IM-0630

Jordan CONTROLS

MV-1005 Electronic Actuator

Table of Contents

Due to wide variations in the terminal numbering of actuator products, actual wiring of this device should follow the print supplied with the unit.

GENERAL INFORMATION

INTRODUCTION

Jordan Controls, Inc., designs, manufactures, and tests its products to meet many national and international standards. For these products to operate within their normal specifications, they must be properly installed and maintained. The following instructions must be followed and integrated with your safety program when installing, using and maintaining Jordan Controls products:

- Read and save all instructions prior to installing, operating and servicing this product.
- If you do not understand any of the instructions, contact your Jordan Controls representative for clarification.
- Follow all warnings, cautions and instructions marked on, and supplied with, the product.
- Inform and educate personnel in the proper installation, operation and maintenance of the product.
- Install equipment as specified in Jordan Controls installation instructions and per applicable local and national codes. Connect all products to the proper electrical sources.
- To ensure proper performance, use qualified personnel to install, operate, update, tune and maintain the product.
- When replacement parts are required, ensure that the qualified service technician uses replacement parts specified by Jordan Controls. Substitutions may result in fire, electrical shock, other hazards, or improper equipment operation.
- Keep all product protective covers in place (except when installing, or when maintenance is being performed by qualified personnel), to prevent electrical shock, personal injury or damage to the actuator.

WARNING

Before installing the actuator, make sure that it is suitable for the intended application. If you are unsure of the suitability of this equipment for your installation, consult Jordan Controls prior to proceeding.

WARNING - SHOCK HAZARD

Installation and servicing must be performed only by qualified personnel.

WARNING - ELECTROSTATIC DISCHARGE

This electronic control is static-sensitive. To protect the internal components from damage, never touch the printed circuit cards without using electrostatic discharge (ESD) control procedures.

RECEIVING/INSPECTION

Carefully inspect for shipping damage. Damage to the shipping carton is usually a good indication that it has received rough handling. Report all damage immediately to the freight carrier and Jordan Controls, Inc.

Unpack the product and information packet—taking care to save the shipping carton and any packing material should return be necessary. Verify that the items on the packing list or bill of lading agree with your own.

STORAGE

If the product 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 be stored in a non-corrosive environment. The actuator is not sealed to NEMA 4 until the conduit entries are properly connected.

EQUIPMENT RETURN

A Returned Goods authorization (RG) number is required to return any equipment for repair. This must be obtained from Jordan Controls. (Telephone: 414/461-9200) The equipment must be shipped, freight prepaid, to the following address after the RG number is issued:

Jordan Controls, Inc.
5607 West Douglas Avenue
Milwaukee, Wisconsin 53218
Attn: Service Department

To facilitate quick return and handling of your equipment, include:
RG Number on outside of box
Your Company Name, Contact Person, Phone/Fax No.
Address
Repair Purchase Order Number
Brief description of the problem

GENERAL INFORMATION

IDENTIFICATION LABEL

An identification label is attached to each actuator cover. When ordering parts, requesting information or service assistance, provide all of the label information.

MODEL NUMBER: MV1005

Actuator Series

SERIAL NUMBER: 1628 C 99

Sequential Number — **Year Built**

Month Built

GENERAL ACTUATOR DESCRIPTION

The MV-1005 is offered as a standard package with the capability to accept analog current and voltage control signals. The design provides smooth, highly accurate positioning, with positive position-lock when not in motion. These rugged actuators may be mounted in any position and will withstand the most adverse environmental conditions.

A stepper motor produces torque, which is transmitted to the output shaft through a screw shaft arrangement. This allows the low torque, high speed motor output to be converted to high thrust, lower speed actuator shaft output motion. The built-in servo drive amplifier controls the stepper motor's speed and direction. It also controls actuator end limits, motor torque, deadband, optional 4-20 mA transmitter, and optional electronic auxiliary limit switches.

BASIC MODELS

MV-1005-0100 Base Unit

MV-1005-0101 Optional 4-20mA transmitter

ABBREVIATIONS USED IN THIS MANUAL

A or Amps	Ampere
ac	Alternating Current
° C	Degrees Celsius
CW	Clockwise
CCW	Counterclockwise
dc	Direct Current
° F	Degrees Fahrenheit
G	Earth Ground
Hz	Hertz
kg	Kilogram
L	Line (power supply)
lbs	Pounds
lbf.	Lbs. Force
LVDT	Linear Variable Differential Transformer
mA	Milliamp
mfd	Microfarad
mm	Millimeters
N	Newton (force)
NEMA	National Electrical Manufacturing Assoc.
Nm	Newton Meter
NPT	National Pipe Thread
Ph	Phase
PL	Position Limit Switch
P/N	Part Number
RPM	Revolutions per Minute
SEC	Second
TL	Thrust Limit Switch
Vac	Volts ac
Vdc	Volts dc
VR	Variable Resistance
W	Watt

WARRANTY INFORMATION

Warranty: Subject to the following, Jordan expressly warrants the products manufactured by it as meeting the applicable Jordan product specifications and that such products are free from defects in material and workmanship for a period of one (1) year from the date of delivery. The foregoing is the sole and exclusive warranty made by Jordan with respect to the products. Jordan makes no other warranties, either express or implied (including, without limitation, warranties as to merchantability or fitness for a particular purpose). The purchaser retains responsibility for the application and functional adequacy of the offering. See Jordan's General Conditions of Sale - Product, for complete warranty information.

