

Installation & Maintenance Instructions

**PUSH-TYPE LINEAR ACTUATOR
WITH ON/OFF OR HIGH/LOW/OFF OPERATION
WITH GENERAL PURPOSE OR WATERTIGHT ENCLOSURE**

SERIES

P159A

⚠ WARNING

To prevent the possibility of death, serious injury or property damage, the actuator must be installed and serviced only by a qualified service technician avoiding the following hazards:

- **Electrical hazard:** Turn off all electrical power to actuator.
- **Risk of electric shock:** More than one disconnect switch may be required to de-energize the device for servicing.
- **Pressure hazard:** Depressurize valve and vent hazardous or combustible fluid to a safe area before inspection or removal of the actuator or valve from service.
- **Explosion, fire or toxic gas hazards:** Extinguish all open flames and avoid any type of sparking or ignition during leakage testing.

⚠ AVERTISSEMENT

Afin de prévenir le risque de décès, de graves blessures ou de dommage matériel, l'actionneur doit être installé et entretenu exclusivement par un technicien de maintenance qualifié, en évitant les dangers suivants:

- **Danger électrique:** Coupez toutes les sources d'alimentation électrique de l'actionneur.
- **Risque d'électrocution:** Plus d'un interrupteurs de coupure peuvent s'avérer nécessaires pour mettre l'appareil hors tension pour les opérations de maintenance et de réparation.
- **Danger lié à la pression:** Dépressurisez la vanne et évacuez le fluide dangereux ou combustible vers une zone sécurisée avant d'inspecter ou de retirer la vanne du service.
- **Risques d'explosion, d'incendie et de gaz toxiques:** Éteindre toutes les flammes nues et éviter tout type d'étincelle ou d'ignition pendant les essais de détection de fuite.

Service Notices

See separate 158A Series Gas Valve or V710_B Gas Valve Installation and Maintenance Instructions for information on: Operation, Positioning, Mounting, Piping, Strainer or Filter Requirements, Flow Controls, Preventive Maintenance and Cause of Improper Operation.

Do not install the P159A Series Actuator with general purpose enclosure (Type 1) in a location subject to weather, wash down or other sources for water ingress. Use Type 4 version of the actuator with watertight enclosure for these locations.

DESCRIPTION

The P159A Series Hydraulic Actuator is a self-contained linear, push-type actuator which extends when powered and retracts by spring force upon power interruption.

The P159A Series Actuator is typically used for control of gas-fired heating equipment, commonly to open and close a valve or both a valve and damper. The P159A Series Actuator positions 158A Series Gas Valves or V710_B Series Gas Valves.

OPERATION

P159A1 - ON/OFF ACTUATOR

Application of electrical power simultaneously drives an electric pump and closes a normally-open dump valve, resulting in up to 1100 N (250 lbf) of force on the actuator stem. This extends the actuator stem and attached valve poppet, to open the valve and/or damper.

Upon reaching the fully extended position, a travel limit switch interrupts power to the electric motor while maintaining power to the dump valve, thus stabilizing hydraulic pressure to hold shaft position. Position indicators on both sides of the actuator show the actual position of the valve stem. Upon power interruption, the dump valve opens, releasing hydraulic pressure and allowing the return spring to retract the stem and close the valve fully. Closing time is one second or less.

P159A2 - HIGH/LOW/OFF ACTUATOR

Application of electrical power simultaneously drives an electric pump and closes a normally-open dump valve and control valve, resulting in up to 1100 N (250 lbf) of force on the actuator stem. This extends the actuator stem and attached valve poppet, to open the valve and/or damper.

Upon reaching the low fire set point, a low fire switch interrupts power to the motor while maintaining power to the dump and control valves, thus stabilizing hydraulic pressure to hold shaft position.

Closing the external high fire switch causes the actuator to extend beyond the low fire point.

Upon reaching the fully extended position, a travel limit switch interrupts power to the electric motor while maintaining power to the dump valve and control valves, thus stabilizing hydraulic pressure to hold shaft position. Opening the high fire switch de-energizes the control valve allowing the gas valve to return smoothly to the low fire position.

Position indicators on both sides of the actuator show the actual position of the valve stem.

Upon power interruption, the dump valve opens, releasing hydraulic pressure and allowing the return spring to retract the stem and close the valve fully. Closing time is one second or less.

