



INSTALLATION OPERATION & MAINTENANCE GUIDE



PNEUMATIC LEVEL CONTROLLER

GEN 3

PNEUMATIC LEVEL CONTROLLER

MODEL: GEN 3

Installation, Operation & Maintenance Guide



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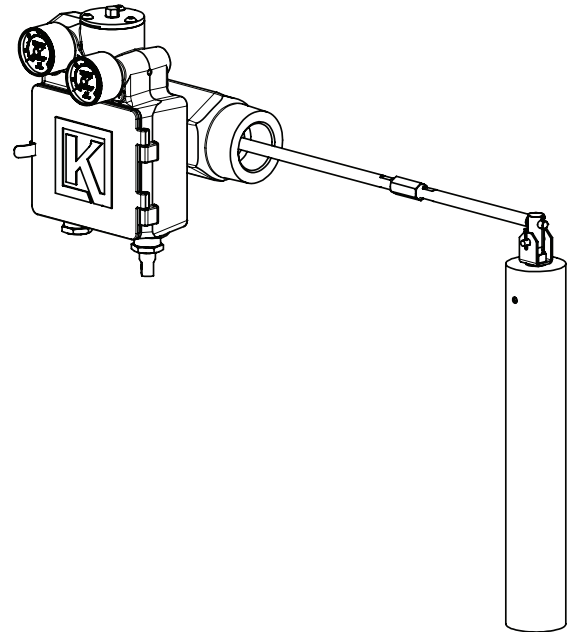
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If you have any questions about this manual, contact your Kimray applications support group before proceeding.

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Introduction

CAUTION:

The instructions provided herein should be completely reviewed & understood before installing, operating or repairing this equipment. All **CAUTION & WARNING** notes must be strictly observed to prevent injury to personnel or damage to equipment.

A1 Scope

This document contains information for the Gen 3 Liquid Level Controller & includes detailed installation, operation & repair/maintenance information for the product.

A2 Description

The Gen 3 Liquid Level Controller is designed for use in single-phase & interface liquid control applications. The pilot is capable of both Snap mode (on/off) & Throttle mode (modulating). Pneumatic output can be set to operate as Direct Acting or Indirect Acting. The mounting body can be flipped to either Left Hand or Right Hand Mount. The displacer may be assembled in vertical or horizontal orientation. Changing between these options does not require additional components nor swapping out pilots.

A3 Definitions

Snap Mode: On/Off, discrete output. Liquid level ranges from high point to low point, large span.

Throttle Mode: Modulating, proportional output. Holds consistent level, with very small span.

Direct Acting: For Fail Closed (FC) aka Pressure-to-Open (PO) Valve. Pilot provides maximum output when liquid level reaches set point at top of span.

Indirect Acting: For Fail Open (FO) aka Pressure-to-Close (PC) Valve. Pilot provides maximum output when liquid level reaches bottom of span.

Left Hand Mount: With front of controller facing operator, unit is mounted on left side of vessel. For Back Mount applications, use this mount option due to the location of the cover latch.

Right Hand Mount: With front of controller facing operator, unit is mounted on right side of vessel.

Set Point: The liquid level at which the controller opens the valve. In Snap Mode, this is at the top of the span. In Throttle Mode, the liquid level should stay consistent at the set point.

Span: Distance between the highest & lowest liquid level during operation. This can be set with the Sensitivity Fulcrum. See "Span Adjustment" below.

CAUTION:

When ordered, the controller configuration & construction materials were selected to meet specific pressure, temperature, & fluid conditions. Do not subject the controller to any other conditions without first contacting the Kimray Inc, sales office or a sales / applications representative.

A4 Tools Needed for Installation, Conversions & Repair

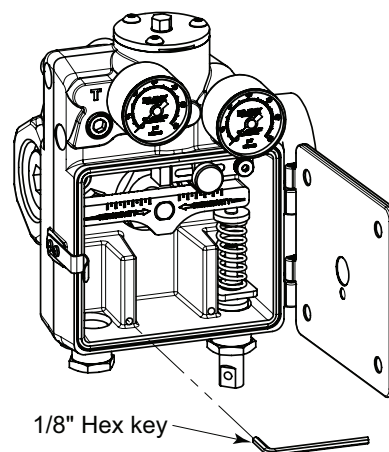
This Kimray controller DOES NOT require special tools for disassembly, inspection & assembly.

These are the standard tools required:

1. Pipe Wrench or other Wrench to fit 2-1/2" Flats.
2. 7/8" wrench for lower 1/2" NPTs
3. 9/16" wrench for Gauges -or- Adjustable Wrench
4. 9/16" socket for the mount screws
5. 3/8" Socket for Pilot Cartridge Caps
6. 1/4" hex key for 1/4" NPT plugs
7. 1/8" Hex Key (included with unit) see below.
8. Thread tape
9. Any equipment needed for tubing connections

The Gen 3 includes a 1/8" hex key which will fit the pilot & lever fasteners.

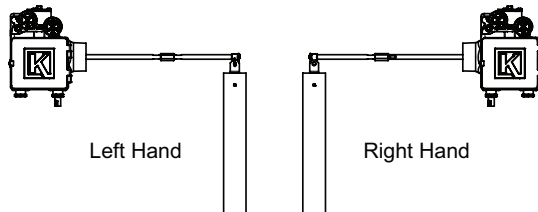
For convenience, the hex key can be stored in the location shown below.



