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MU-12313 Electronic Gear Train

Economizer Actuator General Instructions

APPLICATION

For modulating operation of dampers and other equipment which require the return to normal position upon power interruption. Adjustable minimum position control 0° to 90°. Replaces Honeywell M-7415A and functionally replaces White-Rodgers 3420-4.

SPECIFICATIONS

Control Circuit: Two-wire.

Mixed or Discharge Air Sensor: Thermistor (8" long) with 1/4" male quick connectors and integral mounting flange; 10K ohms at 77°F (25°C), negative temperature coefficient.

Supplied with actuator.

MA (Mixed Air) Setpoint: Dial adjustable 40 to 65°F (4 to 18°C); factory set at 55°F (18°C).

Throttling Range: Factory set; see Table 1.

Power Supply: 24 Vac, Class 2(+ 10, -15% for 0 to 90° travel; +10, -10% for 90 to 180° travel), 60 Hz, 24 Vac, Class 2 (+10, -10%), 50 Hz.

VA:

Running, 14.4.

Holding, 9.6.

Watts:

Running, 14.2.

Holding, 9.2.

Torque:

Rated, 25 lb-in. (2.8 N-m).

Limit, 40 lb-in. (4.5 N-m) under stall conditions.

Maximum Damper Size*:

Parallel, 14 ft.² (1.3 m²).

Opposed, 18 ft.² (1.7 m²).

*Damper ratings are nominal and based on standard (not low leakage) dampers at 1" (25.4 mm) W.C. pressure and 200 FPM (10 m/s).

Shaft Output: Dual output; either shaft can be used if torque limit is not exceeded.

Shaft Rotation: CCW when power is applied. (The front of the actuator is defined as the right end when facing the field wiring terminals). Maximum shaft rotation field adjustable 75°, 90°, 110°, 160°, 180°, factory set 90°. *When used with 50 Hz power supply, rotation is limited to 75° or 90° adjustments.*

Minimum Position: Factory set 22°. Dial adjustable 0° to 90°.

Timing:

Powered, 28 sec/90°.

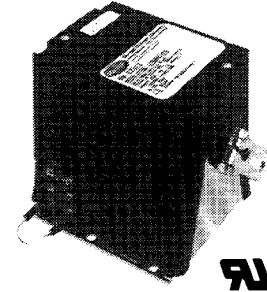
Spring Return, 18 sec/90°.

Environment:

Ambient Temperature Limits,

Shipping and Storage -40 to 160°F (-40 to 71°C).

Operating -40 to 140°F (-40 to 60°C).



MU-12313

(Front of actuator is defined as the right end when facing the field terminal connections.)



Thermistor Sensor
 (shipped with actuator)



AD-931-105
 External Minimum Positioner

Humidity, 5 to 95% RH, non-condensing.

Locations, NEMA Type 1 when mounted in any position. NEMA Type 3R when mounted in vertical position only and AM-219 kit installed.

Vibration, Maximum 1G in any plane.

Wiring Connections: Side mounted #6 self-tapping screw with 1/4" tab.

Case: Glass reinforced thermoplastic (PET) cover, plated steel base.

Mounting: Any position. Five 9/32" (7.1 mm) mounting holes provided.

Crank Arm for Actuator: AM-112 included with actuator. 3/8" (9.5 mm) slot provides for adjustable radius from 7/8" (22 mm) to 3-1/8" (79 mm).

Dimensions: 5-1/2" high x 5" wide x 7-9/32" deep (140 mm x 127 mm x 185 mm). 3/8" (9.5 mm) shaft diameter.

ACCESSORIES

AD-931-105 External minimum positioner

Damper Linkage Accessories:

AM-111 Crank arm for 5/16" diameter damper shaft
AM-112 Crank arm for 3/8" diameter damper or MU-12313 actuator shaft
AM-113 Crank arm for actuator or 1/2" diameter damper shaft
AM-115 Crank arm for 7/16" diameter damper shaft
AM-122 Linkage connector straight type
AM-123 Damper clip
AM-125 5/16" diameter x 20" damper rod
AM-125-048 5/16" diameter x 48" damper rod
AM-132 Ball joint connector
AM-219 Conduit cover kit
AM-221 1 SPDT switch kit
AM-222 2 SPDT switch kit

Table-1 Throttling Ranges^a.

