UTILITY SOLUTIONS GROUP

Model 121 Regulator

Installation and Maintenance Manual

Contents

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Introduction

The Model 121 Regulator represents a combination of capacity, performance, and value. Its streamlined body passages provide large capacity. An external control line is required from the lower case to the control piping. The 121 has rapid response speeds yet is stable in operation. Soft seats ensure positive, tight lock-up. Regulator orifices are replaceable. Springs are color-coded.

Installation

1. Examine the regulator for shipping damage.
2. Check nameplate data. Ensure the regulator conforms with what was ordered.
3. The inside of the regulator and piping must be clean and free of dirt. Remove all dirt and debris before installing the regulator. Failure to remove dirt/debris could result in regulator damage or trouble.
4. Remove all shipping screens and covers from the regulator. Do not let dirt get inside the regulator.
5. Install the regulator. Ensure the inlet and outlet are correctly connected. High-pressure connects to the inlet. The flow arrow must point downstream.

NOTE: Threaded connections must conform with good piping practice free of excess thread engagement per ANSI B2.1. Apply pipe joint compound to male threads only.

The model 121 Regulator is usually right-side up, as shown on the Typical Installation drawing (see Page 5). It may, however, be installed upside down. When inverted, it may be necessary to readjust the set-point.

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

6. Install the control line by connecting it to the outlet pipe. Ensure the outlet pipes have a diameter of at least 8 to 10 inches and are positioned downstream from the regulator.

CAUTION

Do not install any automatic shutoff device that closes completely between the regulator and the control line connection into the piping.

NOTE: To prevent excessive turbulence, ensure the connection is clean and smooth internally and located in a straight pipe that is free of valves and fittings. The control line must be kept clean and protected from corrosion. Pitch it away from the regulator and avoid moisture areas. It must be strong (¼" for 121-8 and 121-12, ½" for 121-16, or larger steel tubing or pipe is preferred). It must be well protected against breakage. Regulator will open wide if the control line breaks.

7. On indoor installations requiring venting outdoors, run the vent piping as short and direct as possible with minimum bends and elbows. Use the same size or larger pipe as the vent connections on the regulator.
8. The inlet and outlet shutoff valves should both be closed. The bypass valve should be closed when utilizing the bypass.

CAUTION

With natural gas or any other hazardous gas, vent to a safe place outdoors in case gas should accidentally be discharged. Screen and protect the opening outdoors to guard against water, ice, dirt, debris, or insects.

Start-Up

1. The inlet and outlet shutoff valves should both be closed. If a bypass is used, the bypass valve should also be closed.
2. Take note of the set-point (set-point is the outlet pressure the regulator is adjusted to deliver). Regulator is factory adjusted to the set-point specified on the order.

CAUTION

This caution applies where the piping downstream of the outlet shutoff valve is pressured. That pressure must not exceed the regulator set-point by more than the pressure noted (see "Maximum Emergency Pressures", Page 21).

3. Slowly and carefully open the inlet shutoff valve just enough to allow inlet pressure to build up slowly in the regulator until it is fully pressured.

CAUTION

During start-up a pressure gauge must be used on the regulator outlet pressure and carefully watched. While inlet pressure builds up, outlet pressure must not exceed set-point by more than 1 pounds per square inch (psi). If outlet pressure begins to exceed set-point by more than 1 psi, close the inlet shutoff valve. This indicates the regulator is not closing properly. Check and make necessary corrections before proceeding with start-up. If regulator outlet pressure exceeds set-point by more than the pressure noted, refer to "Maximum Emergency Pressures", Page 21 for instructions.

4. Check installation for leaks.
5. Slowly open the outlet, shutoff valve to allow a small flow (approximately 1000 standard cubic feet per hour (SCFH)). Ensure the flow of gas does not create a hazard.

NOTE: If piping downstream of outlet shutoff valve is pressurized (see "Caution" under step 2).

6. With gas flowing, check for correct inlet and outlet pressures. It may be necessary to further open the inlet shutoff valve to maintain full inlet pressure.
7. Ensure the regulator closes tight (lock-up). To do this, reduce flow to zero by slowly closing the outlet shutoff valve. Outlet pressure should not exceed set-point by more than 6" water column (w.c.).
8. Fully open inlet and outlet shutoff valves slowly and carefully. Watch pressure gauges.
9. Complete start-up by making sure there are no leaks.

CAUTION

Do not exceed the regulator's pressure ratings (see table on page 6). The regulator outlet has a lower pressure rating than the inlet. Do not expose the regulator outlet or control line to inlet pressure. Regulator with external control may be used as an upstream monitor or upstream regulator in a monitor set. The control line must connect into the outlet piping downstream of the downstream regulator. If the regulator is to be moved to another location, ensure its construction is compatible with the pressure and flow conditions.

Set-Point Adjustment

(See parts diagrams on Pages 8 and 11.)

The 121 is factory adjusted as specified on the order. To change the set-point, readjust as follows:

1. Remove Top cap (**1**).
2. Adjust set-point with adjustment button (**3**) or (**3a**). Turn clockwise to increase or counterclockwise to decrease outlet pressure.

NOTE:

a. Only make this adjustment when gas is actually flowing through the regulator. The flow should be small (approximately 1000 SCFH).

b. Do not adjust when the regulator is closed and there is no flow. Do not increase the set-point beyond the upper limit of the outlet pressure range for the spring (**9**) (refer to spring tables, Page 3).

c. Always check the outlet pressure with a pressure gauge while adjusting the set-point.

3. When adjustment is complete, replace top cap (**1**). Screw it securely into place. Failing to replace cap could cause unstable regulator operation.

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.

Changing a Spring

(See parts diagrams on Pages 8 and 11.)

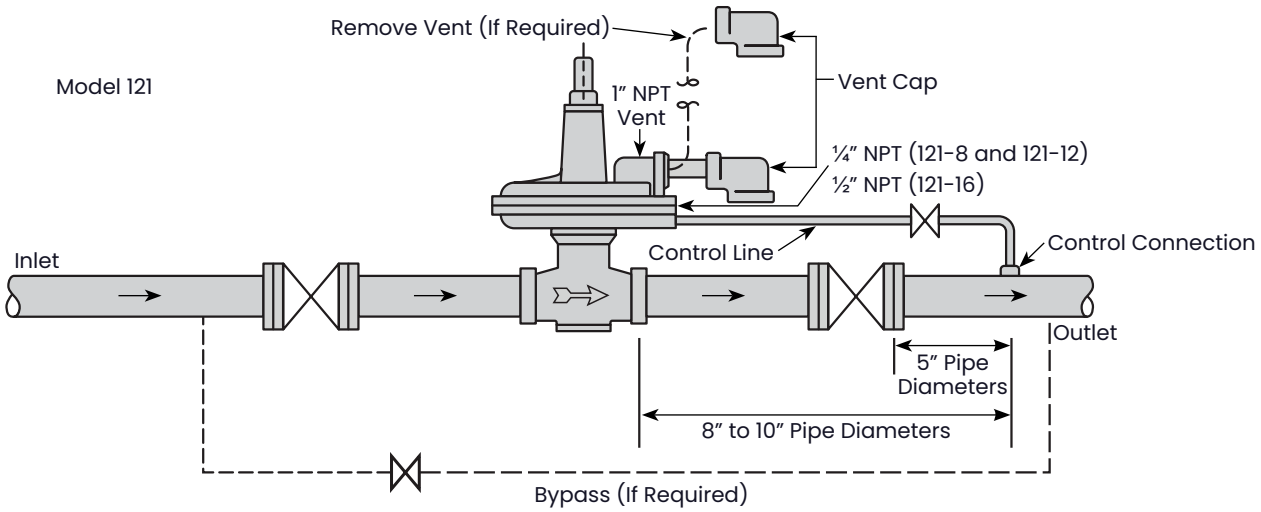
NOTE: The outlet pressure ranges of spring (**9**) are given in the tables on Page 7.

1. Remove top cap (**1**).
2. Unscrew and remove adjustment button (**3**) or (**3a**). by turning counterclockwise, and remove spring (**9**).
3. Insert new spring. Ensure the new spring is positioned correctly at the bottom before replacing adjustment button (**3**) or (**3a**).
4. Adjust for the desired outlet pressure per previous section "Set-Point Adjustment."
5. When adjustment is complete, replace top cap (**1**). Screw it securely into place. Failing to replace cap could result in unstable regulator operation.
6. New spring range should be marked on regulator. If old spring range appears on regulator, it should be removed.

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 material, bees, insects, etc. to minimize the chances for foreign material to collect in the vent side of the regulator diaphragm.

Typical Installation



Shut down Instructions

Shut down and take the regulator out of service:

1. Carefully close the inlet stop valve.
2. Close the outlet stop valve.

NOTE: Before working on regulator, read the next section "General Servicing Instructions" and the applicable servicing instructions.

