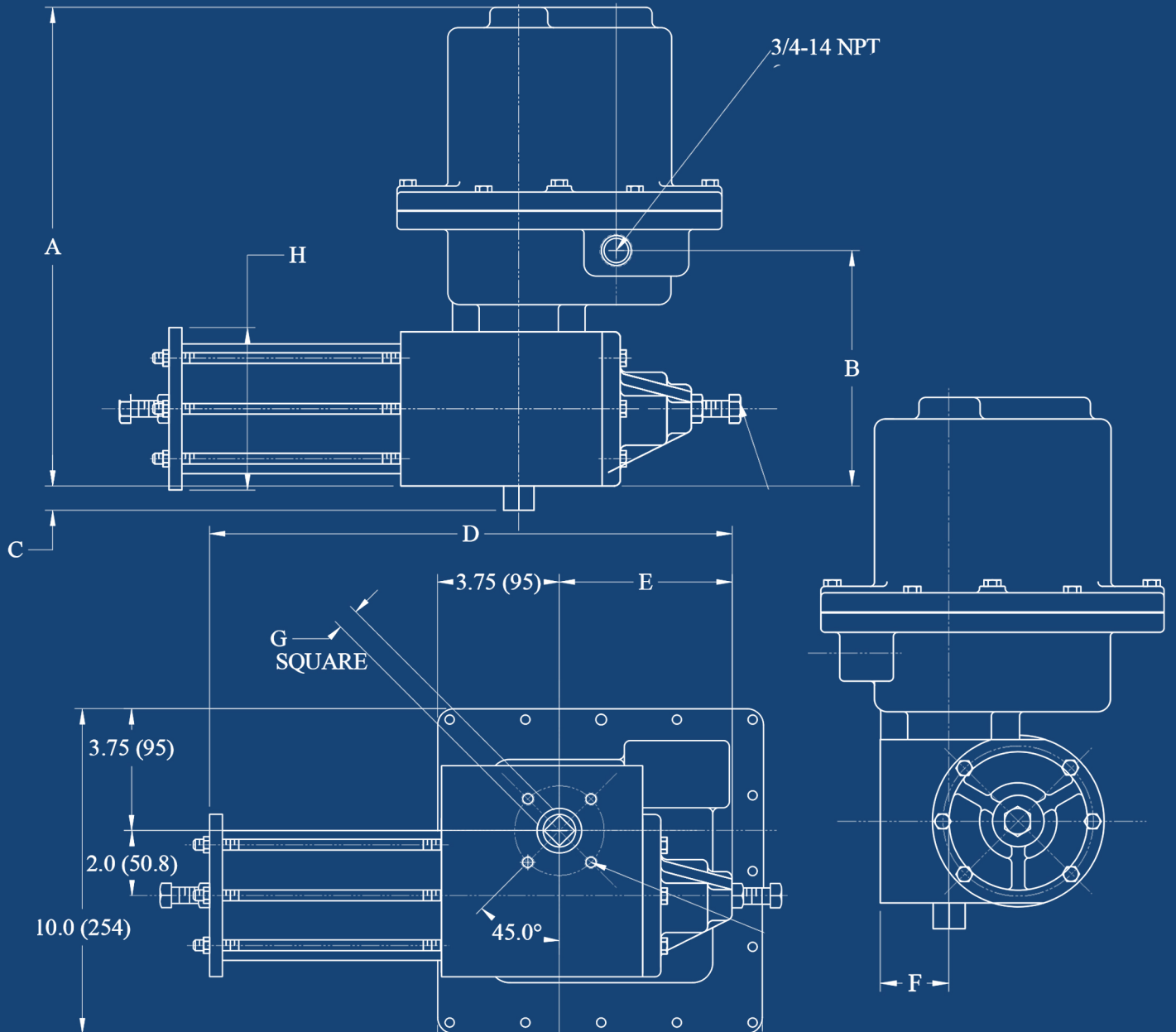


INDELAC

CONTROLS, INC.



ELECTRIC ACTUATOR Spring Return

Installation, Operation & Maintenance Manual

Thank you for selecting Indelac Controls, Inc. (ICI) for your valve or damper automation requirement. We at ICI are proud of our products and feel confident they will meet or exceed your expectations of quality and reliability.

Every precaution has been taken to ensure that your equipment will arrive undamaged; however, accidents do occur. Therefore, the first thing you must do upon receipt of your package is to inspect it for damage. If the box is damaged there is a possibility that the equipment inside the box may be damaged as well. If this is the case, **YOU MUST FILE A CLAIM** with the delivering **CARRIER**. All shipments are **F.O.B.** our factory and it is **YOUR RESPONSIBILITY** to file a claim for damages.

STORAGE:

If the actuators are scheduled for installation at a later date:

1. Store off the floor.
2. Store in a climate-controlled building.
3. Store in a clean and dry area.

FOR FUTURE REFERENCE RECORD:

1. Actuator model number _____
2. Actuator enclosure type NEMA 4__ NEMA 4X__ NEMA 7__ NEMA 4 & 7__
3. Actuator output torque _____ LB-IN
4. Motor characteristics, Voltage _____ Hertz _____ Phase _____
5. Actuator serial number _____
6. Date of installation _____ Put into operation _____
7. Valve Data:
 - 7a. Manufacturer _____
 - 7b. Style & fig. No. _____
 - 7c. Size _____
 - 7d. End connection _____
 - 7e. Material of construction, Body _____ Stem & ball _____
 - 7f. Brake away torque _____ LB-IN @ _____ PSI
 - 7g. Other helpful data _____

MEDIA:

1. System media _____
2. Temperature: _____ (deg. F.) Maximum: _____ Minimum: _____
3. Pressure: _____ PSI

*As this information is listed it is important to pay attention to all of the actuator specifications relative to the valve specifications and system requirements. If the actuator is not properly sized for the valve and application the life will be shortened or it may not work at all.

TOOLS REQUIRED:

Cover Screws

Model ES2	7/16" Socket Wrench
Model AS	3/16" Allen Wrench
Model ASC	3/16" Allen Wrench

Terminal Strip Screws

All Models	3/16" Wide Flat Head Screwdriver
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Cam Set Screw

All Models	5/64" Allen Wrench
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Mounting Pad Screws

All Models	1/2" Socket Wrench
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✓ *ADDITIONAL TOOLS COULD BE REQUIRED FOR FASTENERS USED WHEN MOUNTING THE ACTUATORS TO A VALVE/DAMPER.*

SUGGESTED MAXIMUM TORQUE VALUES FOR FASTENERS (IN-LBS.)

SCREW SIZE	LOW CARBON STEEL	18-8 SS	316 SS	ALUMINUM
2-56	2.2	2.5	2.6	1.4
4-40	4.7	5.2	5.5	2.9
6-32	9	10	10	5
8-32	18	20	21	10
10-24	21	23	24	13
10.32	30	32	33	19
¼-20	65	75	79	45
5/16-18	129	132	138	80
3/8-16	212	236	247	143
½-13	465	517	542	313
5/8-11	1000	1110	1160	715

ABOUT ELECTRIC SPRING RETURN ACTUATORS:

ICI's electric spring return actuators are fail-safe actuators designed to prevent catastrophic loss of system media or production caused by a sudden loss of electricity. Only ASC Models have been designed for use in control applications. When used in the manner for which they were designed they will deliver years of protection for your system. Please read these instructions completely before installing and using your new ICI electric spring return actuator.

ACTUATOR TESTING AND CALIBRATION

Electric spring return actuators must be mounted to a valve or damper prior to testing the spring fail feature of the product. Failure to do this will damage the product and the product will need to be returned to the factory for repair. This type of damage is not covered under the factory warranty.

INSTALLATION:

- PLEASE REFER TO THE **TOOLS REQUIRED** SECTION ON PAGE 3 PRIOR TO INSTALLATION.
- THE ACTUATOR IS SHIPPED IN THE **DESIGNATED FAIL** POSITION FROM THE FACTORY; MAKE SURE THE VALVE AND ACTUATOR ARE IN THE SAME POSITION BEFORE MOUNTING.

1. Manually position the valve/damper to the designated fail position,
 - The actuator is a (FC) Fail Closed model it will fail **CLOCKWISE (CW)** on loss of utility power. The valve/damper must be manually rotated fully **CLOCKWISE (CW)** when mounting the actuator.
 - The actuator is a (FO) Fail Open model it will fail **COUNTER-CLOCKWISE (CCW)** on loss of utility power. The valve/damper must be manually rotated fully **COUNTER-CLOCKWISE (CCW)** when mounting the actuator.