MV-1005 SERIES PRODUCT SPECIFICATIONS

Standard Line Voltage: 120/240 Vac, ± 10%
(Slide switch selectable)

Frequency: 60 Hz

Power: 18 VA; (£ 0.4A)

Command Signal Inputs: (DIP switch selectable)
Current: 4-20 mA
Incremental: Dry contact closures, one for each direction

Limit Switches:
Internal: Part of servo control for end of travel restriction
External: (Optional) Open transistor, low level logic outputs, adjustable over stroke range. 40 Vdc and 40 mA max.

Optional Position Feedback Signal: Isolated 4-20 mA, loop powered with 12-36 Vdc external power supply (Customer supplied)

Field Wiring Terminations: Barrier terminal block, wire size range 26-14 AWG

Current Limit: Factory preset.

Command Signal Monitor: (current command only)
The 1005 series loss-of-signal circuitry monitors the command signal input. If the command signal drops below 3.8 mA, the actuator will lock in place.

Speed/Force: 0.09 in/sec. at 50 lbf.
Example: (0.5 inches in 7 seconds)

Stroke: (pot-adjustable)
0.9 to 1.38 inches, infinitely adjustable within its range.

Output Shaft Motion: All models can go either direction on an increasing command signal.
(DIP switch selectable)

Weight: (not including device mounted to the actuator)
MV-1005: 12 lbs. (5.4 kg)

Conduit Entry: Two 1/2-14 NPT

Temperature Limits: -40° F to 170° F (-40° C to 85° C)

Enclosure: NEMA Type 4.

Positioning Accuracy: MV models: ± 0.001 in. (0.025 mm)

Duty Cycle: Unrestricted modulating duty. (Cont. duty)

MV-1005 SERIES PRODUCT SPECIFICATIONS

GENERAL

All wiring should be done in accordance with prevailing codes by qualified personnel.

Typical wiring diagrams are shown on page 10. **Actual wiring should follow the print supplied with the actuator.**

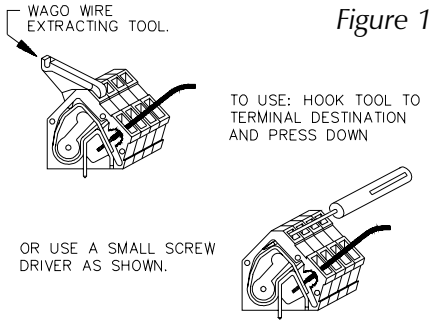
Fusing must be installed in line power, and should be of the slow blow type. Recommend 1 amp for ac input models.

Wiring should be routed to the actuator through one of the two 1/2 inch conduit openings. Generally, one conduit will contain input power and earth ground wires. The other conduit would then contain low level input and output signal wiring. It is recommended that all low level signal wiring be a shielded type with the shield grounded at source common.

After installation, it is recommended that all conduits be sealed to prevent water damage.

Strip 0.22 inch (5.6mm) of insulation from the wire and insert this bare end into the appropriate terminal location, utilizing an insertion tool or a small screw-driver as shown in Figure 1 below.

Figure 1



Maximum recommended wire size is 14 AWG, and minimum is 26 AWG.

WIRING TO TB1

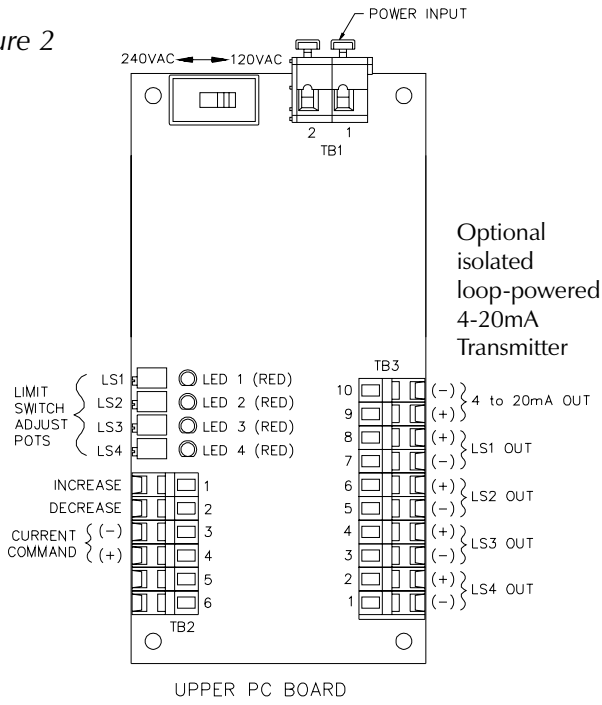
Input power terminates at TB1. For ac models, terminal 1 is hot, and terminal 2 is neutral. Terminal strip tabs are pressed down to insert wires.

