^{3}/Hr. (SCFH) x 0.0283 = Std. Meters^3/Hr.
Kilograms/centimeter^2 (Kg/cm^2) x 14.22 = psi psi x 0.0703 = Kilograms/centimeter^2 (Kg/cm^2)
Kilo Pascals (KPa) x 0.145 = psi psi x 6.90 = Kilo Pascals (KPa)
Bars x 14.50 = psi psi x .0689 = Bars

Caution: Turn gas on slowly. If an outlet stop valve is used, it should be opened first. Do not overload the diaphragm with a sudden surge of inlet pressure. Monitor the outlet pressure during start-up to prevent an outlet pressure overload. **Refer to RM-1361 for more detailed start-up procedures.**

Materials of Construction

Upper Diaphragm Case . . . . . .Iron (ASTM A126-71 Class B)
Lower Diaphragm Case . . . . . Iron (ASTM A126-71 Class B) with ductile iron bodies
. . . . . .Steel (Astm A 216-70a gr WCB) with steel bodies
Housing Cover (Upper Case Cover) . . . . . .Ductile Iron (ASTM A395-71 GR 60-40-18)
Upper Diaphragm Plate & O-Ring Piston. . . . . Stainless Steel
Diaphragm . . . . . Buna-N with Dacron Reinforcement
Diaphragm Connecting Stem & Anti-Friction Bushing . . . . . .Stainless Steel
Removable Seats (Orifices) . . . . . .Cast Iron or Stainless Steel
Valve Stems . . . . . .Brass or Stainless Steel
Soft Seat Valve Material . . . . . .Polyurethane, pressure molded in holder
Holder for Molded Valve . . . . . .Steel
Valve Retainer . . . . . .Cast Iron or Stainless Steel
Side Inspection Plates . . . . . .see table on page 4
Bodies . . . . . .see table on page 4

Full Open Capacity

Use the following formulae for the full open capacity of the 441-X57 regulators.

1. $Q = K\sqrt{P_o (P_1 - P_o)}$ . . . . . .(for $\frac{P_1}{P_o}$ less than 1.894)
2. $Q = \frac{KP_1}{2}$ . . . . . .(for $\frac{P_1}{P_o}$ greater than 1.894)

Q = maximum capacity of the regulator (in SCFH of 0.6 specific gravity natural gas).
K = the **"K" factor**, the regulator constant (from the table).
P1 = **absolute** inlet pressure (psia).
Po = **absolute** outlet pressure (psia).

Other Gases

441-X57 Regulators are mainly used on natural gas. However they perform equally well on LP gas, nitrogen, dry CO_2, air and others.

OTHER GASES	CORRECTION FACTOR
Air (Specific Gravity 1.0)	0.77
Propane (Specific Gravity 1.53)	0.63
1350 BTU Propane-Air Mix (1.20)	0.71
Nitrogen (Specific Gravity 0.97)	0.79
Dry Carbon Dioxide (Specific Gravity 1.52)	0.63
For other noncorrosive gases: CORRECTION FACTOR =	$\sqrt{\frac{0.6}{\text{Specific Gravity of the Gas}}}$

For use with gases not listed above, please contact your Equimeter representative or Industrial Distributor for recommendations.

