FLOWSERVE

Worcester Actuation Systems

14848-A

10-40 39 ACCESS M Mounted Limit Switch and Solenoid with DeviceNet Interface

Installation, Operation and Maintenance Instructions

Worcester/McCANNA ACCESS M/DeviceNet-Interface is an add-on accessory to the Series 39 pneumatic quarter-turn valve actuator. The ACCESS M package adds a single housing to the actuator which contains limit switches or Namur proximity sensors and integral solenoid. The Series 39 actuator utilizes a double-rack, single-pinion concept, with each rack integrally affixed to a piston. Both pistons are supported and centered by large, stainless steel guide rods. In double-acting units, both pistons are pressurized on both strokes of the actuator. Ambient temperature range of ACCESS M unit with DeviceNet is 0°F minimum to 160°F maximum.

Standard actuators feature an extended top shaft for manual override capabilities and a completely modular design which allows simple attachment of a variety of accessories. The ACCESS M unit features a control block (with spool valve) which properly directs supply air to the actuator. The control block provides independently adjustable speed control for both opening and closing strokes of the actuator on double-acting units, and for the closing stroke on spring-return units (standard mounting configuration).

The DeviceNet Interface feature of this equipment permits simple DeviceNet bus connection and communication as either a digital stand alone device on a DeviceNet network or as an additional device to the higher level digital protocol networks via the appropriate “gateway”. Solenoid power, actuator opening, actuator closing and electronic position indication are all accomplished via the DeviceNet bus. Integral Light Emitting Diodes (LEDs) display the status of inputs and outputs.

The DeviceNet Board has two Outputs and three Inputs:

Each output is used to control a 3 watt 24 VDC solenoid. When the output is set to 1 or ON, the solenoid will be energized. When the output is set to 0 or OFF, the solenoid will be de-energized.

Each input is used to monitor either a mechanical switch or an AC/DC two-wire NAMUR Proximity sensor.

The DeviceNet circuit board has six LEDs (See Board Layout)

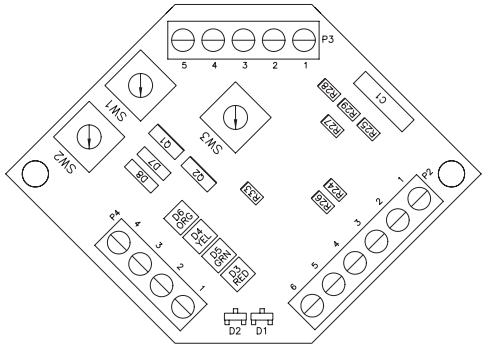
a. Two LED’s for DeviceNet MNS bus activity as required by the ODVA Spec. (green/red) D1 & D2

b. Red LED to monitor CW limit switch D3

c. Green LED to monitor CCW limit switch D5

d. Yellow LED to monitor coil power D4

e. Orange LED to monitor solenoid coil continuity D6



DeviceNet Board Layout

The solenoids are powered from the 24 VDC available in the DeviceNet cable. No additional power is required.

The ACCESS/DeviceNet Circuit Board meets the requirements of the ODVA(Open DeviceNet Vendors Association) Specification. It is a Group 2 slave device which operates as a slave device on the DeviceNet network. It supports Explicit, Polled, Change of State, and Cyclic I/O Messages of the predefined master/slave connection set. It does not support the Explicit Unconnected Message Manager (UCMM).

The ACCESS DevicNet Circuit Board has one byte of output (consumed) data and eleven bytes of input (produced) data. In the output byte, bits 0 through 4 are not used, bit 5 is used to control solenoid one, bit 6 is used to control solenoid 2 (not used in this application), and bit 7 is used to reset the maintenance counter. Of the input bytes, byte 1 is used to monitor the switch and solenoid status of the unit with bit 0 used to monitor switch 1 (CCW position), bit 1 is used to monitor switch 2 (CW position), bit 2 is used to monitor switch 3 (not used in this application), bit 3 is used to monitor solenoid 1, and bit 4 is used to monitor solenoid 2 (not used in this application). Bits 5 through 7 are not used. Of the remaining bytes, bytes 2-5 make up the Maintenance Counter, bytes 6-9 make up the Cumulative Counter, byte 10 contains the opening time in secs., and byte 11 contains the closing time in secs.

