

# OPERATION AND MAINTENANCE MANUAL

## 1/2", 1" and 2" Figure 667 Relief Pilots

### Drawings B-1030, B-1040, B-1076 and B-1078

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**WARNING: Cancer and Reproductive Harm – [www.Prop65Warnings.ca.gov](http://www.Prop65Warnings.ca.gov)**

# OPERATION and MAINTENANCE

## 1/2", 1" and 2" Relief Pilots

### INTRODUCTION

This manual provides information about the operation and proper maintenance of standard GA Industries Figure 667 relief pilots. The relief pilot is an integral part of all GA Industries differential piston actuated, pilot-operated surge relief and pressure sustaining valves. The pilot valve is ruggedly constructed to provide many decades of dependable service with minimal maintenance.

### CAUTION

The valve is NOT recommended for use with toxic, corrosive, or flammable fluids.

The Shop Order (SO) Number, Figure Number, size and pressure rating are stamped on a nameplate attached to the valve. Please refer to the SO number when ordering parts.

### DESCRIPTION OF OPERATION

The pressure relief pilot controls the pressure applied to the top of the main valve piston. Its action determines whether the main valve is closed or open.

The Figure 667 pilot is a direct acting, spring loaded, pressure balanced, diaphragm actuated valve. The valve is held closed by the force produced by the compression spring. System pressure is applied to the underside of the diaphragm through an "impulse line" producing an opening force. The pilot valve opens when the opening force exceeds the closing force. The amount of spring compression determines the "set pressure" at which the valve opens.

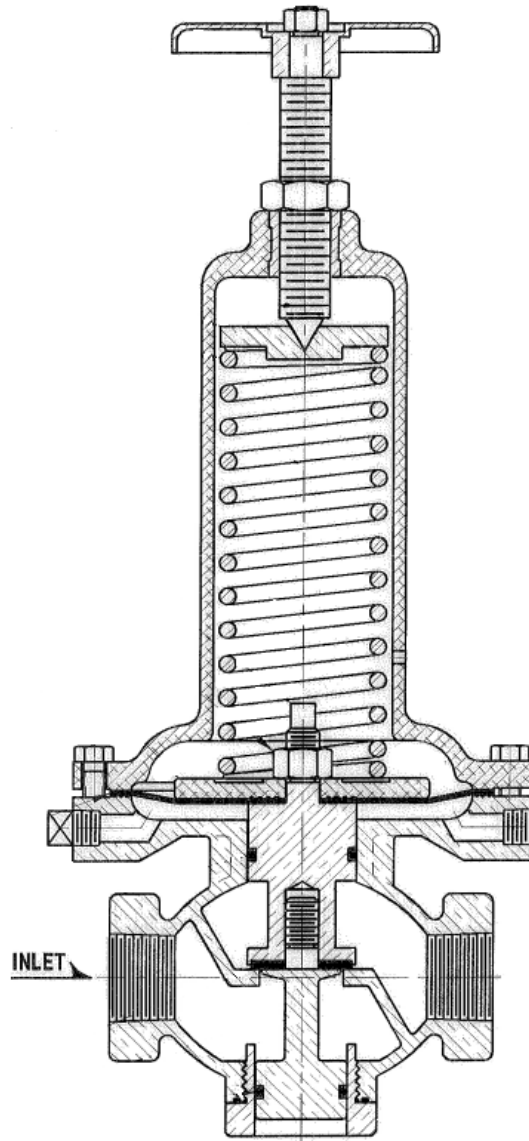
The Figure 667 pilot is "pressure balanced" such that changes in inlet pressure have no effect on the pressure at which it opens.

The valve is typically incorporated into a differential piston control valve pilot system. The pilot is closed whenever system pressure is below its set pressure and it retains pressure on top of the main valve piston thereby holding the main valve closed. The pilot opens when system pressure rises above the set pressure and relieves pressure from on top the main valve piston allowing the main valve to open.

### VALVE CONSTRUCTION

The valve body is made from lead free bronze. Internal "wetted" components are made from stainless steel and the valve seat is made from Buna-N rubber.

The diaphragm is nylon reinforced Buna-N. The adjusting spring is alloy steel and is enclosed in an aluminum spring chamber.



Refer to Pages 4 and 5 for parts identification and location for each size Figure 667 pilot valve.

