

# ***SM-1020-0107***

## ***Electronic Digital Actuators***

### **Table of Contents**

General Information .....	2-3
Product Specifications .....	4
Installation Wiring .....	5
Setup Information .....	6
Start-up Information .....	7-8
Lower PC Board Diagram .....	8
Typical Wiring Diagram .....	9
Troubleshooting Guide .....	9
Component Identification .....	10
Installation Dimensions .....	11

*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 and using Jordan Controls products:

- Read and save all instructions prior to installing, operating and servicing this product.
- If you don't understand any of the instructions, contact Jordan Controls 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 and maintain the unit.
- 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 and securely fastened (except when installing, or when maintenance is being performed by qualified personnel), to prevent electrical shock, personal injury or damage to the actuator.
- Operation of actuator in an inappropriate fashion may cause harm or damage to unit or other equipment/surroundings.

## 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.**

**LA units must only be cleaned with a damp cloth.**

## 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 -40° to 185° F (-40 to 85° C). 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

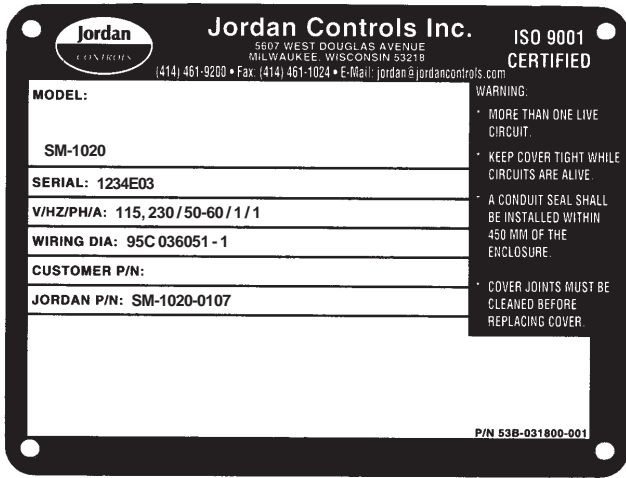
To facilitate quick return and handling of your equipment, include:

1. RG Number on outside of box
2. Your Company Name, Contact Name, Phone/Fax
3. Address
4. Repair Purchase Order Number
5. 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: **SM-1020 Series**

SERIAL NUMBER: **1234 E 03**

Sequential Number | Year Built | Month Built

## 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

## GENERAL ACTUATOR DESCRIPTION

The SM-1020-0107 actuator is a full-featured actuator with the capability to accept an analog current control signal. The design provides smooth, highly accurate positioning. 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 gear shaft arrangement. This allows the low torque, high speed motor output to be converted to high torque, low speed for actuator output shaft motion. The built-in servo drive amplifier controls the stepper motor's speed and direction. It also controls actuator end limits, motor torque, deadband, 4-20 mA transmitter and electronic auxiliary limit switches.

## 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.

# SPECIFICATIONS

## ELECTRICAL

**Input Voltage:** 21.6 - 30 Vdc

**Operating Current:** 2 amperes maximum; 1.5 amperes at 24 Vdc input, less than 10 mA in standby when actuator is at null.

**Command Signal Input:** 4-20 mA input.

**Standby Circuit Turn-On:** Step change in command signal greater than sensitivity setting. Sensitivity is switch selectable in the field from 0.05 mA to 1.5 mA.

**Standby Circuit Turn-Off:** No step change in command signal greater than selected sensitivity for two seconds after actuator enters NULL position.

**Position Transmitter:** A 4-20 mA output, isolated from actuator source and command. This is a loop-powered device, powered by an external 12-36 Vdc power supply.

**Terminations:** PC board mounted terminal blocks accepting up to #14 AWG solid or stranded copper wire; standard 1000 series connectors.

**PC Boards:** Total of three: upper power supply board; middle logic board; and lower dual position feedback potentiometer board with 4-20 mA Position Transmitter and standby circuit.