CAUTION

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

General Service Instructions

1. Before any disassembly of the regulator, ensure it is completely depressurized. Pressure must be fully released from the inlet, outlet, and control line connection.
2. Carefully note location and position of all disassembled parts to be certain reassembly is correct. Inspect each one carefully and replace those that are worn or damaged or otherwise unsatisfactory.
3. Upon completion of servicing, ensure regulator installation is entirely free of leaks.

CAUTION

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

Temperature Limits

The Model 121 Regulator can be used for flowing temperatures from -20°F to 150°F.

Buried Service

Model 121 Field Regulators are not suitable for buried (underground) service.

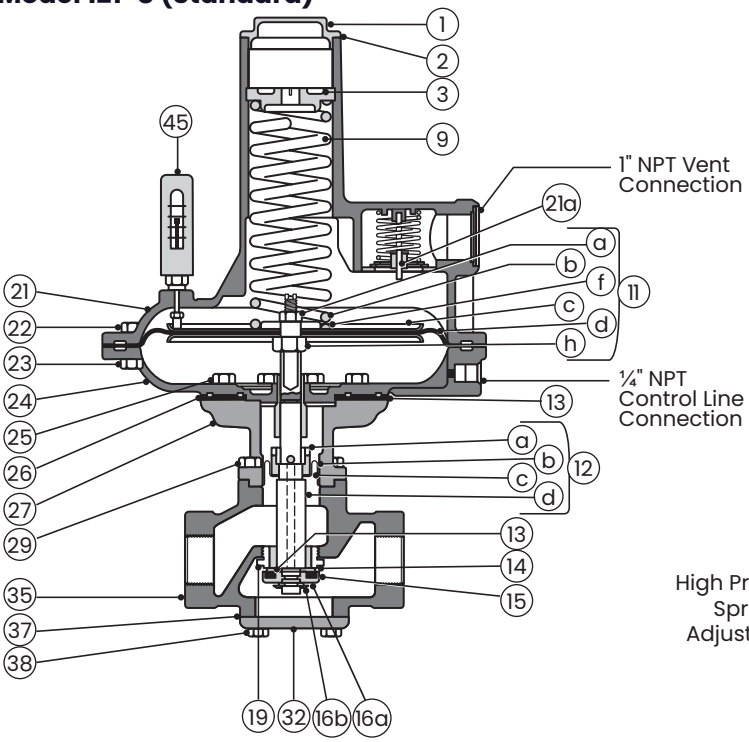
Outlet Pressure Ranges and Springs

Size	Differential Pressure Range	Spring Color	Spring Part Number	Maximum Inlet Pressure	Nominal Diaphragm Size
¾", 1", and 1 ¼" ** Model 121-8	1 ½" to 3 ½" w.c.	Blue-Black	143-82-021-01 (main spring)	60 psi	8"
	1 ½" to 3 ½" w.c.	Black-Red	121-10-021-50 (counter-spring)		
	1 ½" to 12" w.c.	Green-Black	143-82-021-02 (main spring)		
	1 ½" to 12" w.c.	Black-Red	121-10-021-50 (counter-spring)		
	3 ½" to 6 ½" w.c.	Red-Black	143-82-021-00		
	5" to 8 ½" w.c.	Blue-Black	143-82-021-01		
	6" to 14" w.c.	Green-Black	143-82-021-02		
	12" to 28" w.c.	Green (2" O.D.)	143-16-021-05		
	1 psi to 2 psi	Orange (2" O.D.)	143-16-021-06		
	2 psi to 4 ¼ psi	Black	143-16-021-07		
¾", 1", and 1 ¼" ** Model 121-8 HP	3 psi to 6½ psi	Cadmium*	143-16-021-08	60 psi	8"
	6 psi to 10 psi	Cadmium*	143-16-021-08 (outer)		
	6 psi to 10 psi	White	143-16-021-13 (inner)		
1 ½", 2", and 2 ½" Model 121-12	1 ½" to 3 ½" w.c.	Red	143-16-021-0 (main spring)	60 psi	12"
	1 ½" to 3 ½" w.c.	-	120-10-021-10 (counter-spring)		
	1 ½" to 12" w.c.	Maroon	121-42-021-00 (main spring)		
	1 ½" to 12" w.c.	-	120-10-021-10 (counter-spring)		
	3 ½" to 6 ½" w.c.	Red (2" O.D.)	143-16-021-03		
	5" to 8 ½" w.c.	Blue (2" O.D.)	143-16-021-04		
	6" to 14" w.c.	Green (2" O.D.)	143-16-021-05		
	12" to 28" w.c.	Orange (2" O.D.)	143-16-021-06		
	1 psi to 2 psi	Black	143-16-021-07		
	1 ½ psi to 3 psi	Cadmium	143-16-021-08		
1 ½", 2", and 2 ½" Model 121-8	1 psi to 2 psi	Orange (2" O.D.)	143-16-021-06	60 psi	8"
	2 psi to 4 ¼ psi	Black	143-16-021-07		
1 ½", 2", and 2 ½" Model 121-8 HP	3 psi to 6 ½ psi	Cadmium*	143-16-021-08	60 psi	8"
	6 psi to 10 psi	Cadmium*	143-16-021-08 (outer)		
	6 psi to 10 psi	White	143-16-021-13 (inner)		
3" and 4" Model 121-16	3 ½" to 6 ½" w.c.	Red (3" O.D.)	121-62-021-50	15 psi (4" 121) 40 psi (3" 121)	16"
	5" to 8 ½" w.c.	Blue (3" O.D.)	121-62-021-51		
	6" to 14" w.c.	Green (3" O.D.)	121-62-021-52		
	14" to 28" w.c.	Orange (3" O.D.)	121-62-021-53		
	½ psi to 1 ¼ psi	Yellow	121-62-021-56		
3" and 4" Model 121-12	1 psi to 2 psi	Black	143-16-021-07	15 psi (4" 121) 40 psi (3" 121)	12"
	1 ½ psi to 3 psi	Cadmium	143-16-021-08		

* Requires High-pressure Spring Adjustment.
** ¾" × ¾" not available.

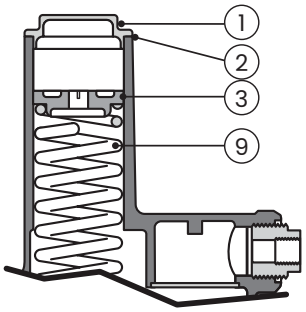
¾", 1", and 1 ¼" - Standard and High-Pressure

Model 121-8 (Standard)

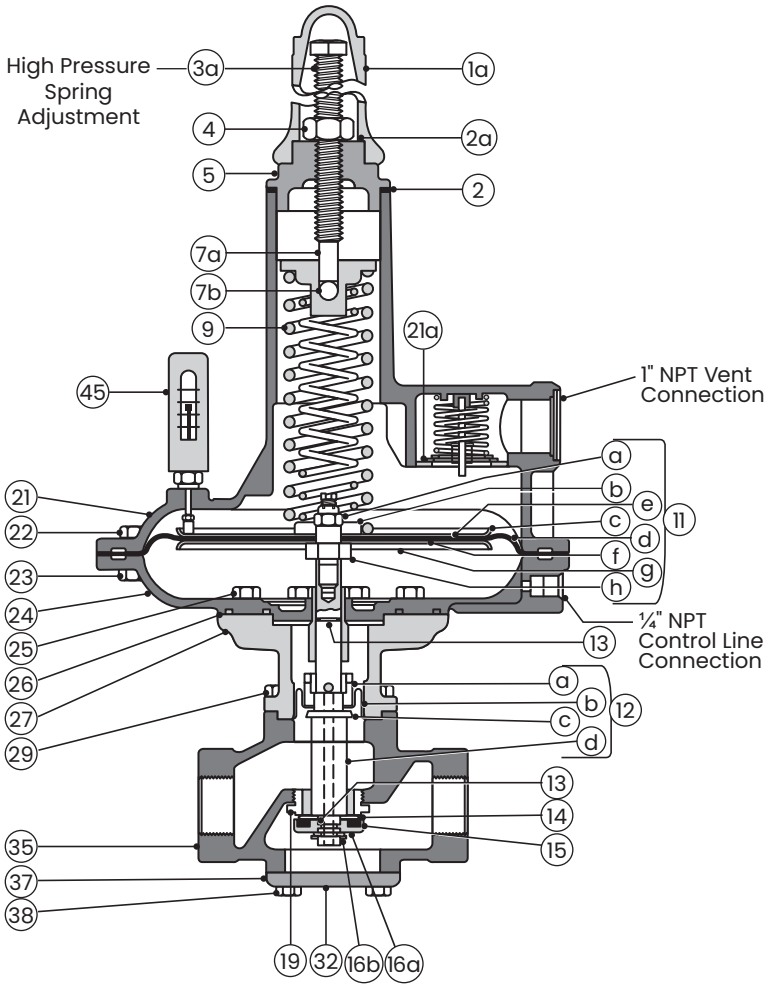


Pipe Sizes (Inlet × Outlet) Threaded, NPT
¾" × 1"
¾ × 1 ¼"
1" × 1"
1" × 1 ¼"
1 ¼" × 1 ¼"