## START-UP

Refer to the Installation, Operation and Maintenance Manual for the start-up procedure applicable to the pilot-operated control valve being installed.

## PREVENTATIVE MAINTENANCE

The Figure 667 pilot valve does not require routine lubrication or adjustments. After the initial start-up, periodic visual inspection is recommended.

Perform any additional preventative maintenance procedures as recommended in the Installation, Operation and Maintenance Manual for the pilot-operated control valve being installed.

## ADJUSTING THE PRESSURE SETTING

The pressure at which the Figure 667 pilot valve opens is typically factory set but can be field adjusted within the range of the pilot's installed spring.

If the required pressure setting is higher than the installed spring's maximum setting, the spring must be changed.

Turning the pilot handwheel clockwise raises the opening pressure, turning it counterclockwise lowers the opening pressure. The below tables list the change in pressure per full 360 degree turn of the handwheel.

GA Industries Figure 667 pilot valves are available with ½", 1" or 2" NPT connections. The ½" size can be supplied with a 5-inch or 7-inch diaphragm, as measured by the outside diameter of the pilot. The 1" and 2" sizes are supplied only with a 7-inch diaphragm.

**½" Size with 5-inch Diaphragm**

SPRING COLOR	MAX SETTING	WIRE DIAMETER	CHANGE PER FULL TURN
White	20 PSI	0.250"	0.64 PSI
Green	45 PSI	0.313"	1.7 PSI
Black	110 PSI	0.375"	4.5 PSI
Red	155 PSI	0.438"	9.1 PSI
Yellow	250 PSI	0.500"	18.6 PSI
Blue	330 PSI	0.563"	36.0 PSI

**½" Size with 7-inch Diaphragm**

SPRING COLOR	MAX SETTING	WIRE DIAMETER	CHANGE PER FULL TURN
Yellow	10 PSI	0.219"	0.25 PSI
Green	20 PSI	0.250"	0.50 PSI
Black	30 PSI	0.313"	1.2 PSI
White	50 PSI	0.375"	2.3 PSI
Red	100 PSI	0.500"	7.2 PSI
Blue	125 PSI	0.563"	11.0 PSI

**1" Size with 7" Diaphragm**

SPRING COLOR	MAX SETTING	WIRE DIAMETER	CHANGE PER FULL TURN
Yellow	10 PSI	0.219"	0.50 PSI
Green	20 PSI	0.250"	0.55 PSI
Black	35 PSI	0.313"	1.3 PSI
White	55 PSI	0.375"	2.5 PSI
Red	110 PSI	0.500"	8.0 PSI
Blue	125 PSI	0.563"	12.0 PSI

**2" Size with 7" Diaphragm**

SPRING COLOR	MAX SETTING	WIRE DIAMETER	CHANGE PER FULL TURN
Yellow	12 PSI	0.219"	1.2 PSI
Green	25 PSI	0.250"	0.6 PSI
Black	40 PSI	0.313"	1.4 PSI
White	60 PSI	0.375"	2.8 PSI
Red	125 PSI	0.500"	9.0 PSI
Blue	153 PSI	0.563"	13.0 PSI

## TROUBLESHOOTING

### Leakage from the bottom of the valve

- Worn lower stem O-ring (3) – Replace

### Leakage from weep hole in spring chamber (14)

- Loose stem nut (11) - Tighten
- Worn/damaged diaphragm (9) – Replace

### Leakage detected from main valve outlet that stops when pilot discharge stop valve is closed

- Worn/damaged pilot rubber seat (2) – Replace
- Damaged valve body seat (1) – Replace pilot

Refer to pages \_\_ to \_\_ for part location. Rubber parts are included in Repair Kit, see page \_\_.

## REPAIR PROCEDURE

Most repairs involve the installation of a soft goods repair kit. It's a rare case when any of the metal components need replacement but they should be inspected for wear or damage upon disassembly and replaced if needed.

### **CAUTION**

Repairs should be conducted by skilled technicians who have read all instructions and are familiar with the equipment and associated drawings. Follow all safety procedures.

### **WARNING**

Before starting repairs, ensure valve is isolated from the system and properly locked out and tagged to prevent accidental pressurization. Completely depressurize the valve before commencing work.

