



**Hays Cleveland**

Div. of UniControl Inc.

Series 9160  
Linear Actuator  
with  
Analog Input Positioner

Instruction Manual 9160.01

Instruction Manual 9160.01

# **CUSTOMER SERVICE INFORMATION**

## **Contacts**

### **Hays Cleveland Sales Office**

1903 South Congress Avenue

Boynton Beach FL 33426

Telephone: 561.734.9400

Fax: 561.734.8060

email: [salescombustion@unicontrolinc.com](mailto:salescombustion@unicontrolinc.com)

### **Hays Cleveland Customer Service Department**

1111 Brookpark Road

Cleveland OH 44109

Telephone: 216.398.4414

Fax: 216.398.8556

email: [customerservice@unicontrolinc.com](mailto:customerservice@unicontrolinc.com)

## **Visit us on the WEB!**

<http://www.hayscleveland.com>

## **Repairs**

Damaged or defective units may be returned to the factory for repair. However, factory authorization must be obtained before shipping whether warranty or non-warranty service is required, and all units must be shipped prepaid.

A letter of transmittal that includes the following information should accompany the returned instrument:

1. Location, type of service, and length of time in service of the unit.
  2. Description of the faulty operation of the device and the circumstances of the failure.
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# CLEVELAND CONTROLS

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## Series 9160 Linear Actuator

### (Type LF/LS)

for Closed Loop Applications Requiring Analog Input Positioner

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## 1.0 INTRODUCTION

The Series 9160 Linear Actuator is a compact, flexible design is suitable for any combustion or process control application. It offers long life, reliable operation, safety, and easy maintenance. Series 9160 actuators accept 4–20 ma or 1–5 v DC control signals to position a final control element such as a damper, control valve, louver, stoker lever, variable speed transmission, or any similar device over a 6-inch range of travel. Three stroke times and thrust ranges are offered for all models. Please note that all specified ratings are based upon using the full six-inch travel of the drive bar. For special stroke time/thrust requirements, please consult the factory. Unlike many older designs, the 9160 requires no mechanical brake assembly. The inherent braking-action of the synchronous stepping motor prevents overtravel without the wear and stress associated with friction or "DC" braking.

Optional features are available to suit any combustion control or process control application. These include an adjustable starting position switch, a second auxiliary switch for the retracted arm position, weather-resistant housing, handwheel, and an externally or internally generated position feedback signal.

### 1.01 Specifications

#### Physical Specifications:

Dimensions (Case): 5.75"H x 7.50" W x 15.75"L

Mounting: any position

Prime Mover Type: Commercially available 72-rpm stepping motor operated in synchronous mode.

Input requirements: 4–20 ma DC or 1–5 V DC.

Power Requirements: 120 V AC or 240 V AC

Wiring Connections: Numbered screw-type terminals for power to motor and for all alarm and control connections.

Case Process Temperature Limits: 0–140F (–19 to 60C)

Case Material:

Hinged, dust-tight and drip-proof; NEMA-3 units are gasketed as required.

Finish: Wear-resistant, sealed, black polyurethane enamel.

Shipping Weight: 35 lbs.

#### Performance Specifications:

Positioning Accuracy:  $\pm 0.25\%$

Resolution:

- 1) 30-second speed: 0.50% of full stroke
- 2) 60-second speed: 0.25% of full stroke
- 3) 120-second speed: 0.12% of full stroke

Deadband: <0.2% of full stroke

Radial Load Limit: Linkage axis not to exceed 15° deflection from drive tube axis.

Expected service life: 15 years @ 70% duty cycle and 70% rated load.

#### Application Specifications:

Speed: 30, 60, or 90 seconds per 6" of travel at 60 Hz.

Handwheel: Optional. Continuous rotation type.

End Switches: High and Low end limit snap switches are standard; optional adjustable "Start" position switch available.

Feedback Potentiometer: Optional. 1000 ohms (standard), 4000 ohms, or 135 ohms available by special order.