Adjustment and Vent Connection



Model 121-8 HP (High-Pressure)



Condensed Parts List ¾", 1", and 1 ¼"

(See parts diagrams on page 8)

Illustration Number	Description	Part Number
1	Seal Cap	143-16-005-00
1a	Seal Cap	121-10-005-52
2	Tetraseal (or O-ring) 2 ¼"× 2 ⅜"	905241
2a	Tetraseal (or O-ring) 1 ½"× 1 ⅝"	906534
3	Adjustment Spring Button	14316-009-00
3a	Spring Adjusting Screw	906537
4	Jam Nut ½"-13	921005
5	Housing Cover	121-10-005-51
7a	Top Spring Button	121-10-009-51
7b	Thrust Bearing, Stainless Ball, ⅜" dia.	930510
9	Spring, see table "Spring Ranges"	--
11	121-8 Standard Diaphragm Assembly (3 ½" w.c. to 4 ¼ psi outlet pressure)	121-10-550-52
	11a Elastic Stop Nut 52-NTE-066	908561
	11b Bottom Spring Button	121-10-220-50
	11c Diaphragm Pan	121-10-017-50
	11d Diaphragm, Buna-N	121-10-150-50
	11d Diaphragm, Viton	121-10-150-52
	11f Seal Washer	121-10-178-50
	11h Diaphragm Stud, Stainless Steel	091-16-058-02
11	121-8 High-Pressure Diaphragm Assembly (3 psi to 10 psi outlet pressure)	121-10-550-55
	11a Elastic Stop Nut 29-NE-066	903955
	11b Bottom Spring Button	121-10-022-53
	11c Diaphragm Pan	121-10-017-50
	11d Diaphragm, Buna-N	121-10-150-50
	11d Diaphragm, Viton	121-10-150-52
	11e Upper Plate	121-10-022-52
	11f Seal Washer	121-10-178-50
	11g Lower Plate	121-10-079-52
	11h Diaphragm Stud, Stainless Steel	091-16-058-02
12	121 Seal Diaphragm Assembly, Buna-N	121-10-564-51
	121 Seal Diaphragm Assembly, Viton	121-10-564-5
	12a Piston	121-10-053-51
	12b Seal Diaphragm, Buna-N	121-10-364-50
	12b Seal Diaphragm, Viton	121-10-364-51
	12c Plate	121-10-010-50
	12d Stem, Stainless Steel	121-10-016-53

Illustration Number	Description	Part Number
13	O-ring, Buna-N, ⅜" × ½"	934007
	O-ring, Viton, ⅜" × ½"	902418
14	Wave Washer	905479
15	Molded Valve, Buna-N (45 to 50 Duro)	121-10-311-50
	Molded Valve, Viton-A (65 to 75 Duro)	121-10-311-51
16a	Retaining Ring	904447
16b	Valve Holder, Split (pair required), Stainless Steel	121-16-130-51
19	Orifice, 1 ¼" dia., Brass	143-16-023-03
	Orifice, 1 ¼" dia., Stainless Steel	143-16-023-14
26	Gasket	121-16-063-51
32	Tetraseal (or O-ring) 2 ⅜" × 2 ½"	904081
46	Repair Kits, consisting of Buna-N Main and Seal Diaphragms, Buna-N Molded Valve plus Wave Washer and Retaining Ring, Buna-N O-rings, Tetraseals, and Gaskets:	
	For 121-8	121-10-598-50
	For 121-8 HP	121-10-598-51

Servicing Models Sized ¾, 1", and 1 ¼"

Use parts diagrams on Page 8 to complete tasks in the following sections.

General Service Instructions

Warning

Pressure must be fully released from the inlet, outlet, and control line connection. Failure to adequately depressurize regulator could result in serious personal injury.

1. The regulator is required to be entirely depressurized before servicing.
2. Shut down and take the regulator out of service by carefully closing the inlet stop valve, then closing the outlet stop valve.
3. Carefully note location and position of all disassembled parts to be certain reassembly is correct. Inspect each one carefully and replace those that are worn, damaged, or otherwise unsatisfactory.
4. A moderate application of lubricant to O-ring (**13**) will ensure free stem movement and a tight seal. Similar application of lubricant to other O-rings or Tetraseals will ensure they are tight. Do not use petroleum based lubricants.
5. Bolted connections should be tightened evenly and firmly. Carefully tighten diaphragms into place. Bolts must be tight enough to prevent leakage, but not so tight the diaphragm material is crushed or damaged.
6. Upon completion of servicing, ensure regulator installation is entirely free of leaks.

CAUTION

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

Service Valve

1. Remove bolts (**38**), bottom cap (**37**), and Tetraseal (**32**).
2. Remove Retaining Ring (**16a**).
3. Remove both halves of valve holder (**16b**).
4. Remove valve (**15**). The wave washer (**14**) will likely remove with the valve, retain it for reassembly.
5. To reassemble, replace parts in reverse sequence.

Service Orifice

1. Remove valve (**15**), per section "Service Valve".
2. Unscrew orifice (**19**) using 1 ⅝" hex socket wrench. When replacing orifice, use a moderate amount of pipe dope on orifice threads.

Service Main Diaphragm

1. Remove top cap (**1**), and release and remove adjustment (**3**) or (**3a**).

NOTE: On high-pressure model remove cap (**1a**), release adjustment (**3a**), and remove cover (**5**) and button (**7a**). Mark or measure position of adjustment (**3**) or (**3a**). Use this to return adjustment to this setting during assembly.

2. Remove spring (**9**).
3. Remove bolts (**22**) and upper case (**21**).
4. Rotate diaphragm assembly (**11**) counterclockwise (this unscrews (**11h**) from (**12d**)), and remove.
5. To disassemble diaphragm assembly, remove nut (**11a**). Carefully note location and position of all parts to be certain of correct reassembly. Abrasive side of emery cloth washers face against diaphragm.
6. To reassemble, replace parts in reverse sequence.

NOTE: During reassembly, ensure the threaded connection between (**11h**) and (**12d**) is loosened approximately one-half turn. To do this, carefully rotate diaphragm assembly (**11**) clockwise until the threaded connection bottoms out (do not jam it together). Then, back off diaphragm assembly (**11**) counterclockwise approximately one-half turn. The (**11h**) and (**12d**) threaded connection must not be tight.

Service Seal Diaphragm

1. Remove valve (**15**), per section "Service Valve".
2. Remove diaphragm assembly (**11**), per section "Service Main Diaphragm".
3. Remove bolts (**25**) and lower diaphragm case (**24**).
4. Remove bolts (**29**) and center piece (**27**), and then remove seal diaphragm assembly (**12**).
5. To disassemble (**12**), unscrew piston (**12a**) from stem (**12d**). Use a spanner wrench in notch in skirt of piston (this can also be done by inserting a standard 7/32" Allen wrench in the notch).
6. To reassemble, replace parts in reverse sequence.

NOTE: During reassembly, ensure the fabric side of seal diaphragm (**12b**) faces upward and "rubber" side faces downward toward body. Do not pinch loop in seal diaphragm (**12b**) between (**35**) and centerpiece (**27**).