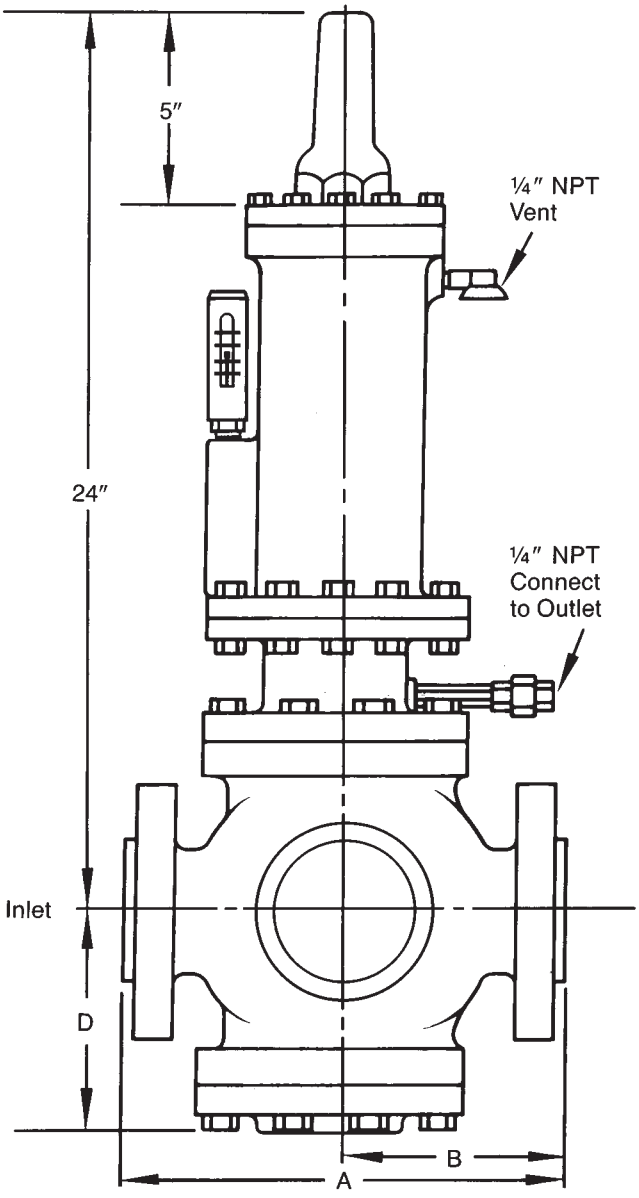
How to Order

Specify:

1. Pipe size and Model 441-X57
2. Piping Connections and body material (see table on page 2)
3. Outlet pressure and/or spring (see table on page 2, "Spring Ranges").
4. Inlet pressure (maximum and minimum, if available)
5. Capacity required (scfh)
6. Type of gas (natural gas, propane, etc.)
7. Trim (standard or stainless steel)
8. If a reduced valve is required, specify size.

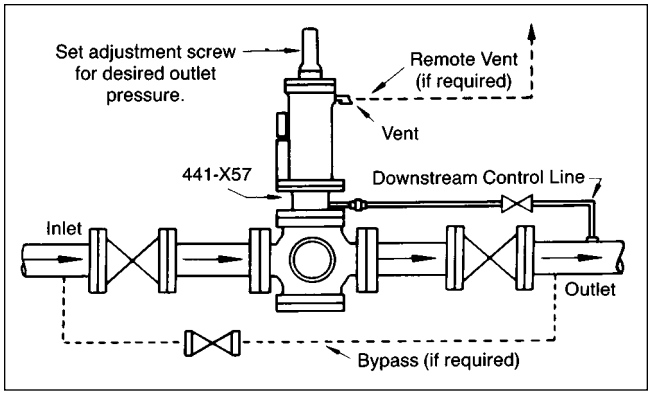
Installation and Maintenance . . . .see RM 1361

Dimensions



Regular Body Type		Pipe Size	
		Flanged ANSI	
		2”	3”
250 lb. Ductile Iron or 300 Lb. Steel	A	10	12 1/2
	B	5 9/19	6 1/2
600 lb. Steel	A	11 1/4	13 1/4
	B	5 15/16	6 7/8
	D	6	6
Shipping Weight, Lbs.		140	180

Typical Installation



Other Equimeter Gas Pressure Regulators

Equimeter produces a broad product line of Gas Pressure Regulators which are widely used throughout the natural gas industry. These regulators are also suitable for non-corrosive industrial gas applications such as propane, butane, air, nitrogen, dry CO_2, etc. For additional detailed information on a particular model, please request the indicated bulletin from the local Equimeter sales office.

Multi-Purpose Service Regulators

Model 143-80
Bulletin: R-1301
3/4″, 1″, 1 1/4″ pipe size
Inlet pressures.....to 125 psi
Outlet pressures.....3 1/2″ w.c. to 6 psi
Capacity to 2000 CFH
Available with straight-through body.
Also available: internal relief valve and low pressure cut-off.

Model 143-6
Bulletin: R-1303
3/4″, 1″, 1 1/4″ pipe size
Inlet pressures.....to 125 psi
Outlet pressures.....3 1/2″ w.c. to 6 psi
Capacity to 2000 CFH
Available with 90° angle or straight-through body.
Also available: internal relief valve and low pressure cut-off.

Industrial Service Regulators

Models 243-8, 243-12, 243-8HP
Bulletin: R-1306
1 1/4″, 1 1/2″, and 2″ pipe size
Inlet pressures.....to 125 psi
Outlet pressures.....3 1/2″ w.c. to 10 psi
Capacity to 25,000 CFH
Also available: internal relief valve, low pressure cut-off, external control line, back pressure regulator, relief valve, vacuum regulator and vacuum breaker.

Industrial Field Regulators

For intermediate to high pressure applications. Ideal on pipeline taps servicing plants and buildings. Appropriate for double stage reduction ahead of service regulators, and for high pressure burners and compressed air systems.

046
Bulletin: R-1312
3/4″, 1″ and 1 1/4″ pipe size
Inlet pressures.....to 1000 psi
Outlet pressures.....3 to 200 psi
Capacity to 40,000 SCFH
Pressure loaded version and internal relief valve also available.