#### Nominal Stroke Time and Thrust Rating:

Stroke Time	Maximum Linear Force Rating	*Equivalent Maximum Torque Rating
30 seconds	75 pounds	18.75 foot pounds
60 seconds	150 pounds	37.5 foot pounds
120 seconds	300 pounds	75.0 foot pounds

## 1.02 Model Nomenclature

### LINEAR ACTUATOR with ANALOG INPUT POSITIONER

916A - BCDE - FG - H

#### A. Nominal Stroke Time/Thrust Range

30-second/75# thrust (18.75 ft. lbs.) .....	1
60-second/150# thrust (37.50 ft. lbs.) .....	2
120-second/300# thrust (75.00 ft. lbs.) .....	3

#### B. Optional Switches

None .....	0
Adjustable Starting Switches .....	1
Second "Retracted" Position Switch .....	2

#### C. Manual Operator

None .....	0
Handwheel .....	1

#### D. Other Options

None .....	0
Auxiliary Feedback Potentiometer* .....	1

\*For information, consult factory.

#### E. Power Requirements

120V 50/60 Hz .....	1
240V 50/60 Hz .....	2

#### F. Input Options

Command Signal .....		Position Feedback Signal	
4-20 ma .....	Internal Potentiometer .....	1	
1-5 v DC .....	Internal Potentiometer .....	2	
1-5 V DC .....	External 1-5 V DC .....	3	
4-20 ma .....	External 4-20 ma .....	4	
1-5 V DC .....	External 4-20 ma .....	5	
4-20 ma .....	External 1-5 V DC .....	6	

#### G. Enclosure

NEMA 1A .....	1
NEMA 3 .....	2

#### H. Current Design Letter ..... A

For related product information, see Price Bulletin 9167.00



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## 2.0 GENERAL THEORY OF OPERATION

### 2.0.1 Function

A self-contained pulse drive controller converts a 4–20 ma or 1–5 v DC control signal to switched 120 v AC line voltage that controls a reversible motor in finite increments to drive an acme screw through a nonslip timing belt drive and pulley system. The screw drives through a travel nut and bearing arrangement to extend or retract the drive tube. The nut and screw assembly self-locks in the case of

- power failure, in order to maintain final drive tube position.

End switches shut off power to the motor when the unit reaches either the inward or the outward travel extreme. Typically, an internal potentiometer in the actuator is used to provide position feedback to the positioner circuit; as an input option, external 1–5 v DC or 4–20 ma DC feedback devices (not included with the actuator) may be used. All applications use the full six-inch travel of the drive arm.

- Linear or nonlinear movement of the final control element, as well as its total range of travel, is controlled by adjustment of the linkage connecting the actuator's drive arm to the operating lever of the final control element. Overload stalling will not damage the motor.

As standard features, "retracted" and "extended" auxiliary switches are provided to operate lights or other ancillary equipment as required for customer use. In addition, the actuator can be equipped with one optional switch: either a second "retracted" position auxiliary end switch or an "adjustable Start" position auxiliary switch can be provided. The Series 9160 Linear Actuators can be mounted in any position, on any flat, rigid surface, free from excessive vibration. All wiring connections are easily accessible for maintenance. The ambient temperature limit is 140 degrees Fahrenheit (60 degrees Celsius). A full range of linkage components and accessories is available.

### 2.02 Pulse-Drive Control

The modulating capabilities of the electric actuator are a result of its self-contained pulse-drive controller. A 1–5 V DC or 4–20 ma DC command signal from an external controller or station is fed directly into the pulse-drive controller inside the actuator enclosure. The controller compares the command signal to a position feedback signal generated from an internal position potentiometer (or external feedback device). The deviation, or "error", between these two signals is used to generate time-proportioning, integral pulse control action for the actuator drive motor.

As the actuator moves toward the desired command position, the control action shifts from a continuous control action range to a proportional pulse "width"(duration) range wherein the actuation decelerates from decreasing "on"-time pulse width until the final command position is reached.