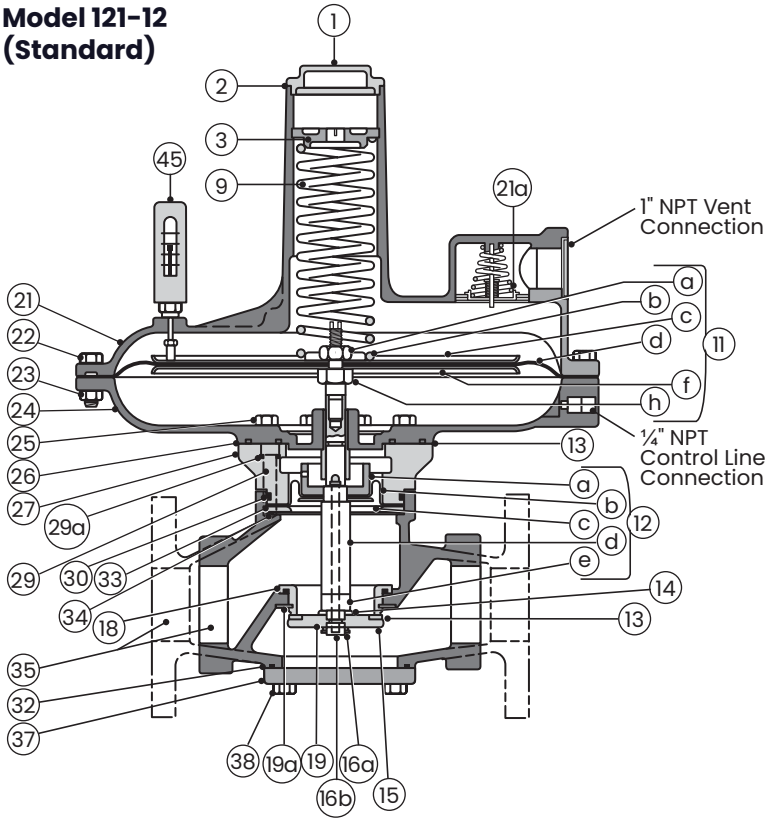
Periodic Inspection

CAUTION

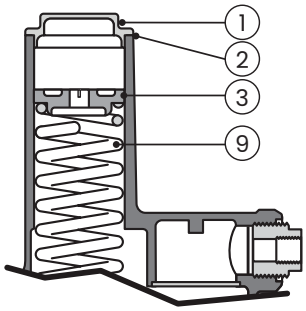
Regulators are pressure control devices with numerous moving parts subject to wear that is independent upon particular operating conditions. To ensure continuous satisfactory operation, a periodic inspection schedule must be adhered to with the frequency of inspection determined by the severity of service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

1 ½", 2", and 2 ½" Standard and High-Pressure

Model 121-12 (Standard)

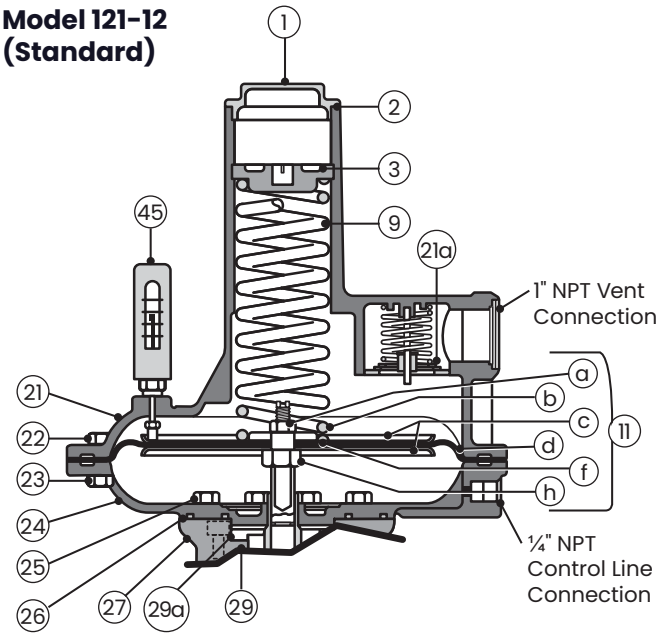


Adjustment 3 and Vent Connection

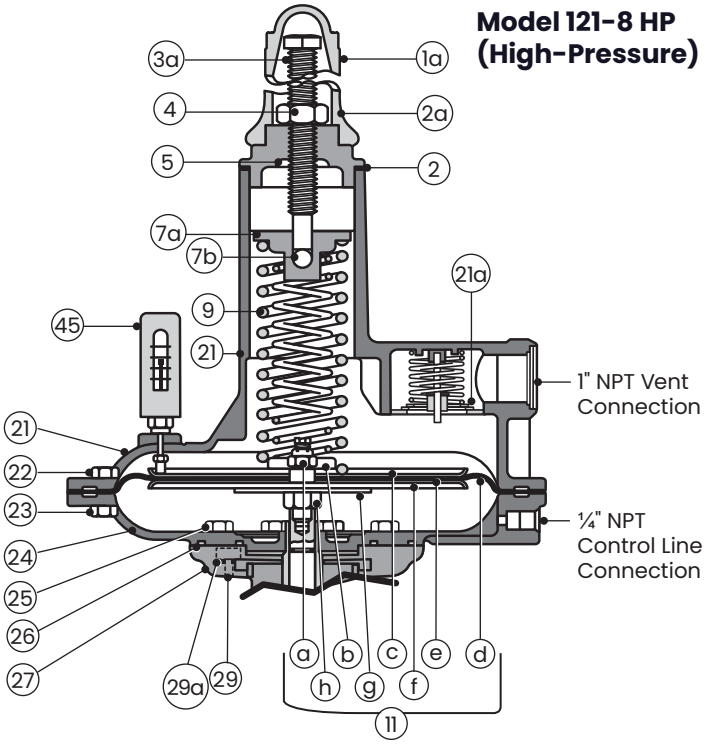


Pipe Sizes (Inlet × Outlet) Threaded, NPT
1 ½" × 1 ½"
1 ½" × 2"
2" × 2"
2 ½" × 2 ½"
Flanged ANSI 125 lb. FF
2" × 2"

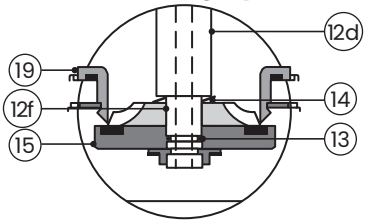
Model 121-12 (Standard)



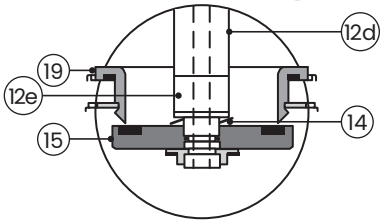
Model 121-8 HP (High-Pressure)



V-Port Wing Option



Standard Retainer Option



Condensed Parts List 1 ½", 2", and 2 ½"

(See parts diagrams on page 11)

Illustration Number	Description	Part Number
1	Seal Cap	143-16-005-00
1a	Seal Cap	121-10-005-52
2	Tetraseal (or O-ring) 2 ¼"× 2 ⅜"	905241
2a	Tetraseal (or O-ring) 1 ½"× 1 ⅝"	906534
3	Adjustment Spring Button	14316-009-00
3a	Spring Adjusting Screw	906537
4	Jam Nut ½ "-13	921005
5	Housing Cover	121-10-005-51
7a	Top Spring Button	121-10-009-51
7b	Thrust Bearing, Stainless Ball, ⅜" Diameter	930510
9	Spring, see table "Spring Ranges"	--
11	121-12 Diaphragm Assembly (3 ½" w.c. to 2 psi outlet pressure)	121-16-550-51
	11a Elastic Stop Nut 52-NTE-066	908561
	11b Bottom Spring Button	121-10-022-50
	11c Diaphragm Pan	121-16-017-50
	11d Diaphragm, Buna-N	121-16-150-53
	11d Diaphragm, Viton	121-16-150-55
	11f Seal Washer	121-10-178-50
	11h Diaphragm Stud, Stainless Steel	091-16-058-52
11	121-8 Standard Diaphragm Assembly (1 psi to 4 ½ psi outlet pressure)	121-10-551-52
	11a Elastic Stop Nut 29-NE-066	903955
	11b Bottom Spring Button	121-10-022-50
	11c Diaphragm Pan	121-10-017-50
	11d Diaphragm, Buna-N	121-10-150-50
	11d Diaphragm, Viton	121-10-150-52
	11f Seal Washer	121-10-178-50
	11h Diaphragm Stud, Stainless Steel	091-16-058-02
11	121-8 HP High-Pressure Diaphragm Assembly (3 psi to 10 psi outlet pressure)	121-10-550-55
	11a Elastic Stop Nut 29-NE-066	903955
	11b Diaphragm Plate	121-10-022-53
	11c Diaphragm Pan	121-10-017-50
	11d Diaphragm, Buna-N	121-10-150-50
	11d Diaphragm, Viton	121-10-150-52
	11e Upper Plate	121-10-022-52
	11f Seal Washer	121-10-178-50
	11g Lower Plate	121-10-079-52
	11h Diaphragm Stud, Stainless Steel	091-16-058-02