141A
Bulletin: R-1311
2″ pipe size
Inlet pressures.....to 1500 psi
Outlet pressures.....5 to 400 psi
Capacity to 55,000 SCFH

Pilot Loaded Regulators

For intermediate and high-pressure applications requiring precise pressure reduction with minimal droop. Ideal for standard and high capacity flows on burners, driers, dehydrators and compressor line. Appropriate for fixed factor billing.

243-RPC
Bulletin: R-1343
1 1/4″, 1 1/2″ and 2″ pipe size
Inlet pressures.....to 150 psi
Outlet pressures.....3 1/2″ w.c. to 35 psi
Capacity to 76,000 SCFH

1100
Bulletin: R-1341
Pipe size: 2″
(screwed or flanged)
Inlet pressures .....to 400 psi
Outlet pressures.....3″ w.c. to 100 psi
Capacity to 414,000 SCFH

1200
Bulletin: R-1342
Pipe Size: 2″ (flanged)
Inlet pressures .....to 1200 psi
Outlet pressures .....20 to 600 psi
Capacity to 789,000 SCFH

805 Liberty Boulevard
P.O. Box 528
DuBois, PA 15801
814-375-8875
Fax 814-375-8460

Authorized Distributor

Model 441-X57 Regulator

Regulator Installation and Maintenance Instructions

Introduction

Maximum Inlet Pressures

Regulator Body Type	441 Body Materials	Max. Working Pressure Of Body	Max. Inlet Pressure
Flanged ANSI 250 lb. RF	Ductile Iron (ASTM A395-71 gr 60-40-18)	575 psi	575 psi*
Flanged ANSI 300 lb. RF	Cast Steel (ASTM A216-70a gr WCB)	720 psi	
Flanged ANSI 600 lb. RF	Cast Steel (ASTM A216-70a gr WCB)	1200 psi	

* Maximum Inlet Pressure for 2" and 3" 441-X57 with 1½" reduced valve is 1000 psi.
Maximum Inlet Pressure for 3" 441-X57 with 2⅛" valve is 400 psi.

Installation and Start-Up

Note: Do not install sideways.
The diaphragm should be horizontal.

1. Make sure the inlet and outlet connections are correct. High pressure connects to the regulator inlet. The flow arrow on the body must point downstream.
2. Tighten flanged joints evenly.

CAUTION

It is the user's responsibility to ensure that all regulator vents and/or vent lines exhaust to a non-hazardous location away from ANY POTENTIAL sources of ignition. Where vent lines are used, it is the user's responsibility to ensure that each regulator is individually vented and that common vent lines ARE NOT used.

3. Before beginning start-up, make sure the regulator is correctly connected, adequately supported and pipe joints are tight.
4. Note the set-point (set-point is the outlet pressure the regulator is adjusted to deliver). The regulator is factory adjusted to the set-point specified on the order.

CAUTION

During start-up a pressure gauge must be used on the piping at the regulator outlet and closely watched. While inlet pressure enters the regulator, outlet pressure must not exceed set-point by more than the small amount needed for lock-up (tight shutoff). If outlet pressure continues to increase above this, close the inlet shutoff valve. The regulator is not closing properly. Make necessary corrections before resuming start-up. Regulator must be fully capable of tight lockup.

5. Only adjust set-point when gas is flowing through the regulator. Flow should be small (10% of maximum regulator capacity or less). Do not adjust if regulator is locked-up (tight shutoff).

CAUTION

Turn gas on very slowly. If an outlet stop valve is used, it should be opened first. Do not overload the diaphragm with a sudden surge of inlet pressure. Monitor the outlet pressure during start-up to prevent an outlet pressure overload.

6. After completing start-up, make sure there are no leaks.
7. From the ¼" union **60** extend pipe or tubing to the control connection into the outlet piping. The control piping should not be less than ¼" in size and should be adequately protected against breakage (regulators go wide open if the control line is broken).

   The regulator will work to deliver the pressure for which it is adjusted at that point in the outlet piping where the control connection is located.

   In general, the control connection should be at least eight pipe diameters from the regulator and should be in as straight a run of pipe as possible where turbulence is a minimum.

   The control connection should be clean and smooth, free of rough edges, welding "icicles", etc. It should be located on the top or side of the pipe, and the line pitched to drain away from the regulator into the outlet pipe.

   Where outlet piping increases in size near the regulator, it is generally preferable to locate the control connection in the larger size.

   Union **60** contains a small orifice, approximately 1/16" diameter. This orifice should not be removed. Also, make certain the orifice is open and free of foreign material.