Degree Rotation	T.R. as Factory Supplied °F (°C)	T.R. with Jumper J1 Removed °F (°C)
75	7 (3.8)	3.5 (1.9)
90	8 (4.4)	4 (2.2)
110	10 (5.5)	5 (2.8)
160	14 (7.2)	7 (3.8)
180	16 (8.9)	8 (4.4)

^a Number of degrees change required at the sensor in order to produce the maximum rotation of the actuator output shaft.

THEORY OF OPERATION

The built-in actuator controller receives a thermistor sensor input. The controller will cause the output shaft to position to maintain the set temperature. The minimum positioner will maintain a minimum output shaft rotation when the sensed temperature calls for less rotation.

PRE-INSTALLATION

Inspection

Visually inspect the carton for damage. If damaged, notify the appropriate carrier immediately. If undamaged, open the carton and visually inspect the device for obvious defects. Return damaged or defective products.

Required Installation Items

- Wiring diagrams
- Tools (not provided):
 - Volt-ohm meter
 - Appropriate screwdriver for mounting screws
 - Appropriate drill and drill bit for mounting screws
- Appropriate accessories
- Mounting screws (not provided).

INSTALLATION

Caution: Installer must be a qualified, experienced technician.

Disconnect power supply before installation to prevent electrical shock and equipment damage.

Make all connections in accordance with the wiring diagram, and in accordance with national and local electrical codes.

Use copper conductors only.

Do not exceed ratings of the device.

Mounting

LOCATION - ACTUATOR

Caution: NEMA type 1 indoor only when mounted in any position; NEMA type 3R outdoor when mounted in vertical position only and AM-219 kit installed.

Do not install actuator or sensor in locations where corrosive fumes or explosive atmospheres are present.

The actuator can be mounted in any position in a weather protected area. Five 9/32" (7.2 mm) mounting holes are provided in the base of the actuator (see Figure 1). Two (2) mounting screws on right side and one (1) screw on left side of actuator are the minimum number of required fasteners. Locate the actuator as close to the damper as possible. (See Figure 1 for mounting dimensions).

LOCATION - SENSOR FLANGE

1. Select mounting location on duct.
2. Drill 3/8" (10 mm) insertion hole in duct.
3. Insert sensor through duct wall and drill two (2) 1/8" (3 mm) holes.
4. Fasten sensor flange with two (2) sheet metal screws (#8 x 1/2" slotted head Type A screws recommended) using flange as a template. (See Figure 2 for mounting dimensions.)

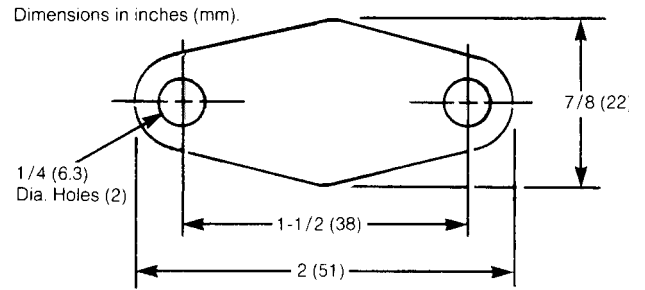
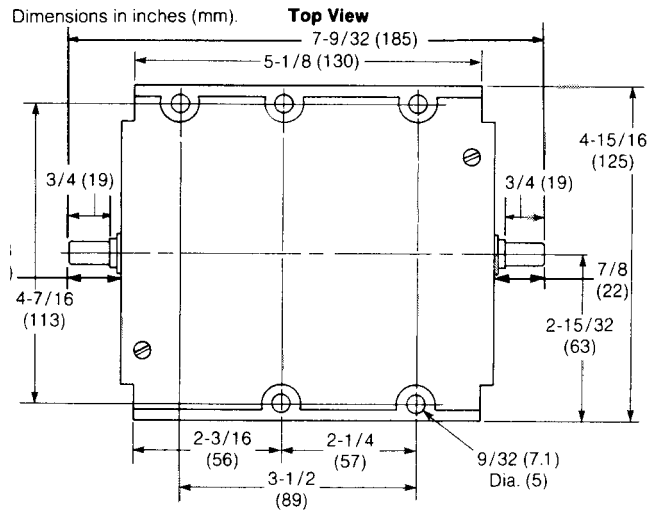


Figure-2 Sensor Flange Dimensions.