For connections to the ACCESS/DeviceNet Circuit Board - See Wiring Diagrams in Section 7.

The customers field connections to the circuit board take place on terminal block P3 as follows:

Terminal 1 - Bus negative from 24 VDC supply (Next to the P3 label)

Terminal 2 - CanL signal

Terminal 3 - Bus Shield

Terminal 4 - CanH signal

Terminal 5 - Bus positive from 24 VDC supply

The switch/sensor connections are made to the terminal block labeled as P2. Terminal 1 is located next to the P2 label. The switches/sensors are wired to the terminals such that terminals 1 & 2 are for SW2, and terminals 3 & 4 are for SW1. Positive 24 VDC is provided on terminals 1 & 3 to the switches and the switch returns connect to terminals 2 & 4 respectively.

The solenoid connects to terminal block P4 terminals 3 & 4. Positive 24 VDC is supplied to the solenoid coil from terminal 3 and the solenoid coil return is connected to terminal 4. The solenoid is energized by turning on a transistor which connects the return to ground. Should it be necessary to operate a second 24 VDC 3 watt device from terminals 1 and 2, terminal 2 is the positive supply and terminal 1 is the return.

The circuit board has three 10 position rotary switches on board (SW1, SW2, and SW3). SW1 and SW2 are used to set the MACID of the board (i.e., address), with SW2 used for the most significant bit and SW1 used for the least significant bit, e.g., for a MACID of 35, SW2 would be set to 3 and SW1 would be set to 5. Valid MACID values range from 00 to 63. A none-valid MACID setting on the switches allows the MACID to be set through software.

SW3 is used to set the DeviceNet baud rate. Valid baud rate selections are 125k, 250k, and 500k. SW3 position 0 represents 125k, SW3 position 1 represents 250k, and SW3 position 2 represents 500k. If the SW3 position is set to an invalid setting it permits the baud rate to be set through software.

NOTE: *WHENEVER THE BAUD RATE AND/OR MACID IS CHANGED VIA THE SWITCHES, THE BOARD POWER MUST BE CYCLED IN ORDER FOR THE CHANGE TO TAKE EFFECT.*

For additional information see Installation, Operation & Maintenance Supplements 1, 2 and 3 that accompany this product.

When shipped for field installation, the limit switch (proximity sensor)/solenoid assembly will be broken down into sub-assemblies. The sub-assemblies are: (1) the switch (proximity sensor) operator assembly, consisting of the switches (sensors), bracket, springs and buttons; and (2) the enclosure (housing), probes, solenoid, control block, block gasket, P.C. board and cover. Hardware items and gasket are packaged separately. Retaining rings and "O-Rings" shall be assembled.

NOTE: *Access M Mounted Limit Switch (proximity sensor)/Solenoid Kits fit only Revision R5 and later 39 Actuators. Included in the Access M Mounted Limit Switch (proximity sensor)/Solenoid Kits is a Rebuild/Accessory Addition Label which is to be marked and applied to actuator after switch has been installed.*

1. The Access M mounted limit switch (proximity sensor)/solenoid assembly will be mounted on the right hand end cap (when viewed from actuator nameplate) with conduit connection on the right side of the housing (when viewed from the cover side of the switch).

CAUTION: When actuator is installed in outdoor conditions, water can enter the exhaust hole(s) of the control block and then freeze. Worcester/McCANNA suggests a cover be used, or mount the actuator such that the block exhaust hole(s) will not fill with water.

The "standard" mounting configuration of the 39 actuator to the valve is fail closed. In this configuration, SW-1, as described in Section 7 and in the wiring diagram, will give indication when the actuator is in the open position (Green LED is on). SW-2 gives indication of the closed position (Red LED is on). Actuator shaft rotation will vary, depending on which fail closed mounting is used. See Section 8 for appropriate wiring diagram.

NOTE: *The rotation of the actuator shaft CW (clockwise) or CCW (counter-clockwise) is determined when viewing the actuator from the nameplate side of the actuator, while being able to read the label from left to right.*

Fail open mounting configuration may be obtained by either inverting the actuator, using in-line coupling, or mounting the actuator cross-line (sizes 10-20) or indexing the coupling (including valve ball and stem) 900 to the actuator shaft (sizes 25-40). In these cases SW-1 & SW-2 indication will be reversed from the above but actuator shaft rotation will vary, depending on which fail open mounting is used. Wiring shall be done per the appropriate wiring diagram in Section 7 and adjustments per Section 6.