CAUTION

The diaphragm case vent must be positioned to protect against flooding, drain water, ice formation, traffic, tampering, etc. The vent must be protected against nest building animals, bees, insects etc., to prevent vent blockage and minimize the chances of foreign material collecting in the vent side of the regulator diaphragm.

8. Make certain there are no leaks and all connections are tight.
9. Put the regulator into operation as follows:
   a. Slowly open the downstream control line valve **A**.
   b. Slowly open the downstream block valve **B**.
   c. Very slowly open the upstream block valve **C**.

   Set the adjusting screw **10** for the required outlet pressure. Turn it clockwise to increase the pressure and counterclockwise to decrease it. Only make this adjustment when gas is actually flowing through the regulator.

   After adjustment is complete, the lock nut **11** should be tightened firmly and the seal cap **1** replaced.
10. To shut down, carefully close valves **C**, **B** and **A** in that order.

Servicing and Adjustment

1. Before any disassembly of the regulator, make sure it is completely depressured. Pressure must be fully released from the inlet, the outlet and the control line connection. Failure to adequately depressure could result in serious personal injury.
2. Carefully note the location and position of all disassembled parts to be certain reassembly is correct. Inspect each part carefully and replace any that are worn or damaged or otherwise unsatisfactory.
3. Adjustment screw lubrication should be checked whenever the regulator is serviced. Make sure the threads are fully

coated with lubricant.

Where there is evidence of thread wear, such as a loose fit or excessive sideplay, the worn parts must be replaced.

NOTE: Even at only 10 PSIG outlet pressure, the force exerted on the adjustment screw by spring compression can be great. As a result, failure from worn threads could result in serious personal injury. Therefore, adjustment screw lubrication and thread condition must be given careful attention.

4. Upon completion of servicing, make certain that the regulator installation is entirely free of leaks.
5. A quick visual inspection of the valve can be made by removing inspection plates **38** from the sides of the body. They also provide greatly improved access to the valve when servicing or adjusting.
6. The diaphragm **20**, the springs **14**, and all other parts from the lower diaphragm plate **22** – and those parts above – are interchangeable with the 461-X57.
7. Valve and body parts are interchangeable with other 441 Regulators (441-S, 441-87S, 441-VPC, etc.)
8. Use lubricants sparingly and with care to avoid exposing tacky surfaces to the gas stream. Such surfaces could cause accumulation of dirt on close clearance parts.

Use moly or silicone-type lubricants. Avoid the use of petroleum base type.

It is best to avoid lubricating stem **24** or guide **50h**. However, a small amount of lubricant on stem O-ring **23** and O-ring **21** will help ensure free movement and a tight seal. An application of lubricant to the other O-rings and the tetraseals in the regulator will help ensure their tightness.

To Remove Valves

1. Remove seal cap **1**, back off adjusting screw **10**, remove housing cover **5**, and spring **14**.
2. Remove bottom plate **33**, and side plates **38**.
3. Insert an Allen wrench through side inspection opening and loosen Allen screw **50g**.
4. Unscrew lower valve assembly and remove through bottom opening (**50h** unscrews from **50e**).
5. Unscrew upper valve assembly and remove through side opening (**50e** unscrews from **50e**).

   NOTE:
   a. If upper valve assembly is too large to remove through side opening, remove it through bottom opening by also removing outlet orifice **29**, (remove cap screws **26** to remove orifice and, if tight, jack out using cap screws in jacking holes).
   b. Entire valve assembly may be removed intact through bottom opening by also removing orifice **29**. This method leaves the lock-up adjustment undisturbed.
   c. Use care with orifice O-ring **27**.
6. To disassemble upper and/or lower valve assembly, remove nuts **50a**.

To Replace and Adjust Valves

1. Assemble upper valve assembly (parts **50a**, **50b**, **50c**, **50d**, **50e**, **50g**), and lower valve assembly (parts **50a**, **50b**, **50c**, **50d**, **50h**). Firmly tighten nuts 5**0a**.
2. Insert upper valve assembly and screw into place (**50e** screws into **24**, **but should be loosened by one-half to one turn**).
3. If orifice **29** was removed, reinstall it.
4. Insert lower valve assembly and screw into place by a few turns (**50h** screws into **50e**).
5. Turn upper valve assembly so Allen screw **50g** is accessible through side inspection opening.
6. Make the valve lock-up adjustment as follows:
   a. Hold upper valve against its seat. This can be done by hand, reaching through side inspection opening
   b. While holding upper valve against its seat, screw lower valve assembly upwards until the lower valve also touches its seat. When both upper and lower valves are touching their seats they are correctly adjusted for tight lock-up.
   c. Firmly tighten Allen screw **50g**. This locks the adjustment by evenly and tightly locking **50h** and **50e** together.