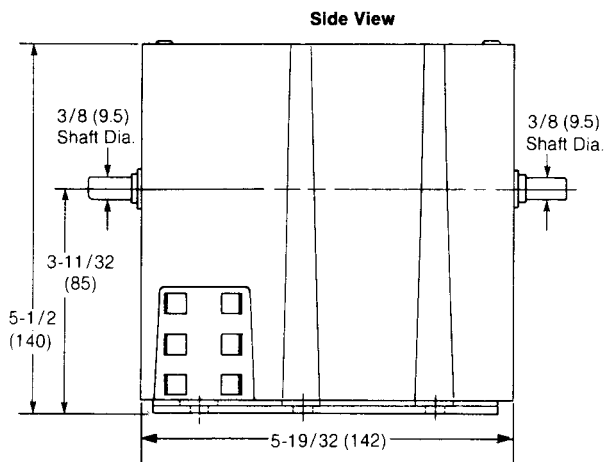


Figure-1 MU-12313 Dimensions.

Wiring

General Wiring Information

Table-2 Sensor or External Minimum Position Adjustor Lead Lengths.

Wire Size AWG	Maximum Run Ft. (m) (1 run has two wires)
22	400 (122)
18	1000 (305)
16	1588 (484)
14	2563 (781)

Table-3 Input/Output Terminal Designations.

Terminal	Designation
T	To sensor lead
T1	To sensor lead
P1	Jumper to P; to Yel/blk lead of AD-931-105 if used
P	Jumper to P1; to Blue lead of AD-931-105 if used
TR	To 24 Vac
TR1	To 24 Vac

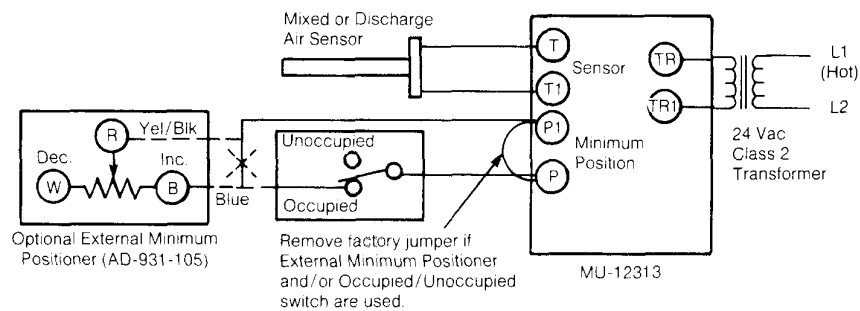


Figure-3 Typical Wiring for MU-12313.