OPTIONAL FEATURES

- **Damper Shaft Arm** is factory-mounted on right hand side. The arm is field-adjustable to 8 positions and can be switched to the left hand side.
 - » **Damper Arm Rating:** Drives damper in one direction only. 9 kgf (20 lbf) maximum at 72.4 mm (2.85 in) radius at -7 °C to 66 °C (20 °F to 150 °F) and 4.5 kgf (10 lbf) maximum at -40 °C to -7 °C (-40 °F to 20 °F). Damper spring and linkage must provide sufficient return force.
 - » **Damper Arm Travel:** 48 mm (1.9 in)
- **Auxiliary Switch** One or Two integral SPDT switches, field adjustable to actuate at any position of stroke. This is not a safety switch.
- **Proof-of-Closure Switch** A single factory set, non-field adjustable, SPDT switch to be used in conjunction with 158A Series Gas Valves or V710_B Series Gas Valves with overtravel seals (See ACTUATOR / VALVE COMPATIBILITY Table).

NOTE: The High/Low/Off Actuator is not available with actuator catalog electrical options 4, Auxiliary and Proof-of-Closure Switch or option 5, Two Auxiliary Switches (See Figure 1).

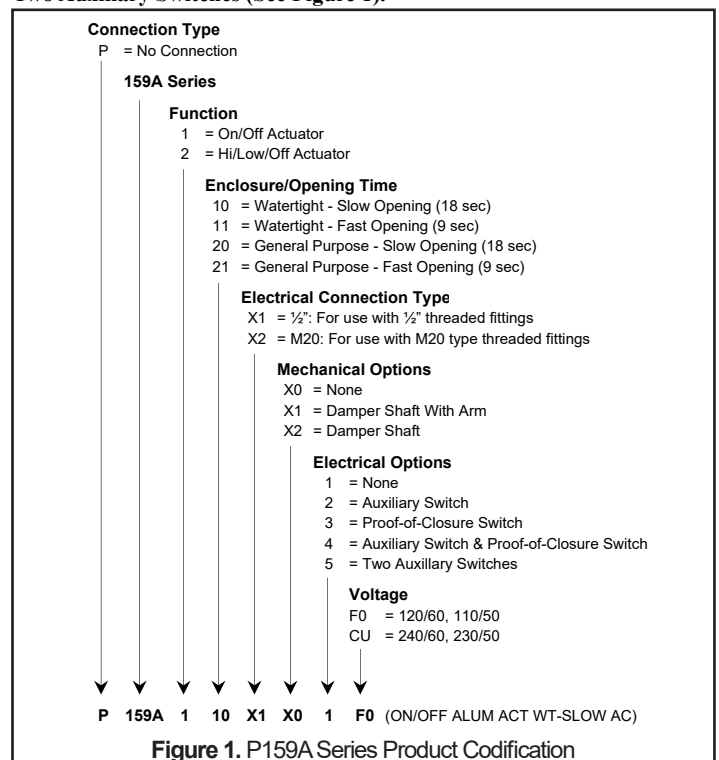


Figure 1. P159A Series Product Codification

ACTUATOR / VALVE COMPATIBILITY

The P159A Series Actuator is designed for use only with ASCO _158A Series Gas Valves or V710_B Series Gas Valves (As shown below):

Actuator	Actuator Electrical Options	Valve/Seal Type	Valve Catalog #
P159A1 ON/OFF	P159A1__X_X_1__ P159A1__X_X_2__ P159A1__X_X_5__	_158A Standard Trim	_158A1 OR _158A5 OR _158A7* OR _158AA* OR _158AC*
	P159A1__X_X_3__ P159A1__X_X_4__	_158A Standard with Seal Overtravel Trim	_158A2 OR _158A6 OR _158A8* OR _158AA**
	P159A1__X_X_1__ P159A1__X_X_2__ P159A1__X_X_5__	V710_B Quick Opening (Standard) Trim	V710_B_
	P159A1__X_X_3__ P159A1__X_X_4__	V710_B Quick Opening with Valve Seal Overtravel Trim	V710_B_V22
P159A2 HIGH/ LOW/ OFF	P159A2__X_X_1__ P159A2__X_X_2__	_158A Linear Trim	_158A3 OR _158A7**
	P159A2__X_X_3__	_158A Linear with Seal Overtravel Trim	_158A4 OR _158A8** OR _158AC**
	P159A2__X_X_1__ P159A2__X_X_2__	V710_B Linear Trim	V710_B_V15
	P159A2__X_X_3__	V710_B Linear with Valve Seal Overtravel Trim	V710_B_V25

