

MC-1100
ELECTRIC TO PNEUMATIC CONVERTER

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I. Description

The MC-1100 series are continuous duty electric motor driven precision 3-15 psi pressure regulators for remote positioning of the regulator to establish set points for pneumatic instruments and actuators. They may be controlled by pushbuttons, contacts, proportional or relay output servo amplifiers. Normal rating is 3-15 psi, however, special pressure ranges are available.

The unit will maintain any pressure setting, with power removed, (for use with a shared time controller). It is available with position feedback and adjustable limit switches for closed loop control.

The electric actuator used on the MC-1110 is a SM-1100 Series actuator with a special output shaft and valve stem coupling.

II. Description of Operation

The standard MC-1100 is equipped with a 115 VAC single phase capacitor run motor. Applying 115 VAC terminals 1 and 3 will drive the regulator in the decreasing pressure direction. Applying 115 VAC across terminals 1 and 2 will drive the regulator in the increasing pressure direction. The standard 3-15 psi regulator uses approximately 4.75 turns on the regulator stem to cover the full pressure range. The shift time of the regulator (time to travel from min. to max. pressure) is determined by the power gear ratio and type of motor used in the electric actuator. Two high speed shift rates (.1 and .2 minute) are obtainable by proper power gear ratio and special modified regulator where the regulator stem and bonnet nut are changed to an acme thread. Changing the regulator stem to an acme thread changes the number of stem turns required for full pressure range to approximately 3 turns. Regulator options other than the standard 3-15 psi range will usually have a different number of stem turns to cover the pressure range. A chart on page 13 gives the model numbers and stem turns for various pressure ranges.

III. Storage

If the actuator will not be installed immediately, it should be stored in a clean, dry area where the ambient temperature is not less than -20 F. The actuator should not be stored in a corrosive environment.

IV. Installation

As shipped from the factory the actuator and regulator are pre-aligned for the pressure range specified by the customer and realignment should not be necessary.

The mounting bracket is provided with two holes for customer mounting to a suitable support so that the weight of the MC-1100 is not carried on the input or output lines of the regulator. After mounting the MC-1100 securely, the conduit line to the actuator may be connected and the lines to the regulator may be connected. Some regulators are equipped with a plain vented exhaust and others are equipped with a tapped exhaust. If a tapped exhaust is provided a line should be connected to vent the regulator to a non-hazardous area. Most regulators as shipped will have plastic dust plugs inserted in the input, output and exhaust ports of the regulator.

Before applying input pressure to the regulator all of the plastic plugs must be removed including the exhaust plug. The regulators are also equipped with a gauge port and as shipped these ports have a steel pipe plug inserted in them. If desired remove the plug and insert a suitable pressure gauge.

A. Wiring

The standard actuator is equipped with one conduit entry which is a 1/2 NPT threaded hole. Use the proper type of connections for your application.

The actuator wiring will vary depending on the customer selected options of motors and feedback built into the actuator. Refer to the wiring diagram supplied with the actuator. If a feedback potentiometer is supplied in the actuator, the wiring to the potentiometer should be a three wire shielded cable for each potentiometer. The shield must not be grounded at the actuator and must be taped or suitably insulated so as not to touch anything in the conduit pipe or actuator. Grounding the shield in the actuator or conduit will nullify the effect of the shield.

A. Wiring cont.

A terminal in the actuator is connected to actuator ground and should be properly connected to system ground. Any actuator used in outside areas, humid areas, or below grade should have heaters installed as an option to prevent condensation inside the actuator. The heater should be permanently energized and only turned off for maintenance to the actuator.

After wiring the actuator, put the actuator cover in place; never leave the cover off of the actuator for any reason.

B. Limit Switch and Potentiometer Adjustment

The standards MC-1100 when supplied with end of travel limit switches will have two color coded cams which activate the switch roller levers. The red cam activates the actuator clockwise limit switch which sets the minimum or decreasing pressure regulator set point, and the set screw must be loosened to reset the travel limit.

Looking down on the cam switch assembly, the red cam rotates counter clockwise to trip the switch and stop the actuator in the decreasing regulator pressure direction. The white cam rotates clockwise to trip pressure direction. The limit switches are wired in series with the motor windings and connected to terminals 2 and 3 of the actuator. Applying 115 VAC across terminals 1 and 3 will cause the regulator to run in the decreasing pressure direction and applying 115 VAC across terminals 1 and 2 will run the regulator in the increasing pressure direction.