**Duty Cycle:** Continuous modulating duty

**Customer Adjustments:** 4mA and 20 mA setpoints to correspond with valve positions; separate 4 mA and 20 mA set points for Position Transmitter. Operating speed, actuator deadband; and torque limit (current limit) are pre-set at Jordan Controls.

## MECHANICAL

**Output Torque:** 125 in. lb. maximum

**Output Shaft Speed:** 3.3 rpm (90 seconds full stroke on 4.6 turn MERLA valve)

**Maximum Turns:** Maximum 5 output shaft turns (Factory set at 4.6 turns)

**Storage Temperature:** -40° to 85°C (-40° 185°F)

**Ambient Operating Temperature:** 4° to 70°C (39° to 158°F)

**Enclosure:** Gray epoxy coating over gray anodized finish. Waterproof and corrosion resistant finish, aluminum or stainless steel external parts. Local manual operating handwheel, rotates when actuator is moving. Designed for Class 1, Div 1, Group C & D 'explosion proof' service.

**Repeatability:** 1% of full span

**Positioning Accuracy:** 1% of full span

**Other:**

- Output shaft locks-in-place on loss of power
- Output shaft locks-in-place on loss of command signal (command signal at zero mA)
- All hardware is stainless steel or aluminum

## VALVE MOUNT

**Valve:** Mount supplied for MERLA FCV valve

**Material:** Machined from extruded aluminum and anodized

**Finish:** Gray epoxy coating over gray anodized finish

**Hardware:** Stainless steel. All needed hardware supplied.

**Torque Required:** 125 in. lb. per customer spec. and MERLA catalog

**Full Stroke:** 4.6 turns (1/2-13 stem thread) as measured

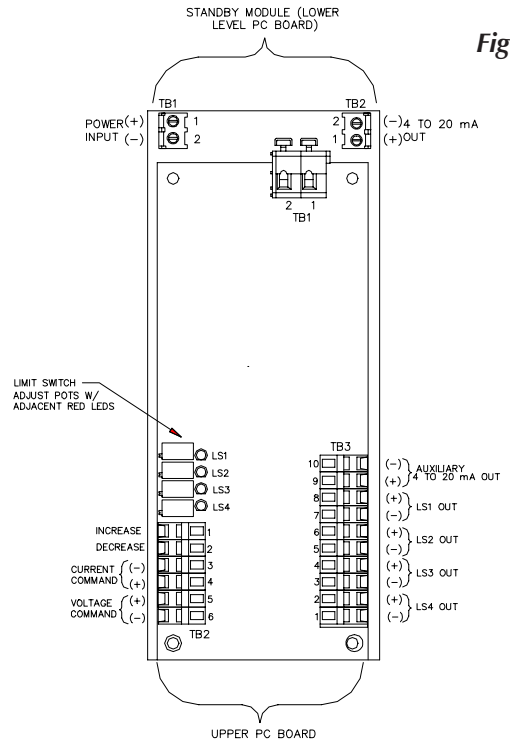
**Stem Rise:** 0.35 inch as measured

# INSTALLATION WIRING

## GENERAL

- All wiring should be done in accordance with prevailing codes by qualified personnel.
- A typical wiring diagram is shown on page 9. **Actual wiring should follow the print supplied with the actuator.**
- 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.
- After installation, all conduits are to be sealed to prevent water damage, and to maintain actuator enclosure rating.
- Maximum recommended wire size is 14 AWG, and minimum is 26 AWG.
- It is recommended that all low level signal wiring be a shielded type with the shield grounded at source common.

Figure 2



## WIRING TO UPPER LEVEL PC BOARD

(See figures 1, 2 & 5)

- 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.