2. Remove valve mechanical stops.

CAUTION: DO NOT REMOVE ANY PARTS NECESSARY FOR THE PROPER OPERATION OF THE VALVE, I.E., PACKING GLAND, GLAND NUT, ETC.

3. Check again that the valve and actuator are in the same position.
4. Install mounting hardware on valve, do not tighten bolts securely at this time, mount actuator to valve, and once actuator screws have been started securely tighten all nuts and bolts.

NOTE: ACTUATOR CONDUIT ENTRY IS NORMALLY POSITIONED PERPENDICULAR TO PIPELINE.

5. Remove actuator cover.
6. Wire actuator using the wiring diagram inside of the actuator. If there is no wiring diagram call the factory to obtain the proper wiring diagram before attempting to wire the actuator. Equipment failure due to improper wiring is not covered under the factory warranty.

CAUTION: BE SURE POWER IS OFF AT THE MAIN POWER BOX.

7. Turn on power to actuator.

CAUTION: USE EXTREME CAUTION, AS THERE ARE LIVE CIRCUITS THAT COULD CAUSE ELECTRICAL SHOCK OR DEATH.
8. Operate the valve to the close position, check the alignment.
9. Operate the valve to the open position, check the alignment.
10. Check to ensure that the cover gasket is properly set in its groove. If the gasket is out of the groove, manipulate it back into place with your fingers to ensure a proper seal to eliminate the ingress of water, dust, or other debris.
11. Replace cover and secure cover screws.

NOTE: FOR QUESTIONS REGARDING ES2 MODELS MOUNTED TO AN EXTERNAL MANUAL OVERRIDE GEARBOX PLEASE CONSULT THE FACTORY.

CALIBRATION OF STANDARD OPEN/CLOSE MODEL:**AFTER CHECKING THE ALIGNMENT OF THE VALVE PORT, CALIBRATION MAY BE REQUIRED.****To Set the Open Position:**

Operate valve to the open position by applying power to terminal connections #1 and #2, the valve will rotate counter-clockwise, CCW, viewing top of actuator.

NOTE: WHEN THE ACTUATOR IS IN THE OPEN POSITION THE SETSCREW SECURING THE CAM TO THE SHAFT IS EASILY ACCESSIBLE.

1. If the valve did not open completely.
 - a. Loosen 8-32 set screw in top cam.
 - b. Rotate cam clockwise (CW) until the switch makes contact, listen carefully for a slight click. The valve will begin to rotate CCW, by making small incremental CW movements of the cam the valve can be positioned precisely in the desired position.
 - c. Securely tighten the setscrew.
2. If valve traveled too far open.

CAUTION: VALVES WITH MECHANICAL STOPS MAY BE DAMAGED OR CAUSE DAMAGE TO THE ACTUATOR IF ALLOWED TO TRAVEL TOO FAR.

- a. Apply power to terminal connections #1 and #3, the valve will begin to rotate CW, allow it to travel to the mid position.
 - b. Follow directions of "To set open position".
3. After the position is set and if open is the designated fail position, rotate the adjusting screw clockwise until the screw touches the mechanical stop then rotate it counter clockwise one full turn and lock the jam nut so the adjusting screw remains in position. By doing this the mechanical stop never comes in contact with the adjusting screw except upon loss of power.

CALIBRATION OF STANDARD OPEN/CLOSE MODEL:**AFTER CHECKING THE ALIGNMENT OF THE VALVE PORT, CALIBRATION MAY BE REQUIRED.****To Set the Close Position:**

Operate valve to the close position by applying power to terminal connections #1 and #3, the valve will rotate CW viewing the top of the actuator.

NOTE: WHEN THE ACTUATOR IS IN THE OPEN POSITION THE SETSCREW SECURING THE CAM TO THE SHAFT IS EASILY ACCESSIBLE.

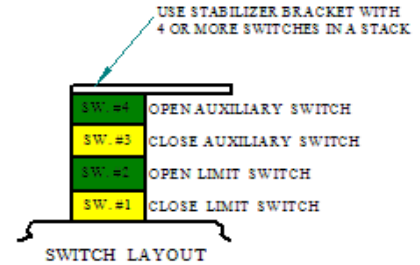
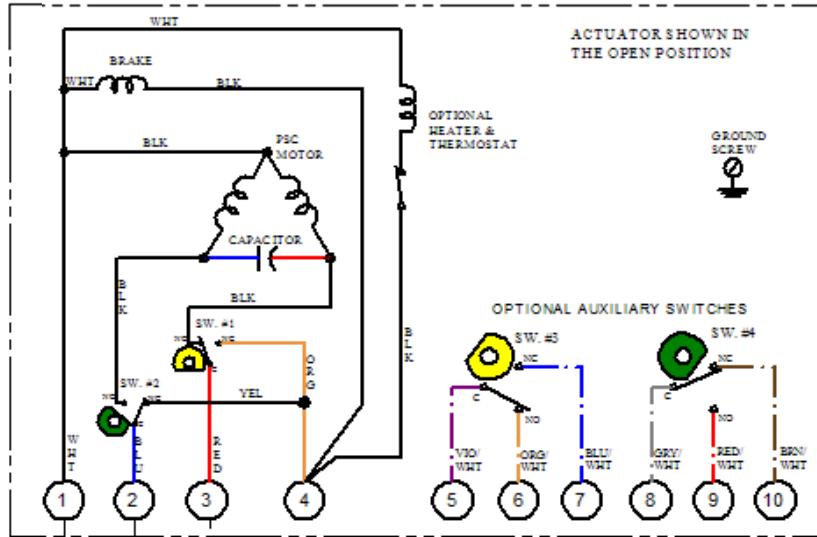
1. If valve did not close completely.
 - a. Loosen 8-32 set screw in bottom cam.
 - b. Rotate cam CCW until the switch makes contact, listen for a slight click. The valve will begin to rotate CW, by making small CCW incremental movements of the cam the valve can be positioned precisely in the close position.
 - c. Securely tighten the setscrew.
2. If the valve has traveled too far closed.

CAUTION: VALVES WITH MECHANICAL STOPS MAY BE DAMAGED OR CAUSE DAMAGE TO THE ACTUATOR IF ALLOWED TO TRAVEL TOO FAR CLOSED.

- a. Apply power to terminal connections #1 and #2, the valve will begin to rotate CCW, allow it to travel to the mid position.
 - b. Follow directions of "To Set Close Position".
3. After the position is set and if open is the designated fail position, rotate the adjusting screw clockwise until the screw touches the mechanical stop then rotate it counter clockwise one full turn and lock the jam nut so the adjusting screw remains in position. By doing this the mechanical stop never comes in contact with the adjusting screw except upon loss of power.

CUSTOMER ELECTRICAL CONNECTIONS:

ES2 & AS SERIES STANDARD 115VAC WIRING DIAGRAM: W990910



SPDT CONTROL SWITCH SHOWN FOR ILLUSTRATION ONLY

N

HOT

A.C. SUPPLY POWER

NOTES:
 POWER TO TERMINALS ONE & TWO OPENS THE VALVE (CCW ROTATION)
 POWER TO TERMINALS ONE & THREE CLOSSES THE VALVE (CW ROTATION)
 TERMINAL 4 SUPPLIES 120V POWER TO THE BRAKE ONCE THE ACTUATOR REACHES IT'S OPEN OR CLOSE POSITION. THE BRAKE WILL HOLD THE ACTUATOR IN THAT POSITION UNTIL POWER IS DELIVERED TO THE OPPOSITE DIRECTION.

LOSS OF SUPPLY POWER WILL SHUT OFF POWER TO THE BRAKE AND CAUSE THE ACTUATOR TO BE SPRING DRIVEN TO THE FAIL POSITION. UPON RETURN OF SUPPLY POWER THE ACTUATOR WILL AUTOMATICLY RETURN TO THE POSITION THE CONTROL SWITCH DESIGNATES.