   NOTE: If the entire valve assembly was removed intact and Allen screw **50g** has not been loosened, the assembly may be reinstalled without making the lock-up adjustment.
7. Screw entire valve assembly up (**50e** screws into **24**) until it bottoms. Then **back off one-half to one full turn – this is important**.
8. Replace the side plates **38**.
9. Replace bottom plate **33**. Match bottom end of **50h** into **32** and then turn bottom plate either way to the first matching bolt hole position. Pin in **32** must be intact.

To Remove Orifices

1. Remove outlet orifice **29** per applicable steps 1 through 5 under section “To Remove Valves,” on this page.
2. Remove inlet orifice **28** as follows:
   a. Remove seal cap **1**, back off adjusting screw **10**, remove housing cover **5** and spring **14**.
   b. Remover bottom plate **33** and then unscrew valve assembly by grasping **50h** and turning (**50e** unscrews from **24**).
   c. Remove diaphragm case assembly by first opening union **60** and removing cap screws **34**.
   d. Remove cap screws **26** and remove inlet orifice **28**. If orifice is tight, jack out cap screws in jacking holes. Use care with O-ring **27**.
   e. When replacing diaphragm assembly, the threaded connection between **24** and **50e** should be screwed together until it bottoms, and then **backed off one-half to one turn – this is important**.

CAUTION

Regulators are pressure control devices with numerous moving parts subject to wear that is dependent upon particular operating conditions. To ensure continuous satisfactory operation, adhere to a periodic schedule with the frequency of inspection determined by the severity of service and applicable laws and regulations.

To Change Spring

1. Remove seal cap **1**, back off adjusting screw **10**, remove housing cover **5**, and remove spring **14**.
2. Insert the new spring. Be sure it nests correctly onto part **15** and travel indicator bracket **45k** is in place. Make a visual inspection of diaphragm **20** before inserting the spring to be sure the roll-out is uniform and in place (use a flashlight, if necessary).
3. Complete as per steps 7, 8 and 9 under “To Assemble 441-X57,” on next page.

To Service Diaphragm

1. Remove seal cap **1**, back off adjusting screw **10**, remove housing cover **5**, and remove spring **14**.
2. Remove bolts 42, then carefully remove upper diaphragm case 8.
3. Turn diaphragm assembly counterclockwise until **24** unscrews from **50e**, then remove assembly and inspect diaphragm.
4. If a new diaphragm **20** is required, remove nut **16** and disassemble.
5. When reassembling, be sure fabric side of diaphragm **20** will be toward the vent side of the regulator and the rubber side of the diaphragm is toward the pressure side. The gasket is always placed on the spring side of the diaphragm.
6. Screw diaphragm assembly back into place (**24** screws into **50e** until it bottoms) then **back off one-half to one full turn – this is important**.
7. Fold roll into roll-out diaphragm and then carefully reinstall upper diaphragm case **8**. Diaphragm must not be pinched between upper and lower cases, **8** and **40**. Also, roll-out loop must be uniformly full and even. It should be in place as shown on the cross-section drawing. Tighten bolts **42** evenly.
8. Replace spring, etc., per steps 6 through 9 under "To Assemble 441-X57."

To Assemble 441-X57

1. Install orifice **28** through opening.
2. Install valve assembly and orifice **29** per applicable steps 1 through 6 under "To Replace and Adjust Valves" (except that **50e** does not yet screw into **24**).
3. Install lower diaphragm case **40**.
4. Install diaphragm assembly and upper case **8** per steps 5 through 7 under "To Service Diaphragm."
5. Replace bottom plate **33**. Match bottom end of **50h** into **32**, and then rotate bottom plate either way to the first matching bolt hole position. Pin in **32** must be intact.
6. Insert the spring. Be sure it nests correctly onto part **15** and travel indicator bracket **45k** is in place. Make a visual inspection of diaphragm **20** before inserting the spring to be sure the roll-out is uniform and in place (use a flashlight, if necessary).
7. Insert top spring button **12**. Be sure it is nested correctly on the spring.
8. Install housing cover **5**. Be sure the lower end of adjusting screw **10** fits into the recess in button **12**.
9. Set adjusting screw **10** for desired outlet pressure (only adjust when gas is flowing through the regulator), firmly tighten nut **11** and replace seal cap **1**.