**Dead Band:** As long as the deviation, defined as the algebraic difference between the command signal and the position feedback signal, is within an adjustable "dead band", no control action is generated.

**Proportional Band:** The proportional band lies immediately outside of either end of the deadband. Whenever the deviation exceeds the preselected proportional band, the controller generates continuous control action, and the motor drives the actuator continuously in either the extended or the retracted direction.

Once the deviation falls within the adjustable "proportional band", the controller signal changes to pulse mode. In pulse mode, the controller generates intermittent pulses of control action to smoothly position the actuator. The "period," or on-time plus off-time pulse cycle, is adjustable (0.1 to 4.0 seconds). As the actuator moves through the proportional band toward the final command position, processing circuitry reduces the duration of the pulse signal from 100% to 0% of the period. A "minimum step" adjustment is provided to establish a minimum pulse duration to ensure effective actuation based upon anticipated load conditions. Digital filtering minimizes unnecessary control action resulting from "noisy" signals. This precise, responsive control action provides superior stability and eliminates overshoot. The actuator is supplied with a potentiometer (1000 ohm standard) for sending or receiving electrical signals to synchronize with other controls.





## 3.0 INSTALLATION & SETUP

### 3.01 Mounting

Mount the actuator on a flat, rigid surface that allows convenient linkage to the damper. We recommend a location where ambient temperatures are normal. The actuator should be protected from radiant or conducted heat.

### 3.02 Linkage to Damper

Optional linkage includes an adjustable lever arm, two clevis turnbuckle assemblies, and a length of 1/2" pipe (supplied by others). Install as follows.

1. Move the damper to the fully closed position.
2. Attach the lever arm to the damper shaft at 45° angle to the damper as shown in Figure 3 for vertical actuator installation, or as shown in Figure 4 for horizontal actuator installation.
3. Insert the bronze bushing (furnished with lever arm) in one of the lever arm holes. For most installations, the third hole from the rounded end will provide sufficient damper movement for effective draft control.
4. Attach one clevis to the lever arm by means of a pin through the bushing.
5. Attach the other clevis to the actuator by means of a pin through the eye in the thrust bar. The thrust bar should be fully retracted if the damper opens on outward stroke, and fully extended if the damper opens on inward stroke.
6. Adjust the turnbuckles until about 1" of threaded rod extends through the adapters.
7. Install the required length of 1/2" pipe between the adapters to complete the linkage. Never use less than a 12" length. For the most effective thrust, make the linkage as long as practical and position the actuator so that movement of the thrust bar is as nearly in line as possible with movement of the linkage.
8. Before operating the damper electrically with the actuator, disconnect the clevis at the actuator end by removing the pin. Operate the actuator electrically through a full cycle of travel while holding the clevis in a simulated *connected* position, and moving it to operate the damper manually. Make sure that the linkage moves freely, without restriction or binding, and that the damper moves to the maximum open and closed positions required by your particular installation.
9. Re-connect the linkage and the actuator is now ready to operate the damper electrically.

#### Linkage

**P/N 26908 Clevis Assembly** • consists of (1) Clevis Yoke and Pin, (1) threaded adjusting rod, (1) reducing coupling, and (2) Hex Head Nuts, 1/2-20. (2 pieces required). \$37.50

**P/N 11372 Damper Lever Arm** • consists of a 2-piece aluminum alloy casting, with bushing, bolts, and nuts • Adjustable for 1/2 to 1-1/2" shafts \$42.00

**P/N 12677 Spring Link** • Provides overtravel and tight closure for valve applications \$210.00

**3.03 Wiring Note:** For wiring instructions, see Figure 1 at the back of this manual.

## 4.0 OPERATION & MAINTENANCE

### 4.01 General

- Hunting may occur when the damper is modulating around a nearly closed damper position: in this situation, small movements of the actuator are extremely effective. The problem may be corrected by moving the clevis at its lever arm end to a hole farther from the shaft. This means a sacrifice of wide-open damper: thus, to complete the procedure, re-adjust the linkage for the *closed* damper position.
- For adjustable starting switch adjustment, if this feature is used, see instructions furnished with the Cleveland Draft Controller.
- Safe operating practice requires that the actuator operation be checked at reasonable intervals.