Actuators supplied with a 1K ohm precision feedback potentiometer will have potentiometer wired to terminals 4, 5 and 6 of the actuator. If a tandem potentiometer is supplied, the second potentiometer will be wired to terminals 7, 8 and 9. Driving the actuator in the decreasing pressure direction will cause the resistance between terminals 4 and 5, and 7 8 to decrease. The potentiometer supplied has a 348 electrical rotation range and a 12 dead area. If the limit cams are re-adjusted the potentiometer must also be adjusted to keep the potentiometer wiper arm on the active portion of the element. The potentiometer used with cam activated

switches has no mechanical stop in the potentiometer, and will not be damaged by misalignment. The potentiometer is also equipped with a clear plastic indicator window on the top of the potentiometer body for quick reference of potentiometer position. Looking into the window a yellow marker should be seen. The yellow marker will rotate counterclockwise as the regulator runs in the decreasing pressure direction.

After the limit switches have been adjusted, run the actuator to the decrease limit position and observe the rotation of the yellow marker in the potentiometer window. Each black mark on the window face represents 10° of potentiometer travel. With the actuator stopped on the decrease limit switch the yellow marker should be 1/2 way between the beginning point of the window and the first black mark. This will represent approximately 50 ohms between terminals 4 and 5 on the actuator. If the yellow marker is not at this point, loosen the nut holding the potentiometer body to the limit switch frame and rotate the body of the potentiometer body to the limit switch frame and rotate the body of the potentiometer until the marker is in the correct position. The nut is located under the top lip of the limit switch frame above the cams. The resistance between terminals 4 and 5 should now be about 50 ohms. tighten the potentiometer body nut and then run the actuator to the increase pressure limit switch while observing the yellow potentiometer marker.

The marker should rotate clockwise and stay viable on the window, it must not pass under the white window band area, if it does the potentiometer is not set correctly and the feedback signal from the potentiometer will be lost. The entire range of the potentiometer will not be used. The normal usage will fall between 60 to 90 of the active range.

MC-10100 units equipped with special regulator of pressure ranges other than 3-15 psi may use more than 5 revolutions of the regulator stem and will not have cam activated limit switches supplied; but if switches and potentiometer are supplied the units will have a multi-turn switch assembly with the actuator running to determine which switch to adjust for the regulator direction.

B. Limit Switch and Potentiometer Adjustment
cont

The 10 turn potentiometer has mechanical stops at each end and must be monitored when adjusting to insure the stops are not run into. Running into the potentiometer stops will break the potentiometer. Use an ohm meter and adjust the potentiometer body for 50 ohms between terminals 4 and 5 with the actuator at the decrease limit switch. Never adjust the limit switches without monitoring the potentiometer position.

V. Maintenance

The actuator is permanently lubricated and only needs re-greasing in the event of repair to the gear train. The bearings are lubricated with SAE-10 non-detergent oil and the gears are lightly coated with grease. If re-greasing use AMOCO-RYKON PREMIUM GREASE #2 or equal. Grease like Amoco Amolit all weather grease #2 or Exxon Beacon P-290 are acceptable. Do Not Fill The Gear Box.

A. Motor Replacement

The motor is secured to the actuator with either 2 or 3 screws depending on the model of the actuator. To replace the motor:

1. Turn off all power.
2. Remove actuator cover.
3. Remove motor screws and motor.
4. Install new motor and tighten screws.
5. Interchange motor wires one at a time so as not to mis-wire.