WIRING TO TB2

LS1 and LS2 are normally factory-wired by Jordan Controls as end of travel limit switches (see Figure 4). LS1 is at the low command position and LS2 is at the high command position.

Current command (4-20 mA) wires terminate at terminal 3 (-) and will be in addition to a wire already there, and to terminal 4 (+).

Figure 2



The incoming power supply earth ground should be securely connected to the green ground screw located inside the actuator base between the two conduit entries.

WIRING TO TB3

If optional LS3 and LS4 are used as auxiliary position limit switches, connection is to terminals 1 through terminal 4. Maximum voltage is 40 Vdc and maximum current is 40 mA.

Optional 4-20 mA position feedback signal wires connect to terminals 9 (+) and 10 (-).

Increasing command signal will result in an increasing position feedback signal. Operation of the transmitter requires an external dc power supply in the range of 12 Vdc (minimum) to 36 Vdc (maximum) and a load connected in series with one lead from the power supply. (see figure 4)

$$\frac{\text{Power Supply Voltage-8Vdc}}{0.020\text{A}} = \text{load resistance}$$

Example:

$$\frac{24\text{Vdc-8Vdc}}{0.020\text{A}} = 800 \text{ ohms maximum load}$$

SETUP INFORMATION

AMPLIFIER SETUP

WARNING: This setup must be done with power off.

INPUT POWER

Select input power of 120 or 240 Vac. The upper pc board slide switch must be placed in the appropriate position. Failure to do this will result in permanent damage.

DIP SWITCH SETTINGS

1. For Current Command, set switches as follows:
   4-20 mA - Place DIP switch #1 in its down position

2. Set switches 2, 3, 4 and 5 in their up position.

3. Direct or reverse action selection.

   A. For direct (normal) action, on increasing command signal (actuator shaft retracts), place DIP switch #6 in the up position.

   B. For reverse action, place DIP switch #6 in the opposite position. The above reverse action logic carries through for automatic or manual operation.

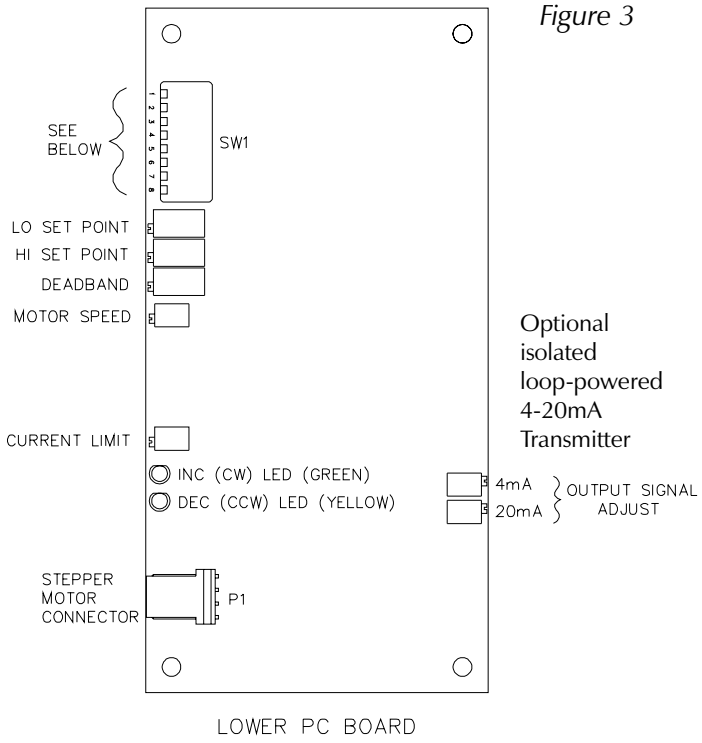
4. Auto-Manual Selection

   A. Automatic mode - Place DIP switch #7 in its down position. In this mode, the actuator output shaft is positioned in proportion to the command signal.

   B. Manual mode or incremental control mode - Place DIP switch #7 in its up position and DIP switch #8 in its down position. In this mode, the actuator output shaft responds to external increase and decrease dry contact closures.

5. Loss of Signal (LOS). Set DIP switch 8 in its up position. The loss of signal monitors current command signals only, and is activated when the signal drops below 3.8 mA. When the signal is lost the actuator will lock in the last position. This is the proper DIP switch setting for automatic operation.