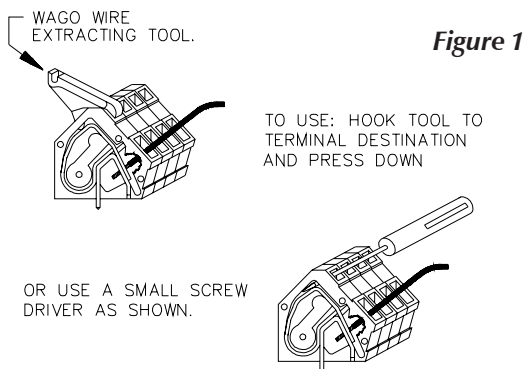


Figure 1

- Field wiring does not terminate at TB1 (except during start-up and calibration).

## WIRING TO LOWER LEVEL PC BOARD

(See figures 2 & 5)

20 to 30 Vdc power supply terminates at TB1 with Terminal 1 (+) and Terminal 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.

4 to 20 mA position feedback signal wires connect to Terminal 1 (+) and Terminal 2 (-) at TB2.

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 5)

# SETUP INFORMATION

## ELECTRICAL SETUP

The actuator is factory calibrated as follows:

4.6 revolutions of the output shaft.

The full CCW (looking at the output shaft) rotation corresponds to a 4 mA command signal and the full CW rotation corresponds to a 20 mA command signal.

Output speed is set for 3.3 rpm and current limit is set for 125 in. lbs. output torque. They are factory sealed and should not be re-adjusted in the field.

Deadband is factory set and sealed to require 0.1 mA or larger command signal changes to reposition the valve stem.

DIP switches on the Middle Level PC Board are pre-set for a 4 to 20 mA command signal with actuator output shaft going full CCW on an increasing signal. The actuator output shaft will lock in its last position in the event of loss of command signal.

In the event these switches need to be reset for any reason, the following procedure should be followed:

### DIP SWITCH RE-SET PROCEDURE

#### 1. Auto/Manual

DIP switch #1 must be in the down (ON) position for the unit to be in AUTO.

#### 2. Loss of Signal

DIP switch #2 must be in the down (ON) position for the unit to lock in place on loss of signal (LOS).

#### 3. Input Signal

DIP switch #3 must be in the down (ON) position for the unit to receive a 4-20 mA command signal.

#### 4. Split Range Enabled

DIP switch #4 must be in the up (OFF) position.

#### 5. Split Range Configuration

DIP switch #5 must be in the up (OFF) position.

#### 6. Model Designation

DIP switch #6 must be in the down (ON) position.