Configuration

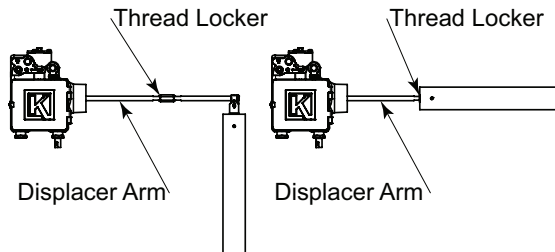
Mount Orientation

The Gen 3 can be ordered in either Left Hand or Right Hand mount, but if you need to change the orientation before installing, see "Left Hand and Right Hand Conversion"



Displacer Orientation

Assemble displacer as shown below for either vertical (typically used for SNAP mode) or horizontal orientation (typically used for THROTTLE). Use thread locker on displacer arm.

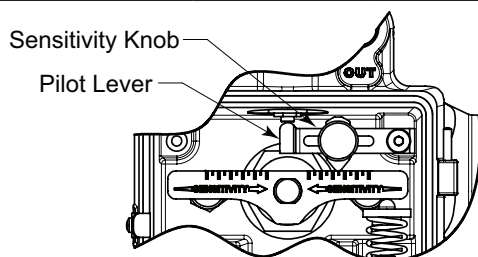


Pilot Action - Direct / Indirect Switch

To switch between Direct and Indirect, move Pilot Lever from one side to the other according to the Pilot Lever Location table below. Move the Sensitivity Knob so that it is facing outward toward operator.

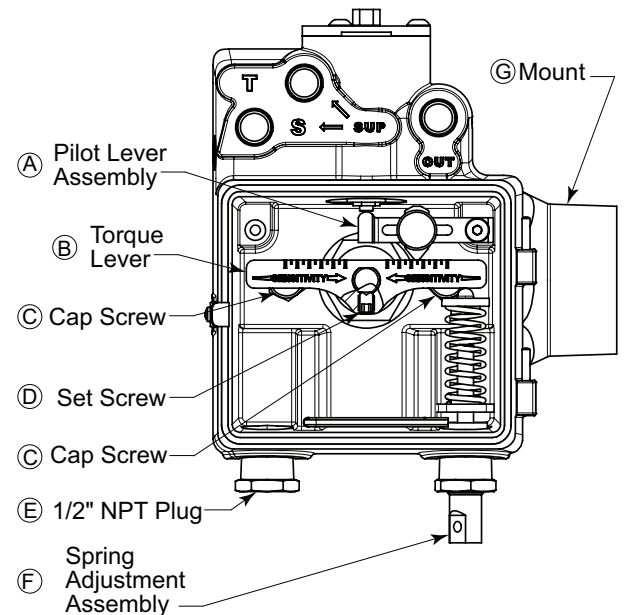
Pilot Lever Location

Pilot Configuration	Throttle	Snap
Direct (For Pressure Open / Fail Closed Valve)	Same side as spring	Opposite side of spring
Indirect (For Pressure Close / Fail Open Valve)	Opposite side of spring	Same side as spring



Left Hand / Right Hand Conversion

1. Remove Spring Adjustment Assembly (F) and 1/2" NPT plug (E).
2. Remove Pilot Lever Assembly (A).
3. Loosen Set Screw (D) at bottom of Torque Lever (B) and slide Torque Lever (B) off shaft.
4. Remove Cap Screws (C) and rotate the Mount (G) 180 degrees.
5. Reinstall Cap Screws (C) with thread locker, replace Torque Lever (B), and tighten Set Screw (D).
6. Reassemble Spring Adjustment Assembly (F) on same side as displacer.
7. Reinstall 1/2" NPT plug (E) on the other side.
8. Reinstall Pilot Lever Assembly (A) on the side shown in the Pilot Lever Location table.-



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Installation

Install Onto Vessel



WARNING:

Before beginning installation, Block & Bleed valve. Make sure all pressure is released from vessel, and confirm no pressure remains in supply gas/instrument air lines. Do not install in a location where Max Allowable Working Pressure could be exceeded. Read and follow instructions.

NPT Connection: Apply PTFE tape or pipe compound to the male threads of the threaded mount. Tighten sufficiently to seal the threads using a wrench on the flats of the mounting piece.

Do not use a wrench on the aluminum enclosure/cover to tighten the connection. Make sure the enclosure is aligned vertically with the pilot on top when finished.

Flanged Connection: Remove the masking sticker from the raised face of each end connection & use a suitable gasket between the mount and the vessel connection flange.



NOTE:

When a Seat Gasket is disturbed during disassembly a new Gasket should be installed during re-assembly to

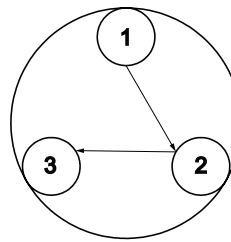
ensure proper sealing.



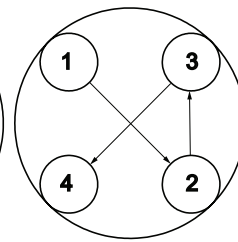
NOTE:

Always check fastener tightness prior to installation, testing, and use, as fasteners have the potential to loosen in transit. This is recommended to ensure your safety and proper function of the unit.

Kimray assembly torque method below



Three Bolt



Four Bolt

Installation

Connections

WARNING: Do not install or tighten any fittings, gauges, or any other connections while there is pressure on the line.