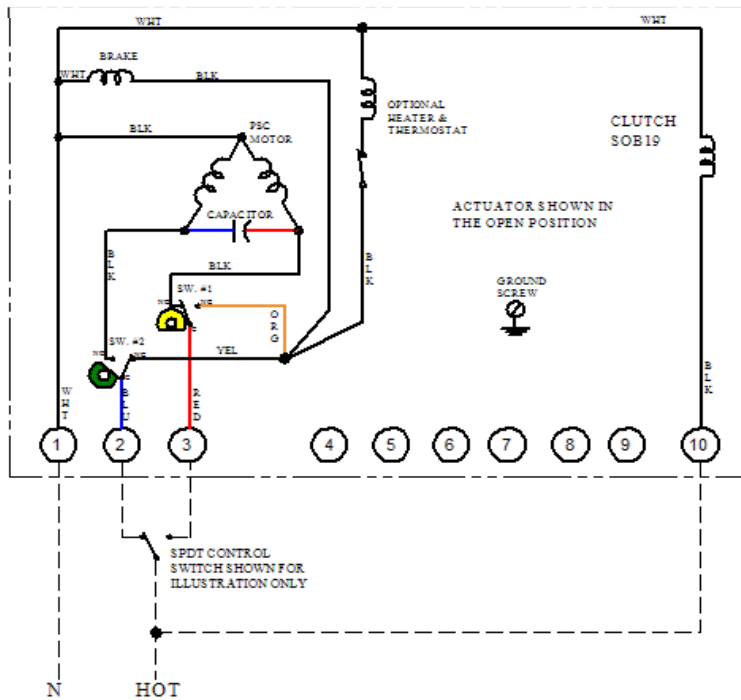
DO NOT MOTOR DRIVE THE ACTUATOR INTO MECHANICAL STOP. OUTPUT PINION WILL BE DAMAGED.

THIS IS A FAIL-SAFE ACTUATOR - DO NOT USE IN CONTROL TYPE APPLICATIONS

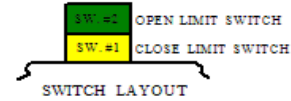
FIELD WIRING

CUSTOMER ELECTRICAL CONNECTIONS:

ASC SERIES STANDARD 115VAC WIRING DIAGRAM: W110928



A.C. SUPPLY POWER
FIELD WIRING



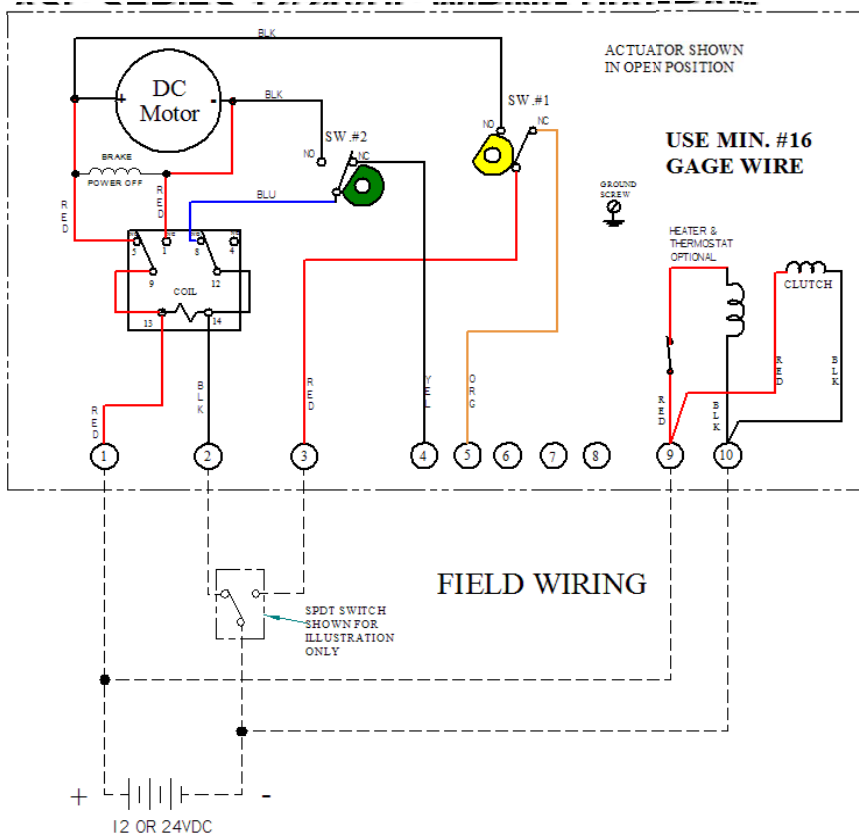
NOTES:
POWER TO TERMINALS ONE & TWO OPENS THE VALVE (CCW ROTATION)
POWER TO TERMINALS ONE & THREE CLOSES THE VALVE (CW ROTATION)

LOSS OF SUPPLY WILL SHUT OFF POWER TO THE CLUTCH AND CAUSE THE ACTUATOR TO BE SPRING DRIVEN TO THE FAIL POSITION. UPON RETURN OF SUPPLY POWER THE ACTUATOR WILL AUTOMATICLY RETURN TO THE POSITION THE CONTROL SWITCH DESIGNATES.

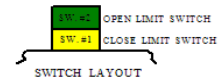
DO NOT MOTOR DRIVE ACTUATOR INTO MECHANICAL STOP, OUTPUT PINION WILL BE DAMAGED.

THIS IS A FAIL-SAFE ACTUATOR DO NOT USE IN CONTROL TYPE APPLICATIONS

ASC SERIES STANDARD 12/24VDC WIRING DIAGRAM: W110621



FIELD WIRING



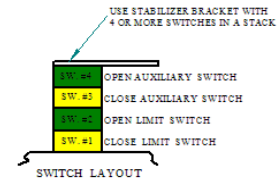
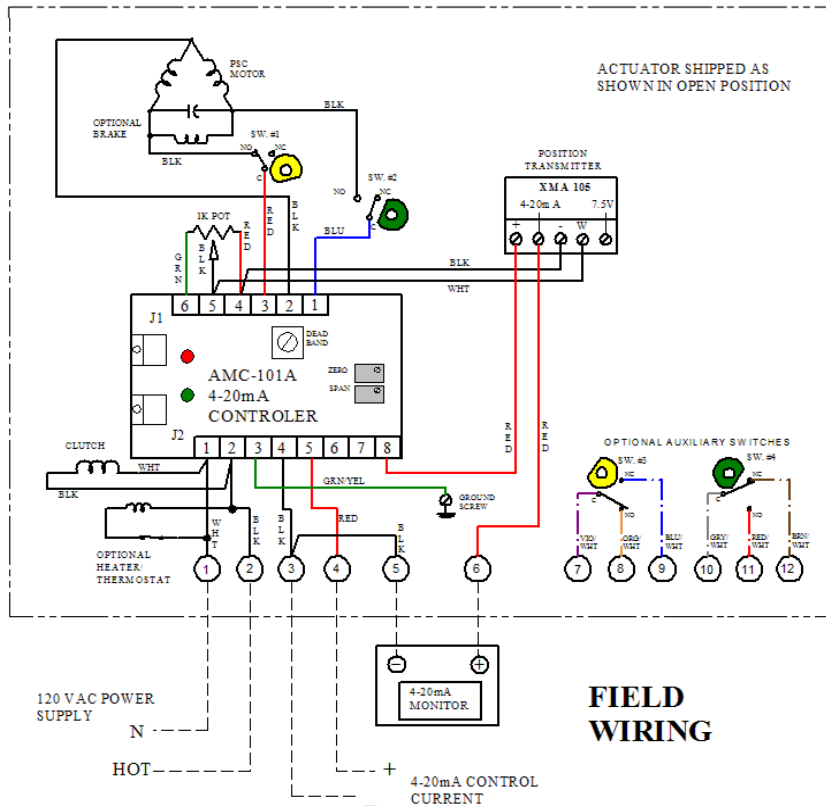
ACTUATOR SHOWN IN OPEN POSITION

USE MIN. #16 GAGE WIRE

OPERATION:
POWER TO 1 & 2 FOR CCW ROTATION (OPEN)
POWER TO 1 & 3 FOR CW ROTATION (CLOSE)
TERMINALS 4 & 5 FOR LIGHT INDICATION
TERMINALS 9 & 10 FOR HEATER, THERMOSTAT & CLUTCH RELAY TO BE 15A CONTACT RATED.

