

Bray

Your Global Flow Control Partner™

Series 70 24V On/Off Electric Actuator Operation and Maintenance Manual

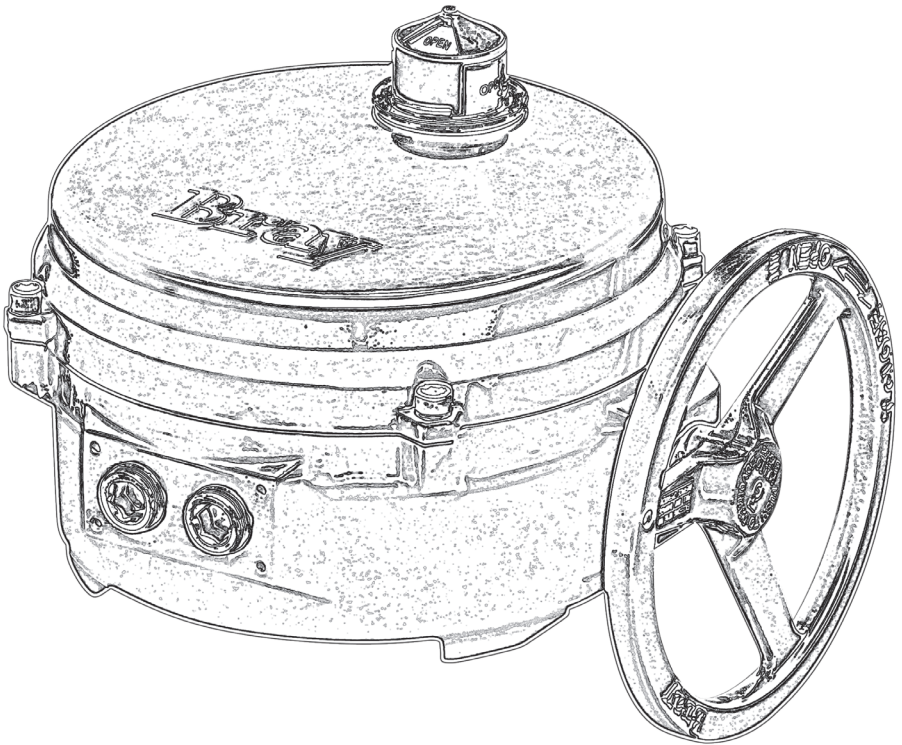


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Read and Follow These Instructions Save These Instructions

1. Definition of Terms



WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE

Used without the safety alert symbol indicates a potential situation which, if not avoided, may result in an undesirable result or state, including property damage.

2. Safety

This device left the factory in proper condition to be safely installed and operated in a hazard-free manner. The notes and warnings in this document must be observed by the user to ensure hazard-free operation of this device.

All necessary precautions need to be taken to prevent damage due to rough handling, impact, or improper storage. Do not use abrasive compounds to clean the device, or scrape its surfaces with any objects.

Configuration and setup procedures for this device are described in this manual. Proper configuration and setup are required for the safe operation of this device.

The control system in which this device is installed must have proper safeguards to prevent injury to personnel, or damage to equipment, should a failure of system components occur.



WARNING

Installation, commissioning, operation and maintenance of the unit must be performed under strict observation of all applicable codes, standards and safety regulations.

The actuator must only be installed, commissioned, operated and repaired by qualified personnel.

As per this document, a qualified person is one who is trained in:

- The operation and maintenance of electrical equipment and systems in accordance with established safety practices.

- Procedures to energize, de-energize, ground, tag and lockout electrical circuits and equipment in accordance with established safety practices.
- The proper use and care of personal protective equipment (PPE) in accordance with established safety practices.

This document does not cover every detail about every version of the product described. It does not take into account every potential occurrence concerning the installation, operation, maintenance and use of this device.

If situations transpire that are not documented in sufficient detail, please request the required information from the Bray Distributor or Representative responsible for your area.