Spring Ranges

Outlet Pressure Min. to Max.	Spring Color	Nominal Diaphragm Size (I.D.)
75 to 100 psi 100 to 175 psi 150 to 250 psi	Red Brown Black	2½" Diaphragm All Ranges

Over-pressurization Protection

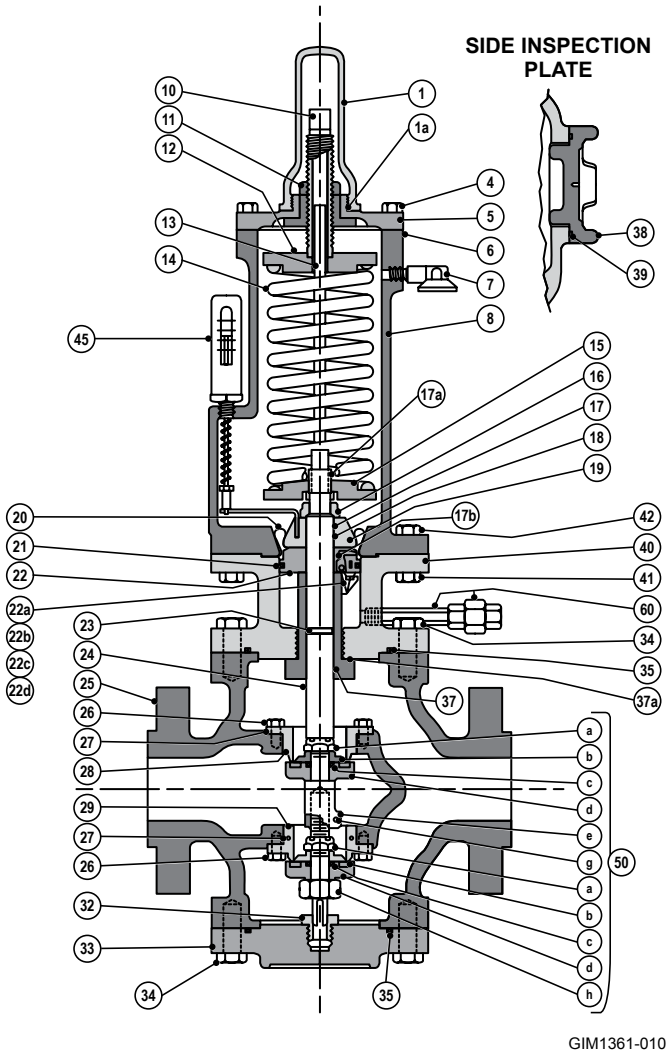
Protection must be provided for the downstream piping system and the regulator's low pressure chambers to ensure against the potential over-pressurization due to a regulator malfunction or a failure of the regulator to lock-up. The allowable over-pressurization is the lowest of the maximum pressures permitted by federal codes, state codes, Sensus Bulletin RDS_1498, or other applicable standards. The method of providing over-pressurization protection could be a relief valve, a monitor regulator, shut off device or any similar device.

Temperature Limits

The 2" and 3" Model 441-X57 Regulator can be used for flowing temperatures from -20°F to 150°F.

Buried Service

The 2" and 3" Model 441-X57 Regulator ***is not*** recommended for buried service.



GIM1361-010

2" AND 3" MODEL 441-X57

Condensed Parts List

2” and 3” Model 441-X57

Illustration Number	Description	Part Number
1	Seal Cap	090-00-005-02
1a	Tetraseal (or O-Ring) 1¾" x 2"	904902
4	Hex Cap Screw 5/16" – 18 x 1" 120,000 tensile, 8 used	910030
5	Top Cap Assembly	091-16-380-01
6	Housing Cover Gasket	091-00-066-30
7	Vent Cap, ¼" NPT	137-02-505-02
10	Spring Adjusting Screw	091-00-007-50
11	Hex Steel Jam Nut, ⅜" – 14	903873
12	Top Spring Button	091-00-009-50
13	Spring Thrust Rod (Upper)	091-00-062-50
14	Spring, Red 75 to 100 psi Spring, Brown 100 to 175 psi Spring, Black 150 to 250 psi	091-00-021-02 091-00-021-01 091-00-021-00
15	Lower Spring Button	091-00-009-51
16	Elastic Stop Nut ¾" – 16	903596
17	Diaphragm Stub (Lower)	091-00-158-50
17a	Type 2 Groove Pin ⅛" x 3/16" Lg.	904118
17b	Thrust Bearing Stainless Steel ⅜" Dia.	930510
18	Diaphragm Stub	090-00-058-50
19	Diaphragm Plate – Upper	091-00-010-50
20	Diaphragm – 2½" Roll-Out	091-00-350-50
21	O-Ring, 2⅛" x 2½"	934033
22	Diaphragm Plate – Lower	091-00-022-50
22a	Stainless Steel Ball ¼" Dia.	930506
22b	Soc. Hd. Cap Screw #10 – 24 x ⅜" Lg.	939900
22c	#10 Steel Lockwasher	904012
22d	Ball Valve Retaining Ring Washer	090-16-178-01
23	O-Ring, 11/16" x ⅞"	934013
24	Diaphragm Connecting Stem, Stainless Steel	090-00-058-51
26	Hex Cap Screw, ¼" – 20 x ½" Lg. 120,000 tensile	910001
32	Guide Bushing with Pin, brass Guide Bushing with Pin, Stainless Steel	090-16-385-01 090-16-385-03
34	Hex Cap Screw, ½" – 13 x 1¼"	910106
35	Tetraseal (or O-Ring), 4⅜" x 4⅝"	904085
37	Centerpiece Stem Bushing	090-16-373-01
37a	Aluminum Seal Ring	090-26-178-00
39	Tetraseal (or O-Ring), 3¼" x 3½"	904078
40	Lower Diaphragm Case, for 250 lb. ductile iron bodies Lower Diaphragm Case, for steel bodies	090-00-002-51 090-00-002-53