The pilot valve can be repaired without removing it from the control valve piping. Ensure all stop valves in control piping that could supply pressure to the pilot being repaired are closed.

#### Disassembly:

1. Note the position of the handwheel (18) by exactly measuring its distance from the adjusting screw locknut (17) or counting the number of exposed threads on the adjusting screw (16). This will allow the pilot to be returned to its original pressure setting after repair.
2. Loosen the adjusting screw locknut (17) and turn the handwheel (18) counterclockwise to relieve all spring compression. It's not necessary to completely unscrew the adjusting screw (16) from the spring chamber (14).
3. Remove the spring chamber screws (15) and lift off the spring chamber (14) exposing the spring guide (13) and spring (12). Inspect the spring for excessive corrosion, replace if necessary. Remove the spring guide and spring and set aside.
4. Remove the body cap (8) and O-ring (23) on the bottom of 1" and 2" pilots.
5. ½" and 1" pilots have a screwdriver slot in the bottom of the lower stem (4) while the 2" pilot has wrench flats in the lower spool (4). With a screwdriver or wrench securing the lower stem/spool, turn the stem nut (11) counterclockwise with another wrench. Remove the stem nut (11), diaphragm disc (10) and diaphragm (9).
6. For ½" pilots, remove the diaphragm washer (8) and stem gasket (5).
7. With the screwdriver or wrench securing the lower stem/spool, use a wrench to grasp the stem (6) by its wrench flats and unscrew the lower stem/spool (4) from the stem (6).
  - a. Note that 2" pilots have a separate upper spool (5) and stem (6).
8. Internal components can now be removed through the top and bottom of the body by hand.
9. Remove the upper and lower stem/spool O-rings (3 & 7) and the rubber seat (2).
10. Inspect the sealing surfaces of the internal components, body, and bottom cap for wear, scoring or gouges. Pay particular attention to the surface where the rubber seat (10) seals on the body for evidence of wear or damage. Clean and polish all sealing surfaces using very fine wet or dry emery cloth. Replace any components that cannot be returned to an unblemished sealing surface.

#### Reassembly:

1. Apply a thin coat of approved grease to the new upper and lower O-rings (3 & 7) and install in the grooves on the upper stem/spool and lower stem/spool (4, 5, 6).
2. Install a new rubber seat (10) in the recess on the bottom of the upper stem/spool (6, 5).
3. Apply a thin coat of grease to the inside of the body bore and insert the upper stem (or 2" upper spool and stem) into the body being careful not to damage the upper O-ring. Push in by hand until the rubber seat (10) is resting on the body seat.

4. For ½" pilots only:
  - a. Apply a thin coat of approved grease inside the bottom bore of the body.
  - b. Insert the lower stem (4) through the bottom of the body being careful not to damage the lower stem O-ring (3).
5. For 1" and 2" pilots only, insert the lower stem/spool (4) through the bottom of the body.
6. Using a wrench and a screwdriver (½" and 1" pilots) or two wrenches (2" pilot) tightly screw the lower stem/spool and upper stem together.
7. For 1" and 2" pilots:
  - a. Apply a thin coat of approved grease to the inside of the body cap (22).
  - b. Apply approved grease to the new bottom cap O-ring (23) and insert into the groove on the bottom of the body.
  - c. Install the body cap (22) being careful not to damage the lower stem/spool O-ring (3). Tighten securely.
8. Install the stem nut (11) a few turns and use it to pull up and push down to ensure the internal components move without binding or sticking. Remove the stem nut.
9. For ½" pilots, install a new stem gasket (8) and the diaphragm washer (5).
10. Place the diaphragm (9) over the stem followed by the diaphragm disc (10) and stem nut (11).
11. Using two wrenches, secure the upper stem (6) while tightening the stem nut (11).
12. Place the spring (12) in the recessed groove in the diaphragm disc (10) and the spring guide on top of the spring (12).
13. Place the spring chamber (14) over the spring, being careful not to move the spring or knock off the spring guide.
14. Align the holes in the spring chamber (14) with those in the body (1) and ensure the diaphragm (9) will be clamped all around.
15. Install spring chamber screws and snug then tighten in an alternating pattern. These screws need to be very tight.
16. Turn the handwheel (16) clockwise until resistance is felt.
17. Continue to turn the handwheel until it is returned to its original position.
18. If it had been removed, the pilot can now be re-installed in the control valve pilot piping.
19. Slowly open isolating and/or stop valves to introduce pressure. Bleed air from the pilot by loosening the pipe plug opposite from where the impulse line is connected to the pilot. Tighten after the air has been purged.
20. The control valve can now be put back into service.