2. Remove cover from enclosure.

CAUTION: The longer probe must be in the left hand through-hole looking at the housing from the cover side. (Both probes are the same length for the 1039 ACCESS only!).

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3. Assemble the enclosure, with probe assemblies, to the actuator inserting the housing gasket between the actuator end cap and the housing. Important! Do not apply any grease to the gasket, it must be installed dry. Secure with 4 machine screws. For all ACCESS M units, 4 threaded tamper proof plugs are installed over the machine screws. Once installed no attempt should be made to remove these plugs. If it becomes necessary to remove enclosure from actuator end cap, consult Worcester Controls/McCANNA. Check the probes for freedom of movement by moving them back and forth slightly.

4. With assembly complete to this point, it is convenient to make conduit connections and bring wiring through enclosure. The power supply to the solenoid coil is 3 watts. Required amperage is shown below. It should be noted that the successful use of this device in hazardous, wet, or other detrimental environments depends on proper conduit construction techniques.

Voltage	Holding Amps
24 VDC	.13

5. When the switch package is assembled, one of the probes will make contact with the switch button. Simply press the switch package until the mounting screws can be engaged. Tighten mounting screws until bracket is secure.

6. Switches/sensors (if installed) have been factory adjusted, but should be rechecked after installation. Adjustment is as follows:

   a. With actuator mounted in "standard" "FAIL CLOSED" mounting configuration (see step 1) and wired per appropriate wiring diagram, set actuator in the full closed position, with the adjustment screw near its loose limit. The Orange LED indicating solenoid coil continuity will not be lit. The Orange LED will remain off as long as the Yellow LED is off. The orange LED will come on when the coil is energized and there is no short or open in the solenoid coil circuit. If there is a short circuit or open circuit with the coil, the Orange LED will remain off even though the yellow LED indicates that power is applied to the coil circuit. Adjust closed position switch or Namur Proximity Sensor SW-2 (see wiring diagram) by tightening the adjustment screw until red LED turns on. Then tighten the adjustment screw one additional turn. With air supplied to actuator, energize the solenoid and cycle valve to full open position. The Yellow and Orange LEDs should be lit indicating power to the coil and coil continuity, respectively. Adjust the open position switch/sensor SW-1 in the same manner as the closed position switch/sensor until the green LED turns on. Then tighten the adjustment screw one additional turn. When the solenoid is de-energized, the actuator will return to its full closed position. The Yellow, Orange, and Green LEDs will turn off indicating that the solenoid is de-energized and the actuator is no longer in the full open position. The Red LED will turn on indicating that the actuator is now in the full closed position.

   b. For actuator mounted in fail open mounting configuration (see step 1) and wired per appropriate wiring diagram, set actuator in the open position with the adjustment screw near its loose limit. Adjust open position switch or Namur Proximity Sensor SW-2 by tightening the adjustment screw until the green LED turns on. Then tighten the adjustment screw one additional turn. With air supplied to actuator, energize the solenoid to change actuator to the full closed position. The green LED will shut off and the yellow and orange LEDs should be lit indicating power to the coil, and coil continuity, respectively.

   Adjust the closed position switch/sensor SW-1 in the same manner as the open position switch/sensor until the Red LED turns on. Then tighten the adjustment screw one additional turn.

   When the solenoid is de-energized, the actuator will return to its full open position. The Yellow, Orange, and Red LEDs will turn off indicating that the solenoid is de-energized and that the actuator is no longer in the full closed position and then Green LED will turn on indicating that the actuator is now in the full open position.

   NOTE: *If actuator is mounted in any configuration other than "standard", consult Step 1 of Installation Instructions to insure proper orientation of probes and switches/sensors.*

7. Wiring instructions for limit switches and proximity sensors. Refer to Step 1 for any actuator mounting configuration other than "standard".

   A. Limit switch/Proximity Sensor Ratings:

   Mechanical Switch - 15.1 amps @ 125/250 VAC; .5 amps @ 125 VDC.