* Actuator to be installed on upstream valve position (Closest to valve inlet port)

** Actuator to be installed on downstream valve position (Closest to valve outlet port)

Specifications

Force Output: 1100 N (250 lbf)

Stroke: 28.6±1 mm (1-1/8±0.04 in)

Electrical Characteristics:

ACTUATOR	Operating Voltage/ Frequency	Current, in Amperes		
		Inrush	Opening	Holding
P159A1 ON/OFF	120/60	11	1.7	0.06
	110/50	11.5	2.1	0.065
	240/60	5.0	0.7	0.03
	230/50	5.5	1.0	0.035
P159A2 HIGH/LOW/OFF	120/60	11	1.8	0.12
	110/50	11.5	2.2	0.13
	240/60	5.0	0.7	0.06
	230/50	5.5	1.0	0.07

Opening Time:

Fast Opening:

- Typical time approximately 9 seconds
- At temperatures below -30 °C, actuator may take as long as 30 seconds

Slow Opening:

- Typical time approximately 18 seconds
- At temperatures below -30 °C, actuator may take as long as 60 seconds

Maximum Closing Time: One second

Ambient Temperature and Duty Cycle Limitations

The actuator may be operated in ambient temperature conditions from -40 °C to 66 °C (-40 °F to 150 °F). During normal operation, the P159A series Actuator can be cycled CLOSED to OPEN, up to 4 times per hour at maximum ambient temperature of 66 °C (150 °F). Higher cycle rates are possible with lower ambient temperatures. During commissioning at room temperature of 20 °C (68 °F), the actuator can be cycled up to 60 times per hour.

NOTICE

The P159A Series Actuator is fitted with a self-resetting thermal cutout device. If the recommended temperatures and duty cycles above are exceeded, the thermal cutout may trip causing the actuator to stop in its current position during valve opening. The valve closing time remains one second or less regardless of thermal cutout trip. Once the actuator cools, the cutout will self-reset and the actuator will resume operation. If the cutout trips repeatedly, verify that the application is within the ambient temperature and the duty cycle limits of the actuator. If the application is within the specified operating limits and the cutout continues to trip, replace actuator.

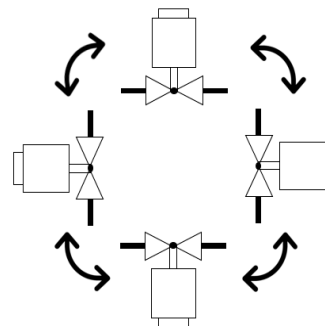
INSTALLATION

Check nameplate for correct catalog number and service. Check the catalog number against Figure 1 to ensure that the actuator meets the requirements of the application. Contact ASCO for more information about this actuator or other actuator options if this actuator is not suitable for your application.

Positioning/Mounting

Follow the _158A or V710_B Series Gas Valves and/or damper manufacturer's instructions when installing the actuator.

1. The P159A Series Actuator can be installed to operate in any position.



2. Check to ensure that the mounting gasket, if applicable, is in the proper position, clean and without damage. Position the actuator to operate the valve (and damper if appropriate). Secure actuator with the three mounting set screws. Tighten set screws to 9,0 ± 0,5 N-m (80 ± 5 in-lbs) using a 4 mm hex bit socket. Ensure actuator base is fully secured against valve body mounting surface for proper operation. (See Figure 2).