3. Storage

Store units on a shelf or wooden pallet in order to protect against floor dampness.

Cover the units to protect against dust and dirt.

To prevent condensation inside these units, maintain a near constant external temperature and store in a well-ventilated, clean, dry room away from vibration. For units with an internal heater, power should be supplied to the heater via conduit entry with an appropriate sealing gland.



WARNING

Actuators are not weatherproof unless they are properly installed on the valve or prepared for storage. Bray will not accept responsibility for deterioration caused on-site.

4. Operating your Actuator

4.1. Operating by Hand

To engage the manual override, simply pull the handwheel to its outermost position. A yellow stripe is revealed to visually indicate manual override engagement as shown in Figure 1.

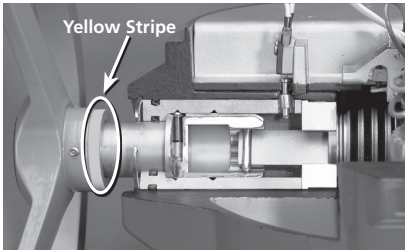


Figure 1. Handwheel is engaged, revealing the yellow stripe.

Once the manual override is engaged, rotating the handwheel in the clockwise direction will rotate the output shaft in the clockwise (close) direction and vice-versa.

To disengage the manual override, the handwheel needs to be pushed towards the actuator until the 'yellow stripe' is hidden.



CAUTION

A label on the handwheel hub warns users not to exceed a specific 'rim pull' force, for each size of actuator.

If the 'rim pull' force is exceeded, the roll pin securing the handwheel onto the manual override shaft is designed to shear, thus preventing serious internal gearing damage.

4.2. Operating Electrically

To control the actuator remotely from a process controller, user must apply 24 VAC or 24 VDC to the actuator. This control signal voltage can be applied locally or remotely from a process controller.



CAUTION

Verify that the main electric power supplied to the actuator is in compliance with the specifications on the actuator label

Engaging the handwheel before or during the application of a control signal voltage will prevent the actuator motor from operating.

If torque switches are installed in the actuator, an overtorque condition will also prevent the actuator motor from operating.

5. Mounting the Actuator

All Bray Series 70 electric actuators are suitable for direct mounting on Bray butterfly valves. With proper mounting hardware, the S70 actuator can be installed onto other quarter-turn valves or devices as well.

NOTICE

The standard mounting position for the actuator is to orient the base of the actuator parallel to the pipeline.

If the actuator is to be mounted on a vertical pipe, it is recommended that the unit be positioned with the conduit entries on the bottom to prevent condensation entering the actuator through its conduits.

Follow the steps below to mount the actuator onto the valve.

1. Manually operate the actuator until the output shaft of the actuator is in line with the valve stem. If possible, select an intermediate position for both the valve and actuator.
2. If required, place the proper adapter onto the valve stem. It is recommended that a small amount of 'anti-seize' lubricant be applied to the adapter to ease assembly.
3. Mount the actuator onto the valve stem. It may be necessary to operate the actuator manually to align the valve and actuator bolt patterns.
4. Install the furnished mounting studs by threading them all the way into the actuator base.
5. Fasten the mounting studs in place with furnished hex nuts and lock washers.

6. Commissioning

6.1. Wiring Your Actuator



Turn off all power and lockout/tagout service panel before installing or modifying any electrical wiring.

1. Take the actuator cover off and place it in a safe location.
2. Each actuator is provided with two conduit entries. Use one for power and the other for control wiring.
3. Wire the actuator as per the wiring diagram attached to the inside of the actuator cover.



- a. A minimum of 18 AWG wire is recommended for all field wiring.
- b. The terminals on the actuator switch plate, On/Off Controller or Servo NXT accepts wire sizes ranging from 14 to 22 AWG.
- c. The conduit connections must be properly sealed to maintain the weatherproof integrity of the actuator enclosure.