   Namur proximity Sensor - ≤ 1 mA (target present), ≥ 3 mA (Target absent) 15 mA max., 5-25 VDC, sensing range 2 mm, switching frequency 1 Khz. Not sensitive to polarity.

   Make electrical connections in accordance with the appropriate wiring diagram on inside of cover or below.

8. **Cover Assembly:** Place the lubricated "O-Ring" down over the threaded section of the housing onto the machined shoulder. The cover must be threaded onto housing tightly for proper performance. The assembly is now complete.

NOTE: *For units with a metal cover, a light coat of grease (such as a #1 grease) shall be applied to the cover threads. A minimum of 1/3 the circumference of the threads to be lubricated.*

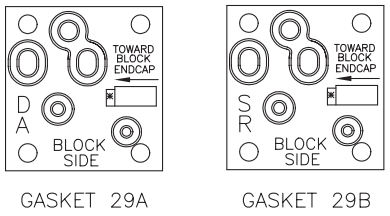


Figure 1

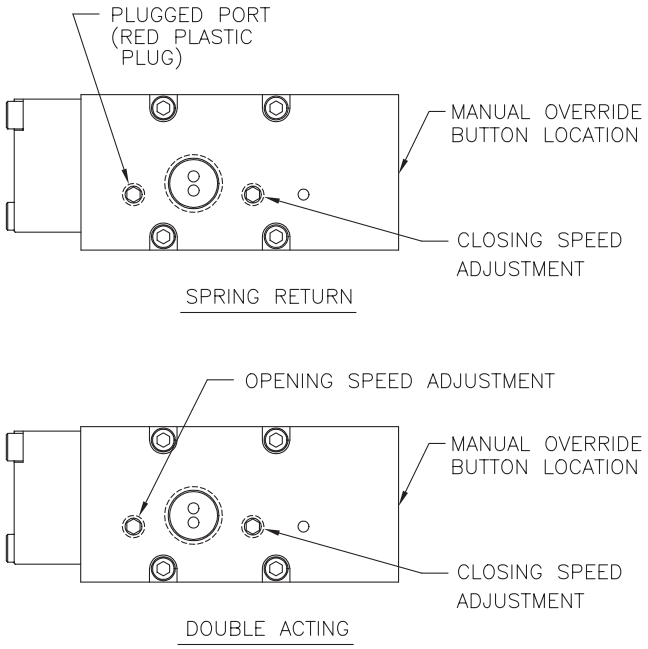
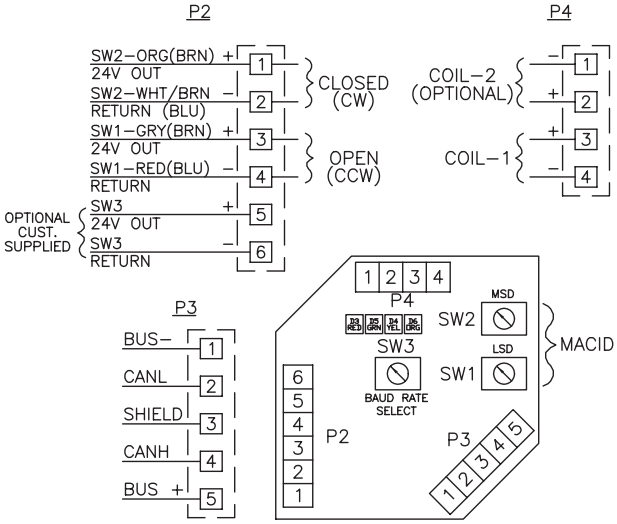
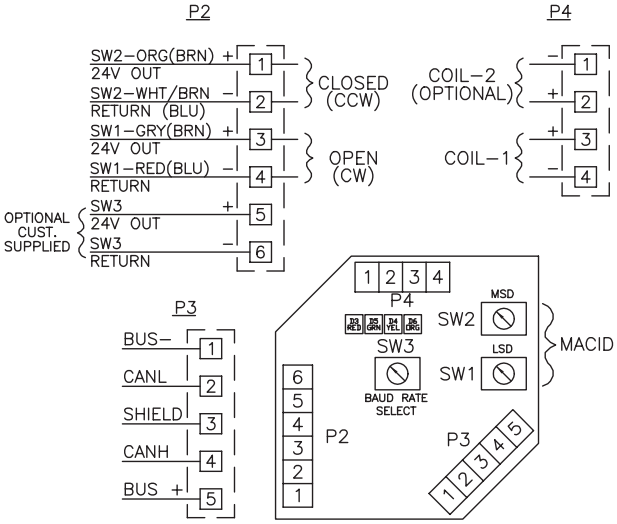