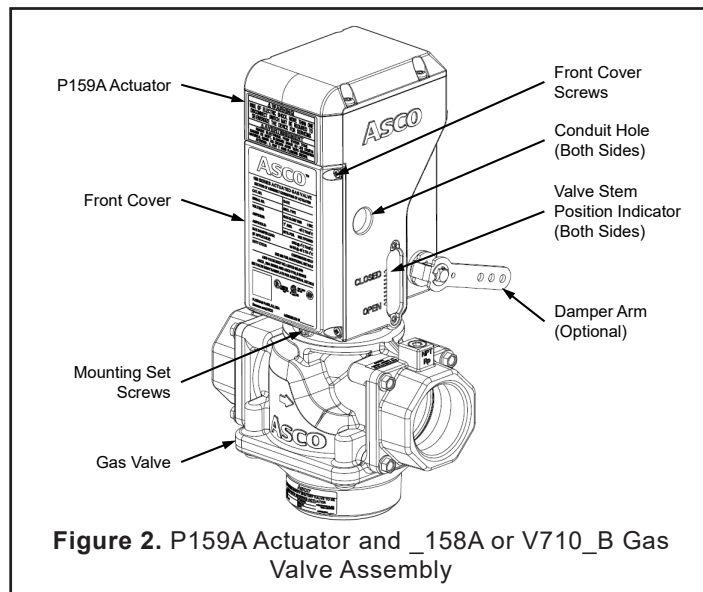
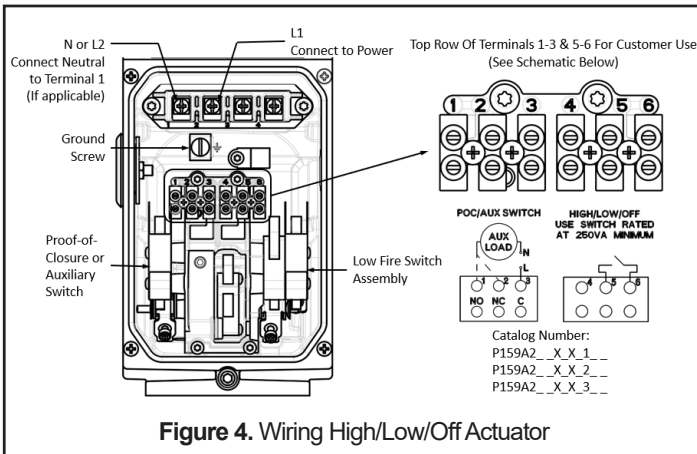
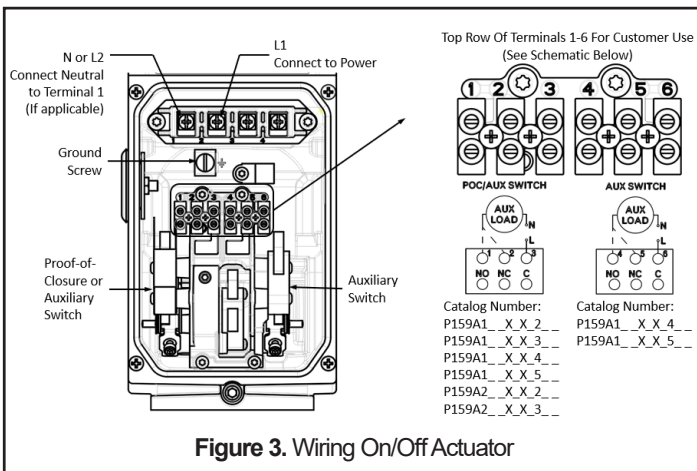


Figure 2. P159A Actuator and _158A or V710_B Gas Valve Assembly

Wiring: (Refer to Figure 3 for On/Off Actuator & Figure 4 for High/Low/Off Actuator)

⚠ WARNING Electrical hazard. To prevent the possibility of death, serious injury or property damage, open all circuits before inspection, service or disassembly.

⚠ AVERTISSEMENT Danger électrique. Afin de prévenir le risque de décès, de graves blessures ou de dommage matériel, ouvrir tous les circuits avant l'inspection, la maintenance ou le démontage.



Wiring must comply with all local codes and NFPA 70 National Electric Code edition appropriate for installation. Installation should conform to all actuator ratings. All wiring must be an approved type suitable for 90 °C.

1. Check the nameplate and confirm that the appropriate power will be supplied to the unit. Turn off all power to the unit prior to servicing. Remove the front cover and set aside to access electrical connections, taking care not to damage the cover O-ring (if applicable). A diagram is located on the inside of the cover to aid in making electrical connections.
2. Upon removing the front cover, a temporary shipping plug will be installed in the right hand side conduit hole. **This plug should be removed & discarded prior to actuator installation.** A reusable conduit plug will be installed on the left hand side (for unused conduit). Install appropriate electrical fittings in the desired conduit holes and replace the reusable plug on the other (if needed). If reusable plug is removed, ensure when reinstalled, the plug is properly centered on conduit opening. Type 4 fittings must be used with watertight units. Tighten watertight plug hex nut until plug gasket is fully compressed against actuator housing surface for watertight seal. Route wiring through the installed electrical fitting(s). Take care not to scratch or otherwise damage the cover sealing surface when working on watertight enclosure.
3. Connect the power wires, stranded 12-14 AWG, to terminals 1 (Neutral/L2) and 2 (Hot/L1). Connect the stranded ground wire of matching gauge, under the grounding terminal saddle provided in the housing below the hot and neutral power terminals.
4. Power Terminal Screw Torque: 1.4 N-m (12 in-lbs)
Ensure all strands are securely fastened under terminal screw.
Ground Screw Torque: 2.3 N-m (20 in-lbs)
Ensure all strands are securely fastened under saddle clamp.
5. Using stranded 12-18 AWG wire, connect wiring from an external high-fire switch (not supplied) to the 3-position terminal strip (position 5 and 6, see wiring diagram). The switch must be rated at 250 VA minimum. Torque terminal strip screws to 0.5 N-m (4.5 in-lbs) (Figure 4).
6. If a Proof-of-Closure or Auxiliary switch is being used make those electrical connections. **Use the markings located on the wiring diagram to determine normally open and normally closed terminals.** Use stranded 12-18 AWG wire. Torque terminal strip screws to 0.5 N-m (4.5 in-lbs). Refer to Auxiliary switch adjustment section on page 4 for instructions on adjusting switch. Proof-of-Closure switches are set at the factory. **Do not adjust Proof-of-Closure switch.**