Figure 3



Optional isolated loop-powered 4-20mA Transmitter

Table 1

Dip Switch Configurations SW1		
Switch	**Switch Position**	**Function**
1	Down	4-20mA Command Signal
2	Up	4-12mA Command Signal
3	Up	12-20mA Command Signal
4	Up	Current Command Signal
5	Up	0-10 Vdc Command Signal
6	See Table 2 on page 7, line 2	
7	Down	Auto Operation
	Up	Manual Operation
8	Up	LOS Lock in Place

NORMAL OUTPUT SHAFT MOTION FOR INCREASING SIGNAL

Table 2

OBSERVATIONS	MV-1005
Standard output shaft motion for increasing signal for this actuator. (Actuator normal.)	Retract
Switch 6 position for "actuator" normal operation	Up
Stepper motor rotation for increasing signal (looking into motor tailshaft/handknob)	CW
Stepper motor drive LED for increasing signal	Green
Stepper motor drive LED for CW motor rotation (looking into motor tailshaft/handknob)	Green
LS1 and LS3 trip (LED turns on) as actuator shaft goes:	Extend
LS2 and LS4 trip (LED turns on) as actuator shaft goes:	Retract
Output shaft movement with CW handwheel rotation	Retract

DIRECTIONAL REFERENCES FOR THE 1000 FAMILY OF ELECTRONIC ACTUATORS

The 1000 family of products use similar servo amplifiers. The 1000 series servo amplifier has directional references: NORMAL/REVERSE, HIGH/LOW, HI/LOW SETPOINTS and INCREASE/DECREASE.

Jordan Controls has established a standard for actuator output motion for all actuators including the 1000 series. Wiring drawings conform to this standard. For globe valve actuators (MV/VA-1000), the actuator will retract for increasing signal.

RECOMMENDED SPARE PARTS LIST

PART NUMBER	DESCRIPTION
Consult Factory	Upper power PC board
Consult Factory	Lower logic PC Board
74B-010957-159	Cover O-Ring
61A-031959-001	Drive Nut
61B-031593-001	Output Shaft
74B-032138-001	Coupling
61A-031481-001	Indicator Window
13A-031481-001	Gasket, Indicator Window

START-UP INFORMATION

I. START-UP FOR 4-20 mA CURRENT SIGNALS

(See Figure 4 on page 10, and Table 2 on page 7 for additional information)

1. **Power**. Apply ac power to TB1, as appropriate for the model.

2. **Setpoints**. These are the the end of travel extremes corresponding to the actuator output shaft positions desired for low and high comand signal levels. They are set by the Lo and Hi setpoint pots.

   A. Set the command signal to lowest level.

   B. Adjust Lo setpoint pot by turning CCW to move actuator output shaft to desired position. (Turn CW if output shaft is beyond this position.) The Yellow (DEC) LED will illuminate while the actuator is moving toward the Lo setpoint position. Should the Red LED adjacent to LS1 trim pot illuminate before getting to desired position, turn LS1 trim pot several turns CCW and continue to adjust the Lo setpoint pot CCW until the desired setting is obtained. NOTE: The Yellow LED and Red LS1 LED should be off.

   C. Set command signal to highest level.

   D. Adjust HI setpoint pot by turning CW to move actuator output shaft to desired position. (Turn CCW if output shaft is beyond this position). The Green (INC) LED will illuminate while the actuator is moving toward the Hi setpoint position. Should the Red LED adjacent to LS2 trim pot illuminate before getting to desired position, turn LS2 trim pot several turns CW and continue to adjust the Hi setpoint pot CW until desired setting is obtained. NOTE: The Green LED and Red LS2 LED should be off.

   E. Some interaction will occur, and it is necessary to repeat above steps until both Hi and Lo setpoint desired positions are obtained.

3. **Deadband**. This adjustment establishes the actuator servo sensitivity and is set to tolerate electrical "noise" on the command signal, mechanical instability, backlash, etc. It governs the "tightness" of the operating servo loop. It is factory set and "sealed" at ± 0.1 mA change in current before actuator position is changed. If the actuator begins to oscillate (Green and Yellow LEDs turn on and off rapidly), decrease the sensitivity by turning the deadband pot slowly CW until oscillation stops.

4. **End of Travel Limit Switches**. (Not for Customer use) These are the electronic position limit switches that are set just outside of the low and high command signal level positions. They are set by LS1 and LS2 trim pots.

   A. Set command signal to low, and adjust LS1 trim pot CW until its LED just comes on. Note that the Green and Yellow LEDs are also on. This is an indication the limit switch tripped and stopped actuator movement just prior to reaching low command level position.

   B. Turn LS1 trim pot approximately 1/8 turn CCW, or just until LS1 LED goes off. The Green and Yellow LEDs will also go off, indicating that the actuator is in correct low command position.

   C. Set command signal to high and adjust LS2 trim pot CCW until its LED just comes on. Note that the Green and Yellow LEDs are also on. This is an indication that the limit switch tripped and stopped actuator movement just prior to reaching high command level position.

   D. Turn LS2 trim pot approximately 1/8 turn CW, or just until LS2 LED goes off. The Green and Yellow LEDs will also go off, indicating that the actuator is in correct high command position.

7. **Optional Auxilliary Limit Switches**. LS3 and LS4 can be set to open or close anywhere within the actuator range. Adjust LS3 and LS4 trim pots to desired "trip" points. The Red LEDs adjacent to LS3 and LS4 indicate their state.