Figure 2

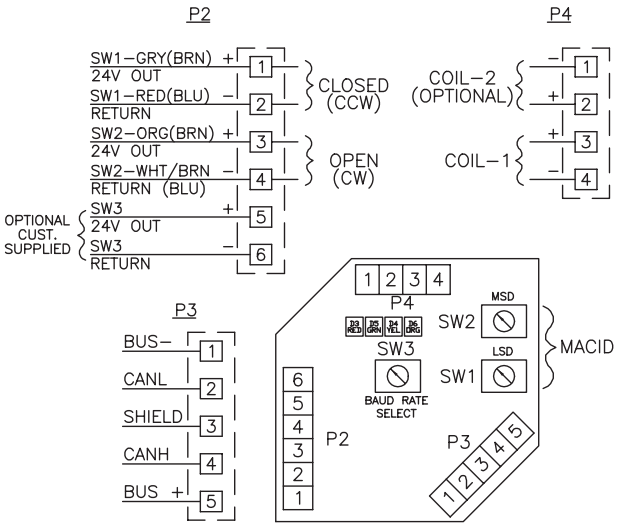
Fail-Closed
(Sizes 10–40 In-line Operation)
(Sizes 25–40 Cross-line Operation)



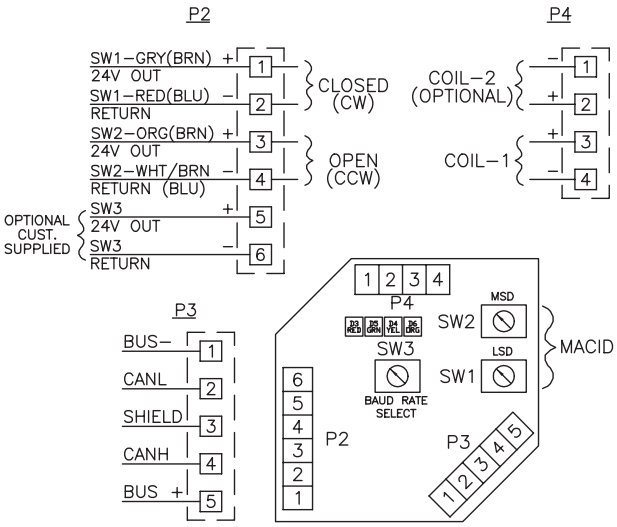
Fail-Closed
(Sizes 10–20 Cross-line, Inverted Operation)



Fail-Open
(Sizes 10–20 Cross-line Operation, or with In-line Coupling
Sizes 25–40 In-line Operation)



Fail-Open
(Sizes 10–20 In-line, Inverted Operation)



NOTE: *Wire colors in parentheses at P2 are for proxinity sensors only.*
For units without switches/sensors, disregard switch/sensor wiring.

9. **Control Block:** If control block is removed, be sure appropriate gasket is properly inserted between block & switch base (see Figure 1 below and Access exploded view). Do not apply any grease to gasket, it must be installed dry.
10. **Air Supply Connection:** Connect air supply to 1/4" NPT connection on control block.
11. **Operation:**

A. Double Acting with Control Block - Air is supplied to the 1/4" NPT port on the block. When the solenoid is energized, the spring loaded plunger is withdrawn, allowing the supply air to shift the spring loaded spool within the block, which opens the supply path to the center chamber of the actuator. Air from the end chambers of the actuator is allowed to pass through the block and exhaust to atmosphere.

When the solenoid is de-energized, the spring loaded plunger blocks the flow of air to the spool seal within the block and the spool spring shifts the spool within the block to a position which opens the supply path to the end chambers of the actuator. Air from the center chamber of the actuator is allowed to pass through the block and exhaust to atmosphere.

The actuator is electrically fail-safe. That is, it will return to its de-energized position upon electrical failure.