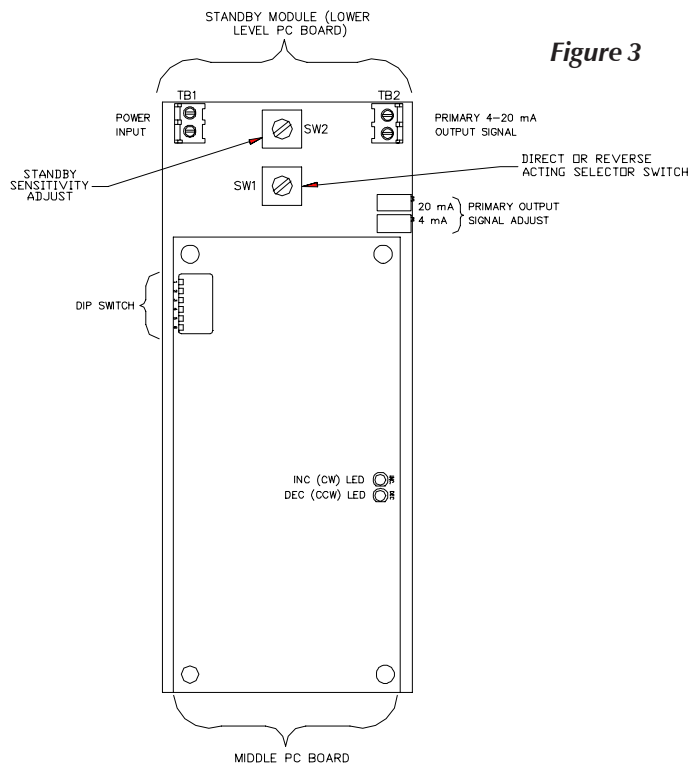


Figure 3

## MECHANICAL SETUP

1. Ensure valve stem is turned to its full closed position. (Full CW looking at top of stem)
2. Slip coupling furnished with actuator onto the valve stem with slotted end facing up. DO NOT install the set screw at this time.
3. Temporarily install the actuator onto the valve yoke in the desired mechanical orientation ensuring actuator output shaft drive pin aligns with the coupling slot.
4. Temporarily install one of the three 3/8-16 x 0.50 long cone point set screws and tighten only enough to support the actuator onto the valve.
5. Match mark the actuator valve adaptor and valve for subsequent re-assembly.
6. Proceed with startup.

# START-UP INFORMATION

## START UP FOR LOW LEVEL CURRENT OR VOLTAGE COMMAND SIGNALS

1. Temporarily remove yellow and green wires from TB1 on the Upper Level PC Board and incoming dc power supply wires from TB1 on the Lower Level PC Board. Reconnect incoming power to TB1 on the Upper Level PC Board to Terminals 1(+) and 2(-).
2. Energize DC power.
3. **Auto Switch.** Place DIP Switch 1 to ON (Down) to place actuator in AUTO mode.
4. **Setpoints.** These are the end of travel extremes corresponding to the actuator output shaft positions for low (4 mA) and high (20 mA) command signal levels. They are set by the ZERO and SPAN push buttons and adjusting knob. All settings require the holding of a push button *and* the turning of the adjusting knob.
  - A) Set the command signal to lowest level, normally 4 mA. Press and hold ZERO (S1) and LOS (S5) pushbuttons until D5 is illuminated to calibrate low command value (approx. 2 seconds).
  - B) Adjust LO setpoint (ZERO) by holding ZERO push button (S1) and turning adjusting knob to move actuator output shaft to desired ZERO position. Rotating the adjusting knob CW will cause the output shaft to rotate CW. Rotating the adjusting knob CCW will cause the output shaft to rotate CCW. For fine adjustments, turn the adjusting knob slowly. The knob is speed sensitive, so the faster it is turned, the more displacement of the actuator will occur. The yellow (DEC) LED will illuminate while actuator is moving toward the LO setpoint. Release button.
  - C) Set the command signal to highest level, normally 20 mA. Press and hold SPAN (S2) and LOS (S5) pushbuttons until D5 is illuminated to calibrate high command value (approx. 2 seconds).
  - D) Adjust HI setpoint (SPAN) by holding SPAN push button (S2) and turning adjusting knob to move actuator output shaft to desired SPAN position. Rotating the adjusting knob CCW will cause the output shaft to rotate CCW. For fine adjustments, turn the adjusting knob slowly. The adjusting knob is speed sensitive, so the faster it is turned, the more displacement of the actuator will occur. The green (INC) LED will illuminate while actuator is moving toward the HI setpoint. Release button.
  - E) To set up the actuator in a reverse acting fashion for linear units, set the ZERO position beyond the SPAN position, which will cause the unit to retract on an increasing command signal. For rotary units, set the ZERO position beyond the SPAN position, which will cause the unit to rotate CW on an increasing command signal.
5. **Deadband** This adjustment establishes the actuator servo sensitivity. It is factory set at 1% and should not be field adjusted. If the actuator begins to oscillate (Green and Yellow LEDs turn on and off rapidly), decrease the sensitivity by holding deadband push button (S4) and turning adjusting knob CW until oscillation stops. Release button.
6. **Speed Adjust** Speed is preset at the factory. To adjust speed, hold the speed push button (S3) and turn the adjusting knob CW to increase or CCW to decrease actuator speed. *Note that actuator force and speed are related, see speed/force curves.*
7. **Loss of Signal Preset.** This adjustment establishes the position to which the actuator will travel upon a loss of command signal condition. To activate this setting, SW2 must be OFF (Up). Adjust the setting by holding the LOS push button (S5) and turning the adjusting knob to set the preset position. Turn the adjusting knob CW to extend the feedback potentiometer, and CCW to retract it.
8. **Auxiliary Limit Switches.** LS-1, LS-2, LS-3 and LS-4 are available for customer use. They are adjusted with trim pots on upper PC board, and the adjacent red LEDs indicate state.
9. **Isolated Position Feedback.** 4 to 20 mA current feedback signal is taken from one of the integral feedback pots and is isolated from all other servo electronics. It is calibrated with 2 pots on the lower PC board. (If reverse-acting signal output is desired, move the slide switch labeled SW1 to its opposite position)
  - 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.