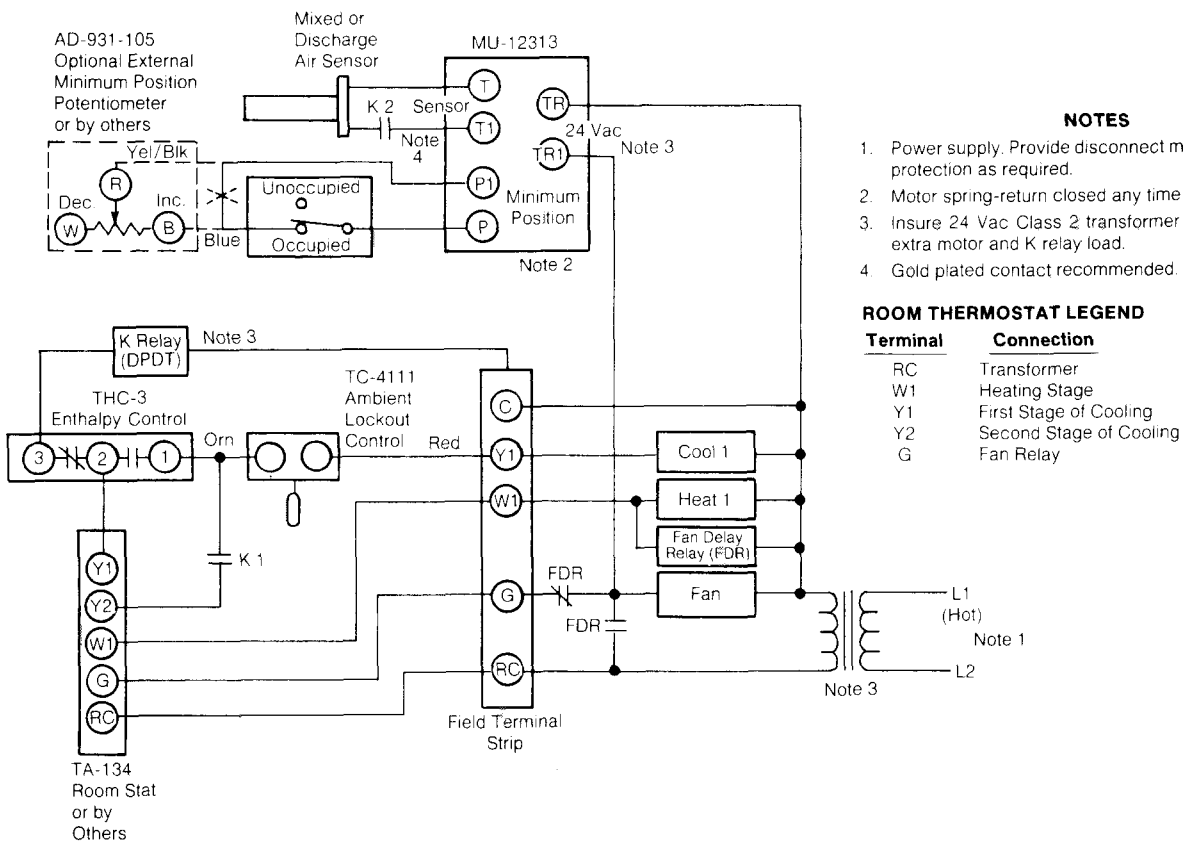


Figure-4 Single-Stage Cooling System with Modulating Economizer.

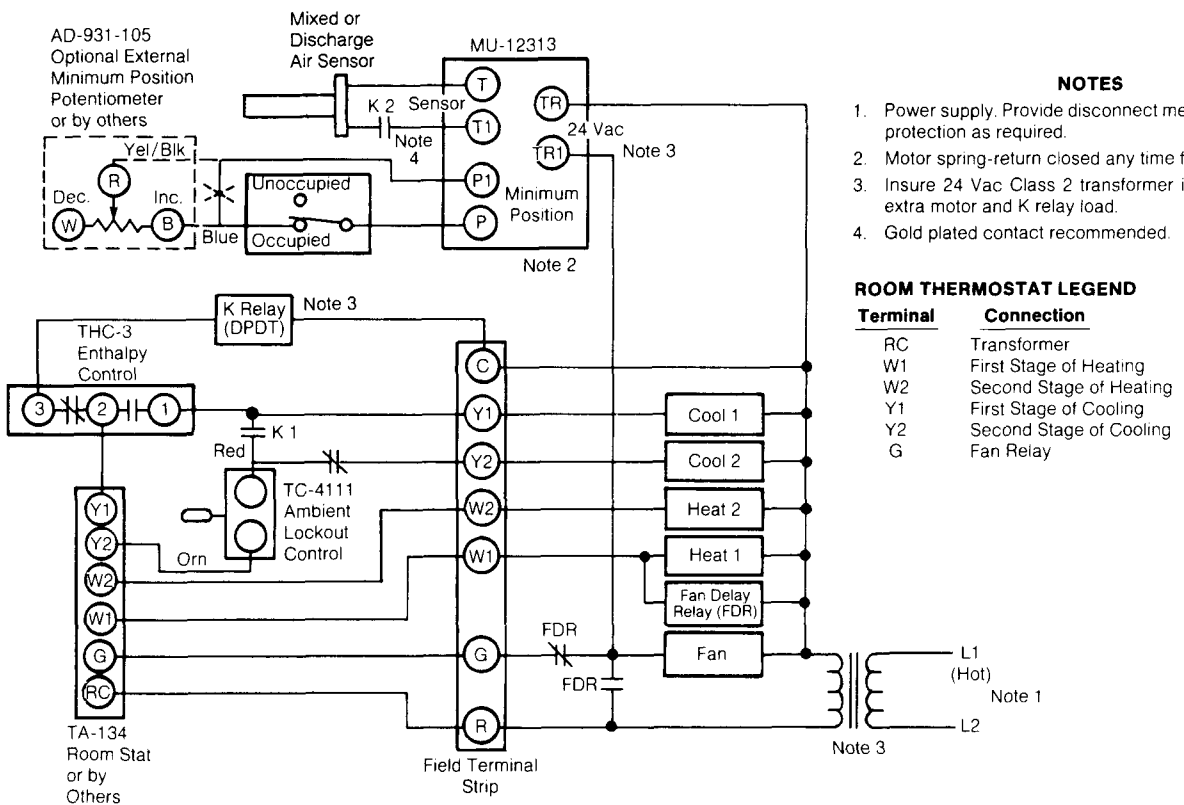


Figure-5 Two-Stage Cooling System with Modulating Economizer.