The unit has two independently adjustable speed control screws which can be used to adjust the speed of operation for the opening and/or closing stroke (see Figure 2 above). If the speed control screws are too tight, the unit will fail to operate. NOTE: Speed control screws are shipped from the factory in the full open position.

B. Spring Return with Control Block - Air is supplied to the 1/4" NPT port on the block. When the solenoid is energized, the spring loaded plunger is withdrawn, allowing the supply air to shift the spring loaded spool within the block, which opens the supply path to the center chamber of the actuator. Air from the end chambers of the actuator is allowed to pass through the block and exhaust to atmosphere.

When the solenoid is de-energized, the spring loaded plunger blocks the flow of air to the spool within the block and the spring loaded spool returns to a position which allows air from the center chamber of the actuator to pass through the block and exhaust to atmosphere as the actuator is cycled by the springs in the end chambers of the actuator. The end chambers are exhausted to atmosphere at all times.

The actuator is fail safe. That is, it will return to its de-energized position upon electrical or pneumatic failure.

The unit has one speed control screw, which can be used to adjust the speed of operation for the closing stroke (on a fail closed unit) or opening stroke on a fail open unit, and one port plugged with a red plastic plug (see Figure 2 on page 5). If the speed control screw is too tight, the unit will fail to operate.

Note: *Speed control screws are shipped from factory in the full open position.*

CAUTIONS: If converting a double acting actuator to a spring return actuator or vice-versa, be sure the correct control block gasket is used (see Figure 1 on page 5 and Access exploded view).
Be sure red plastic plug is installed in plugged port (Figure 2 on page 5) for spring return actuators.

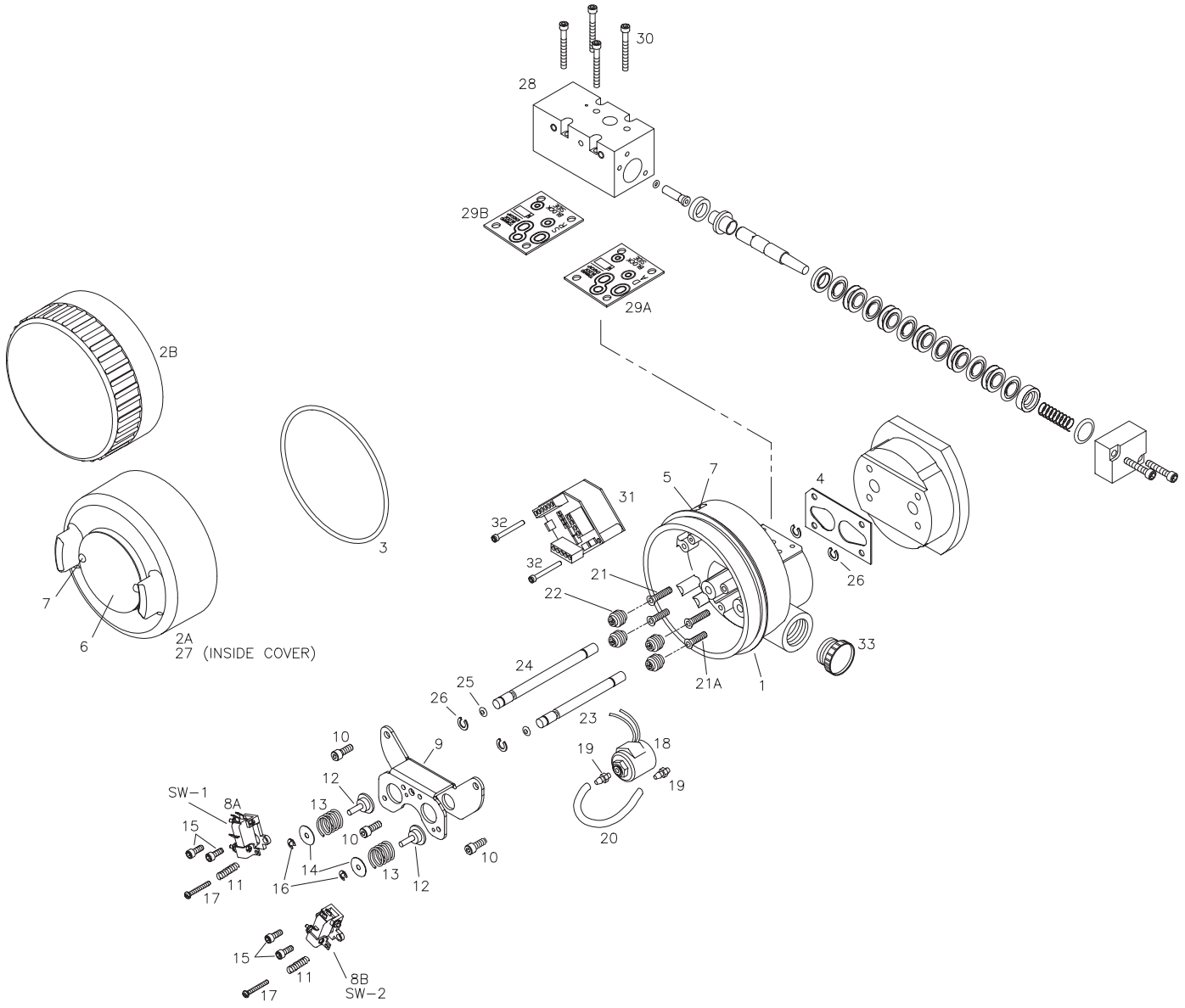
C. Manual Operation - In the event of air failure, the Series 39 actuator with Access unit can be cycled manually. This is accomplished by applying a wrench to the exposed top shaft of the actuator and turning it in the desired direction.