Remove plastic plugs from 1/4" NPT openings. Use 1/4" or 3/8" tubing (not provided).

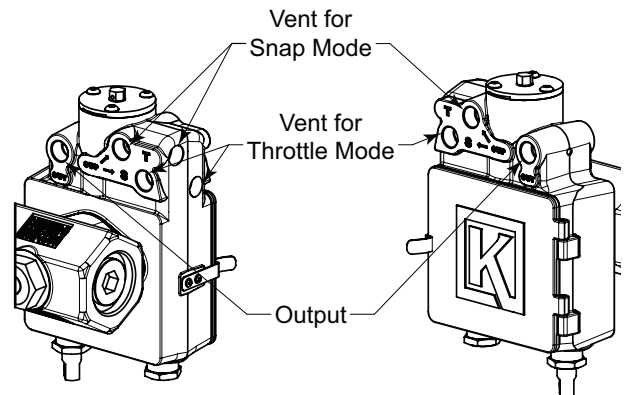
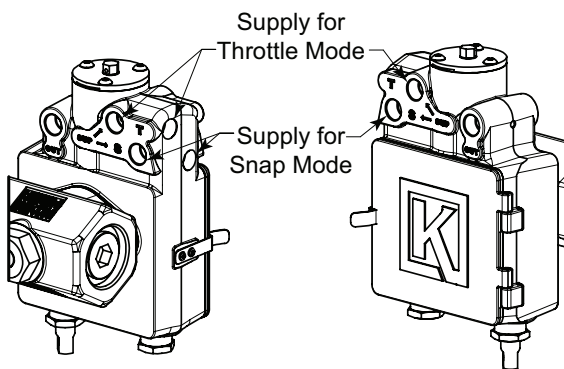
Throttle Mode: Connect supply gas filter and pressure gauge to any of the three ports labeled "T" and plug the remaining "T" port. Connect supply line to filter. Use "S" ports for Vent.

Snap Mode: Connect supply gas filter and pressure gauge to any of the three ports labeled "S" and plug the remaining "S" port. Connect supply line to filter. Use "T" ports for Vent.

Vent: Connect a Vent Line or Breather Plug to one of the three Vent ports, and install plugs in remaining two ports.

Output: Connect pressure gauge to either port labeled "OUT", where it is easiest for operator to see. Connect output line to remaining "OUT" port.

CAUTION: Ensure supply gas is clean and dry.



Snap and Throttle Mode Switch

To switch from one mode to the other, swap all "T" (Throttle - top row) port connections with "S" (Snap - bottom row) port connections (including supply gas filter) and move Pilot Lever from one side to the other. See Pilot Lever Location table on page 5.

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Operation

Start-up



WARNING:

Verify all pressure connections are tight before pressurizing the system.



WARNING:

Never stand directly in front of or over a controller when the system is pressurized.



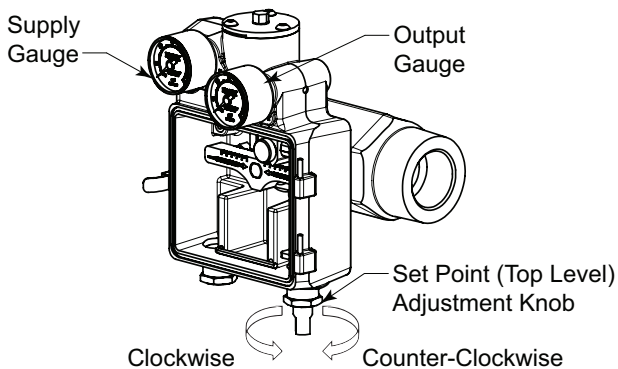
WARNING:

Do not exceed Maximum Allowable Working Pressure or maximum instrument supply pressure. Never loosen or tighten any fitting while there is pressure on the line.

Pressurize the system. If any leaks are detected, bleed off pressure and address. Failure to take the controller out of service immediately may create a hazardous condition.

Calibration

Calibrate the controller's set point with no liquid on the displacer.



Throttle Mode:

Direct Acting - Fail Closed (aka PO) Valve: With the output at 0 psi, turn the set point adjustment knob counterclockwise to produce about 10 psi. Next, turn clockwise until the output reaches 0 psi.

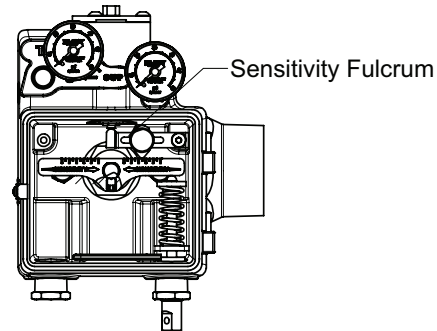
Indirect Acting - Fail Open (aka PC) Valve: With the output at 0 psi, turn the set point adjustment knob clockwise until full output pressure is produced.

Snap Mode:

Direct Acting - Fail Closed (aka PO) valve: With the output at 0 psi, turn the set point adjustment knob counterclockwise to "snap on", producing the full output pressure. Then turn the knob clockwise until the output pressure returns to 0 psi.

Indirect Acting - Fail Open (aka PC) valve: At full output pressure, turn the set point adjustment knob counterclockwise to "snap off" the output pressure to 0 psi. Then turn the knob clockwise until full output pressure is reached.