Illustration Number	Description	Part Number
12	121 Seal Diaphragm Assembly, Buna-N	121-16-564-51
	121 Seal Diaphragm Assembly, Viton	121-16-564-52
	12a Piston	121-16-053-51
	12b Seal Diaphragm, Buna-N	121-16-364-50
	12b Seal Diaphragm, Viton	121-16-364-51
	12c Plate	121-16-010-53
	12d Stem, Stainless Steel	121-16-016-53
	12e Retainer	121-16-016-00
	12d V-Port Wings	121-16-012-52
13	O-ring, Buna-N, ⅜" × ½"	934007
	O-ring, Viton, ⅜" × ½"	902418
14	Wave Washer	905479
15	Molded Valve, Buna-N (45 to 50 Duro)	121-16-311-50
	Molded Valve, Viton-A (55 to 75 Duro)	121-16-311-51
16a	Retaining Ring	904447
16b	Valve Holder, Split (pair required), Stainless Steel	121-16-130-51
18	Tetraseal (or O-ring) 2 ½" × 2 $^{11}/_{16}$"	904207
19	Orifice, 2 $^{5}/_{32}$" dia., Brass	121-16-023-51
	Orifice, 2 $^{5}/_{32}$" dia., Stainless Steel	121-16-023-52
19a	Retaining Ring, Stainless Steel	904656
26	Gasket	121-16-063-51
30	O-ring, 3 ⅜" × 3 ½"	934041
32	Tetraseal (or O-ring) 3 ¼" × 3 ½"	904078
33	Seal Diaphragm Ring	121-16-008-50
34	Gasket	121-16-104-50
45	Travel Indicator	Contact Utility Solutions Group
46	Repair Kits, consisting of Buna-N Main and Seal Diaphragms, Buna-N Molded Valve plus Wave Washer and Retaining Ring, Buna-N O-rings, Tetraseals, and Gaskets:	
	For 121-12	121-16-598-50
	For 121-8	121-86-598-50
	For 121-8 HP	121-86-598-51

NOTE: For discontinued models, please contact the manufacturer directly to obtain replacement parts.

Servicing Models Sized 1 ½", 2", and 2 ½"

Use parts diagrams on Page 11 to complete tasks in the following sections.

Warning

Pressure must be fully released from the inlet, outlet, and control line connection. Failure to adequately depressurize regulator could result in serious personal injury.

General Service Instructions

These are the same instructions as in section "General Instructions" found on page 10.

Service Valve

1. Remove bolts (**38**), bottom cap (**37**), and Tetraseal (**32**).
2. Remove Retaining Ring (**16a**).
3. Remove both halves of valve holder (**16b**) .
4. Remove valve (**15**). The wave washer (**14**) will likely remove with the valve, retain it for reassembly.
5. To reassemble, replace parts in reverse sequence.

Service Orifice

1. Remove valve (**15**), per section "Service Valve".
2. Remove main diaphragm assembly (**11**), per steps 1 through 4 of section "Service Main Diaphragm".
3. Remove seal diaphragm assembly (**12**), per steps 3 and 4 of section "Service Seal Diaphragm".
4. Remove Retaining Ring (**19a**).
5. Remove orifice (**19**) through top opening.
6. To reassemble, replace parts in reverse sequence.

NOTE: During reassembly, ensure (**19a**) is fully seated in its groove. The beveled edge of (**19a**) faces downward toward bottom cap (**37**).

Service Main Diaphragm

1. Remove top cap (**1**), and release and remove adjustment (**3**).

NOTE: On high-pressure model remove cap (**1a**), release adjustment (**3a**), and remove cover (**5**) and button (**7a**). Mark or measure position of adjustment (**3**) or (**3a**). Use this to return adjustment to this setting during assembly.

2. Remove spring (**9**).
3. Remove bolts (**22**) and upper case (**21**).
4. Rotate diaphragm assembly (**11**) counterclockwise (this unscrews (**11h**) from (**12d**)) and remove.
5. To disassemble diaphragm assembly, remove nut (**11a**). Carefully note location and position of all parts to be certain of correct reassembly. Abrasive side of emery cloth washers face against diaphragm.
6. To reassemble, replace parts in reverse sequence.

NOTE: During reassembly, ensure the threaded connection between (**11h**) and (**12d**) is loosened approximately one-half turn. To do this, carefully rotate diaphragm assembly (**11**) clockwise until the threaded connection bottoms out (do not jam it together). Then, back off diaphragm assembly (**11**) counterclockwise approximately one-half turn. The (**11h**) and (**12d**) threaded connection must not be tight.

Service Seal Diaphragm

1. Remove valve (**15**) per section "Service Valve".
2. Remove diaphragm assembly (**11**) per section "Service Main Diaphragm".
3. Remove bolts (**25**) and lower diaphragm case (**24**).
4. Remove bolts (**29**) and center piece (**27**), and then remove seal diaphragm assembly (**12**).
5. To disassemble (**12**), unscrew piston (**12a**) from stem (**12d**). Use a spanner wrench in notch in skirt of piston.

NOTE: This can also be done by inserting a standard 7⁄32" Allen wrench in the notch.

6. To reassemble, replace parts in reverse sequence.

NOTE: During reassembly, ensure the fabric side of seal diaphragm (**12b**) faces upward and "rubber" side faces downward toward body. Do not pinch loop in seal diaphragm (**12b**) between (**33**) and centerpiece (**27**). The rounded edge of (**33**) faces upward toward seal diaphragm (**12b**).

Install V-Port Wing

1. Remove valve (**15**), per section "Service Valve".
2. Remove wave washer (**14**).
3. Remove retainer (**12e**). It will not be used.
4. Reinstall wave washer (**14**).
5. Install V-Port wing (**12f**) on stem with v-notch side against the wave washer and flat area exposed.
6. Reassemble remaining parts in reverse sequence.

CAUTION

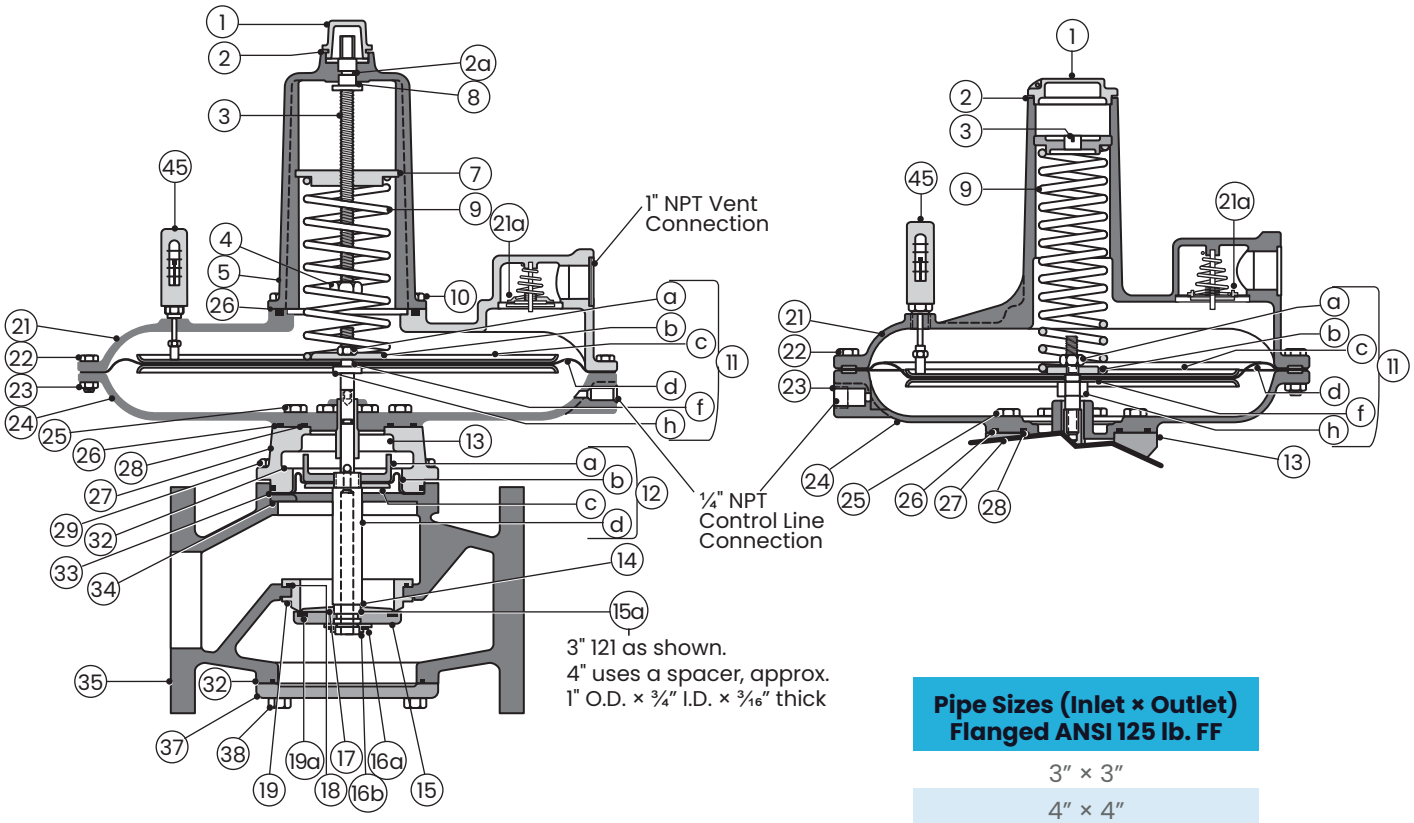
Turn gas on very slowly. If an outlet stop valve is used, it should be opened first. Do not overload diaphragm with a sudden surge of inlet pressure. Monitor the outlet pressure during start-up to prevent an outlet pressure overload.