Damper Linkage

Figure 6 illustrates linkage for 90° actuator shaft rotation operating an arm through 90° arc. To fasten linkage proceed as follows:

1. Fasten linkage connector at end of driven crank shaft arm.
2. Fasten linkage connector at end of slot of actuator crank arm.
3. Attach damper rod to connectors.
4. Move damper to approximately 85° of full open position and clamp connecting links to damper rod.
5. Check adjustment for proper operation by running actuator and driven shaft between limits of travel.

Caution: If crank arm does not provide proper travel, reset connecting link in linkage connector. NEVER ATTEMPT TO TURN THE ACTUATOR SHAFT WITH A WRENCH OR A CRANK. This will cause internal damage.

Figure 7 illustrates linkage for 180° actuator shaft rotation operating an arm through 90° arc. (See Adjustments - Maximum Output Shaft Rotation to change maximum rotation.) To fasten linkage proceed follows:

1. Fasten linkage connector at end of driven crank shaft arm.
2. Fasten linkage connector at punch mark on actuator crank arm (about .707 of the radius).
3. Attach damper rod to connectors.
4. Move damper to approximately 85° of full open position and clamp connecting links to damper rod.
5. Check adjustment for proper operation by running actuator and driven shaft between limits of travel.

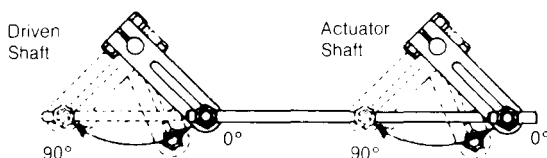


Figure-6 Actuator Linkage to Damper.

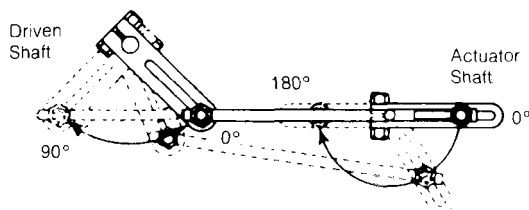


Figure-7 180° Actuator Linkage to Damper.

Caution: If crank arm does not provide proper travel, reset connecting link in linkage connector. NEVER ATTEMPT TO TURN THE ACTUATOR SHAFT WITH A WRENCH OR A CRANK. This will cause internal damage.

FIELD ADJUSTMENTS

Maximum Output Shaft Rotation (See Figure 8)

Caution: Actuators operated with 50 Hz power supplies can be changed only to 75° or 90° maximum output shaft rotation. Remove power to the actuator before removing the cover, or the printed circuit board may short out.

The factory set output shaft rotation is 90°. This setting may be changed by:

1. Removing the two single slotted screws on the top of the actuator cover.
2. Remove the cover.
3. Lift the stop lever away from the output gear until the lever can be rotated to a different setting.

Note: A small screwdriver may be needed to lift the stop lever away from the output gear when it is in the 110° or 180° position.

4. Move the stop lever to the required setting.
5. Replace cover and screws.

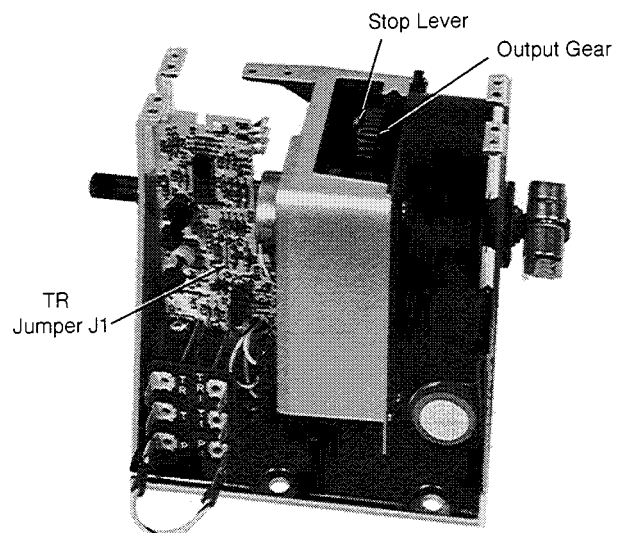


Figure-8 Maximum Output Shaft Rotation.

