

180° Rotation, Center-Off Kit

For 10-30 75 Electric Actuators

Installation, Operation and Maintenance

FCD WCENIM2074-01 AQ (Part 19530)

Installation

NOTE: This kit should not be used with actuators with extra limit switches. To add a center-off kit to an actuator with more than two switches, consult the factory. The differences for 75 DC actuators are either in parentheses or stated separately.

I. Changing a 90° actuator to a 180° actuator

A. Verify 90° operation of the existing actuator.

1. Connect power to terminals 1 and 4 for AC (+ to 1 and - to 4 for DC). The actuator will turn clockwise to the initial zero position.

Limit switch #1 on the right side of the actuator (viewed from the terminal strip) stops shaft rotation in the clockwise direction (CW). This stop point is 0° and is the position where a ball valve is closed.

The bottom cam on the actuator shaft (called the #1 cam) actuates this limit switch.

2. Connect power to terminals 1 and 3 for AC (- to 1 and + to 3 for DC). The actuator shaft will turn counterclockwise (CCW).

Limit switch #2 on the left side of the actuator (viewed from the terminal strip) stops shaft rotation in the counterclockwise direction (CCW). This point is 90° and is the position where a ball valve is open.

The top cam on the actuator shaft (called the #2 cam) actuates this limit switch.

B. Adjusting actuator cams for 180° operation

1. Once proper operation of cams and switches for 90° operation is verified: Adjust (see Step 2) the clockwise cam (the bottom cam or #1 cam) so that the actuator shaft can rotate 180°—±90° from the initial zero (#1 limit switch) position.

2. Perform cam adjustment as follows:

- a. Power actuator terminals 1 and 3 for AC (- to 1 and + to 3 for DC) to move the actuator shaft to its full counterclockwise (CCW) position as established in Step A2 of this procedure.
- b. Loosen the set screws on the #1 cam and energize terminals 1 and 4 for AC (+ to 1 and - to 4 for DC) to move the actuator shaft clockwise (CW) a total of 180° to the new 0 position.
- c. At this position, stop the actuator and adjust the #1 cam so that the limit switch (on right side of actuator, viewed from terminal strip) is actuated. Listen for click. Retighten set screws on the cam.
NOTE: To ensure full rotation of the driven device, set the actuator cams so that an additional 2° of rotation can be achieved at each end position.
- d. Verify that the actuator moves 180° by energizing terminals 1 and 3 for AC (- to 1 and + to 3 for DC) (CCW) and terminals 1 and 4 for AC (+ to 1 and - to 4 for DC) (CW).

Remember: The only stop point now common to the 90 degree actuator is the CCW limit—the position where a 90° ball valve is open.



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II. Installation of the Center-Off Switch and Wiring

Wiring Notes: All wiring to terminal strip should be inserted only to midpoint of terminal strip. Grounding wires should be connected to green-colored grounding screw (if present) on actuator base or to any baseplate mounting screw in actuator.

A. The 180° center-off switches' lever arms will be located in the same direction as the existing limit switches' lever arms.

B. For 10-23 75 Actuators:

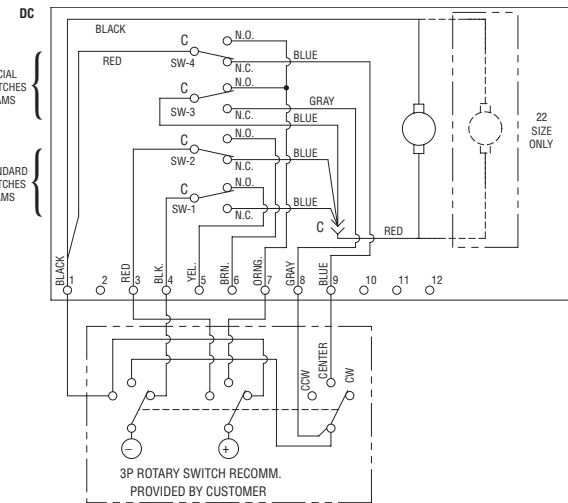
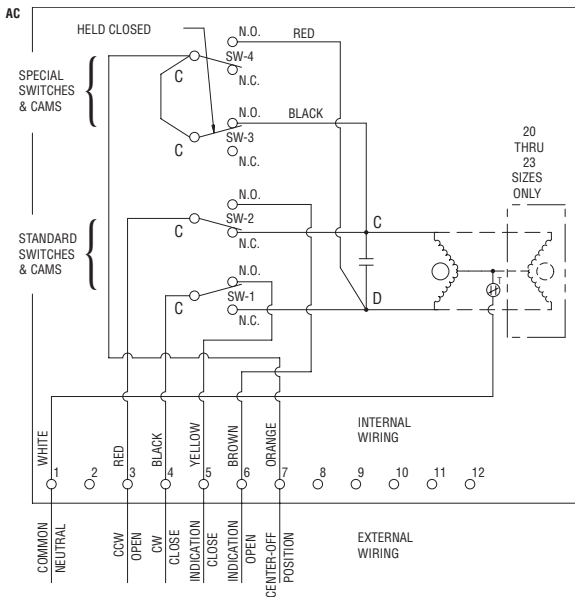
Remove the screws holding down the existing actuator limit switches. Place the spacers provided in the kit between the existing actuator limit switches (use straight lever arms) and the new center-off limit switches (use hooked lever arms).