# START-UP INFORMATION

E. The position feedback signal is now calibrated and will be proportional to the actuator output shaft travel when actuator power is removed or when the actuator is in standby mode.

## 10. De-energize dc power.

- A. Re-locate power supply wiring to TB1 terminals 1(+) and 2(-) on the Lower Level PC Board.
- B. Re-connect yellow and green wires removed in Step 1 to terminals 1 and 2 respectively on TB1 Upper Level PC Board.

11. **Standby Circuit Calibration.** Re-energize dc power.

12. **Standby Circuit.** A sensitivity adjustment is provided to prevent false starting of the actuator due to noise on the command signal line. Rotate SW2 clockwise to decrease the sensitivity, and counter-clockwise to increase the sensitivity. The most sensitive setting is 0, and the least sensitive setting

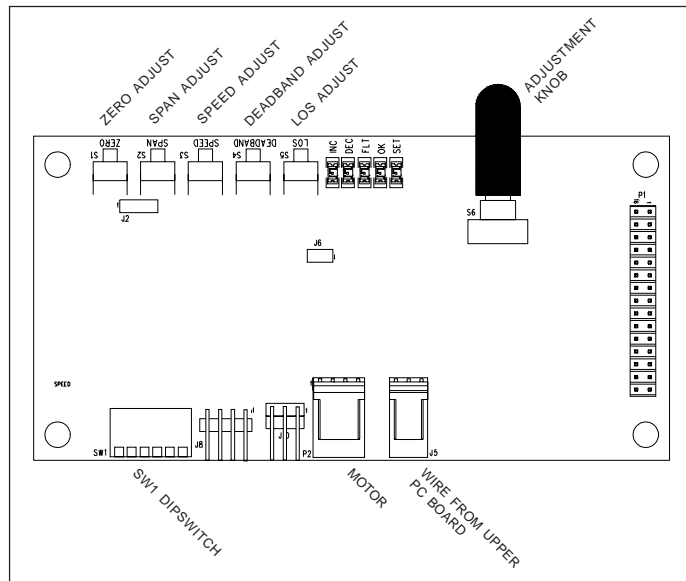
is F. The standby circuit will automatically turn off the amplifier and actuator when the actuator position is reached, thereby conserving power. A change in the command signal is recognized by this circuit and restores power to the amplifier and normal operation resumes.

13. **Verify** all settings by running the actuator through its travel range several times. Also, verify loss of signal action.