8. **Optional Isolated Position Feedback**. 4-20 mA current feedback signal is taken from the integral feedback pot, and is optically isolated from all other servo electronics. It is calibrated with two trim pots.

   A. Set command signal to low.

   B. Adjust 4 mA output signal pot until output is at 4 mA.

   C. Set command signal to high.

   D. Adjust 20 mA output signal pot until output is at 20 mA.

   E. Some interaction will occur, and it is necessary to repeat above steps until no further adjustment is necessary.

   F. The position feedback signal is now calibrated and will be proportional to the actuator output shaft travel.

9. **Verify all settings** by running the actuator through its travelrange several times. Also verify loss of signal (LOS) lock in place.

10. **Transfer to automatic control** and observe that operation is proper before leaving the actuator unattended.

START-UP INFORMATION

II. STARTUP FOR INCREMENTAL (DISCRETE) CONTROL

(See Figure 5 on page 10)

1. **Power**. Apply ac power to TB1.
2. Two isolated, dry contact closures are used to position the actuator. These contacts may be within a remotely located controller or may take the form of external pushbuttons or switches for manual control. NOTE: the Hi and Lo setpoint pots have no influence in this mode.
   A. Adjust LS1 full CW and LS2 full CCW. This will allow for full range of travel.
   B. Close DEC contact. The actuator will move toward the low command position. The Yellow LED comes on.
   C. Set LS1 trim pot so adjacent LS1 Red LED turns off at desired low command position. The Yellow LED will also turn off at this point.
   D. Open DEC contact and close INC contact. The actuator will move toward the high command position. The Green LED comes on.
   E. Set LS2 trim pot so adjacent LS2 Red LED turns off at desired high command position. The Green LED will also turn off at this point.
   F. If reverse action is desired, DIP switch #6 should be moved to its opposite position, and the above steps repeated.
3. **Deadband**. The Deadband pot adjustment has no influence in this mode of operation.
4. **Auxilliary Limit Switches**. Same procedure as Step 7 on page 8.
5. **Isolated Position Feedback Signal**. Same procedure as Step 8 on page 8.

TYPICAL WIRING DIAGRAMS

Due to wide variations in the terminal numbering of actuator products, actual wiring should follow the print supplied with the actuator.

Analog Command With Position Limits

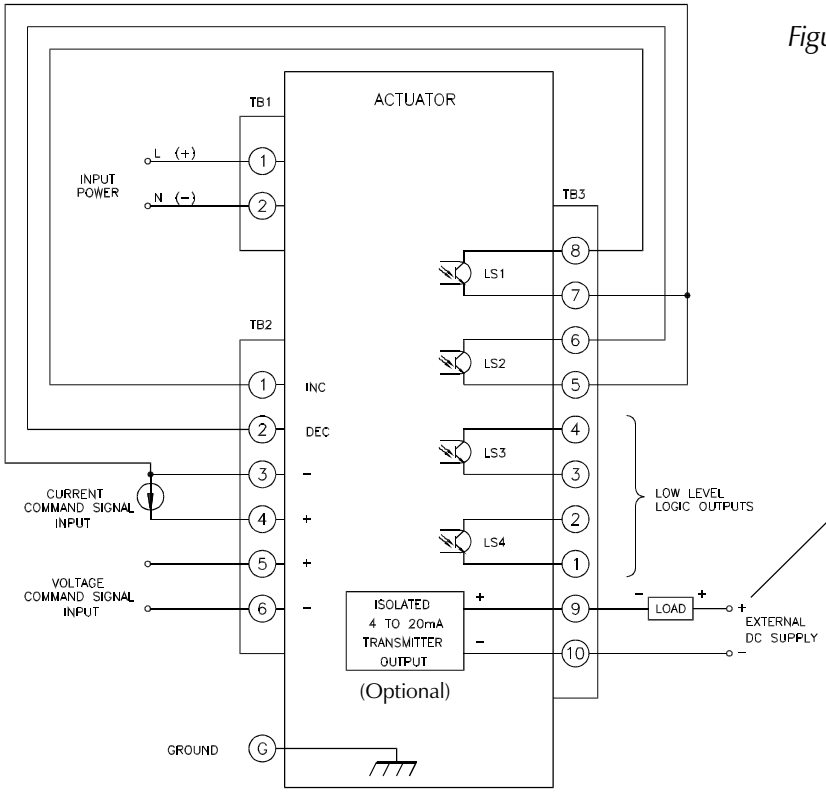


Figure 4

Optional, refer to page 3 for model information.