7. Install the front cover. Be certain that the O-ring (if applicable) and sealing surfaces are clean and there is no damage to the surfaces or O-ring. Snug down all screws before tightening. Torque screws to 1.4 to 1.8 N-m (12 to 16 in-lbs) evenly using crisscross pattern.
8. If the damper arm is being used, connect linkage and adjust as needed for proper operation of the damper.
Damper Arm Adjustment: To reposition the damper arm, remove the e-ring retainer and damper arm then reposition arm and reinstall e-ring. When repositioning arm onto the opposite side, remove e-rings on both sides. Reposition and install on opposite side. **Do not remove the square damper shaft.**
9. Operate actuator (with valve) through five cycles to verify proper operation of valve and damper/ linkage system prior to use.

Auxiliary and Proof-of-Closure Switch Ratings

120 VAC: 7 Amps Resistive, 3 Amps Inductive
240 VAC: 7 Amps Resistive, 3 Amps Inductive

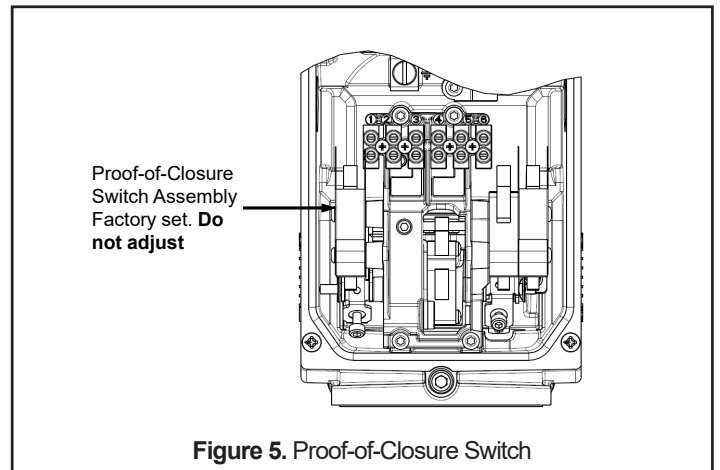
Total connected load of Auxiliary and Proof-of-Closure switches not to exceed 1800 VA.

CAUTION Proof-of-Closure Switch must only be used as per ACTUATOR / VALVE COMPATIBILITY Table on page 2 of 4

ATTENTION L'interrupteur de preuve de fermeture ne doit être utilisé que conformément au tableau de COMPATIBILITÉ ACTIONNEUR / VANNE des pages 2 de 4.

Proof-of-Closure Switch (Refer to Figure 5)

The P159A Series Actuator with the optional Proof-of-Closure switch equipped, is to only be installed on 158A Series or V710 B Series Gas Valves with overtravel seals (See ACTUATOR / VALVE COMPATIBILITY Table on page 2). The Proof-of Closure switch is set at the factory to provide both a mechanical and electrical means of proving valve closed position interlock to the primary control. This switch is not to be field adjusted.



Auxiliary Switch Adjustment (Refer to Figure 6)

NOTE: The Auxiliary switch is not a safety switch.

1. **Before removing the front cover, review WARNING statements on page 1.** Remove front cover (with O-ring, if applicable). Take care not to damage the sealing surfaces and front cover O-ring, if supplied.
2. Insert 2.5 mm Allen key into adjusting screw on auxiliary switch assembly.
3. Turn screw clockwise to move set point towards beginning of actuator stroke. Turn screw counterclockwise to move set point toward the end of the actuator stroke. (Approximately 7.5 turns from 0 to 100% travel).
4. Cycle the actuator to verify the switch setting and readjust as required.
5. Install the front cover. Be certain that the O-ring (if applicable) and sealing surfaces are clean and without damage. Snug down all screws before tightening. Torque screws to 1.4 to 1.8 N-m (12 to 16 in-lbs) evenly using crisscross pattern.