CUSTOMER ELECTRICAL CONNECTIONS:

ASC SERIES 115VAC WITH 4-20MA POSITIONER WIRING DIAGRAM: W160624



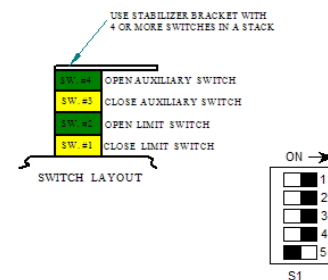
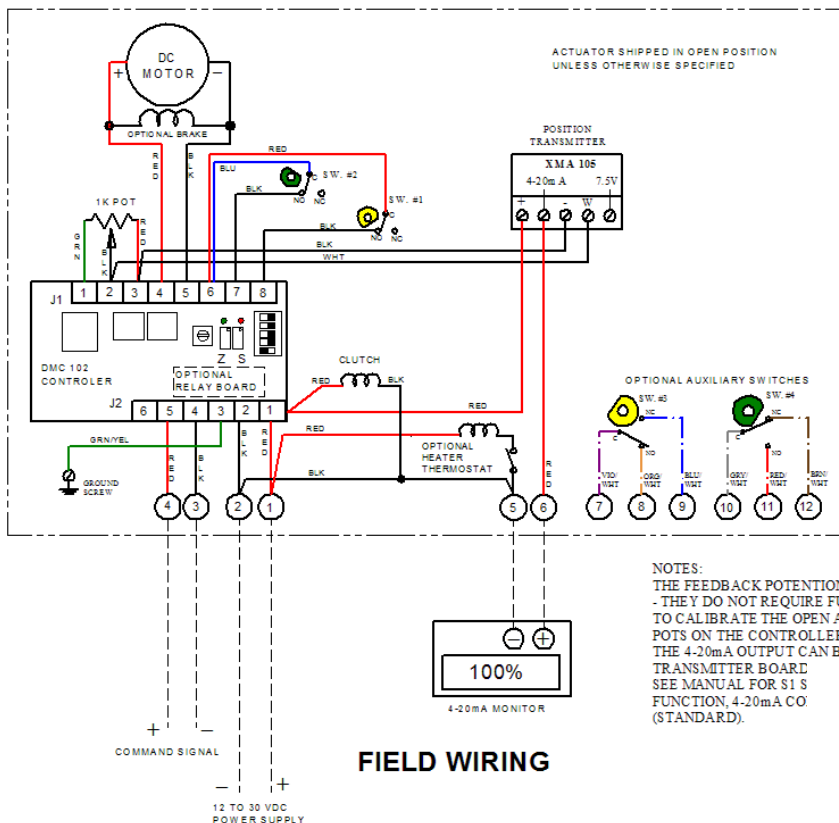
NOTE:
THE FEEDBACK POTENTIOMETER AND LIMIT SWITCHES HAVE BEEN SET AT THE FACTORY - THEY DO NOT REQUIRE FURTHER CALIBRATION.

TO CALIBRATE THE OPEN AND CLOSE POSITION USE THE TRIM POTS LABELED Z (ZERO) FOR CLOSE (4mA) AND S (SPAN) FOR OPEN (20mA).

115VAC POWER TO BE APPLIED ALL THE TIME - THIS POWERS AND ENGAGES THE MOTOR CLUTCH. WHEN POWER IS REMOVED, THE CLUTCH DIS-ENGAGES AND THE ACTUATOR WILL FAIL TO THE DESIRED POSITION.

W160624

ASC SERIES DC VOLTAGE WITH 4-20MA POSITIONER WIRING DIAGRAM: W120716



LOSS OF SUPPLY WILL SHUT OFF POWER TO THE CLUTCH AND CAUSE THE ACTUATOR TO BE SPRING DRIVEN TO THE FAIL POSITION. UPON RETURN OF SUPPLY POWER THE ACTUATOR WILL AUTOMATICLY RETURN TO THE POSITION THE CONTROL SWITCH DESIGNATES.

DO NOT MOTOR DRIVE ACTUATOR INTO MECHANICAL STOP, OUTPUT PINION WILL BE DAMAGED.

THIS IS A FAIL-SAFE ACTUATOR DO NOT USE IN CONTROL TYPE APPLICATIONS

NOTES:
THE FEEDBACK POTENTIOMETER AND LIMIT SWITCHES HAVE BEEN SET AT THE FACTORY - THEY DO NOT REQUIRE FURTHER ADJUSTMENT.
TO CALIBRATE THE OPEN AND CLOSE POSITION, USE THE ZERO (4mA) AND SPAN (20mA) POTS ON THE CONTROLLER BOARD.
THE 4-20mA OUTPUT CAN BE FINE TUNED USING THE ZERO AND SPAN POTS ON THE TRANSMITTER BOARD
SEE MANUAL FOR S1 S FUNCTION, 4-20mA CO (STANDARD).

W120716

AC VOLTAGE MODULATING POWER / SIGNAL (J2):

Power is connected to input terminals as shown in the wiring diagrams above. The fuse installed on the unit is rated for maximum output current that can be safely delivered by the AC to the motor. Replacement fuses must not exceed these maximum ratings (5A slow blow) to prevent damage to the unit.

An appropriate command signal, either 0-10V, 1-5V, or 4-20mA, should be connected to the input terminals (as shown in the wiring diagram). The positioner must be configured for the type of command signal that is to be used - jumper plug JP1 must be installed whenever a 4-20mA or 0-10V input is used. Terminal 7 of J2 provides an auxiliary +10V output, which can be used to connect a command potentiometer. By connecting one end of a potentiometer to terminal 7, the other end to terminal 4, and the wiper to terminal 6, a local control knob can be implemented. Terminal 8 provides an auxiliary +24VDC output, which can be used to power feedback transmitter.

WARNING! Verify that the unit is properly grounded for safety.

AC VOLTAGE MODULATING ACTUATOR (J1):

The position potentiometer is connected so that when the actuator moves towards the open position (CCW), the potentiometer's resistance between terminals 4 and 5 on J1 will increase. This can also be measured as a voltage - the voltage between terminals 4 and 5 on J1 should increase when the actuator moves towards the open position (CCW). If the potentiometer is wired incorrectly, the typical response of the unit will be to run the actuator to the full open or closed position (the appropriate open/close indicator will remain on) regardless of the command signal input. For best results, position the actuator to the midway point between the open and closed positions; then adjust the position potentiometer for approximately 5VDC (or 1/2 of the potentiometer's resistance) between terminals 4 and 5 of J1. Since the position potentiometer is crucial for proper operation of the modulating board, the following items should be carefully observed:

- 1 - Potentiometer resistance should be a value from 1K to 10K ohms.
- 2 - The potentiometer should be a linear taper type.
- 3 - The potentiometer must be properly wired to provide the correct position signal.
- 4 - The potentiometer must be properly and securely mounted in order to provide a reliable signal to the board.

AC VOLTAGE MODULATING OUTPUT INDICATORS:

ICI's modulating units have on-board indicators that identify when one of the motor outputs is turned on. When the open output is turned on, the red LED indicator will turn on, and when the close output is turned on the green LED indicator will turn on. Many actuators are equipped with limit switches at the open and closed positions which are intended to disconnect power to the motor to prevent mechanical damage. For this reason, it is possible that the positioner will indicate that one of the motor outputs is turned on when the actuator is not in motion. However, it should be noted that when the indicator is on, power is applied to the motor output. If one of the motor output LEDs is on and the motor is not turning, see the **CALIBRATION** section on page 10.

AC VOLTAGE MODULATING LOSS OF INPUT SIGNAL:

When the 1-5V or 4-20mA type command signal is used, the modulating board can detect if the input signal has been disconnected. The unit can be configured to respond to the loss of command signal in one of three ways: turn both outputs off (leaving the actuator in its last position at the time signal was lost), turn on the open output (to move the actuator to the full open position), or turn on the close output (to move the actuator to the full closed position). AC power must be present for the actuator to fail open or fail closed. To select the desired response to a loss of input signal, move jumper plug JP2 (last position), JP3 (fail open), or JP4 (fail close) as shown in the board diagram. **CAUTION! Power must be disconnected when installing or removing these jumpers - damage to the unit may occur if these jumpers are set with power on.**

When using this feature, certain precautions should be observed. For applications using the 0-10V input signal, the unit cannot detect a loss of signal; do not install jumper plugs JP2, JP3, and JP4 for these applications. When JP3 or JP4 are installed, the unit will turn on one of the motor outputs when the input signal is lost; if the actuator does not use limit switches, these selections should not be used.