Span Adjustment



Throttle Mode:

For throttle mode, start with the sensitivity fulcrum at the center hashmark of the pilot lever. Note the current span. If span is too large, move the sensitivity fulcrum inward or outward to another hashmark. If resulting span is larger, move sensitivity fulcrum in opposite direction and note new span. If smaller, continue to move sensitivity fulcrum further in the same direction until constant level or minimum span is achieved.

Snap Mode:

For snap mode, start with the sensitivity fulcrum at the innermost hashmark. This should yield the smallest span. Adjust the fulcrum outward as need until the desired span is achieved.

Set Point Adjustment

Raise Set Point: Turn the Set Point Adjustment Knob clockwise

Lower Set Point: Turn the Set Point Adjustment Knob counterclockwise

Maintenance



WARNING:

A leaking controller is an indication that service is required. Failure to take controller out of service immediately may cause a hazardous condition.



WARNING:

Before beginning repair, Block & Bleed valve. Make sure all pressure is released from vessel, and confirm no pressure remains in supply gas/instrument air lines.

To locate an authorized Kimray repair facility or to find your local Kimray authorized Distributor visit Kimray.com.

When conducting repairs, only use genuine Kimray repair kits and replacement parts. Repair kits and detailed repair instructions & videos are available at Kimray.com

Perform maintenance on a regular basis. An initial inspection interval of 6 months is recommended. Depending on the service conditions and the condition of the controller, the inspection interval may be decreased or increased.

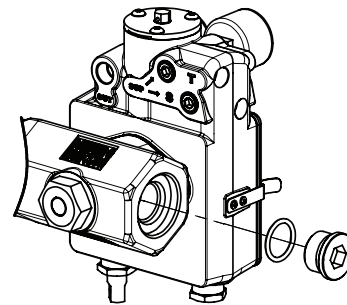
The pilot can be repaired without removing the controller from the vessel as long as the supply air/gas pressure has been bled down and fully released.

Paraffin Cleanout Port

The Gen 3 is equipped with an access port to give the ability to inspect and clean out the area inside the Mount, without having to remove the unit from the vessel. This can help if there are paraffins or other solids that build up over time inside the Mount, restricting movement of the Displacer Rod.



WARNING: Make sure all pressure is released from the vessel before loosening the cleanout port plug.



Repair Kit Replacements

Repair kits contain all seals and wear components recommended to be replaced during scheduled maintenance intervals for the entire unit, including Pilot, Well-Wetted, and Adjustment Spring Assembly Components. The following sections instruct how to replace these components. A list of repair kit components can be found in the kit sheet RK:F001.

Other Replacements

If any other components that were inspected need to be replaced, use the Technical Specs document 08:05.1 to determine which part number(s) are needed and contact your local Kimray authorized store or distributor to order.

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Maintenance - Pilot Assembly

Pilot - Disassembly

Step 1 – Remove 3 socket screws (1/8" hex key) holding pilot to enclosure. Remove pilot by prying under flats and then pulling pilot out.

Step 2 – Remove and discard 4 O-rings around outside of pilot cartridge.

Step 3 – Place flats on lower pilot cartridge into vise or hold in place with wrench.

Step 4 – Unthread and carefully remove flanged top pilot cap to (3/8" socket).

Step 5 – Carefully remove upper diaphragm assembly to avoid damaging conical spring. If diaphragm is stuck, do not pry with screwdriver. Use pliers to pull out diaphragm assembly.

To remove pilot plug, turn pilot assembly over and it will fall out. Inspect pilot plug and seat surfaces shown for scratches, pitting, or any other potential leak paths. Clean off any debris.

Step 6 – Holding flats of pilot cartridge in place, unthread and remove bottom pilot cap (3/8" socket).

Step 7 - Remove lower diaphragm assembly and lower spring. If diaphragm is stuck, do not pry with screwdriver. Use pliers on stem of actuator to pull out diaphragm assembly.

Step 8 - Clean out all communication holes.

Pilot - Reassembly

Step 1 – Clean pilot cartridge and install pilot plug, small diameter first, into the side of the cartridge with the upper seat.

Step 2 – Place conical spring on upper diaphragm assembly. Apply grease to assembly where spring rests.

Step 3 – Place booster spring in top cap. Apply grease in top cap where spring sets.

Step 4 – Place diaphragm assembly in pilot block such that conical spring contacts pilot plug.

Step 5 – Screw the top cap (3/8" socket) into the pilot cartridge. Ensure that spring is centered on the upper diaphragm assembly. Torque top cap to 25-30 in-lbs.

Step 6 – Place lower spring on lower diaphragm assembly and install into lower portion of pilot cartridge.

Step 7 – Install lower cap (3/8" socket) over lower diaphragm assembly. Torque lower cap to 25-30 in-lbs.

Step 8 – Install 4 new O-rings into grooves on outside of cartridge. Apply grease to O-rings.