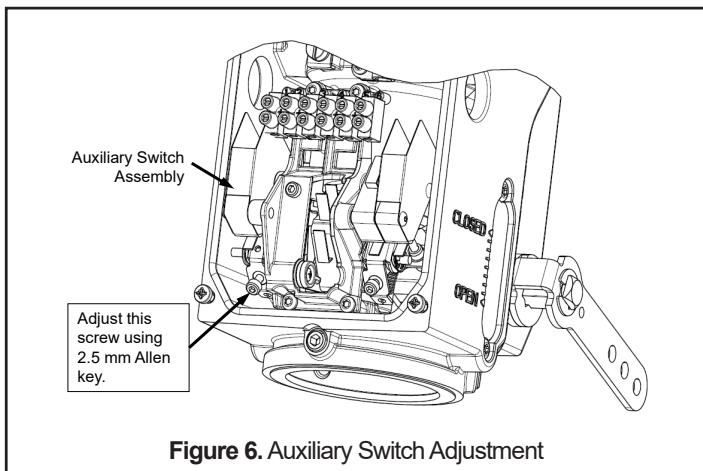


Figure 6. Auxiliary Switch Adjustment

Low Fire Switch Adjustment (Refer to Figure 7)

1. **Before removing the front cover, review WARNING statements on page 1.** Remove front cover (with O-ring, if applicable). Take care not to damage the sealing surfaces and cover O-ring, if supplied.
2. Insert a 2.5mm Allen key into the adjusting screw on low fire switch assembly.
3. The P159A2 Series Actuator is supplied with the Low Fire Switch set at approximately 50% of the valve stroke. Turn screw clockwise to move setpoint towards the beginning of actuator stroke. Turn screw counterclockwise to move setpoint towards the end of the actuator stroke. (One turn = approximately 15% of valve stroke).

NOTE: Do not apply excessive force to the low fire adjustment screw while setting.

Attention: Under some operating conditions, when the low fire set screw is adjusted to less than 15% of the valve stroke, the P159A2 Series Actuator unit may not open when energized from the closed position.

Please unscrew the low fire set screw in 1/4 turn counterclockwise increments until the unit opens when energized. Then further apply 1/2 turn counterclockwise.

4. Cycle the actuator several times to verify the switch setting and readjust as required.
5. Install the front cover. Be certain that the O-ring (if applicable) and sealing surfaces are clean and without damage. Snug down all screws before tightening. Torque screws to 1.4 to 1.8 N-m (12 to 16 in-lbs) evenly using crisscross pattern.

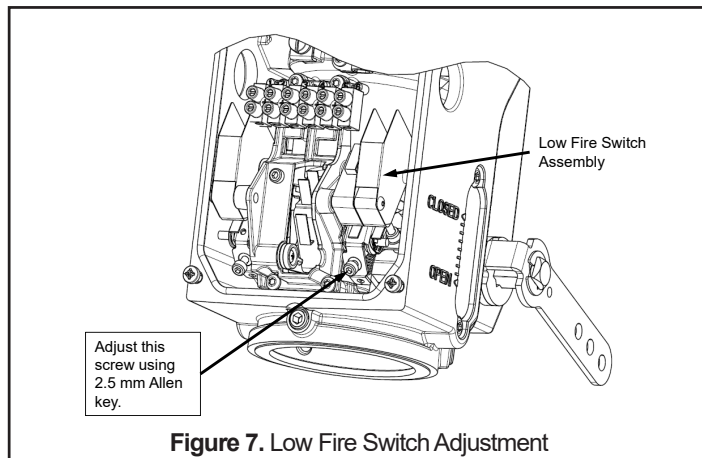


Figure 7. Low Fire Switch Adjustment

MAINTENANCE

Before inspection, maintenance or rebuild, review WARNING statements on page 1. Maintenance should include annual inspection and cleaning. Use a mild cleaning fluid, not aggressive solvents to remove dirt and oil. Organize a maintenance schedule based on environment and frequency of use. Check for loose electrical and mechanical connections and replace damaged parts. Do not remove the top cover for maintenance. There are no serviceable parts contained inside the actuator housing.