### 4.02 Troubleshooting

Problem	Possible Source	Remedy
Drive arm hunts continuously.	<ul style="list-style-type: none"> <li>• Linkage connected too close to damper shaft.</li> <li>• Faulty control response.</li> <li>• Damper modulates at partially closed position.</li> </ul>	<ul style="list-style-type: none"> <li>• Lengthen damper lever arm.</li> <li>• Check operation of draft controller, per instructions shipped with it.</li> <li>• See Adjustments section of this manual.</li> </ul>
Motor overheats.	<ul style="list-style-type: none"> <li>• Improper voltage.</li> <li>• Improper wiring.</li> <li>• High ambient temperature.</li> <li>• Overloading.</li> <li>• Binding damper or linkage.</li> <li>• Hunting.</li> </ul>	<ul style="list-style-type: none"> <li>• Check voltage.</li> <li>• See wiring instructions with Draft Controller.</li> <li>• Check location, spacing, and shield from reflected heat.</li> <li>• Ease load or counterbalance.</li> <li>• Free damper or linkage.</li> <li>• See item 1.</li> </ul>
Actuator fails to operate.	<ul style="list-style-type: none"> <li>• Faulty control response.</li> <li>• Faulty limit switches.</li> <li>• Broken belt.</li> <li>• Motor failure.</li> </ul>	<ul style="list-style-type: none"> <li>• Check voltage.</li> <li>• Check switches. Replace if necessary.</li> <li>• Replace.</li> <li>• Replace.</li> </ul>

If improper operation cannot be corrected by above methods, call your Cleveland Controls agent or contact the factory. Use only authorized Cleveland replacement parts as listed below. If factory repair service is desired, please follow the procedure detailed in section 5.0 of this manual.





## 4.03 Replacement Parts

28113 .....	Positioner Card with Potentiometric Input .....
30314 .....	Positioner Card with Dual 1-5 Volt Inputs .....
28055 .....	120 v AC Resistor & Capacitor Assembly .....
28094 .....	240 v AC Resistor & Capacitor Assembly .....
29561 .....	Drive Screw Assembly, 30 & 60 second stroke .....
29562 .....	Drive Screw Assembly, 120 second stroke .....
28035-001 .....	120 v AC Motor .....
28093-001 .....	240 v AC Motor .....
20594 .....	Drive Belt, 60 sec/150#, or 120 sec/300# units .....
24496 .....	Drive Belt, 30 sec/75# units .....
28030 .....	Motor Pulley, for 60 sec./150# or 120 sec./300# units .....
28031 .....	Motor Pulley, 30 second/75# units .....
28018 .....	Drive Screw Pulley for 60 second/150# or 120 second/300# units .....
28032 .....	Drive Screw Pulley, 30 second/75# units .....
12336 .....	Bushing, Drive Tube .....
11010 .....	Retaining Ring (Bushing) .....
12338 .....	Guide Nut for 30 & 60 second models .....
12339 .....	Guide Nut, 120-second models .....
12325 .....	Drive Tube .....
10467 .....	Eyebolt .....
10151 .....	Eyebolt Adapter .....
30128-102 .....	Internal 1000 ohm Potentiometer (for position feedback) .....
28143 .....	Potentiometer, 1K ohm (as above, but precalibrated, mounted on bracket) .....
26985 .....	Ladder Chain, 7" .....
13064 .....	Torsion Spring .....
12965 .....	Inward Limit Switch Assembly .....
12966 .....	Outward Limit Switch Assembly .....
10999 .....	Auxiliary Limit Switch .....
13382 .....	Adjustable Start Switch Assembly .....