Replace and tighten the limit switch screws securely back into position. (See diagram for switch identification.)

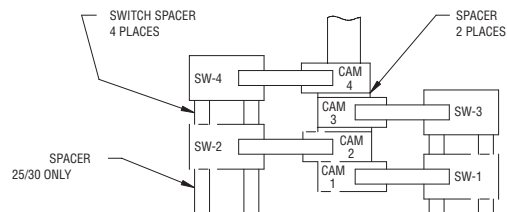
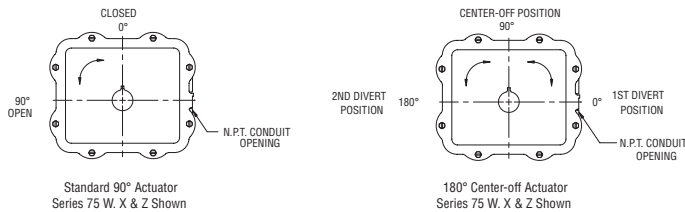
For 25-30 75 Actuators:

Remove the screws holding down the existing actuator switches. Be sure the existing spacers remain under the switches.

Place the spacers provided in the kit between the existing actuator limit switches (use straight lever arms) and the new center-off limit switches (use hooked lever arms). Replace the limit switch screw with new longer screws (4-40 x 1½) and securely tighten switches in their proper position. (See diagrams for switch identification and spacer location.)

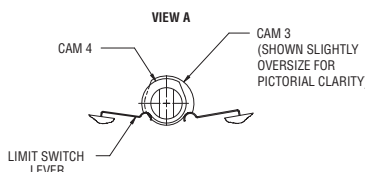
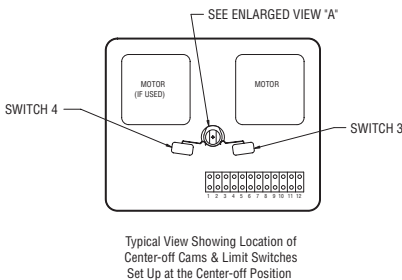


1. Switch configuration is as shown above (When viewed from the terminal strip side of the actuator).



- Actuator shown at 0° position (all the way CW).
- Cam settings are as follows:
 - Switch 1. Opens at 0°. Controls 1st divert position.
 - Switch 2. Opens at 180°. Controls 2nd divert position.
 - Switch 3. Opens at 89°. Controls center-off position from 1st divert position.
 - Switch 4. Opens at 91°. Controls center-off position from 2nd divert position.

Note: 1. Switches 1 and 2 and cams 1 and 2 are standard. Switches 3 and 4 and Cams 3 and 4 are center-off type.
2. Use cam spacer as needed to line up Cam and switch.



C. For 75 AC Actuators:

Connect the red wire of the center-off kit to the N.O. terminal of switch #4 using the wire end which uses the 3/16" slide-on connector. Connect the other end of the red wire, which uses the 1/4" slide-on connector to the capacitor terminal to which the blue wire from N.C. terminal of switch #1 is connected, Push on the 1/4" red wire connector at the capacitor terminal. (See schematic wiring diagram.)

Connect the end of the black wire in the center-off kit, which uses the 3/16" slide-on connector, to the N.O. terminal of switch #3. Connect the other end of this black wire, which uses the 1/4" slide-on connector, at the capacitor terminal to which the gray wire from N.C. terminal of switch #2 is connected (**not** the gray wire from the motor).

Connect the other two terminations on the orange wire to the common terminals of switches #3 and #4. Connect the stripped end of the orange wire in the kit to terminal 7.

D. For 75 DC Actuators:

NOTE: DC center-off wiring diagram shown is for sizes 10, 20 and 23 actuators. For 12 and 22 sizes, the red/black motor leads are reversed.

Connect common terminal of switch #4 to terminal strip 1 or splice with present wire. Use red wire from center-off kit.

NOTE: Do not remove existing red motor wire.

Connect N.O. terminal of switch #3 to N.O. terminal of switch #4 and on to terminal strip 7. Use orange double wire from center-off kit.

Connect N.C. terminal of switch #4 to terminal strip 9. Use blue wire approximately 7" long from center-off kit.

Connect N.C. terminal of switch #3 to terminal strip 8. Use gray wire from center-off kit.

Connect C (common) terminal of switch #3 using blue wire from center-off kit. Join together with splice containing other two blue wires from N.C. of switches #1 and #2 and black wire(s) from motor lead.