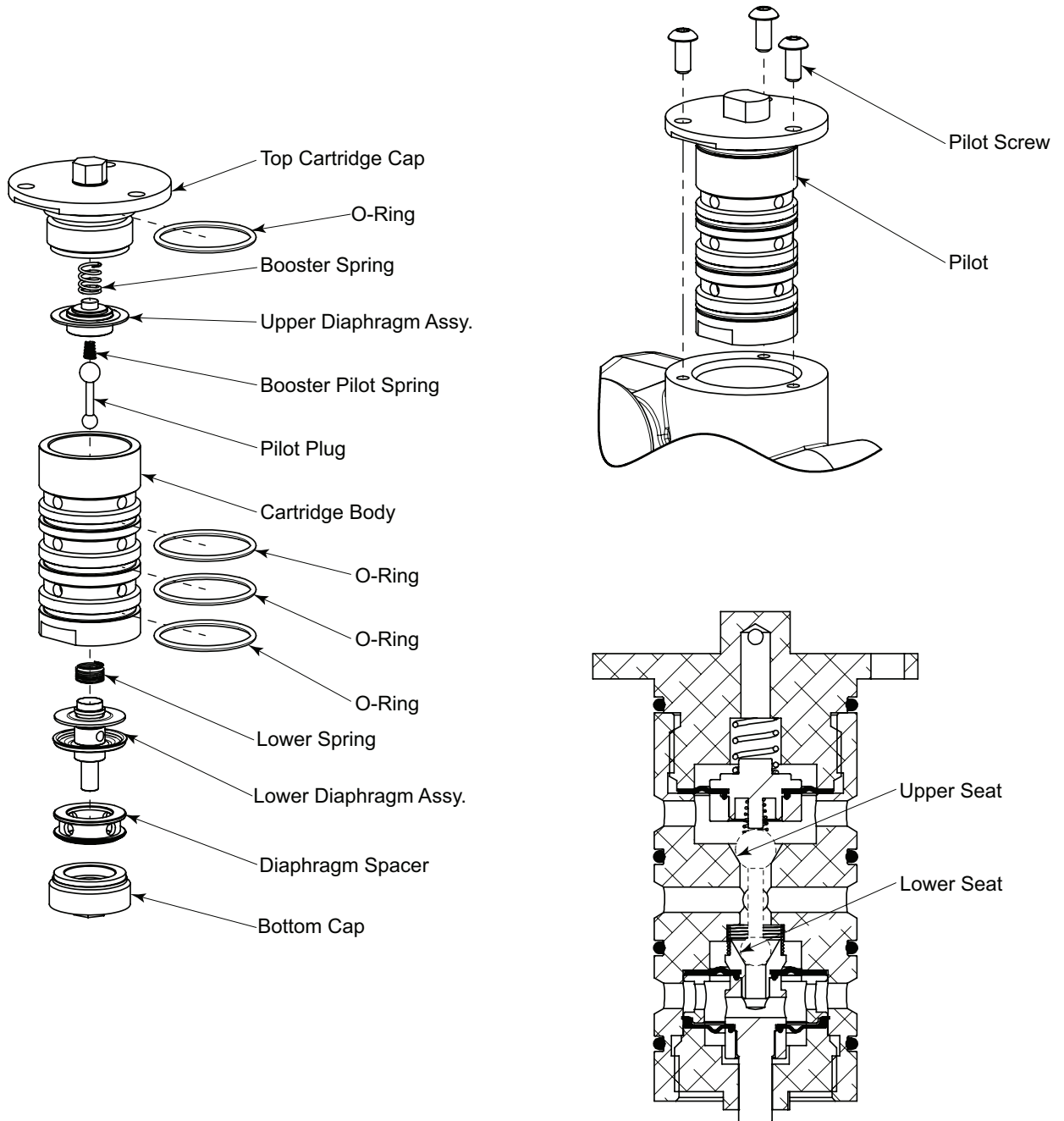


CAUTION: Do not allow grease to get on any other components or into communication holes. If grease gets into pilot plug/seats, or blocks communication paths, the pilot might not operate correctly.

Step 9 – Insert pilot cartridge into enclosure.

Step 10 – Install 3 socket screws (1/8" hex key) to retain pilot.

Maintenance - Pilot Assembly



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Maintenance - Mount Assembly

Mount - Disassembly

Step 1 – Mount controller in vise or stand if available

Step 2 – Remove displacer arm and extensions from mount.

Step 3 – Open and remove cover. Inspect cover gasket for rips or tears.

Step 4 – Relieve force on spring by rotating spring adjuster knob clockwise. Remove spring and upper spring plate.

Step 5 – Remove torque lever by loosening set screw on underside.

Step 6 – Remove mount screws and lift enclosure off of mount, leaving mount in vise if available. Remove and inspect gasket between enclosure and mount for damage.

Step 7 – Remove first bearing hub and shaft. Flip mount and remove second bearing hub. Remove socket plug from end of mount. Remove and discard O-rings from threads.

Step 8 – Remove flanged bearings from hubs. Inspect flanged bearings for wear or damage. Remove and discard O-rings and back-up rings inside hubs.

Step 9 – Inspect shaft for wear or damage. Clean out inside of mount.

Mount - Reassembly

Step 1 – Install O-ring over threaded hubs & socket plug. To avoid seal damage, do not push O-ring over threads. Roll O-ring over threads. Install socket plug. Tighten to 30-35 ft·lbs.

Step 2 – Insert components into both hubs in the following order: back-up ring, O-ring, flanged bearing.

Step 3 – Install a bearing hub on one side of mount. Insert shaft with flats facing side of mount that attaches to enclosure. Install second bearing hub over shaft. Tighten both bearing hubs to 30-35 ft·lbs.

Step 4 – Align mount gasket and enclosure over mounting holes. Apply blue Loctite to mount screws then install.