6.2. Setting Travel Limit Switches Cams

Bray uses its patented cam design along with 2 SPDT mechanical switches to set the 'Open' and 'Close' position of the valve.

The green cam actuates the 'open' switch when the actuator reaches the 'open' position. Similarly, the red cam actuates the 'close' switch when the actuator reaches the 'close' position.

Standard factory setting of the travel limit switches allows 90° travel between open and close positions. Cams for each switch are adjustable for applications where less than 90° degree travel is desired between the open and closed positions.

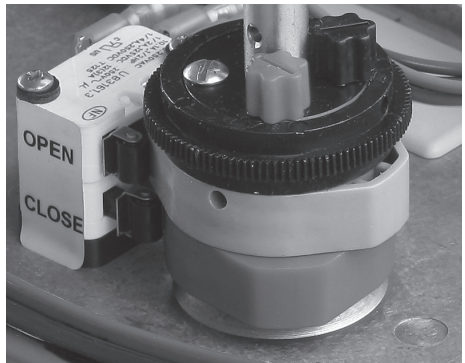


Figure 3. Two SPDT Travel Limit Switches.

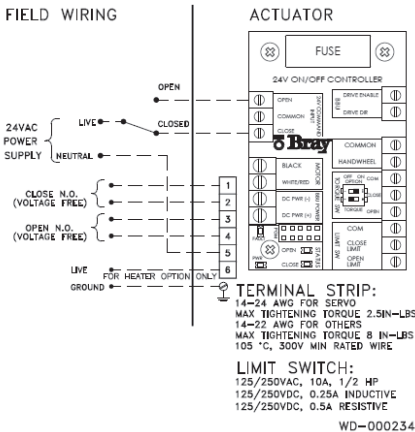


Figure 2. Sample field wiring diagram for Series 70 24V On/Off Actuator with auxiliary switches.

Follow the steps below to adjust the travel limit cams.

1. Remove the indicator rotor by pulling it away from the indicator shaft as shown in Figure 4.

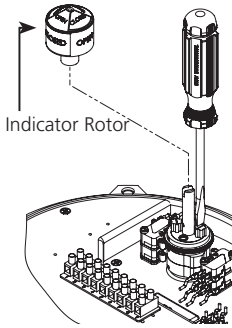


Figure 4. Indicator rotor pulled up from the indicator shaft.

2. Manually operate the actuator clockwise until the valve reaches the desired 'close' position.
3. Loosen the cam locking screw shown in Figure 5.

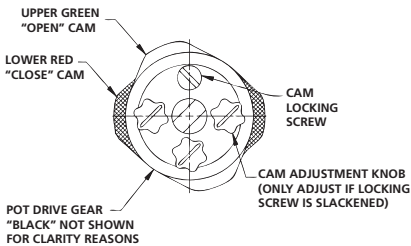


Figure 5. Top view of the indicator cam shaft.

NOTE: It is possible that the rotation of one cam will move the other cam. If this occurs, hold the other knobs or cams during adjustment.

4. Rotate the red cam adjustment knob by hand or with a flat head screwdriver until the red cam lobe activates (depresses) the 'close' switch from a clockwise direction.
5. Manually operate the actuator counterclockwise until the valve reaches the desired 'open' position.
6. Rotate the green cam adjustment knob until the green cam lobe activates (depresses) the 'open' switch from a counterclockwise direction.
7. After both travel switch adjustments have been completed, tighten the cam locking screw and place the indicator rotor back on the indicator shaft.

6.3. Setting Mechanical Travel Stops

Mechanical travel stops are designed to prevent overtravel while manually operating the actuator. They are not designed to stop the electric motor.

Mechanical travel stops are located outside the actuator base for easy readjustment. Stainless steel lock nuts with O-ring seals hold the travel stops securely in place as shown in Figure 6.