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## 5.0 Factory Information

### 5.01 Factory Repair Service

Damaged or defective units may be returned to the factory for repair. However, factory authorization must be obtained before shipping whether warranty or non-warranty service is required, and all units must be shipped prepaid.

The returned instrument should be accompanied by a letter of transmittal that includes the following information:

- Location, type of service, and length of time in service of the unit.
- Description of the faulty operation of the device and the circumstances of the failure.
- Name and telephone number of the person to contact if there are questions about the unit.
- Written request for either warranty or non-warranty service.
- Purchase order attached for all out-of-warranty repairs.
- Complete shipping instructions for the return of the repaired instrument.
- Original purchase order number and date of purchase.
- Return goods authorization number.

Clearly label the shipping container:

RETURN FOR REPAIR

MODEL

RGS#

Ship prepaid to:

CLEVELAND CONTROLS

1111 BROOKPARK ROAD

CLEVELAND OH 44109-5869

Thank you for following this procedure. It expedites handling of the returned item, and eliminates additional charges for inspection and testing to determine the problem before repairing it.



## 5.02 Standard Terms and Conditions of Sale

All goods sold by Cleveland Controls are subject to the Standard Terms and Conditions of Sale appearing below. These Standard Terms and Conditions of Sale are reproduced here for the Buyers convenience in the form in which they appear on the "Original Invoice and Sales Contract" and the "Acknowledgment and Sales Contract" forms, both of which customers receive with any purchases made of Cleveland Controls' products.

**TERMS OF SALE:** 1% discount if paid in ten (10) days, net amount due and payable in thirty (30) days.

**AGREEMENT OF SALE:** Acceptance by Seller of any order placed for goods whether submitted on Buyer's purchase order form or on seller's Sales Order Acknowledgment form, shall be subject to Seller's Standard Terms and Conditions of Sale and is conditioned upon the Buyer's acceptance of these Standard Terms and Conditions.

**TERMS OF CONTRACT:** Any terms or conditions of the buyer's order which are inconsistent with these terms and conditions shall not be binding on the Seller and shall not be considered applicable to the sale or shipment of goods or materials. Unless buyer shall notify Seller in writing to the contrary within ten (10) days after the mailing of the Sales Contract by Seller, acceptance of the terms and conditions hereof by Buyer shall be indicated and, in the absence of such notification, the sale and shipment by Seller of the goods and materials covered hereby shall be conclusively deemed to be subject to the terms and conditions hereof.

**PRICES:** All prices and specifications and applicable discounts are subject to change without notice. Sales contracts which call for delivery in the future will be billed at prices in effect at the time of shipment. Shipping weights shown are approximate and subject to change without notice.

**SHIPMENT AND PAYMENTS:** All prices contained on the Sales Contract are F.O.B. Factory in Cleveland, Ohio. No freight is allowed on any shipments. Shipments and deliveries shall at all times be subject to the approval of Seller's Credit Department, and at any time seller may require payment in advance or satisfactory security or guarantee that invoices will be promptly paid when due. If buyer fails to comply with any terms of payment, seller, in addition to its other rights and remedies, but not in limitation thereof, reserves the right to withhold further deliveries or terminate the Agreement, and any unpaid amount thereon shall become due immediately. Terms of payment shall be as set forth on the Sales Contract.

**DELAYS AND DEFAULTS:** Delays or defaults in delivery by Seller of the goods and materials covered by the Sales Contract shall be excused so far as the same is caused by fire, strikes, accident, governmental regulation, or any delays unavoidable or beyond reasonable control of Seller. In no event shall Seller be liable for any consequential, special, or contingent damages on account of any default or delay in delivery.

**NON-CANCELLATION:** Orders are not subject to suspension, reduction, or cancellation, except on terms that will indemnify Seller against loss.

**SPECIFICATIONS:** Seller relies on specifications and other data furnished by the Buyer, an architect, contractor, or consulting engineer in all phases of the work covered by the Sales Contract. Seller shall be responsible to check quantities only. Alterations to or changes in specifications, approval of samples, changes in delivery instructions and all other instructions must be submitted in writing to Seller.