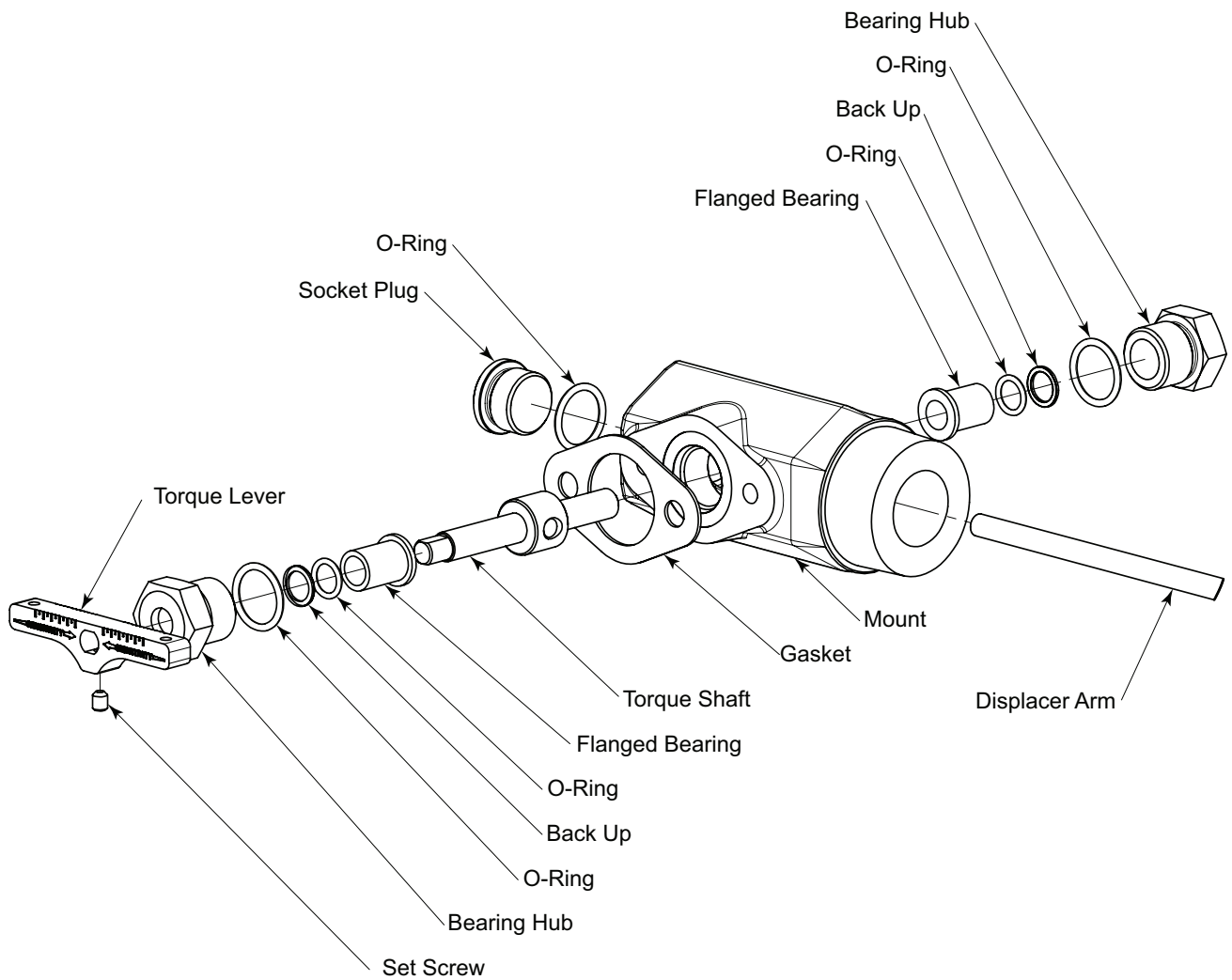
Step 5 – Apply blue Loctite to displacer arm and extension threads (if applicable) and install in shaft.

Step 6 – Slide torque lever over flats of shaft with set screw facing downward. Tighten set screw.

Step 7 – Install spring and upper spring plate.

Step 8 – Install and close cover.

Maintenance - Mount Assembly



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Maintenance - Spring Assembly

Spring Assembly - Disassembly

Step 1 – Rotate spring adjusting knob clockwise to relieve force on spring.

Step 2 – Remove spring and upper spring plate.

Step 3 – Remove ½" NPT spring bushing. Unthread spring assembly from lower spring plate and remove from enclosure.

Step 4 – Remove spring adjusting knob from bushing. Remove and replace PTFE washer and O-ring on spring adjusting knob.