2" and 3" Model 441-X57 (Continued)

Illustration Number	Description	Part Number
41	Hex Steel Nut, ⅜" x 16"	920053
42	Hex Steel Bolt, ⅜" x 16" x 1¾" Lg. 120,000 tensile	910058
45	Travel Indicator Assembly	091-00-365-83
50	Valve Assembly, 1¾", brass trim, Polyurethane (red, 65-75 Duro) Valve Assembly, 1½", brass trim, Polyurethane (red, 65-75 Duro) Valve Assembly, 1¾", Stainless Steel trim, Polyurethane (red, 65-75 Duro) Valve Assembly, 1½", Stainless Steel trim, Polyurethane (red, 65-75 Duro)	090-16-515-32 090-16-515-33 090-16-515-52 090-16-515-53
50a	Valve Lock Nut, ⅝" – 18	905564
50b	Valve Retainer, standard, steel, 1¾" Valve Retainer, standard, steel, 1½" Valve Retainer, standard, Stainless Steel, 1¾" Valve Retainer, standard, Stainless Steel, 1½" Valve Retainer, v-port wings, steel, 1¾" Valve Retainer, v-port wings, steel, 1½" Valve Retainer, v-port wings, Stainless Steel, 1¾" Valve Retainer, v-port wings, Stainless Steel, 1½"	090-16-018-00 090-16-018-01 090-16-018-30 090-16-018-31 090-16-012-50 090-16-012-52 090-16-012-53 090-16-012-55
50c	O-Ring, ⅝" x 13/16"	934012
50d	Molded Valve, 1¾", Polyurethane (red, 65-75 Duro), all trim Molded Valve, 1½", Polyurethane (red, 65-75 Duro), all trim Molded Valve, 1¾", Polyurethane (tan, 85-95 Duro), all trim Molded Valve, 1½", Polyurethane (tan, 85-95 Duro), all trim	090-16-315-02 090-16-315-03 090-16-315-05 090-16-315-04
50e	Female Valve Stem, brass Female Valve Stem, stainless steel	090-16-116-00 090-16-116-01
50g	Adjustment Clamp Screw, Soc. Hd. Screw, 10 – 24 x ½" Lg. Adjustment Clamp Screw, for 1½" valve only	903486 090-16-046-01
50h	Male valve Stem, brass Male valve Stem, stainless steel	090-16-016-01 090-16-016-02
60	Nipple, Orifice Plug & Union Assembly	091-00-361-03

2" Model 441-X57

Illustration Number	Description	Part Number
27	O-Ring for Orifices	904832
28	1¾" Inlet Orifice, plated steel 1½" Inlet Orifice, plated steel 1¾" Inlet Orifice, stainless steel 1½" Inlet Orifice, stainless steel	090-16-028-00 090-16-028-01 090-16-028-50 090-16-028-51
29	1¾" Outlet Orifice, plated steel 1½" Outlet Orifice, plated steel 1¾" Outlet Orifice, stainless steel 1½" Outlet Orifice, stainless steel	090-16-029-00 090-16-029-01 090-16-029-50 090-16-029-51