Incremental (Discrete) Command With Position Limits

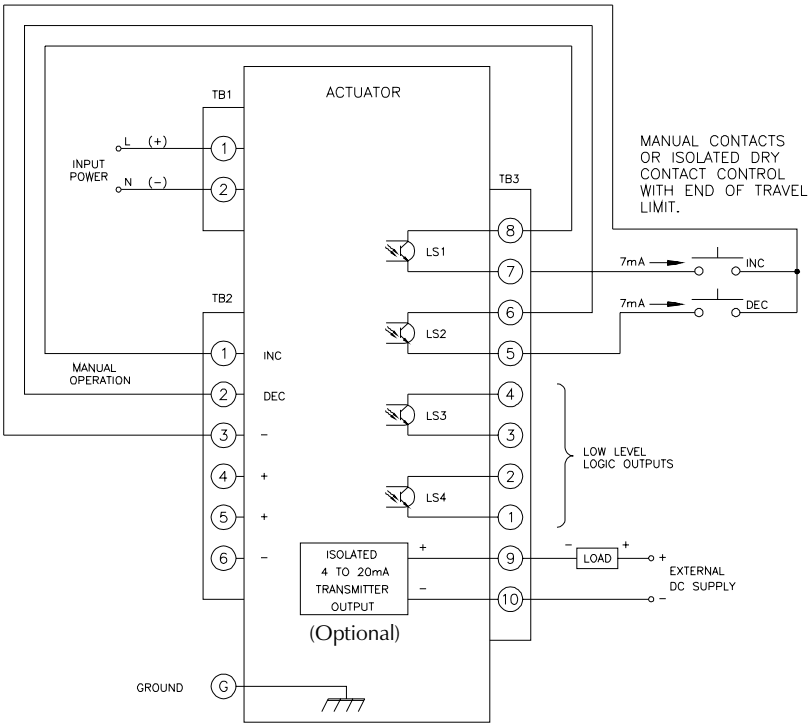


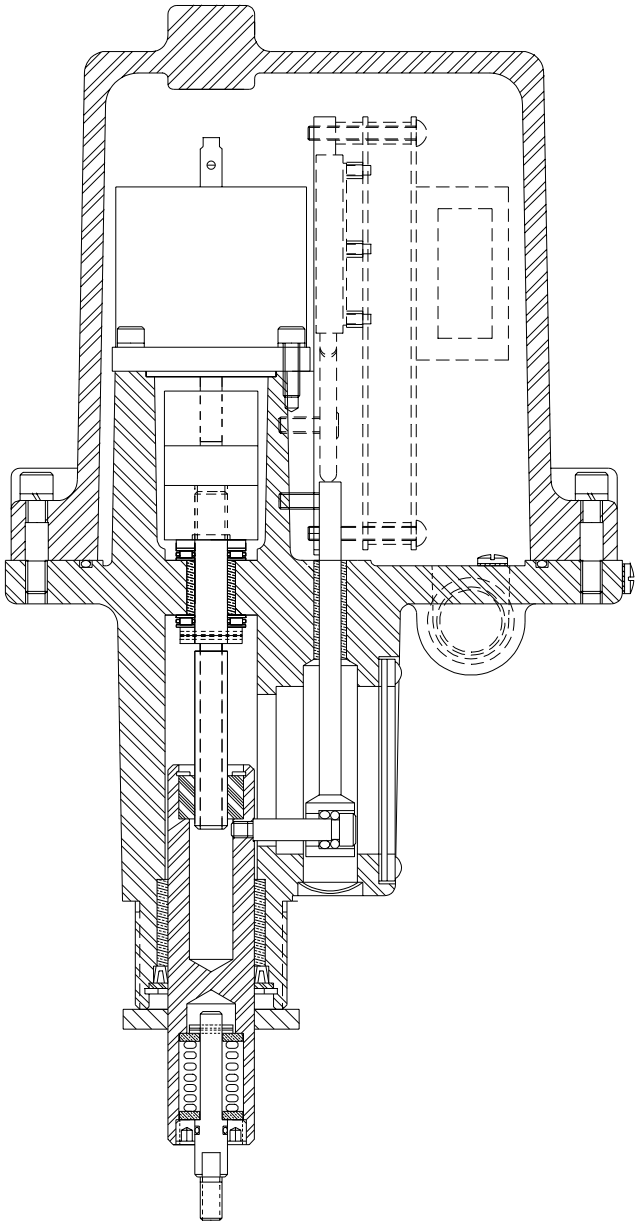
Figure 5

TROUBLESHOOTING GUIDE

TROUBLE	POSSIBLE CAUSE	REMEDY
Can't get full stroke by adjusting setpoint pots.	a. Run into a mechanical stop.	a. Set stroke within actuator limits.
	b. LS1 and/or LS2 opens (LED comes on) before reaching desired setpoint.	b. Adjust LS1, LS2 and setpoint pots per set-up procedure.
Output shaft goes in opposite direction as desired.	DIP switch #6 is in incorrect position.	Reverse DIP switch #6 position and recalibrate.
No response when in manual mode.	DIP switch #8 is in incorrect position.	Reverse DIP switch #8 position.
Actuator "chatters" and Green & Yellow LEDs go on and off rapidly.	a. Deadband too tight.	a. Turn deadband pot CW to decrease sensitivity until "chattering" stops and Green & Yellow LEDs go off.
	b. Excessive noise on command signal.	b. Remove noise.
	c. Command signal shield not grounded, or grounded incorrectly.	c. Ensure shield is grounded at source common only
Erratic operation.	a. DIP switches set incorrectly.	a. Correct settings.
	b. Incorrect wiring.	b. Correct wiring.
Loss of signal action incorrect.	DIP switch # 8 set incorrectly.	Correct DIP switch #8 position.
Actuator won't run.	a. No power or power out of range.	a. Check and restore power or connect to proper power.