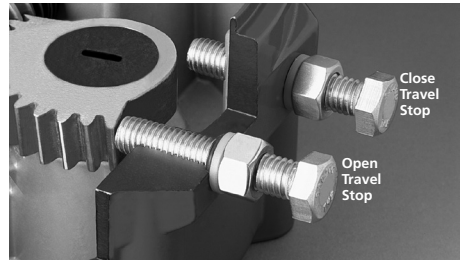


Figure 6. Mechanical Travel Stops (CW Close).

Follow the steps below to set the mechanical travels stops.

1. Manually drive the actuator to the closed position.
2. Once the actuator is in the closed position, rotate the handwheel clockwise:
 - ½ turn for Housing Size 6.
 - 1 turn for Housing Size 12.
 - ½ turn for Housing Size 30.

NOTE:

| Maximum Actuator Torque | Housing Size |
|-------------------------|--------------|
| 600 Lb-In | 6 |
| 2000 Lb-In | 12 |
| 5000 Lb-In | 30 |

3. Adjust the closed travel stop bolt until it contacts the output segment gear and lock it in position with the locknut.
4. Manually drive the actuator to the open position.
5. Once the actuator is in the open position, rotate the handwheel counterclockwise:
 - ½ turn for Housing Size 6.
 - 1 turn for Housing Size 12.
 - ½ turn for Housing Size 30.
6. Adjust the open travel stop bolt until it contacts the output segment gear and lock it in position with the locknut.

6.4 Configuring your 24V On/Off Controller

Every Series 70 24V On/Off Actuator is fitted with a 24V On/Off Controller as shown in Figure 7.

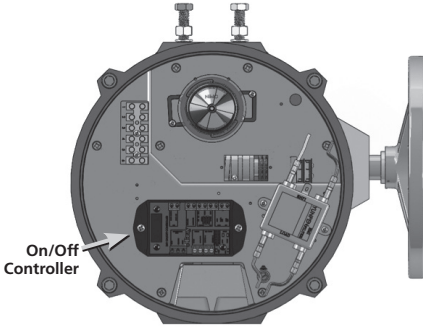


Figure 7. S70 24V On/Off Actuator.

The 24V On/Off Controller offers 3-wire control for the actuator.

To drive the actuator in the open direction, 24VDC or 24 VAC power must be applied between the 'Open' and 'Common' terminals of the controller.

Similarly, to drive the actuator in the close direction, 24VDC or 24VAC power must be applied to the 'Close' and 'Common' terminals of the controller.

When the command signal is first applied, the Controller will wait for 1 second before powering the actuator motor. This delay is necessary to prevent a simultaneous reversal of the motor if an abrupt change in command signal direction occurs (instant reverse delay).

Once the actuator has reached the 'Open' or 'Close' position, the travel limit switch is activated and the controller turns off power to the motor.

NOTICE

Verify that the main electric power supplied to the actuator is in compliance with the specifications on the product label

6.5 DIP Switch Setting

The DIP switches on the 24V On/Off Controller are dependent on the installation of mechanical torque switches in the actuator. Table 1 shows the DIP switch settings for the 24V On/Off Controller.

Table 1

| Mechanical Torque Switches installed | DIP Switch 1 | DIP Switch 2 |
|--------------------------------------|--------------|--------------|
| YES | OFF | ON |
| NO | OFF | OFF |

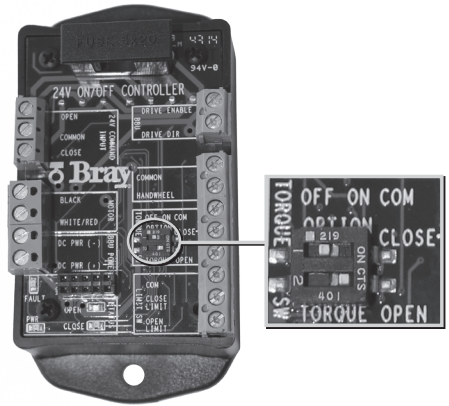


Figure 8. DIP switch settings when mechanical torque switches are installed in an actuator.