B. Potentiometer Replacement - Cam Activated Switched

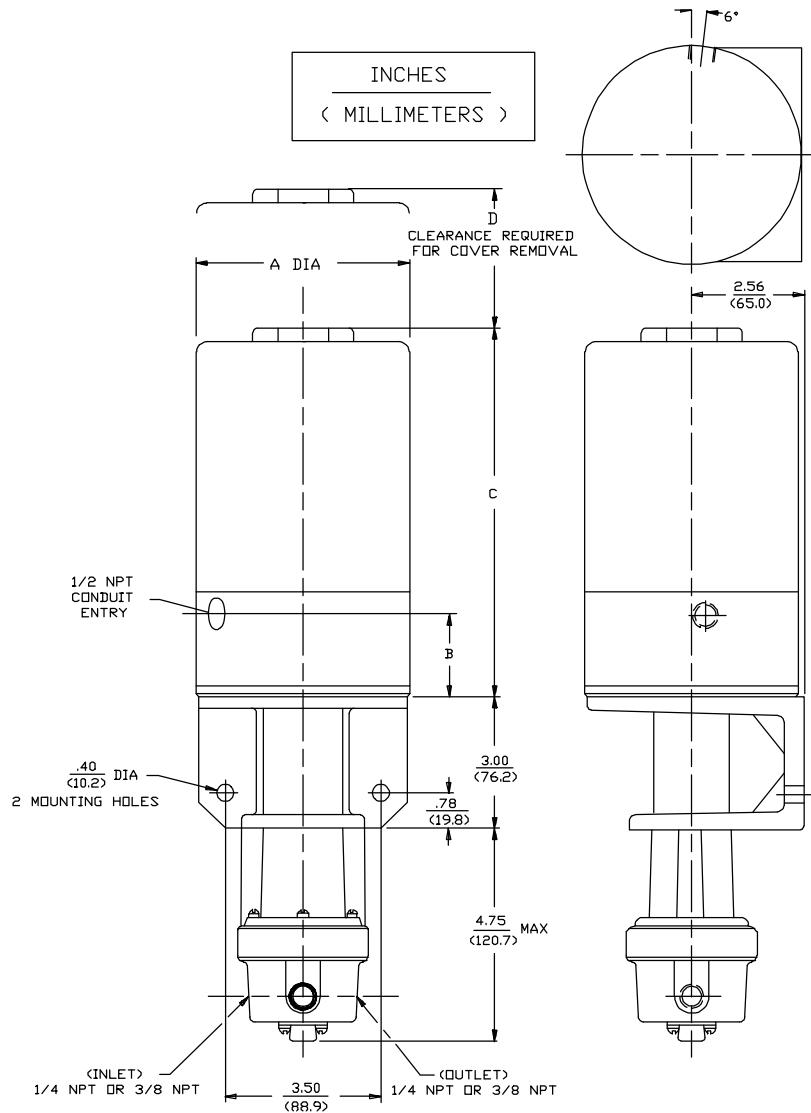
1. Turn off all power.
2. Remove three screws holding limit switch frame to actuator.
3. Lift frame with potentiometer and switches out of actuator.
4. Measure and record location of gear on potentiometer shaft. Loosen set screws on gear and remove gear.
5. Loosen set screws holding cams to potentiometer shaft.
6. Loosen potentiometer body nut and

- pull potentiometer out of frame.
7. Install new potentiometer in frame with lockwasher, nut and cams in place.
8. Put gear on shaft to proper locations.
9. Mount frame in actuator and secure with three screws.
10. Transfer wires from old potentiometer to new, one at a time so as not to mis-wire - use a 25 watt solder iron don't overheat.
11. Align limit switches and potentiometer with regulator.

C. Gear Repair

1. Turn off all power.
2. Remove actuator from regulator bracket.
3. Using a pin punch, remove pin from output shaft coupling and remove coupling.
4. Remove 3 screws holding gear box together and pull off front cover over the output shaft.
5. Clean entire unit and check gears for wear or damage.
6. Check all bushings for wear and replace if needed.
 - A. Bushings are removable using a tap and wrench which will thread into the bushing and jack the bushing out of its hole.
 - B. Press new bushings into holes using a proper sized mandrel to prevent bushing collapse.
 - C. Lubricate bushings with a couple of drops of SAE-10 Non-Detergent Oil.
7. Replace gears as needed and be sure retaining rings are on gear shafts.
8. Lightly lubricate gears with Amoco Rykon Premium Grease #2 or equal.
9. Assemble gear case and coupling.
10. Mount to regulator bracket and align.

VI. Physical Installation Drawing



MC-1100 SERIES	A	B	C	D
NEMA 12 (ENCL. "D")	4.50 (114.3)	1.59 (40.4)	7.13 (181.1)	5.00 (127.0)
NEMA 4 (ENCL. "E") AND X-PROOF (ENCL. "X")	4.88 (124.0)	1.84 (46.7)	8.65 (219.7)	6.28 (159.5)

MC-1100/AD-8100 SERIES	A	B	C	D
NEMA 4 (ENCL. "E") AND X-PROOF (ENCL. "X")	4.88 (124.0)	1.84 (46.7)	10.21 (259.3)	7.81 (198.4)