Periodic Inspection

CAUTION

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

3″ to 4″ Standard



Pipe Sizes (Inlet × Outlet) Flanged ANSI 125 lb. FF
3″ × 3″
4″ × 4″

Condensed Parts List 3" and 4"

(See parts diagrams on page 14)

3" and 4" Models

Illustration Number	Description	Part Number
1	Seal Cap for 121-16	138-02-005-01
	Seal Cap for 121-12	143-16-005-00
2	Seal Cap Gasket for 121-16	120-08-066-00
	Tetraseal (or O-ring) 1 ½"× 1 ⅝"	905241
3	Adjustment Spring Button for 121-12	143-16-009-00
8	Thrust Washer	141-10-160-01
9	Spring (see table "Spring Ranges")	--
11	121-12 Diaphragm Assembly	121-62-550-50
	11a Elastic Stop Nut 52-NTE-066	903955
	11b Bottom Spring Button	121-62-022-50
	11c Diaphragm Pan	121-62-017-50
	11d Diaphragm, Buna-N	121-62-150-50
	11d Diaphragm, Viton	121-62-150-52
	11f Seal Washer	121-10-178-50
	11h Diaphragm Stud, Stainless Steel	121-16-058-52
11	121-12 Diaphragm Assembly (3 ½" w.c to 2 psi outlet pressure)	121-10-551-52
	11a Elastic Stop Nut 29-NE-066	903955
	11b Bottom Spring Button	121-10-022-50
	11c Diaphragm Pan	121-16-017-50
	11d Diaphragm, Buna-N	121-16-150-53
	11d Diaphragm, Viton	121-16-150-55
	11f Seal Washer	121-10-178-50
	11h Diaphragm Stud, Stainless Steel	121-16-058-52
13	O-ring, Buna-N, ⅜" × ½"	934007
	O-ring, Viton, ⅜" × ½"	902418
14	Wave Washer	905481
16a	Retaining Ring	904448
16b	Valve Holder, Split (pair required), Stainless Steel	121-22-130-51
17	O-ring, Buna-N, ⅝" × ¾"	902922
	O-ring, Viton, ⅝" × ¾"	902698
26	Tetraseal (or O-ring) 4 ⅜" × 4 ⅝"	904085
28	Tetraseal (or O-ring) 2 ¾" × 3"	904079
46	Repair Kits, consisting of Buna-N Main and Seal Diaphragms, Buna-N Molded Valve plus Wave Washer and Retaining Ring, Buna-N O-rings, Tetraseals, and Gaskets:	
	3" 121-16	121-60-598-50
	3" 121-12	121-20-598-50
	4" 121-16	121-62-598-50
	4" 121-12	121-22-598-50

3" Model Only

Illustration Number	Description	Part Number
12	12a Piston	121-20-053-50
	12b Seal Diaphragm, Buna-N	121-20-364-50
	12b Seal Diaphragm, Viton	121-20-364-51
	12c Plate	121-20-010-50
	12d Stem, Stainless Steel	121-20-016-51
15	Molded Valve, Buna-N (45 to 50 Duro)	121-20-311-50
	Molded Valve, Viton (65 to 75 Duro)	121-20-311-51
15a	Valve Wing	121-20-018-50
	Valve Wing, Stainless Steel	121-20-018-51
18	Tetraseal (or O-ring) 3 ¾" × 4"	904200
19	Orifice, 3 ¼" dia., Steel	121-20-023-50
	Orifice, 3 ¼" dia., Stainless Steel	121-20-023-51
19a	Retaining Ring, Stainless Steel	904660
32	Tetraseal (or O-ring) 5" × 5 ¼"	934328
33	Seal Diaphragm Ring	121-20-008-50
34	Gasket	121-20-104-50
45	Travel Indicator (specify scale 091-00-008-02)	091-00-365-00

4" Model Only

Illustration Number	Description	Part Number
12	12a Piston	121-22-053-50
	12b Seal Diaphragm, Buna-N	121-22-264-50
	12b Seal Diaphragm, Viton	121-22-364-51
	12c Plate	121-22-010-50
	12d Stem, Steel	121-22-016-53
	12d Stem, Stainless Steel	121-22-016-51
15	Molded Valve, Buna-N (45 to 50 Duro)	121-22-311-50
	Molded Valve, Viton (65 to 75 Duro)	121-22-311-51
15a	Valve Spacer	121-22-038-50
18	Tetraseal (or O-ring) 4 ¾" × 5"	950625
19	Orifice, 4 ⁷⁄₃₂" dia., Steel	121-22-023-50
19a	Retaining Ring, Stainless Steel	904229
20	Orifice, 4 ⁷⁄₃₂" dia., Stainless Steel	121-22-023-52
20a	Retaining Ring, Stainless Steel	121-22-130-52
	Pliers for Retaining Ring 19a Truarc 0600	OB5
32	O-ring 6 ¼" × 6 ½"	
33	Seal Diaphragm Ring	
34	Gasket	
45	Travel Indicator (specify scale 091-00-008-02)	

For discontinued models, please contact the manufacturer directly to obtain replacement parts.

Servicing Model Sized 3" and 4"

Use parts diagrams on Page 14 to complete tasks in the following sections.

Warning

Pressure must be fully released from the inlet, outlet, and control line connection. Failure to adequately depressurize regulator could result in serious personal injury.

General Instructions

These are the same instructions as in section "General Instructions" found on Page 10.

Service Valve

1. Remove bolts (**38**) and bottom cap (**37**).
2. Remove Retaining Ring (**16a**).
3. Remove both halves of valve holder (**16b**).
4. Remove valve (**15**), and wing (**15a**) or spacer (wave washer (**14**) will likely remove with the valve). Retain it for reassembly.
5. To reassemble, replace parts in reverse sequence.

Service Orifice

1. Remove valve (**15**) per section "Service Valve".
2. Remove seal diaphragm assembly (**12**) per step 2 of section "Service Seal Diaphragm".
3. Remove Retaining Ring (**19a**).
4. Remove ring (**33**) and orifice (**19**) through top opening.
5. To reassemble, replace parts in reverse sequence.

NOTE: During reassembly, ensure (**19a**) is fully seated in its groove. The beveled edge of (**19a**) faces downward toward bottom cap (**37**).

Service Main Diaphragm

1. Remove top cap (**1**).
2. Release adjustment (**3**).

NOTE: Count the turns of adjustment (**3**) and use the same number of turns when returning the adjustment to this setting during reassembly.

3. Remove bolts (**10**) and housing (**5**).

NOTE: This step is for the 3" and 4" 121-16 models only.

4. Remove spring (**9**).
5. Remove bolts (**22**) and upper case (**21**).
6. Rotate diaphragm assembly (**11**) counterclockwise. This will unscrew (**11h**) from (**12d**). Remove diaphragm assembly.
7. To disassemble diaphragm assembly, remove nut (**11a**). Carefully note location and position of all parts to be certain of correct reassembly. Abrasive side of emery cloth washers face against diaphragm.
8. To reassemble, replace parts in reverse sequence.

NOTE: During reassembly, ensure the threaded connection between (**11h**) and (**12d**) is loosened approximately one-half turn. To do this, carefully rotate diaphragm assembly (**11**) clockwise until this threaded connection bottoms (do not jam it together). Then back-off diaphragm assembly (**11**) counterclockwise approximately one-half turn. The (**11h**) to (**12d**) threaded connection must not be tight.

Service Seal Diaphragm

1. Remove valve (**15**), per section "Service Valve".
2. Remove bolts (**29**) and upper case assembly. Then remove seal diaphragm assembly (**12**).
3. To disassemble (**12**), unscrew piston (**12a**) from stem (**12d**). Use a spanner wrench in notch in skirt of piston (this can also be done by inserting a standard 7⁄32" Allen wrench in the notch).
4. To reassemble, replace parts in reverse sequence.

NOTE: During reassembly, ensure the fabric side of seal diaphragm (**12b**) faces upward and "rubber" side faces downward toward body. Do not pinch loop in seal diaphragm (**12b**) between ring (**33**) and centerpiece (**27**). The rounded edge of (**33**) faces upward toward seal diaphragm (**12b**). Ensure the threaded connection (**11h**) and (**12d**) is loosened approximately one-half turn. To do this, carefully rotate seal diaphragm assembly (**12**) clockwise until the threaded connection bottoms out (do not jam it together). Then, back-off seal diaphragm assembly (**12**) counterclockwise approximately one-half turn. The (**11h**) to (**12d**) threaded connection must not be tight.