NOTICE

An engaged torque switch will prevent the actuator motor from operating in the over torque direction.

The 24V On/Off Controller has four LED's for status and fault indication as shown in Figure 9.

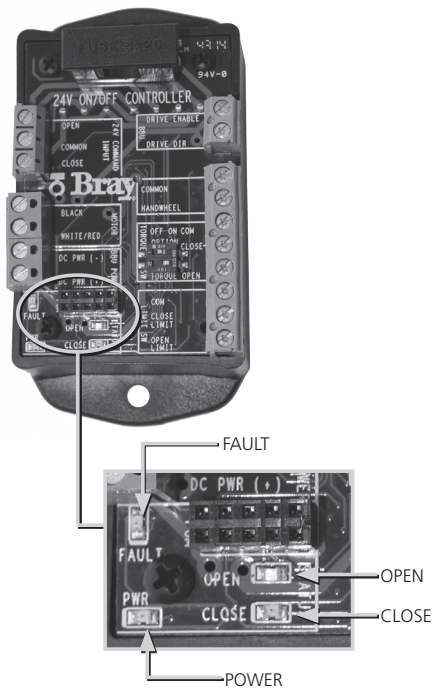


Figure 9. 24V On/Off Controller LEDs.

The LED flash codes for the 24V On/Off Controller are described in Table 2 below.

Table 2

| LED Behavior | Meaning |
|--|---|
| 'Pwr' LED flashes green every 1/2 second | The actuator has power and is operational. |
| 'Fault' LED glows red | Hand-wheel is engaged/pulled out |
| | The Open or Close Torque switch is engaged Both the travel limit switches are engaged at the same time |
| 'Open' LED glows green | Actuator is being driven in the open direction. |
| 'Close' LED glows red | Actuator is being driven in the close direction |

7. Field or Factory Installable Options

7.1. Heater

To prevent condensation from forming inside the actuator, Bray offers an optional heater as a field or a factory installable option.

The heater is thermostatically controlled. It self-regulates by increasing or decreasing its electrical resistance relative to its temperature.



Figure 10. Heater installed on an S70 switch plate.

NOTICE

- a. The heater must have a constant power supply to be effective.
- b. The heater surface can reach temperatures in excess of 200° Celsius.



The heater surface can reach temperatures in excess of 200° Celsius

7.2. Control Station

Bray's Control Station gives the operator the ability to locally drive the actuator with electrical power; overriding the control signal from the process controller.

The control station has a red (close) and green (open) light to provide end of travel indication. It also has two 3-position switches as shown in Figure 11.

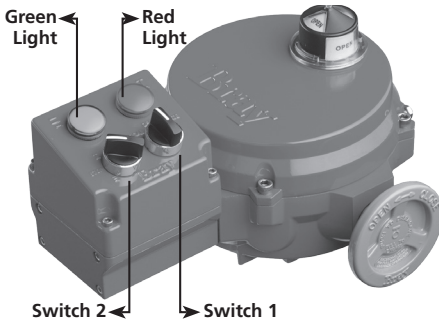


Figure 11. S70 with the Control Station.

Switch 1 lets the operator choose between the following three modes of operation:

- 1. Local:** In this mode, using switch 2 the operator can drive the actuator to open or close position, or stop the actuator; overriding any control signal from the process controller.
- 2. Off:** In this mode, the actuator can only be operated manually.
- 3. Remote:** In this mode, the Actuator is controlled remotely from a process controller using a 24 VDC or 24 VAC signal.

NOTE:

- a. Control Station can also be ordered with key lockable switches.
- b. Control Station requires a dedicated set of auxiliary switches. These switches are required for turning on or off the lights on the control station to locally indicate actuator position.
- c. Control Station does not contain terminal strips. All wiring is done directly to the switches and lights via 2 x 3/4" NPT holes in the bottom of the control station housing. Wire the process controller to the control station in accordance to the wiring diagram provided.
- d. Ordering the Control Station with optional pin connector receptacles will eliminate the necessity of field wiring.