**REPLACEMENT PARTS**

Genuine replacement parts are available from your local GA Industries representative or from the factory:

VAG USA, LLC  
 234 Clay Avenue  
 Mars, PA 16046 USA  
 Telephone: 724-776-1020  
 Fax: 724-776-1254  
 E-mail: [quotes-ga@vag-group.com](mailto:quotes-ga@vag-group.com)

Please have the nameplate data available when ordering parts.

**REPAIR KITS**

The below Soft Goods Repair Kits are applicable to GA Industries Figure 667 relief pilots. The 1/2" pilot repair kits contain item numbers 2, 3, 7, 8 and 9. The 1" and 2" pilot repair kits contain items 2, 3, 7, 9 and 23.

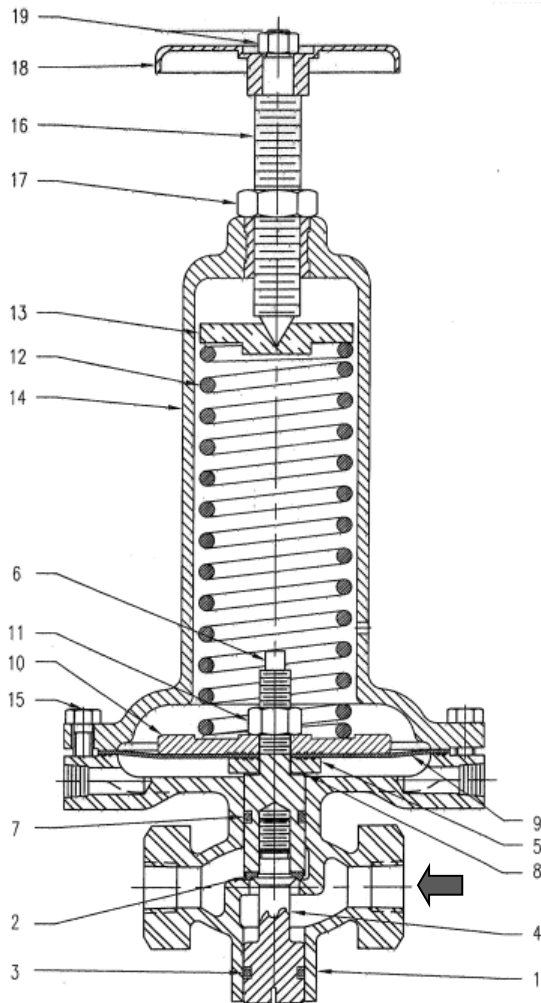
**Relief Pilot Repair Kits**

Size	Kit Number	Part Number
1/2" -5 inch	P5	2-80-23000-026
1/2" -7 inch	P7	2-80-23000-027
1"	P1REL/RED	2-80-23000-017
2"	P2REL	2-80-23000-023

All other parts are ordered separately.