CAUTION

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

Periodic Inspection

CAUTION

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

Model 121-RPC (Relay Pilot Control)

The 121-RPC is a genuine Pilot Operated Regulator (Relay Principal of Operation). The relay principal means exceptional precise control. Accuracy is largely unaffected by changes in the inlet pressure. The control line is piped to both the inlet and main regulator. The loading pressure to the main regulator varies with the downstream pressure resulting in precise regulation. Available in 1 ½", 2", and 2 ½" pipe sizes. The outlet pressure ranges from 3 ½" w.c. through 35 psi. As seen on the cutaway drawing, the main spring is reversed to provide the upward closing force.

Outlet Pressure Ranges

Outlet Pressure Range	Pilot Spring	
	Spring Color	Spring Part Number
3 ½" to 6 ½" w.c.	Red	143-08-021-00
5" to 8 ½" w.c.	Blue	143-08-021-01
6" to 14" w.c.	Green	143-08-021-02
12" to 28" w.c.	Orange	143-08-021-03
1 psi to 2 psi	Black	143-08-021-06
1 psi to 5 psi	White	138-18-021-01
3 psi to 15 psi	Gray	138-18-021-04
10 psi to 35 psi	Brown	138-18-021-03
3 ½" w.c. to 5 psi	Aluminum	138-18-021-05

Set-Point Adjustment

The 121-RPC is factory-adjusted as specified on the order. To change the set-point:

1. Remove pilot seal cap (**10**) and loosen lock nut (**12**).

NOTE: Do not remove main cover cap (**1**). The upper case is sealed and pressurized. The main spring does not contribute to set-point adjustment.

2. Rotate set-point adjustment (**11**) clockwise to increase or counterclockwise to decrease the outlet pressure.

CAUTION

There should be gas flow through the regulator during adjustment, preferably small (approximately 250 SCFH). Do not adjust set-point when there is no flow.

3. When the desired set-point is achieved, tighten locknut (**12**) and install seal cap (**10**). Ensure tetraseal (**13**) is not damaged.

Pilot Spring Change

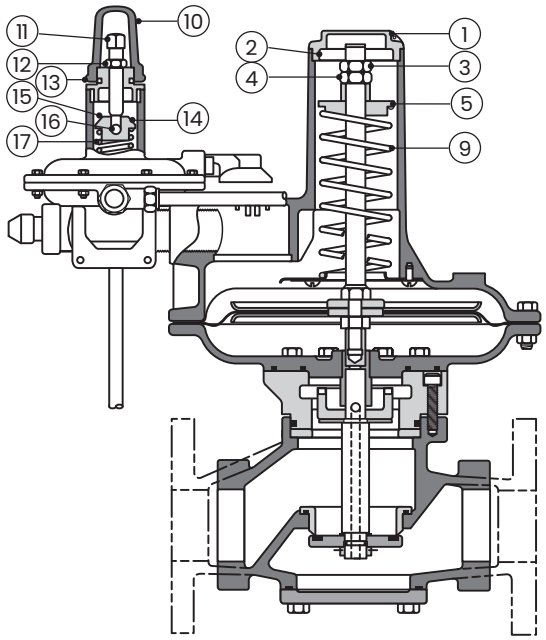
The outlet pressure range of the 121-RPC is determined by the pilot spring (see table of "Outlet Pressure Ranges").

NOTE: Do not change main spring (**9**). It does not contribute to set-point adjustment.

To change spring:

1. Take regulator out of service per section "Shutdown Instructions" on Page 6.
2. Remove pilot seal cap (**10**), loosen lock nut (**12**), and turn set-point adjustment (**11**) counterclockwise until spring compression is released.

Model 121-RPC (Relay Pilot Control)



3. Remove top cap (**14**), ferrule (**15**), and spring (**17**). Be careful not to lose ball (**16**).
4. Install new spring. During reassembly ensure the spring is nested correctly at both ends.
5. Adjust to the desired set-point, per section "Set-Point Adjustment".

Model 121-RPC Service

1. Take regulator out of service per section "Shutdown Instructions" on Page 6.
2. Remove cover cap (**1**). Measure depth from top of cover to ferrule (**5**) for reassembly.
3. Hold stem (**2**) from turning using screwdriver on end of stem.
4. Unlock nut (**3**) from nut (**4**) and remove nut (**3**).
5. Slowly remove nut (**4**) while maintaining pressure on the spring ferrule (**5**) to prevent ejection of the spring from the upper case.

CAUTION

Do not allow stem (2) to unscrew during removal of nut (4).

6. Remove spring (**9**).
7. Disconnect control line at the pilot, which connects to downstream piping.
8. Disconnect pilot supply line between body and pilot regulator.
9. Follow procedures for standard 121 regulators by size, per instructions on Page 13.

Model 121-PL (Pressure Loaded)

The 121-PL is a pressure loaded, Pilot Operated Regulator. The pressure loading of the diaphragm minimizes droop caused by spring and diaphragm effect, thus providing more accurate control. The outlet set pressure is controlled by adjusting the pilot regulator of the 121-PL.

Warning

The main regulator spring is NOT to be adjusted.

The two available pressure ranges are 3 ½" w.c. to 20 psi and 3 ½" w.c. to 35 psi, governed by two available pilot regulators.

Set-Point Adjustment

The 121-PL is factory adjusted as specified on the order.

To change set-point:

1. Loosen lock nut (**12**) on pilot regulator top.
2. Rotate set-point adjustment (**11**) of pilot regulator clockwise to increase or counterclockwise to decrease the outlet pressure.
3. When the desired set-point is achieved, tighten lock-nut (**12**).

NOTE: Do not remove main cover cap (**1**). The upper case is sealed and pressurized. The main spring is not to be adjusted to control outlet pressure.

Model 121-PL Service

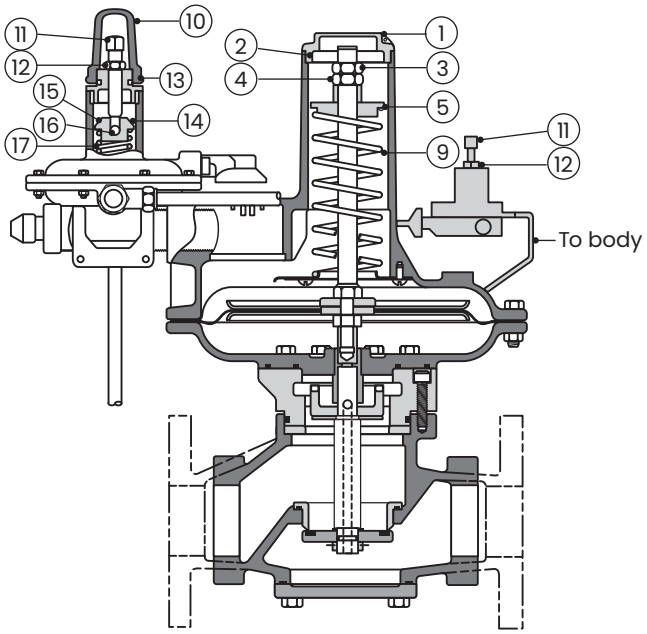
1. Take regulator out of service per section "Shutdown Instructions" on page on Page 6.
2. Remove cover cap (**1**). Measure depth from top of cover to ferrule (**5**) for reassembly.
3. Hold stem (**2**) from turning using screwdriver on end of stem.
4. Unlock nut (**3**) from nut (**4**) and remove nut (**3**).
5. Slowly remove nut (**4**) maintaining pressure on the spring ferrule (**5**) to prevent ejection of the spring from the upper case.

CAUTION

Do not allow stem (2) to unscrew during removal of nut (4).

6. Remove spring (**9**).
7. At pilot, disconnect control line which connects to downstream piping.
8. Disconnect pilot supply line between body and pilot regulator.
9. Follow procedures for standard 121 regulators by size, per instructions on Pages 10, 13, and 16.

121-PL (Pressure Loaded)



Over-pressurization Protection

The method of over-pressurization protection can be a relief valve, monitor regulator, shutoff device, or similar mechanism. These prrotect the downstream piping system and the regulator slow pressure chambers against over-pressurization due to the possible regulator malfunction or failure to achieve complete lockup. The allowable outlet pressure is the lowest of the maximum pressures permitted by federal and state codes, Utility Solutions Group document USG-IG-038, or other applicable standards.