Check all the wiring to ensure that it is smooth and out of the way of any rotating parts; ensure that all connections are firmly made.

III. Installation and adjustment of "center-off" cams

- A. With the actuator placed with the cover removed and the terminal strip facing the operator, switches #1 and #3 are to the right and switches #2 and #4 are to the left of the main shaft.

B. For 10-23 75 Actuators:

Place the cam spacer, cam #3, cam spacer, and cam #4 over the shaft.

▲ CAUTION: Do not bend the limit switch levers.

Loosen their set screws as necessary to slide the cams into position. There are now four cams on the shaft. Per the drawing, the cams are numbered 1 through 4, from bottom to top. (See proper drawing for the approximate location and correct orientation of the center-off cams.)

C. For 25-30 75 Actuators:

Place the two slotted bushings into the two center-off cams (#3, #4). Loosen the cam set screws as necessary. Over the actuator's sensing shaft, slide a cam spacer (nylon washer), cam #3, the other cam spacer, and cam #4. There are now four cams and two spacers on the sensing shaft. Per the drawing, these cams are now numbered 1 through 4, from bottom to top. (See proper drawing for approximate location and correct orientation of the center-off cams.)

- D. Using the manual override (see the series 75 actuator installation operation and maintenance instructions) as necessary, set the actuator shaft to a "center-off" location.

Set cam #3 such that hook of switch #3 lever arm has just dropped off the cam. Tighten cam screw without moving cam.

Set cam #4 such that hook of switch #4 lever arm will match the arch of cam #4. Tighten cam screw without moving cam.

Release manual override.

- E. Power the actuator to the full clockwise (CW) limit, to the 0° reference position. Check position of ball and valve stem to verify that valve is in the true 0° position, as required by the application.

- F. Repeat the above step for the 180° or full CCW position. Verify that the driven device is in the required position.

- G. Apply power to terminals 1 and 7 for AC (+ to 7 and - to 8 for DC) to verify proper operation of center-off switches. With the actuator shaft positioned at the 180° position, power applied to terminals 1 and 7 for AC (+ to 7 and - to 8 for DC) moves the actuator shaft clockwise (CW) to the center-off position.

With the actuator shaft at the full clockwise position, 0°, apply power to terminals 1 and 7 for AC (+ to 7 and - to 9 for DC). The actuator shaft should move counterclockwise (CCW) to the center-off position.

SPECIAL NOTE: If during any of these checks, the actuator shaft stops other than at the required positions, a readjustment of the center-off cams is needed. At no time should both center-off switches be activated by their cams at the same time.

The N.O. contacts on both center-off switches are typically closed. The center-off switch levers must be tripped by their center-off cams at different times.

Therefore, the center-off cams should be set as close to the 90 degree position as possible, yet the cam/switch actuation for each switch is never at the identical position. If the center-off switches are set to actuate at a close angular differential, the actuator shaft may oscillate, or not operate. Loosen one cam and move this cam to increase the actuation differential between each of the center-off switches.

If the center-off switches are set to actuate at a wide angular differential, the actuator will not stop at a true center-off position. Adjust one or both cams to decrease the angular differential between each of these switches.

- H. As a final check, alternately apply power to terminals 1 and 4, 1 and 3, and 1 and 7 for AC (+ to 1 and - to 4; - to 1 and + to 3; - to 8 and + to 7 for DC).

No oscillation or hunting of the actuator output shaft should occur.

If the above problems are noted, simply readjust the center-off cams, as noted in Step G.

IV. External switching and switch wiring for 75 DC actuators

Using a three-pole, rotary switch, connect as follows:

Link Pole 1, Position 1 to Pole 2, Position 3; connect to actuator terminal 1.

Link Pole 1, Position 2 to Wiper Pole 3; connect to actuator terminal 8.

Connect Pole 1, Position 3 to actuator terminal 4.

Connect Pole 2, Position 1 to actuator terminal 3.

Connect Pole 2, Position 2 to actuator terminal 7.

Connect Pole 3, Position 2 to actuator terminal 9.

NOTE: Pole 3, Position 1 and Position 3 are unused.

Connect positive supply to Pole 2 wiper (common).

Connect negative supply to Pole 1 wiper (common).

Indicator lamps for 0° are connected between actuator terminal 5 and positive supply. Indicator lamps for 180° are connected between actuator terminal 6 and negative supply. No signaling as standard is provided at center-off position.

- V. Check all the wiring and ensure that all connections are firmly made to their respective terminal or termination lug. Ensure that the wires are run smoothly and kept out of the way of any rotating parts.

Finish the installation of the center-off kit by replacing the actuator cover and override knob (if any) and attaching the "OPEN"

label (supplied in the kit) in a position that is 180° from the existing "OPEN" label, which should already be attached to the cover of the Watertight and Hazardous Environment actuators. On General Purpose actuators (with no override knob), the "OPEN" label is not used.

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