WARNING: Care must be taken to ensure that the actuator is not operated automatically while manual operation is being performed.

If a routine cycle check is to be performed on an actuator with a control block, the actuator can be cycled manually by shifting the spool valve within the control block. This can be done by pushing the override button in the control block (See Figure 2 on page 5 for location of button). Care must be taken to hold the spool valve in the desired position until the actuator has cycled. Provided the air supply is still on, the actuator will cycle to its original position as soon as the manually applied pressure on the override button is released.

PARTS LISTING

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
1	1	ENCLOSURE	19	2	SOLENOID EXHAUST PORT FITTINGS
2A	1	COVER “Z”	20	1	SOLENOID EXHAUST TUBING
2B	1	COVER “W”	21	2	UPPER MOUNTING SCREW - ENCLOSURE (1-1/8" LONG)
3	1	O-RING - COVER	21A	2	LOWER MOUNTING SCREW - ENCLOSURE (1" LONG)
4	1	GASKET	22	4	THREADED TAMPER PROOF PLUG
5	1	NAMEPLATE	23	1	ROD PROBE
6	1	CAUTION LABEL “Z”	24	1	PISTON PROBE
7	4	DRIVE SCREW	25	2	O-RING - PROBE
8A	1	LIMIT SWITCH OR NAMUR PROXIMITY SENSOR ASSEMBLY-LEFT	26	4	RETAINING RING - PROBE
8B	1	LIMIT SWITCH OR NAMUR PROXIMITY SENSOR ASSEMBLY-RIGHT	27	1	WIRING DIAGRAM - NOT SHOWN
9	1	BRACKET - SWITCH/SENSOR	28	1	CONTROL BLOCK ASSEMBLY
10	3	MOUNTING SCREW - BRACKET	29A	1	GASKET-CONTROL BLOCK (DOUBLE ACTING) (SEE FIG. 1 ON PAGE 5)
11	2	ADJUSTMENT SPRING - SWITCH/SENSOR	29B	1	GASKET-CONTROL BLOCK (SPRING RETURN) (SEE FIG. 1 ON PAGE 5)
12	2	BUTTON - SWITCH/SENSOR	30	4	CONTROL BLOCK BOLTS
13	2	SPRING - SWITCH/SENSOR	31	1	PRINTED CIRCUIT BOARD
14	2	FLAT WASHER - SWITCH/SENSOR	32	2	MOUNTING SCREW - PRINTED CIRCUIT BOARD
15	4	MOUNTING SCREW - SWITCH/SENSOR	33	1	CONDUIT PLUG
16	2	RETAINING RING - SWITCH/SENSOR			
17	2	SCREW - SWITCH/SENSOR ADJUSTING			
18	1	SOLENOID ASSEMBLY			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