Maximum Emergency Pressures

The Maximum inlet pressures model 121 bodies may be subjected to under abnormal conditions without causing internal damage are as follows:

1" through 2 ½" pipe sizes ..... 70 psi
3" pipe size ..... 50 psi
4" pipe size ..... 25 psi

The maximum pressures the diaphragms in model 121 regulators may be subjected to under abnormal conditions without causing internal damage are as follows:

121-8 ..... set-point +5 psi
121-8HP ..... set-point +10 psi
121-12 ..... set-point +5 psi
121-16 ..... set-point +2 psi

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

CAUTION

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

The maximum pressures that can be safely contained by model 121 diaphragm cases are as follows:

121-8 ..... 25 psi
121-8HP ..... 25 psi
121-12 ..... 20 psi
121-16 ..... 10 psi

NOTE: "Safely contained" means no leakage as well as no bursting.

CAUTION

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

Full Open Capacity

Capacity of the Model 121 in the full open position can be calculated using the following formulas and K factors:

$Q = K\sqrt{P_o(P_i - P_o)}$ ..... (for P_i/P_o less than 1.894)

$Q = \frac{K P_i}{2}$ ..... (for P_i/P_o less than 1.894)

Q = Full open capacity in SCFH of 0.6 specific gravity natural gas

P_i = absolute inlet pressure (psi)

P_o = absolute outlet pressure (psi)

1" Pipe Size (outlet) ..... K=1,400
1 ½" Pipe Size ..... K=2,750
2" Pipe Size ..... K=4,750
2 ½" Pipe Size ..... K=5,250
1 ¼" Pipe Size (outlet) ..... K=1,750
3" Pipe Size ..... K=11,000
4" Pipe Size ..... K=18,000

NOTE: At the above full open capacities, the droop is significantly greater than specified in the capacity tables. When checking 121 regulator capacity to provide adequate relief valve capacity, use the above calculated full open capacity.

Construction Materials

Component	Materials Used
Body and Adapter	Cast Iron
Diaphragm Case:	
8" and 12" Diaphragm	Die Case Aluminum Alloy
16" Diaphragm	Permanent Mold Aluminum Alloy
Main and Seal Diaphragms	Buna-N or Nylon
Piston for Seal Diaphragm (¾" to 2 ½")	Powdered Iron, Zinc Plated
Piston for Seal Diaphragm (3" and 4" Models)	Aluminum Alloy
Stem, Stud, Pans, and Plates (for 8", 12", and 16" Diaphragms)	Plated Steel
Stem Bushing	Stainless Steel
Orifice:	
¾" to 1 ¼" Models	Brass
1 ½" to 4" Models	Cast Iron
Retaining Ring 1 ½" to 4" Models	Plated Steel
Valve	Plated Steel with Molded Buna-N Soft Steel
Valve Wing	Plated Steel (3" Model)
Valve Holder	Plated Steel
Retaining Ring and Wave Washer	Stainless Steel
O-rings and Tetraseal	Buna-N
Adjustable Spring Ferrule	Zinc Die Casting
Bottom Spring Button	Powdered Iron-Plated
Adjustment Screw (16" Diaphragm and HP Adjustment Spring Screw)	Plated Steel
Adjustment Ferrule (16" Diaphragm and HP Adjustment Spring Screw)	Cast Iron
Seal Cap:	
8" and 12" Diaphragm	Zinc Die Casting
16" Diaphragm	Die Cast Aluminum Alloy

Body Taps

Inlet and outlet taps are available on either side of the body. Tap sizes are ¼" national pipe thread (NPT). Refer to "Dimensions" on Page 21. Desired taps must be specified when ordering.

Other Gases

Model 121 Regulators are most widely used with natural gas. However, they perform equally well with LP gas, nitrogen, dry CO2, and air.

For other gas capacities, multiply the table values on Pages 4, 5, 6, and 7 by the applicable correction factors:

Pipe Sizes

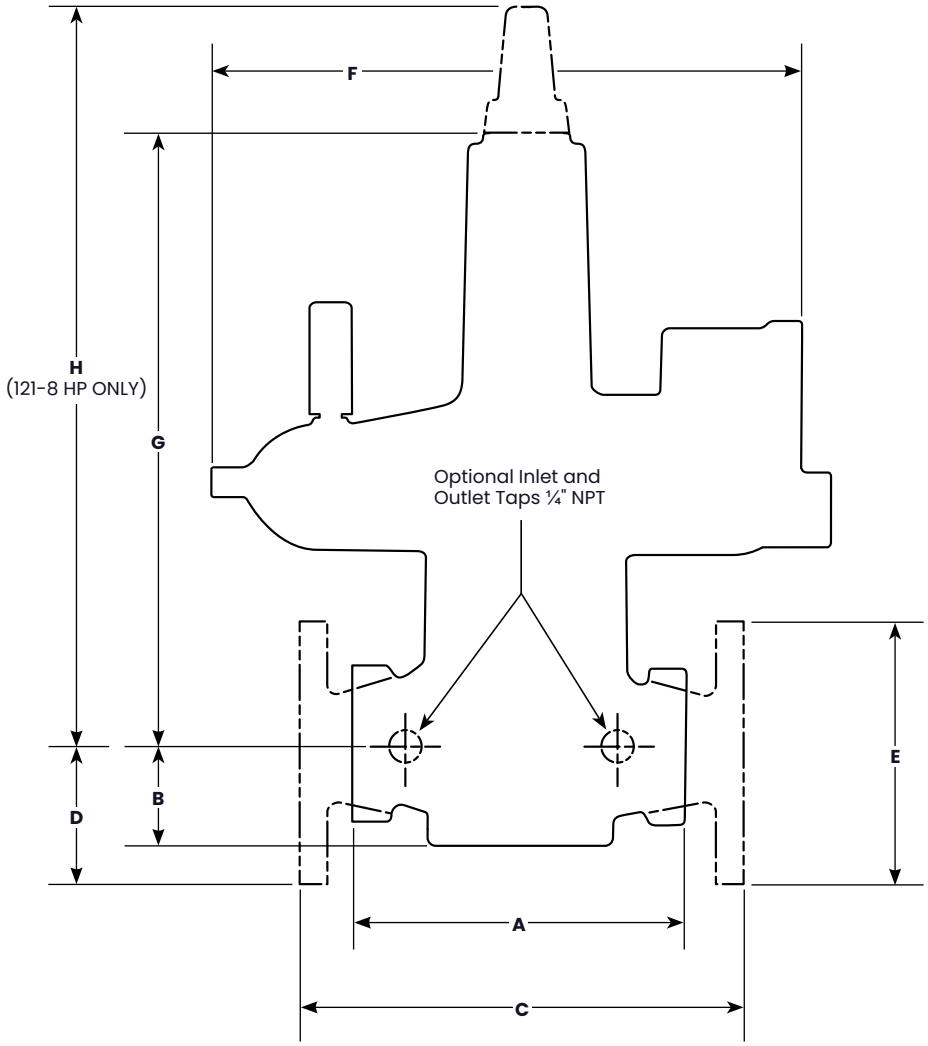
Type of Gas	Correction Factor
Air (Specific Gravity 1.0)	0.77
Propane (Specific Gravity 1.53)	0.63
1350 BTU Propane-Air Mix (Specific Gravity 1.20)	0.71
Nitrogen (Specific Gravity 0.97)	0.79
Dry Carbon Dioxide (Specific Gravity 1.52)	0.63

For other non-corrosive gases, use the following formula:

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

When used with gases not listed above, please contact your Utility Solutions Group representative or Industrial Distributor for recommendations.

Dimensions



Pipe Size	Model Number	Threaded NPT		Flanged ANSI 125 lb. FF			F (Dia.)	G	High-Pressure Spring Adjustment
		A	B	C	D	E			H
¾"-1"-1 ¼"	121-8 & -8 HP	5 ¾"	1 ⅞"	—	—	—	10 3/16"	13 9/16"	19 ⅛"
1 ½"	121-8 & -8 HP	7 ½"	2 ⅜"	—	—	—	10 3/16"	13 11/16"	19 ¼"
1 ½"	121-12	7 ½"	2 ⅜"	—	—	—	14"	14 ⅛"	—
2"	121-8 & -8 HP	7 ½"	2 ⅜"	10"	3"	6"	10 3/16"	13 11/16"	19 ¼"
2"	121-12	7 ½"	2 ⅜"	10"	3"	6"	14"	14 ⅛"	—
2 ½"	121-8 & 121-8 HP	8 ¼"	2 ⅜"	—	—	—	10 3/16"	13 11/16"	19 ¼"
2 ½"	121-12	8 ¼"	2 ⅜"	—	—	—	14"	14 ⅛"	—
3"	121-12	11 ¾"	3 9/16"	11 ¾"	3 ¾"	7 ½"	14"	15 ½"	—
3"	121-16	11 ¾"	3 9/16"	11 ¾"	3 ¾"	7 ½"	18"	19"	—
4"	121-12	—	—	13 ⅞"	4 ½"	9"	14"	16 ½"	—
4"	121-16	—	—	13 ⅞"	4 ½"	9"	18"	20"	—

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