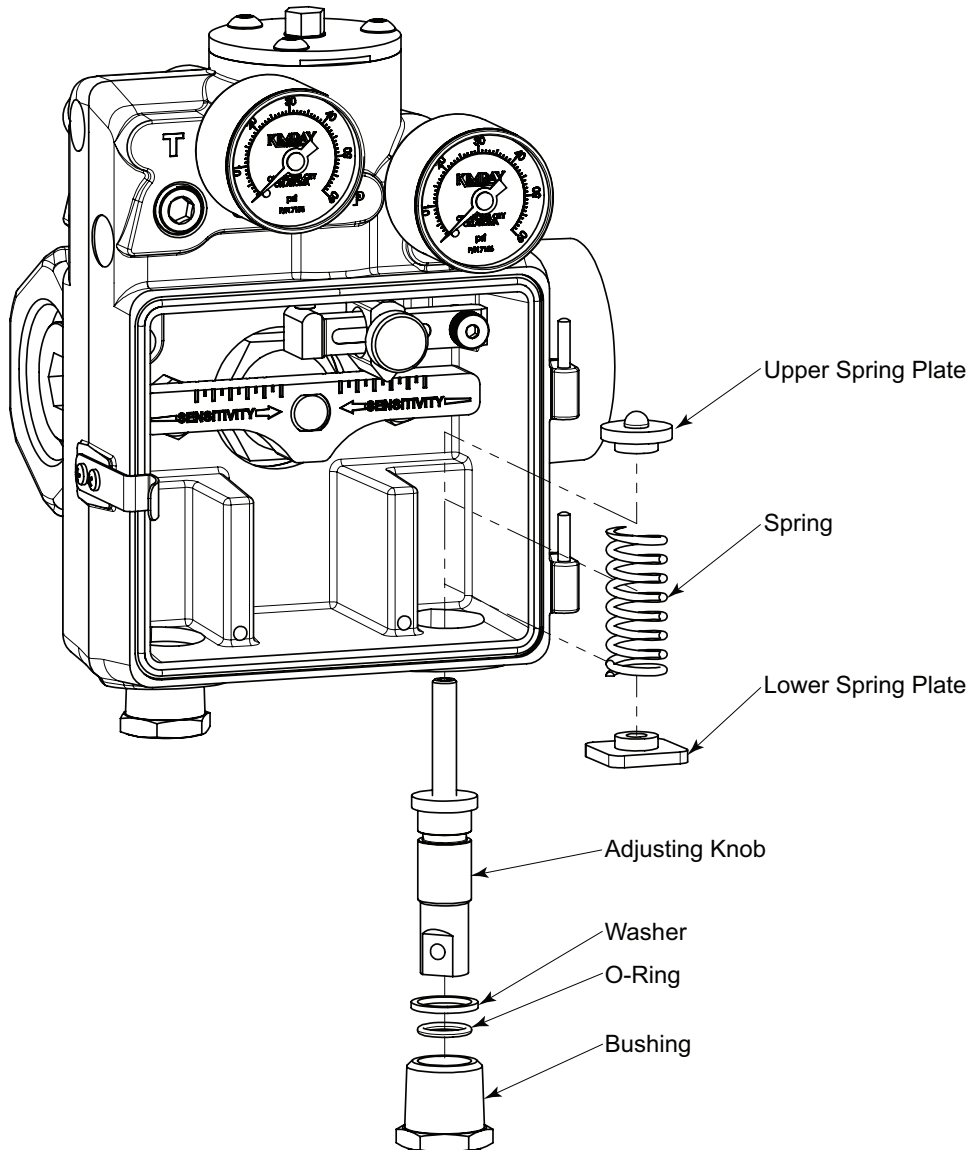
Spring Assembly - Reassembly

Step 1 – Install spring adjusting knob into ½" NPT bushing.

Step 2 – Install bushing and spring assembly into enclosure.

Step 3 – Thread lower spring plate onto adjusting knob. Install spring and upper spring plate.

Step 4 – Rotate spring adjusting knob to set controller level per Calibration instructions on pg. 8.



Maintenance - Filter

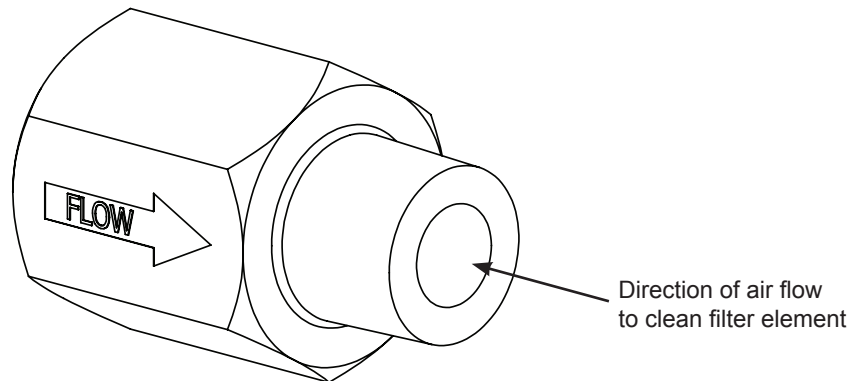
Filter - Disassembly

Step 1 – Shutoff supply pressure to controller and bleed supply line

Step 2 – Remove the supply line from the filter and remove the filter from the controller

Step 3 – Clean out filter element. Using compressed air in the downstream (male) connection will help to ensure debris is dislodged.

Step 4 – Reinstall filter.