3" Model 441-X57

Illustration Number	Description	Part Number
27	O-Ring for Orifices	950818
28	2⅛" Inlet Orifice, crs 1¾" Inlet Orifice, crs 1½" Inlet Orifice, crs 2⅛" Inlet Orifice, Stainless Steel 1¾" Inlet Orifice, Stainless Steel 1½" Inlet Orifice, Stainless Steel	090-20-028-00 090-20-028-02 090-20-028-03 090-20-028-50 090-20-028-52 090-20-028-53
29	2⅛" Outlet Orifice, crs 1¾" Outlet Orifice, crs 1½" Outlet Orifice, crs 2⅛" Outlet Orifice, Stainless Steel 1¾" Outlet Orifice, Stainless Steel 1½" Outlet Orifice, Stainless Steel	090-20-029-00 090-20-029-02 090-20-029-03 090-20-029-50 090-20-029-52 090-20-029-53
50	Valve Assembly, 2⅛", brass trim, Polyurethane (red 65-75 Duro) Valve Assembly, 2⅛", iron trim, Polyurethane (red 65-75 Duro)	090-20-515-40 090-20-515-10
50b	Valve Retainer, standard, crs, 2⅛" Valve Retainer, standard, Stainless Steel, 2⅛" Valve Retainer, v-port wings, crs, 2⅛" Valve Retainer, v-port wings, Stainless Steel, 2⅛"	090-20-018-00 090-20-018-30 090-20-012-50 090-20-012-51
50d	Molded Valve, 2⅛", Polyurethane (red, 65-75 Duro), all trim Molded Valve, 2⅛", Polyurethane (tan, 85-95 Duro), all trim	090-20-315-02 090-20-315-03

Maximum Emergency Pressure

NOTE: Before using any of the following data, make sure this entire section is clearly understood.

The following are the maximum pressures which the regulator body may be subjected to under abnormal conditions without causing internal damage:

Ductile Iron Body .....Maximum Inlet Pressure + 60 psi

Cast Steel Body.....Maximum Inlet Pressure + 100 psi

If body pressure exceeds the above values, the regulator must be removed from service and inspected. Damaged or otherwise unsatisfactory parts must be repaired or replaced before returning the regulator to service.

The maximum pressure which the diaphragm may be subjected to under abnormal conditions without causing internal damage is set-point + 50 psi. If the pressure on the diaphragm exceeds set-point by more than 50 psi, the regulator must be removed from service and inspected. Damaged or otherwise unsatisfactory parts must be repaired or replaced before returning the regulator to service. The set-point is the outlet pressure the regulator is adjusted to deliver.

The maximum pressure that can be safely contained by the diaphragm case is 350 psi. Safely contained means no leakage as well as no bursting.

Other Gases

The 2" and 3" Model 441-X57 Regulators are mainly used on natural gas service; however, this regulator will perform equally well with other gases. When using the 2" and 3" Model 441-X57 Regulators with other gases, the regulator capacities must be adjusted using the following correction factors.

Type of Gas	Correction Factor
Air (Specific Gravity 1.0)	0.77
Propane (Specific Gravity 1.53)	0.63
1350 BTU Propane-Air Mix (Specific Gravity 1.20)	0.71
Nitrogen (Specific Gravity 0.97)	0.79
Dry Carbon Dioxide (Specific Gravity 1.52)	0.63

For other non-corrosive gases use the following formula:

$$\text{CORRECTION FACTOR} = \sqrt{\frac{0.60}{\text{Specific gravity of the gas}}}$$

For use with gases not listed above, please contact your Sensus representative or Industrial Distributor for recommendations.

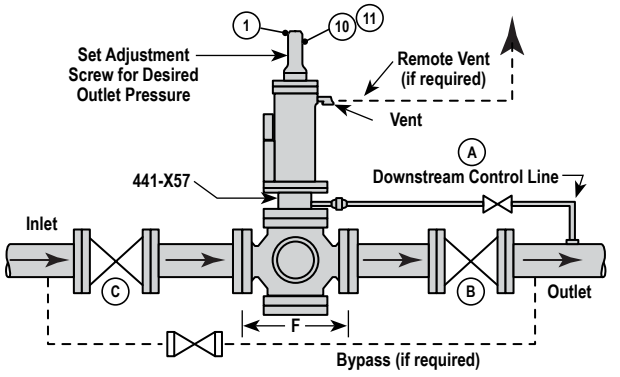
Monitoring

The 2" and 3" Model 441-X57 Regulators make excellent monitors. They can act as standby regulators installed in series which assumes control if a failure in the operating regulator permits the outlet pressure to exceed the set-point. It can be located in either the upstream or the downstream position.

When a 2" or 3" Model 441-X57 Regulator is used to monitor a regulator with an identical inner valve (another 441 Regulator), the **total maximum capacity** through both regulators can be figured at 70% of the capacity of one regulator alone. This applies with the monitor located upstream or downstream.

Typical Arrangement And Dimensions

(Indoor or Outdoor Installation)



GIM1361-005

441-X57

Regulator Body Type	F (Face To Face)	
	2" Pipe	3" Pipe
Flanged ANSI 250 lb.	10½"	12½"
Flanged ANSI 300 lb.	10½"	12½"
Flanged ANSI 600 lb.	11¼"	13¼"

Authorized Distributor:

805 Liberty Boulevard
DuBois, PA 15801
1-800-375-8875

For more information, visit us at www.sensus.com/gas