	b. Transformer burned out due to incorrect setting of slide switch (240 Vac supply and switch set on 120 Vac).	b. Replace upper PC board and recalibrate.
	c. Transformer connection to PC board broken, due to excessive vibration.	c. Replace upper PC board and eliminate excessive vibration. Recalibrate.
	d. Slide switch set in 240 Vac position when power is 120 Vac.	d. Remove power, set slide switch to 120 Vac position and restore power.
	e. ESD damage to PC boards.	e. Replace PC board set.
	f. Incorrect wiring.	f. Correct wiring.
	g. Loss of command signal.	g. Restore command signal.
	h. Excessive side load on output shaft.	h. Eliminate side load.
	i. Command signal not received or not in range	i. Check and correct.
	j. Actuator mechanically at end of travel.	j. Recalibrate to bring into mechanical range.
	k. External actuated device binding or at its end of travel.	k. Eliminate bind or recalibrate.

MAJOR COMPONENT IDENTIFICATION

Figure 6



Captive Cover Screws

Bearing

Mounting Nu

Output Shaft W
Seating Mechan

1A 4 Enclosure

ower PC Board

er Power PC Board

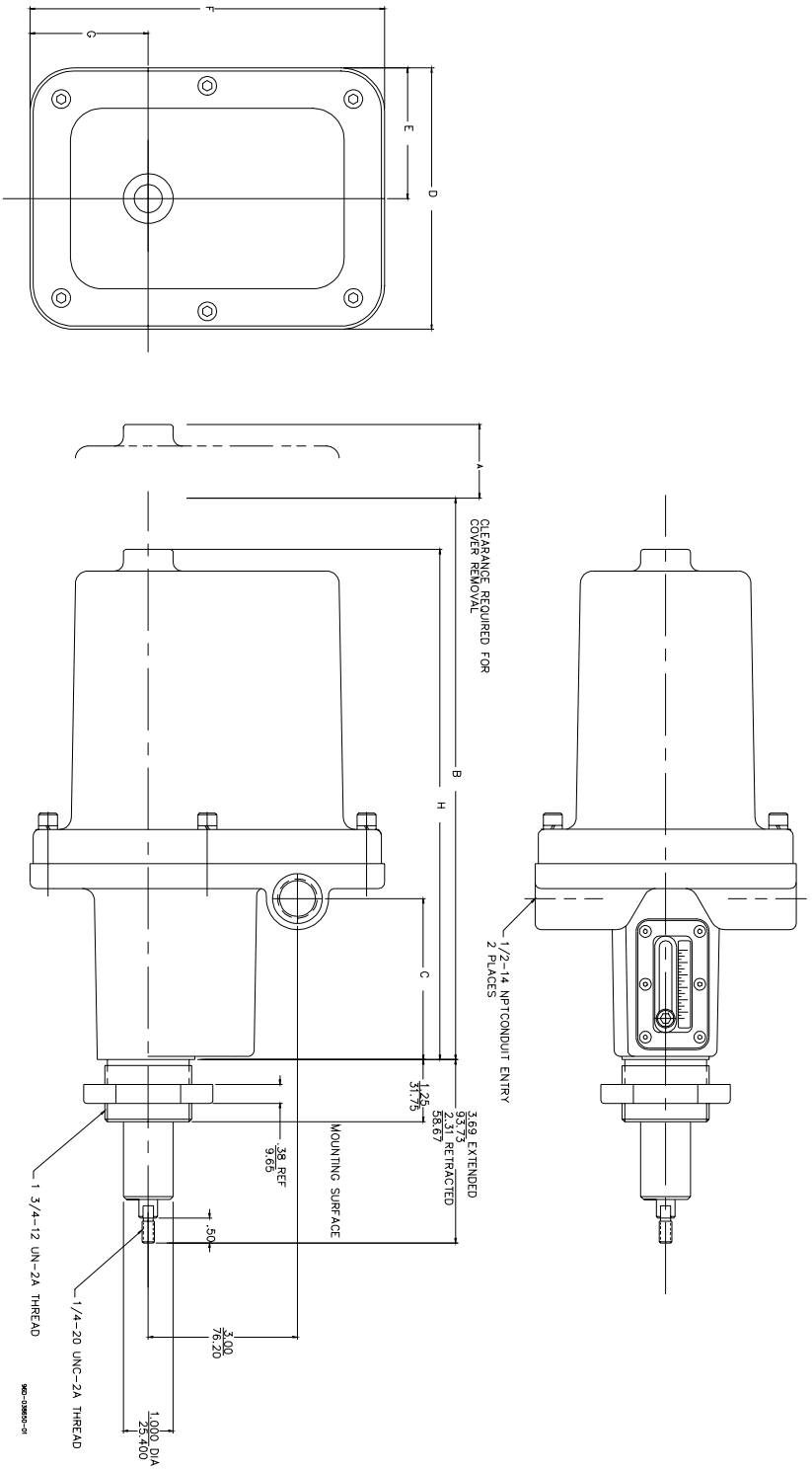
Feedback Element

Ground Screw

Actuator Base

l Conduit Entries

INSTALLATION DIMENSIONS



	A	B	C	D	E	F	G	H
MV-1005	4.22 (107.19)	16.00 (406.4)	3.25 (82.55)	5.25 (133.35)	2.63 (66.80)	7.13 (181.10)	2.38 (60.45)	10.28 (261.11)

Note: These dimensions apply to cast yoke base models only. Consult factory for universal mounting kit or mechanical tubing mount models.