7.3. Auxiliary Switches

Auxiliary switches are a pair of dry-contact (voltage free) SPDT mechanical switches used to indicate travel position to remote customer control systems.

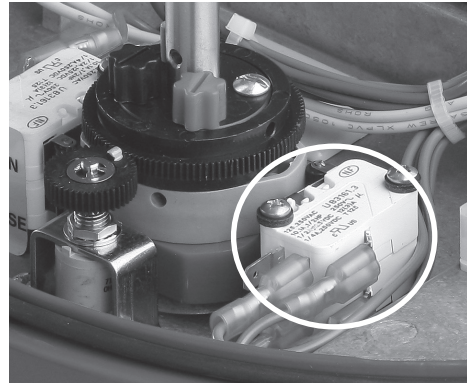


Figure 12. Fixed auxiliary switches installed in an actuator.

NOTE:

- a. Fixed Auxiliary switches activate 3° before the travel limit switches. They are available as a factory and field installable option.
- b. Adjustable auxiliary switches can be set to any position. They are available as a factory or field installable option.

7.4. Torque Switches

Mechanical Torque switches are designed to interrupt power to the motor windings when the actuator torque exceeds the calibrated factory setting.

Mechanical Torque switches are a factory installed and calibrated option available for all Series 70 units.

7.5. Battery Backup Unit

To meet customer needs, Bray offers a Battery Backup Unit (BBU) for the 24 V Series 70 Electric Actuator.

In the event of power failure, the BBU will switch the actuator to battery power to reach its fail position. After the actuator has reached its fail position, the BBU goes to 'Standby Mode' until external power is restored.

Once external power has been restored, the actuator returns to the position corresponding to the control signal present.

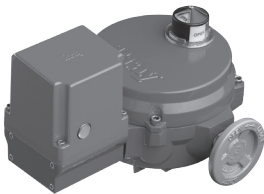


Figure 13. S70 with Battery Backup Unit.

Battery Backup Unit is available as a factory installable option. For more information, please refer to the 'S70 24V Actuator with BBU' Manual. This manual is available on the company website (www.bray.com).

7.6. Spinner

A spinner is available as an attachment to the actuator handwheel to ease and speed the manual operation of the actuator.



Figure 14. S70 with Handwheel Spinner Attached.

NOTE:

Care should be exercised in the use of spinner equipped handwheels.

Rapid operation of the handwheel to close the valve may cause water hammer.

Rapid travel into a travel stop may also cause damage.

7.7. Receptacles (Quick Connectors)

For quick and easy field wiring, Bray offers plug-in receptacles. Cordsets to fit these connectors can also be ordered in several lengths.

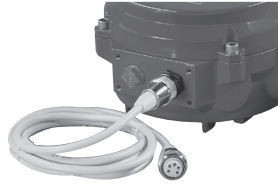


Figure 15. S70 with a 5-pin receptacle and the corresponding cordset.

Appendix A

A.1. Troubleshooting Guide

The Series 70 24V On/Off actuator is easy to configure and operate, but if problems do occur, the following guide can assist in troubleshooting.

The first step is to observe the 'Pwr' LED on the 24V On/Off Controller to verify that proper electrical power has been connected. If the 'Pwr' LED is flashing green, it means that the actuator has been powered correctly.

Next, observe the Fault LED. If the 'Fault' LED on the 24V On/Off Controller is turned on red, refer to Table 2 on page 7 of the manual to determine the root cause of the fault. After the root cause of the fault has been addressed, the 'Fault' LED should turn off.

If the problem still persists refer to the Actuator Troubleshooting Chart below.