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

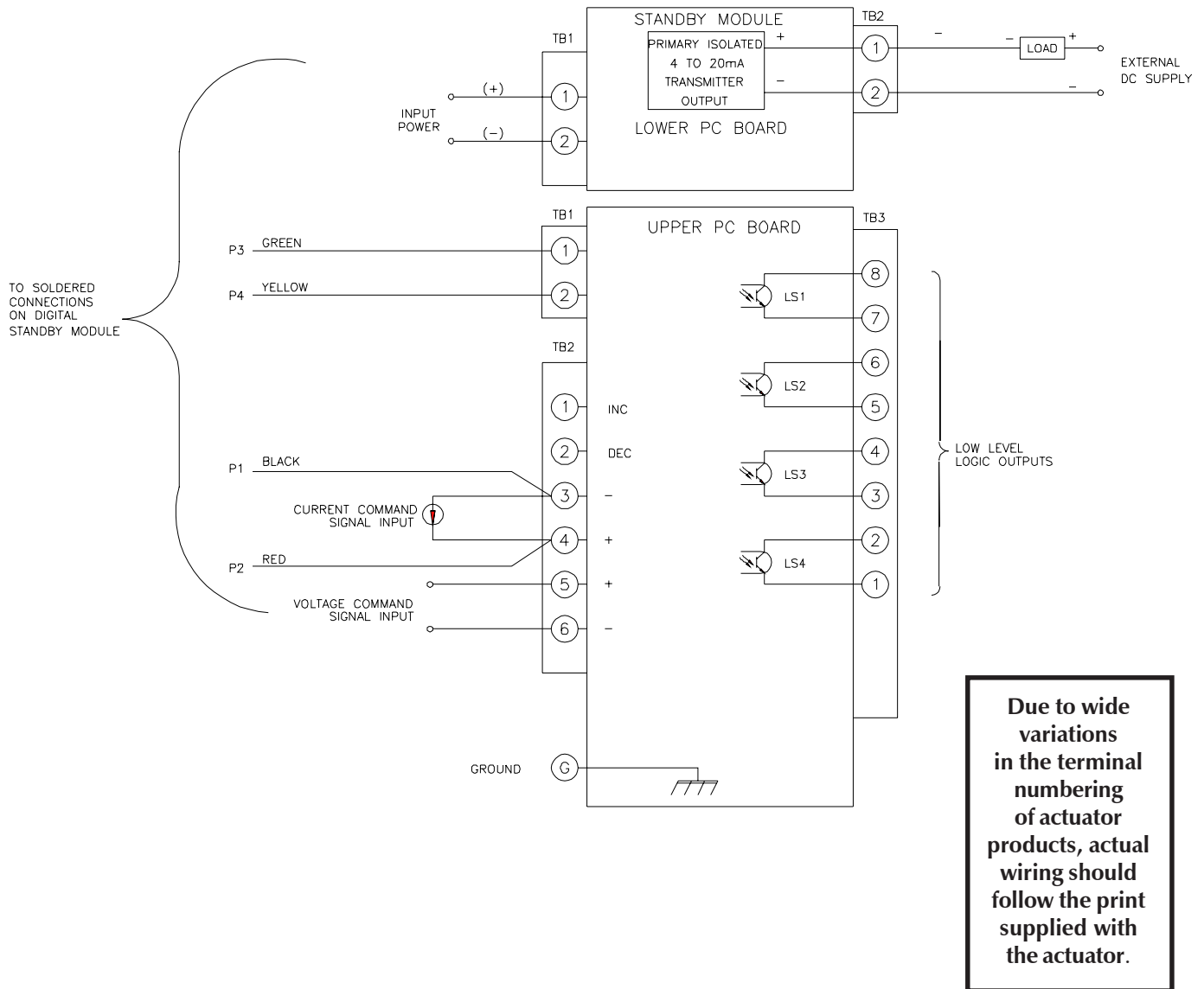
15. **Reset defaults.** Factory presets may be restored by depressing and holding SPEED (S3), DEADBAND (S4), and LOS (S5) until D5 is illuminated (approximately 2 seconds).