AMPLIFIER SWITCH, POT & TERMINAL LOCATIONS

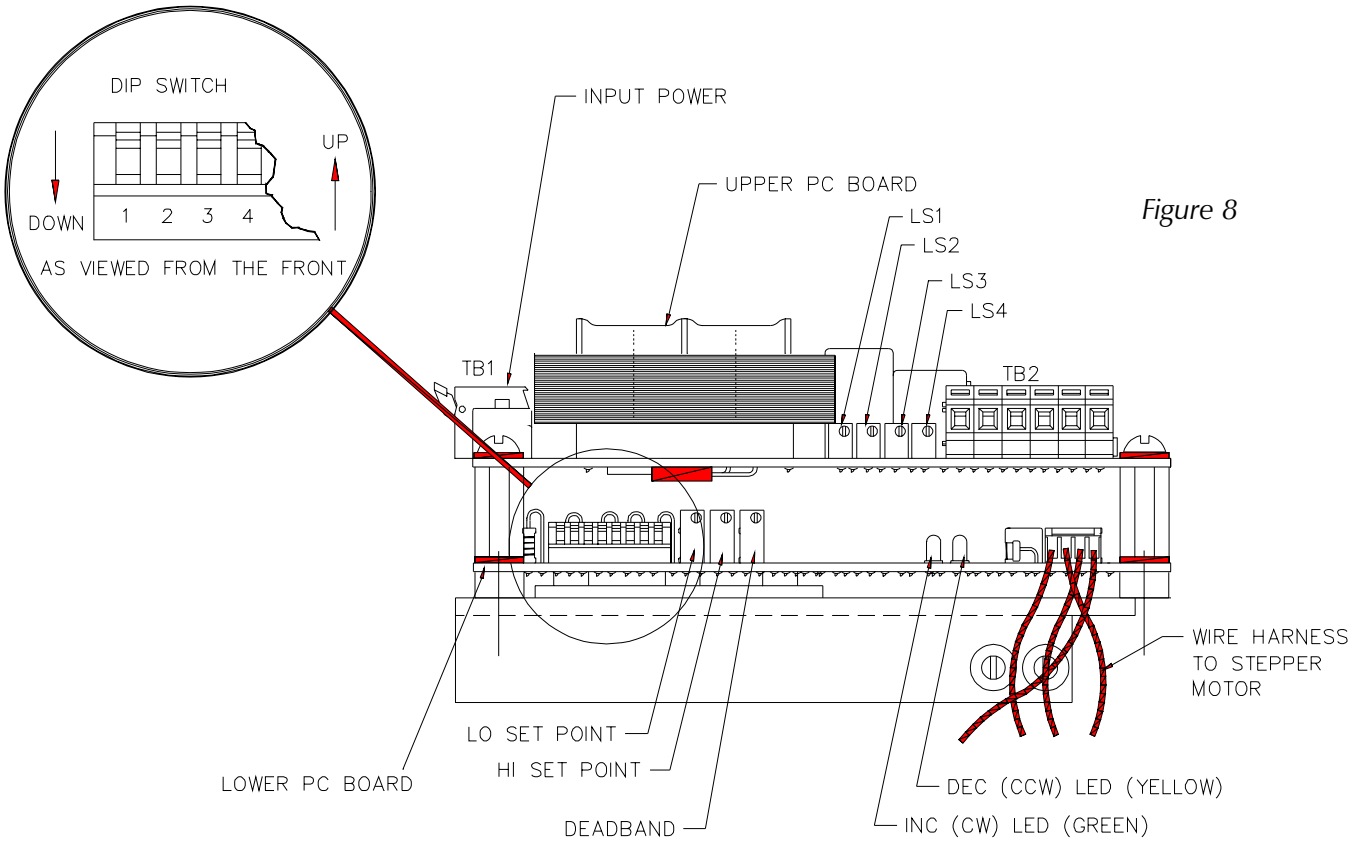


Figure 8

JORDAN CONTROLS, INC.
5607 West Douglas Avenue
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FAX: (414) 461-1024
E-Mail: jordan@jordancontrols.com
www.jordancontrols.com
IM-0630 8/99

The dimensions in this manual are subject to change without notice and should not be used for preparation of drawings or fabrication of installation mounting. Current installation dimension drawings are available upon request.

Jordan
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