MA (Mixed Air) Setpoint

See Figure 9.

1. Remove the two (2) single slotted screws holding the adjustment cover plate that is located just above the field wiring terminals.
2. Remove the adjustment cover plate.
3. Adjust the MA setpoint to the required setting (dial scale in 5°F (3°C) increments.
4. Replace the plate and adjustment cover plate.

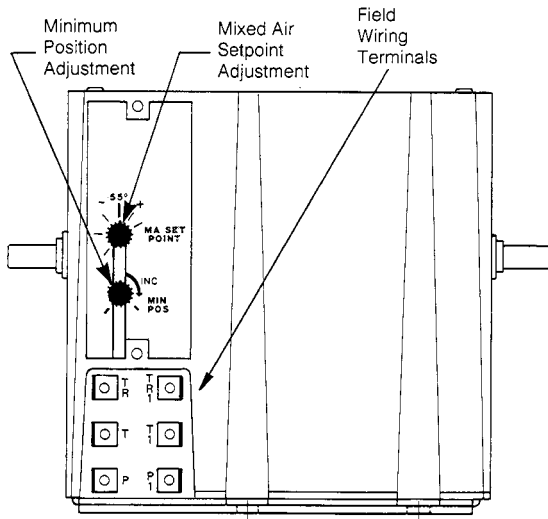


Figure-9 MU-12313 Adjustments and Terminal Configuration. Shown with Adjustment Cover Plate Removed.

Throttling Range

Factory set; see Table 1, but may be changed by:

1. Removing the two (2) single slotted screws on the top of the actuator cover.
2. Remove the cover.
3. Carefully cut jumper J1 on the P.C. Board; see Figure 8.
4. Replace cover and screws.

Minimum Position

See Figure 10.

This setting may be adjustable by:

1. Removing the two single slotted screws holding the plate that is located just above the output terminals.
2. Remove the adjustment switch plate.
3. Move the minimum position dial to the required setting (maximum 90° shaft rotation).
4. Replace the plate and screws.

Note: External minimum positioner (AD-931-105) may be used in place of internal adjuster. (See Figures 3 through 5, 10). Remove Yellow/Black jumper between field terminals P and P1, wire AD-931-105, set actuator minimum position dial to full CW position and adjust AD-931-105 as required.

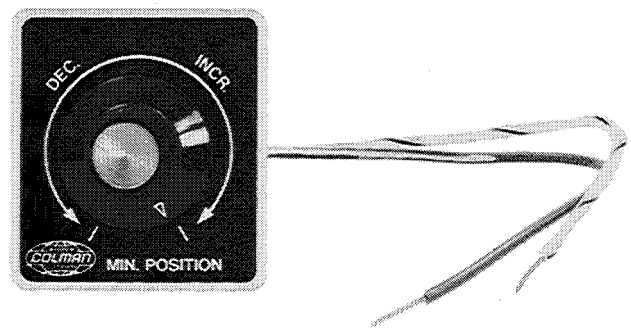


Figure-10 AD-931-105 External Minimum Positioner (Optional).

CHECKOUT

After the entire system has been installed, the following check for proper operation can be made (see Figures 3 through 5).

1. Be sure that the system power is connected to TR and TR1.
2. Open circuit between T & T1 and open between P & P1 (if external minimum positioner is used) will cause the output shaft to rotate full CW position with minimum position setpoint dial in any position. The internal spring will return the output shaft CW to 0° when the actuator is de-energized.
3. Open circuit between T & T1 and jumper between P & P1. The actuator shaft will travel to minimum position, factory set at 22°.
4. Jumper between T and T1 shaft will rotate to full CCW position.
5. If sensor is connected to T and T1 and the output shaft fails to rotate in response to sensed conditions within the throttling range of the controller, the continuity of the sensor should be checked, 10K ohms at 77°F (25°C).
6. Be sure there is no binding of the linkage at any point in the stroke.
7. If the output shaft fails to rotate, check the field wiring to insure proper voltage supply.

MAINTENANCE

Regular maintenance of the total system is recommended to assure sustained optimum performance.

FIELD REPAIR

Replace a defective actuator with a functional unit (thermistor sensor shipped with actuator). Thermistor sensor replacement part number BDHE-55.

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