AC VOLTAGE MODULATING POSITION CALIBRATION:

The non-interactive zero and span adjustments of the modulating board allow for easy calibration once the unit is installed. Follow these steps to calibrate the unit (see board diagram for the location of the adjustments):

1. Apply AC power to the actuator and set the command input signal to minimum: 0V for 0-10V input type 1V for 1-5V input type 4mA for 4-20mA input type.
2. Adjust the "Zero" adjustment so that the actuator moves to the desired closed position. If the desired position cannot be achieved, check that the position potentiometer provides a feedback signal as described under "ACTUATOR (J1)"; also, check the position of the CLOSE limit switch. Adjust the CLOSE cam CCW to allow for more travel in CLOSE position, if needed.
3. If the actuator is hunting for position, turn the "Deadband" adjustment clockwise until hunting stops. If the actuator is not hunting for position, turn the "Deadband" adjustment counterclockwise until the actuator begins to hunt; then turn the "Deadband" adjustment slightly clockwise until hunting stops. **WARNING!** Actuator failure may occur if the "Deadband" adjustment is set to allow continuous hunting. This can cause excessive wear of motor bearings, gear train, dynamic brake, and position potentiometer. Hunting can also cause the internal temperature of the actuator housing to rise to a level that exceeds the maximum rating of the motor.
4. Set the command signal input to maximum: 10V for 0-10V input type 5V for 1-5V input type 20mA for 4-20mA type.
5. Adjust the "Span" adjustment so that the actuator moves to the desired open position. If the desired position cannot be achieved, check the position of the OPEN limit switch. Adjust the OPEN cam CW to allow for more travel in OPEN position, if needed.

NOTE: The "Zero" adjustment is an offset setting rather than an absolute setting. Should the "Zero" adjustment be changed, the "Span" adjustment should be checked for the desired open position. Setting of the "Span" adjustment has no effect on the "Zero" adjustment.

6. To check proper operation and linearity, set the command signal to halfway: 5V for 0-10V input type 3V for 1-5V input type 12mA for 4-20mA input type. Verify that the actuator's position is midway between the open and closed positions.

AC VOLTAGE REVERSE ACTING CALIBRATION

4Ma: OPEN | 20Ma: CLOSED

When converting a direct acting actuator to a reverse acting actuator, two changes in wiring must be made and the cams reset:

- 1 - Reverse the feedback potentiometer wires connected to J1-4 and J1-6.
- 2 - Reverse the motor output wires connected to J1-1 and J1-3.

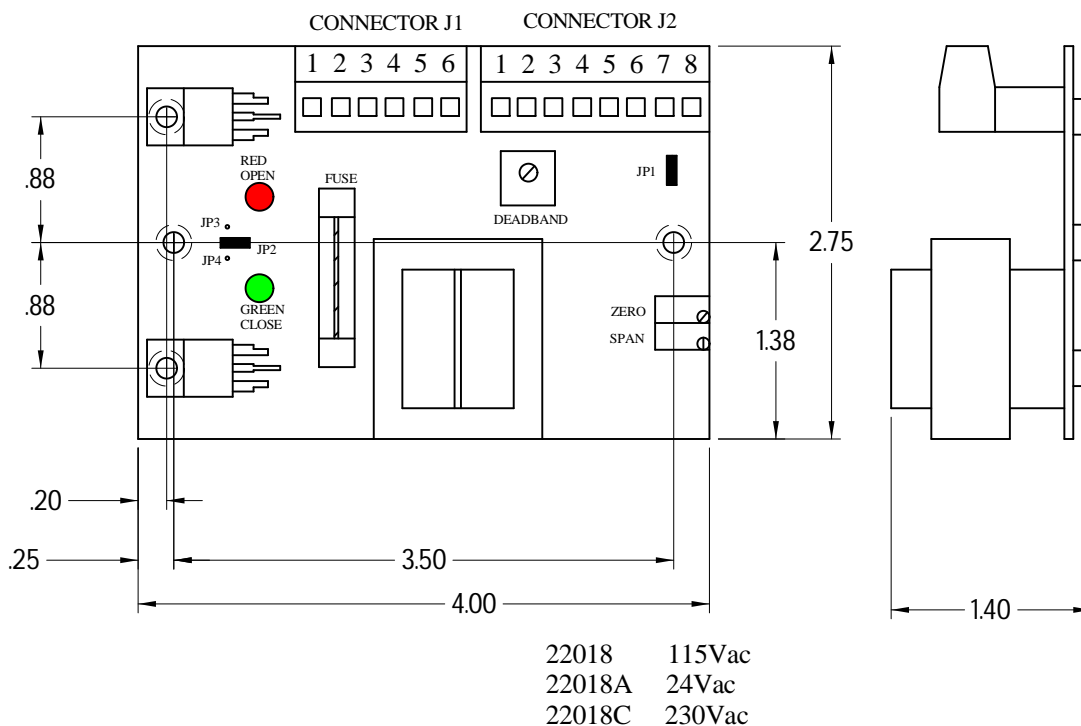
NOTE: DO NOT reverse the input signal polarity. Also, make sure that both wiring changes are made - if only one is made, the actuator will run to either full open or full closed. After the wiring changes have been made, refer to **CALIBRATION** for setting the zero and span adjustments.

AC VOLTAGE RECALIBRATION OF MODULATING BOARD

1. Move motor and valve to 45° or mid-position between open and close.
2. Loosen set screw on the potentiometer shaft gear.
3. Turn power to the actuator OFF so that the motor does not move.
4. Pull the 6-terminal J1 green connector out away from the controller board so that the potentiometer is isolated from the circuit card.
5. Using a DVM, measure the resistance of the potentiometer between terminals 4 & 5 at the free hanging J1 connector.
6. Rotate the potentiometer shaft gear until the resistance reads approximately 500 ohms (+/-10).
7. Tighten down the potentiometer shaft gear set screw to lock the gear in place.
8. Push the green J1 connector back into the controller board.
9. Connect a User Control Signal (4-20mA, 0-10v, etc.) to the actuator input terminals. This may be either to a white input terminal strip or directly to the 8 -terminal J2 Connector. The connections at J2 (8 Terminal Green Connector) are: terminal 4 = (-); terminal 5 = (4-20mA +); terminal 6 = (0-10v +). Consult your actuator's wiring diagram for the proper terminal connections.
10. Set the User Control Signal to the CLOSE level (0%) - 4.0mA or 0V.
11. Make sure the Deadband pot on the controller board is at mid position.
12. Loosen the set screws to the 2 Lower CAMs and rotate the CAMs so that the flat of each CAM is toward the switch levers. The switch levers should NOT be pressed in.
13. Turn the AC power back ON to the actuator. Use **CAUTION** with the next few steps because power is present, and an electrical shock is possible.
14. The Green LED on the board should come on. If not, adjust the Zero Pot until the Green LED illuminates.
15. Press the bottom switch lever (or CLOSE CAM) in so that the motor starts to move to the CLOSE position.
16. When the valve reaches the fully CLOSED position, release the switch lever to stop the motor. If the valve does not reach the fully CLOSED position on the first adjustment, keep adjusting the Zero Pot until full travel is reached.
17. Adjust the Zero Pot so that both the Green and Red LEDs are OFF.

18. Adjust the CLOSE (bottom) CAM so that the bottom switch lever is pressed in, but further travel in the CLOSE direction would “click” the lever to the open position. Tighten the bottom CAM set screw.
19. Set the User Control Signal to the OEPN level (100%) - 20.0mA or 10V.
20. The Red LED should turn on.
21. Press the top switch lever (or OPEN CAM) in so that the motor starts to move to the OPEN position.
22. When the valve reaches the fully OPEN position, release the switch lever to stop the motor. If the valve does not reach the fully OPEN position on the first adjustment, keep adjusting the Span Pot until full travel is reached.
23. Adjust the Span Pot so that both the Green and Red LEDs are OFF.
24. Adjust the OPEN (top) CAM so that the top switch lever is pressed in, but further travel in the OPEN direction would “click” the lever to the open position. Tighten the top CAM set screw.
25. Deliver OPEN, MID and CLOSE (0%, 50% & 100%) Control Signals a few times to verify that the valve travels to the proper positions. Adjust as described above if further adjustments are needed.
26. Turn OFF the AC Power and check that all the set screws are tightened. Replace the actuator cover and tighten the screws.
27. Re-apply the AC power to the actuator.

AC VOLTAGE MODULATING BOARD DIMENSIONS:



AC VOLTAGE MODULATING BOARD SPECIFICATIONS

POWER REQUIREMENTS:

117VAC ±10%, 50/60 Hz
 234VAC ±10%, 50/60 Hz
 24VAC ±10%, 50/60 Hz
 3.6 VA typical (not including output load)
Fuse Type: 5A 3AG Slo-Blo

COMMAND SIGNAL INPUT:

0-10 VDC Input
 Input Impedance: 11K ohms minimum
 External Command Potentiometer: 1K ohm
1-5 VDC Input
 Input Impedance: 1M ohms minimum
 Loss of Command Signal Threshold: □0.75V
4-20 mA Input
 Input Impedance: 250 ohms ±1%
 Loss of Command Signal Threshold: □3mA

FEEDBACK SIGNAL INPUT:

Input Voltage: 0 to 10 VDC
 External Feedback Potentiometer: 1K ohm to 10K ohms

POWER SUPPLY OUTPUTS:

Input or Output Transmitter Power: (J2-8): 24VDC @ 20mA max
 Command Signal Potentiometer Power: (J2-7): 10VDC @ 10mA max
NOTE: Do not connect these outputs to other power supplies.