A.2. Actuator Troubleshooting Chart

| Problem | Possible Cause | Solutions |
|--|---|---|
| Actuator motor does not run in either direction and the 'Pwr' LED on the 24V On/Off Controller is flashing green | Manual override/handwheel is engaged. | Push handwheel in all the way |
| | Wiring is incorrect | Check wiring and power supply |
| Actuator operates in reverse directions | Field wiring is reversed | Rewire field wiring per wiring diagram |
| Actuator does not fully close valve (or open valve) | Limit switches are set incorrectly | Readjust travel limit switches |
| | Mechanical travel stops are set incorrectly | Adjust mechanical travel stops |
| | Valve torque requirement is higher than actuator output | Manually override out of seat, try angle seating or larger actuator |
| | Optional torque switches are activating | Valve torque exceeds actuator torque rating - consult factory |
| | Voltage power supply is low | Check power source |
| Corrosion inside unit | Water leaking in | Check all seals and possible water entry through conduit |
| Actuation only runs in one direction | Wiring is incorrect | Correct field wiring |
| | Incorrect control signal | Check/correct the control signal wire |

A.3. Troubleshooting Example

The following example demonstrates a typical troubleshooting process.

Assume these starting conditions:

1. The handwheel is engaged (pulled away from the actuator).
2. The 24V On/Off Controller has been configured to enable torque switches but torque switches are not physically installed on the actuator.
3. 24VAC signal has been properly applied between the 'Open' and 'Close' terminals of the 24V On/Off Controller. The 'Pwr' LED is flashing indicating the control signal has been properly applied.

The 'Fault' LED on the 24V On/Off Controller is turned on red. Evaluate all possible reasons for the 'Fault' LED to be turned on as per Table 2 on page 7 of this manual.

1. Observe if the handwheel is engaged. In this case, the handwheel is engaged. Disengage the handwheel by pushing it in to eliminate a possible reason for the 'Fault' LED to be turned on red.
2. Evaluate if the limit switches have been correctly wired.
3. Check if the 24V On/Off Controller has been configured correctly to enable or disable the torque switches. In this case, torque switches have not been installed in the actuator but the 24V On/Off Controller has been configured to enable the torque switches. Correctly configure the 24V On/Off controller correctly to disable the torque switches as per Table 1 (on page 6).
4. The 'Fault' LED on the 24V On/Off Controller turns off and the actuator is now ready for service.

Appendix B

B.1. Basic Tools

| Common To All Units | |
|---|------------------------------------|
| Terminal connections, cam adjustment | Screwdriver, ¼" tip flat tip blade |
| All switches, terminal strip, torque switch plate | Screwdriver, No.1 Phillips |
| Switchplate screws | Screwdriver, No. 2 Phillips |
| Housing Size 6 | |
| Mounting nuts | Wrench, ½" |
| Cover captivated capscrews | Hex key, ¼" |
| Travel stop adjusting bolts | Wrench, 7/16" |
| Travel stop jam nuts | Wrench, 7/16" |
| Conduit Entry Plug (½" NPT) | Hex key, 3/8" |
| Housing Size 12 | |
| Mounting nuts (small pattern) | Wrench, ½" |
| Mounting nuts (large pattern) | Wrench, ¾" |
| Cover captivated capscrews | Hex key, 5/16" |
| Travel stop adjusting bolts | Wrench, 9/16" |
| Travel stop jam nuts | Wrench, 9/16" |
| Conduit Entry Plug (¾" NPT) | Hex key, 9/16" |
| Housing Size 30 | |
| Mounting nuts (small pattern) | Wrench, ¾" |
| Mounting nuts (large pattern) | Wrench, 1 1/8" |
| Cover captivated capscrews | Hex Key, 3/8" |
| Travel stop adjusting bolts | Wrench, ¾" |
| Travel stop jam nuts | Wrench, ¾" |
| Conduit Entry Plug (¾" NPT) | Hex key, 9/16" |

Bray[®] CONTROLS

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