# LOWER PC BOARD





# TYPICAL WIRING DIAGRAM



## TROUBLESHOOTING GUIDE

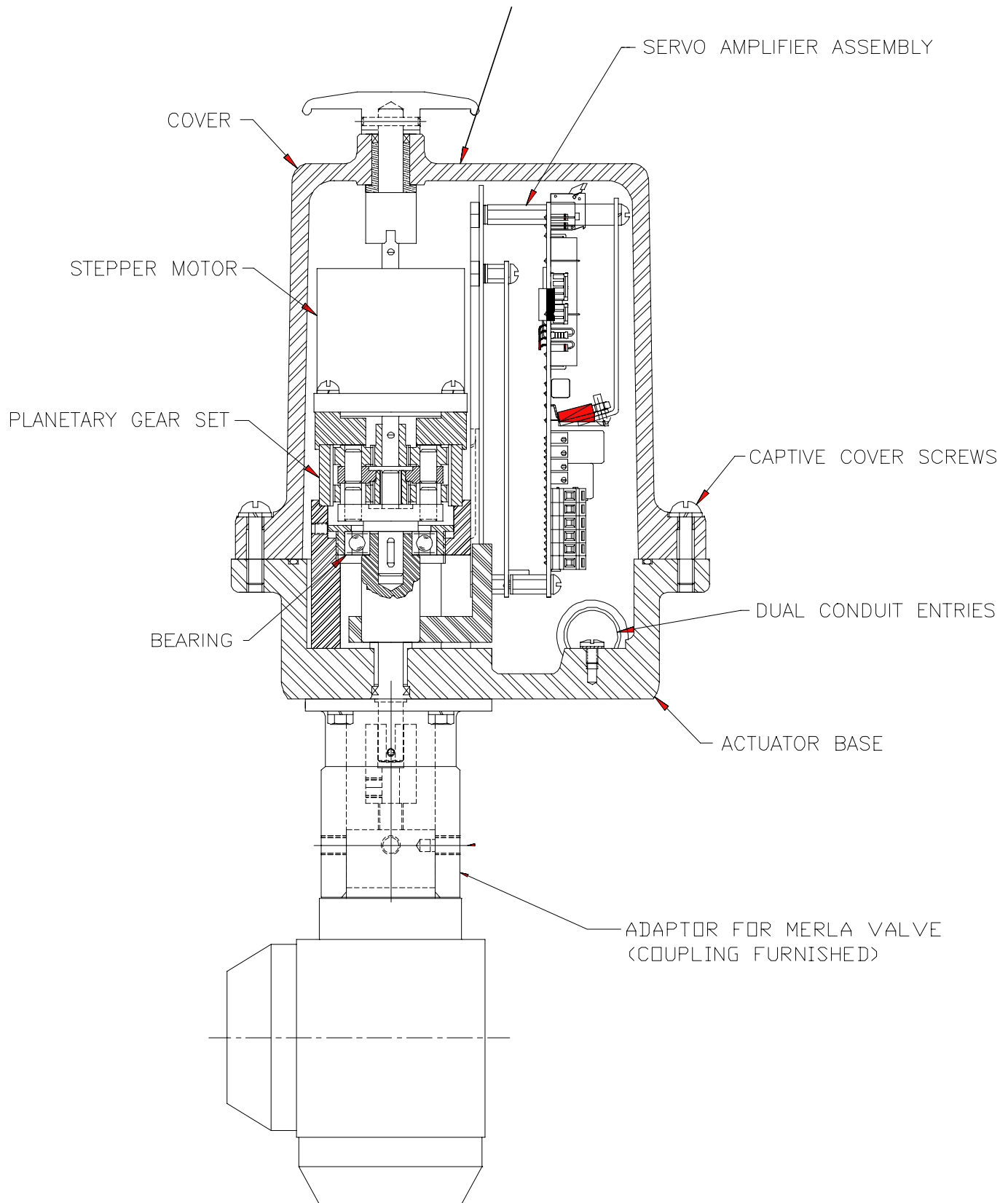
### VISUAL TROUBLESHOOTING

For visual troubleshooting, LEDs are provided to display the status of the actuator. These are located on the same side of the lower board as SW1. The identification of these LEDs are shown in the table below, and are ordered as the LEDs appear: left to right.

LED	Function
Microprocessor running (D4)	This LED flashes when the microprocessor is running. If this is not on, verify power to the board.
Actuator Increasing	This LED is on when the actuator is moving in the increasing direction
Actuator Decreasing	This LED is on when the actuator is moving in the decreasing direction.
Fault	This LED will illuminate if there is a loss of 4-20 mA signal (LOS).