AC MOTOR OUTPUTS:

Off-state Leakage Current: <15mA
 Maximum Load Current @ 60° C:
 AMC-10 1x: 5A (when properly mounted to bracket)

CONTROL ADJUSTMENTS:

Zero: adjustable throughout feedback signal range
 Span: adjustable throughout command signal range
 Deadband: adjustable from 0.12% to 2.4% of span
 Hysteresis: 1%
 Linearity: 1%
 Repeatability: 2%

ENVIRONMENTAL:

Operating Temperature Range: 0 °C to 60 °C
 Storage Temperature Range: -40 °C to 85 °C
 Relative Humidity Range: 0 to 90% (non-condensing)

DC VOLTAGE MODULATING POWER / SIGNAL (J2):

Power is connected to the input terminals as shown in the wiring diagrams above. The controller board is capable of delivering up to 10A continuous motor power AND up to 60A Locked Rotor Current. There is an on-board fuse, but it is not replaceable in the field.

An appropriate command signal should be connected to the input terminals (as shown in the wiring diagram). The positioner must be configured for the type of command signal that is to be used by setting the appropriate DIP switches (see configuration below). Terminal 6 of J2 provides an auxiliary +5V output, which can be used to connect a command potentiometer. By connecting one end of a potentiometer to terminal 6, the other end to terminal 4, and the wiper to terminal 5, a local control knob can be implemented. Terminal 4 will also need to be connected to Power Ground for this application.

WARNING! Verify that the unit is properly grounded for safety.

S1

COMMAND INPUT SIGNAL CONFIGURATION

COMMAND TYPE	SW1	SW2	SW3	SW4	LOSS OF COMMAND OPERATION
4-20mA	ON	ON	ON	ON	Motor off
			ON	OFF	Close (Zero setting)
			OFF	ON	Open (Span setting)
1-5V	OFF	ON	ON	ON	Motor off
			ON	OFF	Close (Zero setting)
			OFF	ON	Open (Span setting)
2-10V	OFF	OFF	ON	ON	Motor off
			ON	OFF	Close (Zero setting)
			OFF	ON	Open (Span setting)
0-5V	OFF	ON	OFF	OFF	NA
0-10V	OFF	OFF	OFF	OFF	NA

NOTE: All other settings are not valid and can cause abnormal operation.

CONTROL FUNCTION	SW5
Normal	OFF
Log Rate	ON

DC VOLTAGE MODULATING ACTUATOR (J1):

The position potentiometer is connected so that when the actuator moves towards the open position (CCW), the potentiometer's resistance between terminals 2 and 3 of J1 on the board, will increase. This can also be measured as a voltage - the voltage between terminals 2 and 3 should increase when the actuator moves towards the open position (CCW). If the potentiometer is wired incorrectly, the typical response of the unit will be to run the actuator to the full open or closed position (the appropriate open/close indicator will remain on) regardless of the command signal input. For best results, position the actuator to the midway point between the open and closed positions; then adjust the position potentiometer for approximately 5VDC (or 1/2 of the potentiometer's resistance) between terminals 2 and 3 of J1. Since the position potentiometer is crucial for proper operation of the modulating board, the following items should be carefully observed:

- 1 - Potentiometer resistance should be a value of 1K ohms.
- 2 - The potentiometer should be a linear taper type.
- 3 - The potentiometer must be properly wired to provide the correct position signal.
- 4- The potentiometer must be properly and securely mounted in order to provide a reliable signal to the board.

DC VOLTAGE MODULATING OUTPUT INDICATORS:

ICI's modulating units have on-board indicators that identify when one of the motor outputs is turned on. When the open output is turned on, the red LED indicator will turn on, and when the close output is turned on the green LED indicator will turn on. Many actuators are equipped with limit switches at the open and closed positions which are intended to disconnect power to the motor to prevent mechanical damage. These switch set points need to be set just out of the range of OPEN and CLOSE range, so that the switch will NOT trip prior to reaching the desired full OPEN or full CLOSE positions. If the limit switch/es trip prior to reaching the OPEN or CLOSE position, one or more of the LEDs will begin flashing. See chart below. If one of the motor output LEDs is flashing and the motor is not turning, see the **CALIBRATION** section below.

GRN	RED	CONDITION
-	ON	MOTOR 1 on (+)
ON	-	MOTOR 2 on (+)
-	flash	LIMIT SW1 disconnected
flash	-	LIMIT SW2 disconnected
blink	OFF	Feedback WIPER < 0.25V
OFF	blink	Feedback WIPER > 4.75V
blink	blink	Low Battery Voltage
ON	ON	Overvoltage

DC VOLTAGE MODULATING LOSS OF INPUT SIGNAL:

When the 1-5V or 4-20mA type command signal is used, the modulating board can detect if the input signal has been disconnected. The unit can be configured to respond to the loss of command signal in one of three ways: turn both outputs off (leaving the actuator in its last position at the time signal was lost), to move the actuator to the full open position, to move the actuator to the full closed position. DC power must be present for the actuator to fail open or fail closed. To select the desired response to a loss of input signal, configure the DIP switches as shown in the above chart. **CAUTION! Power must be disconnected when configuring these switches - damage to the unit may occur if these switches are set with power on.**

NOTE: For applications using the 0-10V input signal, the unit cannot detect a loss of signal - set SW#3 and SW#4 for OFF.

DC VOLTAGE MODULATING POSITION CALIBRATION:

The non-interactive zero and span adjustments of the modulating board allow for easy calibration once the unit is installed. Follow these steps to calibrate the unit (see board diagram for the location of the adjustments):

1. Apply DC power to the actuator and set the command input signal to minimum: 0V for 0-10V input type 1V for 1-5V input type 4mA for 4-20mA input type.
2. Adjust the "Zero" adjustment potentiometer so that the actuator moves to the desired closed position. If the desired position cannot be achieved, check that the position potentiometer provides a feedback signal as described under "ACTUATOR (J1)"; also, check the position of the CLOSE limit switch. Adjust the CLOSE cam to allow for more travel in CLOSE position, if needed.
3. If the actuator is hunting for position, turn the "Deadband" adjustment clockwise until hunting stops. If the actuator is not hunting for position, turn the "Deadband" adjustment counterclockwise until the actuator begins to hunt; then turn the "Deadband" adjustment slightly clockwise until hunting stops. **WARNING!** Actuator failure may occur if the "Deadband" adjustment is set to allow continuous hunting. This can cause excessive wear of motor bearings, gear train, dynamic brake, and position potentiometer. Hunting can also cause the internal temperature of the actuator housing to rise to a level that exceeds the maximum rating of the motor.
4. Set the command signal input to maximum: 10V for 0-10V input type 5V for 1-5V input type 20mA for 4-20mA type.
5. Adjust the "Span" pot adjustment so that the actuator moves to the desired open position. If the desired position cannot be achieved, check the position of the OPEN limit switch. Adjust the OPEN cam to allow for more travel in OPEN position, if needed. **NOTE:** The "Zero" adjustment is an offset setting rather than an absolute setting. Should the "Zero" adjustment be changed, the "Span" adjustment should be checked for the desired open position. Setting of the "Span" adjustment has no effect on the "Zero" adjustment.
6. To check proper operation and linearity, set the command signal to halfway: 5V for 0-10V input type 3V for 1-5V input type 12mA for 4-20mA input type. Verify that the actuator's position is midway between the open and closed positions.