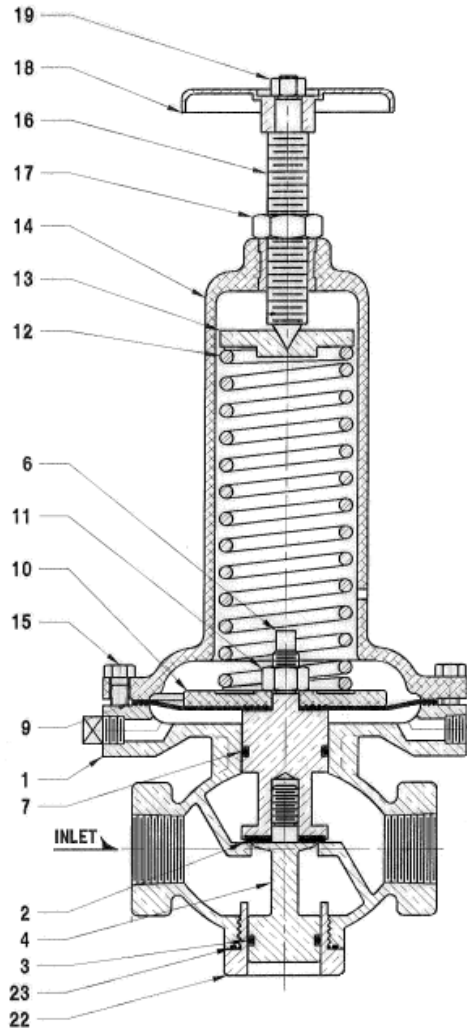
**WARRANTY:**

The Warranty for GA Industries valves is included in our Terms and Conditions which can be found here: <https://gairindustries.com/terms>



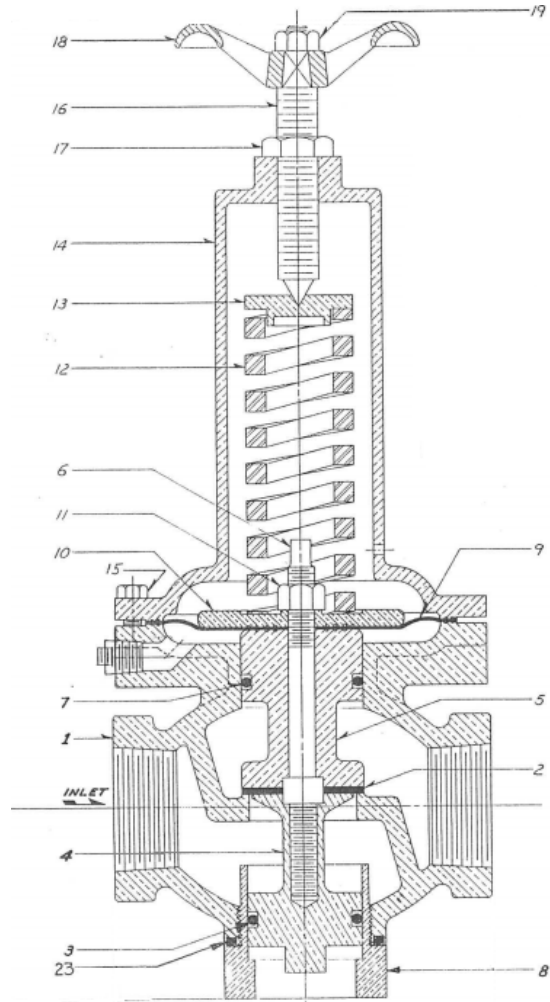
**1/2" PILOT PARTS LIST**

Item	Description
1	Body
2	Rubber Seat
3	Lower Stem O-Ring
4	Lower Stem
5	Diaphragm Washer
6	Upper Stem
7	Upper Stem O-Ring
8	Stem Gasket
9	Diaphragm
10	Diaphragm Disc
11	Stem Nut
12	Spring
13	Spring Guide
14	Spring Chamber
15	Spring Chamber Screw
16	Adjusting Screw
17	Adjusting Screw Locknut
18	Handwheel
19	Handwheel Nut



**1" PILOT PARTS LIST**

Item	Description
1	Body
2	Rubber Seat
3	Lower Stem O-Ring
4	Lower Stem
5	Not Used
6	Upper Stem
7	Upper Stem O-Ring
8	Not Used
9	Diaphragm
10	Diaphragm Disc
11	Stem Nut
12	Spring
13	Spring Guide
14	Spring Chamber
15	Spring Chamber Screws
16	Adjusting Screw
17	Adjusting Screw Locknut
18	Handwheel
19	Handwheel Nut
22	Body Cap Bushing
23	Body Cap Bushing O-Ring



**2" PILOT PARTS LIST**

Item	Description
1	Body
2	Rubber Seat
3	Lower O-Ring
4	Lower Stem
5	Not Used
6	Upper Stem
7	Upper O-Ring
8	Body Cap
9	Diaphragm
10	Diaphragm Disc
11	Stem Nut
12	Spring
13	Spring Guide
14	Spring Chamber
15	Spring Chamber Screws
16	Adjusting Screw
17	Adjusting Screw Locknut
18	Handwheel
19	Handwheel Nut
22	Body Cap Bushing
23	Body Cap Bushing O-Ring