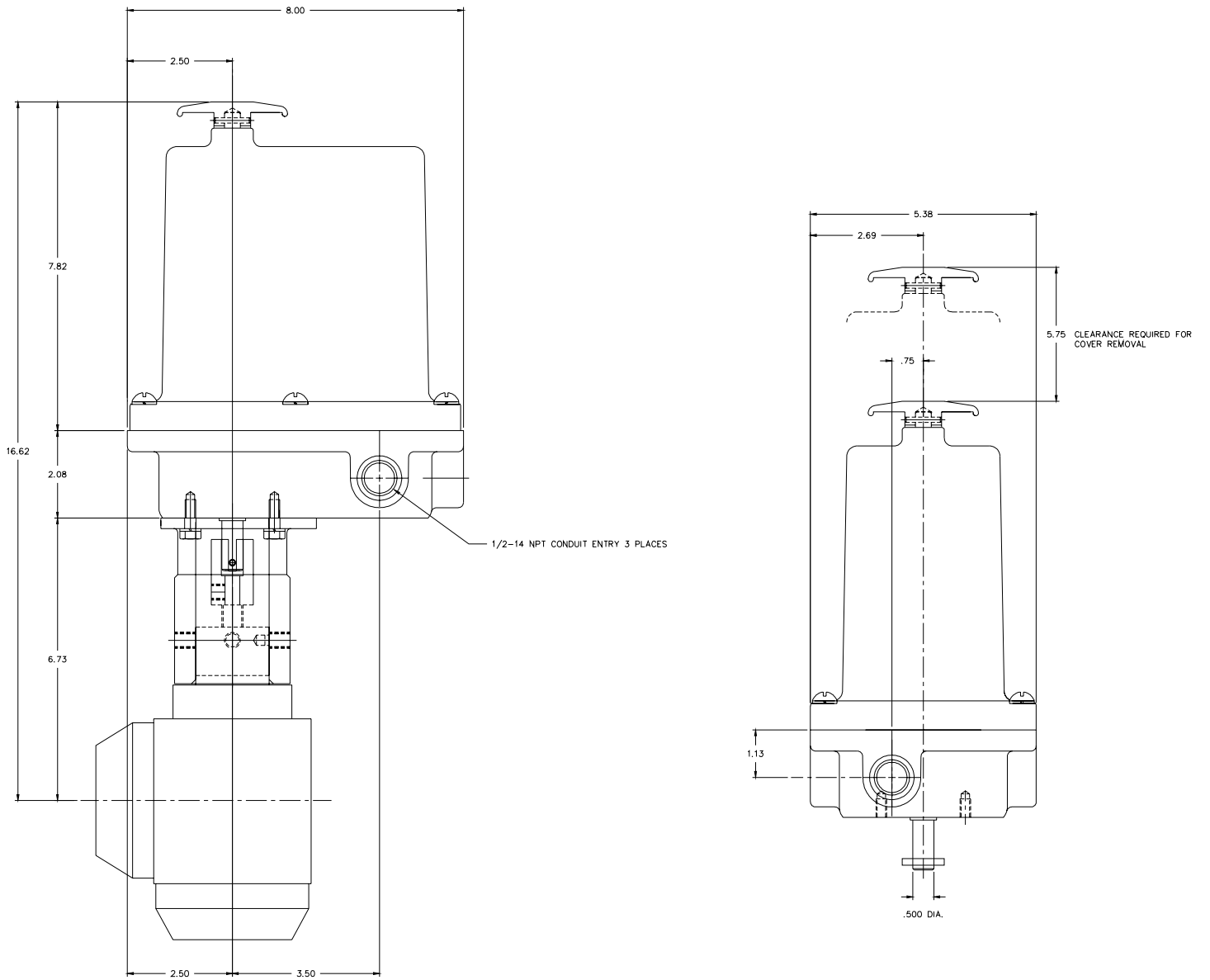
# COMPONENT IDENTIFICATION

EXPLOSIONPROOF AND NEMA 4 ENCLOSURE



# INSTALLATION DIMENSIONS

(Inches)



*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.*

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