DC VOLTAGE REVERSE ACTING CALIBRATION

4Ma: OPEN | 20Ma: CLOSED

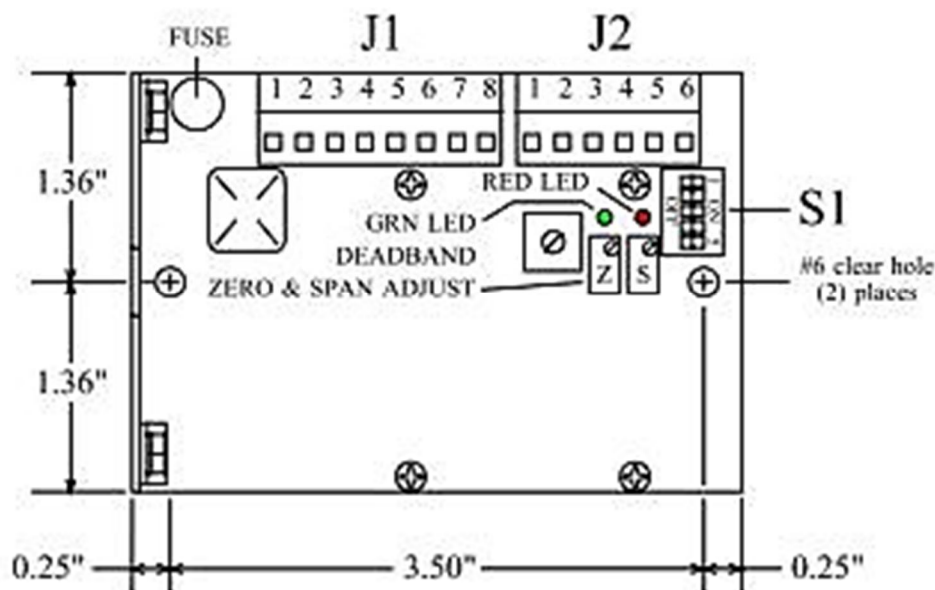
The ZERO and SPAN adjustments can be set to any position within the feedback potentiometer's range, so Reverse Acting applications do not require any wiring changes. When delivering a 4mA signal, adjust the ZERO pot to the valve's fully OPEN position. Then, deliver a 20mA signal and adjust the SPAN pot to the valve's full CLOSE position. If using a different control signal other than 4-20mA, deliver the appropriate signal and adjust as described above.

DC VOLTAGE RECALIBRATION OF MODULATING BOARD

1. Move motor and valve to 45° or mid-position between open and close.
2. Loosen set screw on the potentiometer shaft gear.
3. Turn power to the actuator OFF so that the motor does not move.
4. Pull the 8-terminal J1 green connector out away from the controller board so that the potentiometer is isolated from the circuit card.
5. Using a DVM, measure the resistance of the potentiometer between terminals 2 & 3 at the free hanging J1 connector.
6. Rotate the potentiometer shaft gear until the resistance reads approximately 500 ohms (+/-10).
7. Tighten down the potentiometer shaft gear set screw to lock the gear in place.
8. Push the green J1 connector back into the controller board.
9. Connect a User Control Signal (4-20mA, 0-10v, etc.) to the actuator input terminals. This may be either to a white input terminal strip or directly to the 6 –terminal J2 Connector. The connections at J2 (6 Terminal Green Connector) are: terminal 4 = (-); terminal 5 = (+). Consult your actuator's wiring diagram for the proper terminal connections.
10. Cut the wire tie from around the motor and carefully pull the Red motor wire and connector off the "+" motor terminal. Pull aside so that it does not make contact with the motor or any metal parts.
11. Set the User Control Signal to the CLOSE level (0%) - 4.0mA or 0V.
12. Make sure the Deadband pot on the controller board is at mid position.
13. Turn the DC power back ON to the actuator. Use **CAUTION** with the next few steps because power is present, and an electrical shock is possible.
14. Verify that both CAMs are pressing the switch levers in towards the switch bodies.
15. The Green LED on the board should come on. If not, adjust the Zero Pot until the Green LED illuminates.
16. If any of the LEDs are blinking or flashing or there is a question regarding the setup of the Command Signal Configuration Switches, please see the Positioner Data Sheet.
17. Connect and lightly hold the Red motor wire onto the "+" motor terminal so that the valve moves in the CLOSE direction.
18. When the valve reaches the fully CLOSED position, remove the Red motor wire to stop the motor. If the valve does not reach the fully CLOSED position on the first adjustment, keep adjusting the Zero Pot until full travel is reached.
19. Adjust the Zero Pot so that both the Green and Red LEDs are OFF.
20. Verify that the CLOSE CAM engages the switch lever so that it is pressed in.

21. With the Red motor wire still removed from the "+" motor terminal, set the User Control Signal to the OEPN level (100%) - 20.0mA or 10V.
22. The Red LED should turn on.
23. Connect and lightly hold the Red motor wire onto the "+" motor terminal so that the valve moves in the OPEN direction.
24. When the valve reaches the fully OPEN position, remove the Red motor wire to stop the motor. If the valve does not reach the fully OPEN position on the first adjustment, keep adjusting the Span Pot until full travel is reached.
25. Adjust the Span Pot so that both the Green and Red LEDs are OFF.
26. Verify that the OPEN CAM engages the switch lever so that it is pressed in.
27. Reconnect the Red motor wire to the "+" motor terminal and make sure that it is fully seated on the terminal. Install a new wire tie to hold the motor leads from becoming disconnected.
28. Deliver OPEN, MID and CLOSE (0%, 50% & 100%) Control Signals a few times to verify that the valve travels to the proper positions. Adjust as described above if further adjustments are needed.
29. Turn OFF the DC Power and check that all the set screws are tightened. Replace the actuator cover and tighten the screws.
30. Re-apply the DC power to the actuator.

DC VOLTAGE CONTROL BOARD DIMENSIONS:



DC VOLTAGE CONTROL BOARD SPECIFICATIONS

POWER REQUIREMENTS:

10 to 30VDC
 82mA Typical Operating Current
Fuse Type: 10A TR5 (non-replaceable)

COMMAND SIGNAL INPUT:

DC Voltage Input
 Input Impedance: 13K ohms
 Loss of Command Signal Threshold: <0.75V
4-20 mA Input
 Input Impedance: 250 ohms ±1%
 Loss of Command Signal Threshold: <3mA

FEEDBACK SIGNAL INPUT:

Input Voltage: 0 to 5 VDC
 External Feedback Potentiometer: 1K ohms

POWER SUPPLY OUTPUTS:

Command Signal Potentiometer Power: (J2-6): 5VDC @ 5mA max
NOTE: Do not connect this output to other power supplies.

DC MOTOR OUTPUTS:

Maximum Load Current = 10A
 Maximum Locked Rotor Current = 60A

CONTROL ADJUSTMENTS:

Zero: adjustable throughout feedback signal range
 Span: adjustable throughout feedback signal range
 Deadband: 6mV to 118mV of feedback signal

ENVIRONMENTAL:

Operating Temperature Range:	0 °C to 60 °C
Storage Temperature Range:	-40 °C to 85 °C
Relative Humidity Range:	0 to 90% (non-condensing)

MAINTENANCE:

After your ICI spring return electric actuator has been properly installed there is little or no maintenance ever required. The gear train has been permanently lubricated at the factory and requires no routine maintenance. In the event it becomes necessary to perform maintenance on the actuator upon reassembling, we recommend using Shell Darina #2 grease.

SET AUXILIARY SWITCHES:

TOOLS REQUIRED:

SEE PAGE 3 FOR TOOLS USED IN COVER REMOVAL AND CAM ADJUSTMENT

Read these instructions completely before beginning installation, if you have any questions please call our service technician at 1-800-662-9424 for assistance.

1. Turn off power supply to actuator.
2. Remove screws securing cover to gearbox, remove cover.
3. Turn on power to actuator.

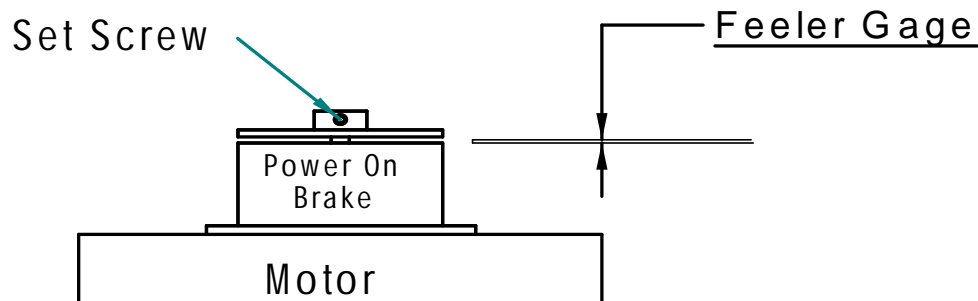
CAUTION: At this time there are live circuits in the actuator; contact may cause electrical shock or death.