TROUBLESHOOTING

Troubleshooting	
Problem	Possible Cause and Solutions
Liquid level over-running the displacer but controller not actuating (above top or below bottom of displacer)	<ol style="list-style-type: none"> 1. No Supply Gas pressure. Check supply source; make sure it is on and regulated to between 15 and 45 psi. 2. Level and/or span settings need to be adjusted. If liquid is overrunning the top of the displacer, turn spring adjustment knob CCW to actuate at a lower level. If liquid is dropping below the bottom of the displacer, turn the spring adjustment knob CW to actuate at a higher level. In SNAP mode, try reducing the span by sliding sensitivity fulcrum towards the center of rotation of the torque lever. 3. Incorrect Direct / Indirect setup. Should be Direct Mode for Fail Closed Valve, and Indirect Mode for Fail Open Valve. See decal on inside of cover for which side the pilot lever should go. 4. Undersized displacer. Switch to a larger displacer. Standard displacer detects 0.2 specific gravity differential. Larger displacers detect 0.1 s.g. differential. 5. Wrong size level adjustment spring. Switch out the spring if displacer size and extension arm length requires, using the chart in Gen 3 Technical Specs Document, pg. 08:05.3 as a guide. 6. Moisture or solids like sand, dirt or errant Teflon tape inside of the pilot or communication holes. Check pilot plug and communication holes and clean as needed. Supply gas must be clean and dry. Add extra filtration if needed. 7. Supply line blockage. Disconnect supply lines and clean them out. Ensure there are no dips/low spots in the line, which can allow water to collect and freeze, causing complete blockage. 8. Downstream pressure in vent line due to gas gathering system. Increase supply pressure (45 psi max) or reduce the downstream pressure of the gas gathering system. 9. Obstructions in vessel like sand buildup, collars, weir plates or emulsion dumping onto the displacer could prevent full range of motion of the arm or displacer. Minimize span to get actuations within smaller travel range, change displacer orientation or add/remove arm extensions to avoid obstructions. 10. Build-up of paraffins/solids in collar preventing full range of motion of displacer arm. Remove cleanout port plug to clean out solids. Caution: Bleed down vessel pressure completely before loosening/removing plug.
continued on next page	

Troubleshooting cont.	
Problem	Possible Cause and Solutions
Valve not dumping fast enough or closing fast enough, even though controller is actuating when it should	<ol style="list-style-type: none"> 1. Supply/Output/Vent gas blockages inside pilot or communication holes in the controller. Remove pilot from controller, disassemble, clean out and remove any moisture from all pilot components. Blow out the supply, output, and vent communication holes throughout the controller. 2. Contamination or liquid in supply lines impeding the flow of supply gas. Remove supply lines and clean them out. Ensure there are no dips in the lines where moisture could collect and pool. 3. Insufficient supply gas pressure to fully actuate valve. Increase supply gas pressure (45 psi max) 4. Vent too slow. Kimray offers a Quick Exhaust fitting, which bypasses the pilot during the vent cycle, allowing valve to return to fail position faster. 5. Downstream pressure in vent line due to gas gathering system. Increase supply pressure (45 psi max) or reduce the downstream pressure of the gas gathering system. 6. Displacer Orientation. To get actuations with less liquid level movement switch to horizontal displacer orientation if vessel space allows. 7. Hardened Diaphragms in Pilot. Replace elastomers. Kimray offers full repair kits containing all soft components to be replaced at regular service intervals. 8. Valve inappropriately sized. Check valve sizing using Sizing Calculator page on Kimray.com. Change to different sized trim or replace with appropriately sized valve if needed. 9. Obstruction inside valve not allowing valve to close or open fully. Block and bleed valve, then remove trim and check for obstructions. 10. Blown actuator diaphragm in valve. Block and bleed the valve, then open up the actuator and replace the actuator diaphragm. 11. Obstructions in vessel like sand buildup, collars, weir plates or emulsion dumping onto the displacer could prevent full range of motion of the arm or displacer. Minimize span to get actuations within smaller travel range, change displacer orientation or add/remove arm extensions to avoid obstructions. 12. Build-up of paraffins/solids in collar preventing full range of motion of displacer arm. Remove cleanout port plug to clean out solids. Caution: Bleed down vessel pressure completely before loosening/removing plug.
Controller Vents or Outputs continuously	<ol style="list-style-type: none"> 1. Damaged o-rings or diaphragms in pilot. Remove pilot, disassemble and inspect pilot O-rings and diaphragms and replace those needed. 2. Teflon tape, wet gas, or other obstructions on pilot plug or seats causing it to stick. Clean pilot plug, seat, and pilot communication holes. Ensure filter is clean and add extra filtration if needed.
Gas emitting into atmosphere from somewhere other than vent port, like out bottom of pilot or out of breather hole in top of pilot	Damaged O-rings or diaphragms in pilot. Remove pilot, disassemble and inspect pilot O-rings and diaphragms and replace those needed.
Oil going into gas line even though oil top level is staying within sight glass	Foaming Oil. Use defoamers or other chemicals to help prevent foaming. Address containments in flow stream causing the foaming.
For more details, watch our Gen 3 Troubleshooting Video on the Kimray Youtube Channel.	

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Kimray is an ISO 9001- certified manufacturer.
Kimray quality assurance process maintains strict controls
of materials and the certification of parts used in the Kimray severe service control valve.

Please visit our website for up to date product data www.Kimray.com

For questions or comments, contact your local Kimray authorized distributor, or visit www.kimray.com.

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‡ Configuration of Back Pressure Valve is a trademark of Kimray, Inc.

WHO WE ARE

Kimray is a manufacturer of oil and gas control equipment based in Oklahoma City, Oklahoma, USA.

Trusted for generations, Kimray has been creating simple, effective solutions for temperature, level, flow, and pressure control since 1948. Common applications include separation, heating, compression, dehydration, and artificial lift.

Buying from Kimray is about much more than the product. We are partners with hearts to serve. The relationships between our representatives and our customers extend from before the sale through the life of the product. Our focus is not on short-term profits but long-term growth for our customers.

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