4. Operate actuator to the close position.
5. Rotate the third cam up from the base CCW so the setscrew is accessible, and the round of the cam has switch arm compressed.
6. Rotate the cam CW until the switch snap from the NO to the NC contact & switch arm moves away from switch body.
7. Lock cam in position by securing 8-32 x 1/4" long set screw to shaft.
8. Operate actuator to the open position.
9. Rotate top cam CW so set screw is accessible and round of cam has switch arm compressed.
10. Rotate top cam CCW until the switch snaps from the NO to the NC contact & switch arm moves away from switch body.
11. Lock cam in position by securing 8-32 x 1/4" long set screw to shaft.
12. Test setting to assure proper operation using DNM for proper switch closure.
13. If desired setting has not been achieved repeat steps 2 through 11.
14. Once proper settings have been accomplished replace cover and secure cover screws.

TO SET BRAKE:

If it is ever becomes necessary to set the brake:

- 1) Using a .050" Allen wrench loosen the two setscrews in the brake disk hub
- 2) Using a feeler gage set the gap between the disk and stationary coil & field assembly to .015" +/- 0.005"
- 3) Secure the 2 set screws in the hub.



DUTY CYCLE:

ICI actuators rated 100 LB-IN up to 1500 LB-IN output torque are rated for 25% duty cycle at 100% ambient temperature at rated torque (75% duty cycle motors are available upon request). Actuators rated for 2000 LB-IN output torque and greater are rated for continuous duty. All direct current (dc) motors are rated for 75% duty cycle.

THERMAL OVER LOAD:

All alternating current (AC) motors are equipped with thermal over load protection to guard the motor against damage from overheating.

MECHANICAL OVER LOAD:

ICI' actuators are all designed to withstand stall conditions. It is not recommended to subject the unit to repeated stall conditions; however, should it occur the actuator would not experience gear damage.

AUXILIARY SWITCH CONTACT RATINGS:

The Snap Action Auxiliary Switches are SPDT, the contacts are rated for **15 Amps @ 250 VAC**.

ORDERING PARTS:

When ordering parts please specify:

- | | |
|--------------------------|--------------------|
| - Actuator Model Number | - Part Number |
| - Actuator Serial Number | - Part Description |

RECOMMENDED SPARE PARTS:

Set of cams and switches (positioner board and potentiometer for modulating controls).

NEMA 7 ENCLOSURE, GENERAL:

In general, operation and maintenance of a NEMA 7 electric actuator is no different than that of a NEMA 4 electric actuator. However, there are some precautions that must be followed.

1. **DO NOT** install in ambient temperatures that exceed **140 degrees F**.
2. **DO NOT** under any circumstances **remove the actuator cover** while in a hazardous location when the contacts are still live, this could cause ignition of hazardous atmospheres.
3. **DO NOT** under any circumstances **use a NEMA 7 electric actuator in a hazardous location that does not meet the specifications for which the actuator was designed**. The actuator is clearly tagged with the NEMA classification it was designed for.
4. Mount, test and calibrate actuator on valve in non-hazardous location.
5. When removing the cover care must be taken not to scratch, scar or deform the flame path of the cover or base of the actuator, this will negate the NEMA 7 rating of the enclosure.
6. When replacing the cover on actuators rated NEMA 4 and 7 take care that the gasket is in place to assure the proper clearance after the cover is secured. After securing the cover screws check the clearance between the cover and the base, a .002" thick by 1/2" wide feeler gauge may not enter between the two mating faces more than .125".
7. All electrical connections must be to state and local codes and in accordance with the specifications for which the unit is being used.

**After proper installation the actuator will require little or no maintenance. In the event maintenance is required remove it from the hazardous location before attempting to work on it. If the actuator is in a critical application and down time is not permitted it is advisable to have a spare actuator in stock.*

INDELAC CONTROLS INC. 
AMERICAN MADE ACTUATORS & CONTROLS



INDELAC 1-YEAR STANDARD WARRANTY POLICY:

INDELAC CONTROLS, INC. (ICI) WARRANTS THAT FOR A PERIOD OF **1 YEAR** FROM THE DATE OF SHIPMENT IT WILL EITHER REPAIR OR REPLACE, AT ITS OPTION, ANY OF ITS PRODUCTS, WHICH PROVE TO BE DEFECTIVE IN MATERIAL OR WORKMANSHIP.

THIS WARRANTY DOES NOT COVER DAMAGE RESULTING FROM CAUSES SUCH AS ABUSE, MISUSE, MODIFICATION OR TAMPERING.

THIS WARRANTY IS EXTENDED ONLY TO THE REGISTERED PARTY, FOR WHICH THE PRODUCT SERIAL NUMBER MATCHES. THE EXTENDED WARRANTY OF ICI'S PRODUCT AND IS NOT TRANSFERABLE.

TO OBTAIN SERVICE UNDER THIS WARRANTY, THE PURCHASER MUST FIRST OBTAIN A RETURN AUTHORIZATION NUMBER FROM ICI. PRODUCTS MUST BE RETURNED TO ICI FREIGHT PREPAID FOR EVALUATION.

IF THE UNIT FAILED DUE TO POOR WORKMANSHIP OR MATERIALS THE UNIT WILL BE REPAIRED OR REPLACED. THE UNIT WILL BE RETURNED GROUND/STANDARD FREIGHT PAID BY ICI, IF AIR/RUSH SHIPMENT IS REQUESTED THE PURCHASER SHALL PAY THE DIFFERENCE.

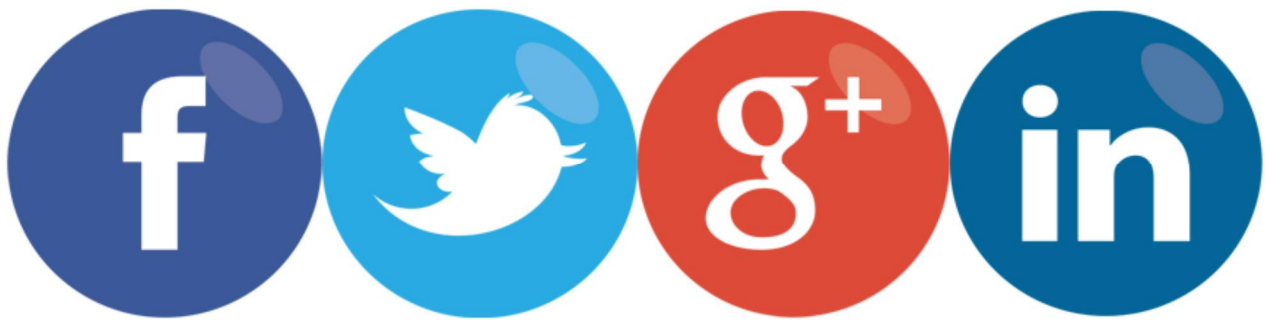
THIS WARRANTY IS IN LIEU OF ALL OTHER OBLIGATIONS, LIABILITIES OR EXPRESSED WARRANTIES. ANY IMPLIED WARRANTIES, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY ARE HEREBY EXPRESSLY EXCLUDED.

IN NO EVENT SHALL ICI BE LIABLE FOR SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING IN CONNECTION WITH THE USE OF ITS PRODUCTS, OR FOR ANY DELAY IN THE PERFORMANCE OF THIS WARRANTY DUE TO CAUSES BEYOND ITS CONTROL.

6810 POWERLINE DR.-FLORENCE, KY. 41042 - TELEPHONE 859-727-7890, TOLL FREE 1-800-662-9424
FAX. 859-727-4070, E-MAIL: DVOGES@INDELAC.COM, OR MROBINSON@INDELAC.COM
VISIT OUR WEBSITE AT WWW.INDELAC.COM

Frequently Asked Questions

SYMPTOM	PROBLEM	SOLUTION
ACTUATOR DOES NOT RESPOND TO CONTROL SIGNAL.	Power not on Actuator wired wrong Wrong voltage Thermal overload activated Actuator and valve in opposite positions when actuator was mounted. Bad Brake	Turn on power Check wiring diagram & rewire Check power supply & make appropriate changes Allow motor to cool, actuator will automatically reset Remove actuator and rotate 90 degrees & remount Remove brake hub & try to run
ACTUATOR WILL NOT OPEN OR CLOSE COMPLETELY.	Travel limits set wrong Valve torque too high for actuator Mechanical stops not removed	Reset cams. Install correct size actuator. Remove stops, CAUTION: Do not remove any part required for proper operation
VALVE OSCILLATES.	Valve torque too high for actuator Actuator without brake installed on butterfly valve Motor brake out of adjustment. Set screw loose in brake disc	Install correct size actuator. Install brake Adjust brake Adjust brake and tighten set-screw
MOTOR RUNS BUT OUTPUT SHAFT DOES NOT ROTATE.	Gear damage or sheared pin	Contact ICI or nearest distributor



Contact Information

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For the Most Updated Information Please Visit www.INDELAC.com