In the event Seller performs design or engineering work at the request of Buyer, an architect, contractor, consulting engineer, or representative in any phase of the work covered by the Sales Contract, Seller shall not be responsible for any damages claimed by Buyer as a result of alleged errors or defects in such design or engineering work.

**WARRANTY AND LIMITATION OF LIABILITY:** Seller warrants that the goods supplied by it have been manufactured in accordance with its standard manufacturing practices and conform to the contract or catalog description set forth in the order. Seller further warrants that the goods supplied by it are fit for the ordinary purpose or purposes specified in its catalog for which such goods are

used when installed in accordance with Seller's recommended installation procedures. Except as stated herein, Seller makes no express warranty with respect to goods supplied by it and Seller makes no warranty that the goods are fit for any particular purpose.

When the use of materials not manufactured by Seller is suggested by Seller's recommended installation procedures or otherwise, Seller makes no express warranty with respect to such materials nor that such materials are merchantable or fit for any particular purpose.

Seller will, at its sole option, credit, repair or replace, any goods supplied by it which its examination shall disclose to its satisfaction are defective in workmanship or material and are returned to it within one year from the date of shipment and any claim not made within this period shall conclusively be deemed waived by Buyer. Credit, repair or replacement will be preconditioned upon examination of the goods by Seller, and, if requested by Seller, return of the goods to Seller at its direction and expense. No goods are to be returned to Seller without its written consent. Seller shall not be liable for any expense incurred by Buyer in order to remedy any defect in its goods. Seller shall not be liable for any consequential, special, or contingent damage or expense, arising directly or indirectly from any defect in its goods or from the use of any defective goods. The remedies set forth herein shall constitute the exclusive remedies available to Buyer and are in lieu of all other remedies.

**CLAIMS:** claims for shortage of goods or for mistakes or errors in billing must be presented within forty-five (45) days from the date of shipment of goods and must state the packing slip number and container number applicable to the claim. Any claim not so presented will be conclusively deemed waived.

**TAXES:** Any federal taxes or other government charges on the sale, shipment, or installation of the goods or equipment covered by the Sales Contract shall be added to the price and paid by Buyer, or, in lieu thereof, the Buyer shall furnish the Seller with tax-exemption certificates acceptable to the taxing authority. The procedure also applies to duty and other similar charges on export sales. Seller is not responsible for sales and/or use tax in any state other than Ohio. The purchase made under this Sales Contract must be exempt or paid directly by Buyer. If Seller is required to pay any such tax, there shall be added to the prices quoted herein all such state and local taxes. Buyer agrees to reimburse and save Seller harmless from all such state and local taxes, including interest and penalties thereon, which may at any time be payable to any state or local government unit with respect to the sale of any goods or materials covered by the Sales Contract.

**CORRECTIONS:** Typographical or clerical errors contained in the Sales Contract, including prices, are subject to correction by the Seller.

**FAIR LABOR STANDARDS:** All goods covered by the Sales Contract have been produced in conformity with all applicable provisions of the Fair Labor Standards Act of 1938 as amended.

**RENEGOTIATION:** Unless advised by Buyer in writing, Seller assumes that Buyer's order and the Sales Contract are not renegotiable under the Renegotiation Act of 1951.

**APPLICABLE LAW:** All questions arising out of the Sales Contract, which shall be deemed an Ohio contract, shall be governed by the laws of the state of Ohio.

**EXCLUSIVE TERMS:** The Sales Contract shall constitute the complete contract between the parties, and no one has authority to depart from the terms and conditions set forth therein, nor to make any representations or arrangements other than those printed thereon whether in the execution or in the performance of the Sales Contract, unless the same are written on the face of the Sales Contract or are given in writing with it or in pursuance of it, and are fully approved in writing by an officer or authorized employee of the Seller.

**LIMITATION FOR SUITS:** Any controversy or claim arising out of or relating to this Sales Contract or the breach thereof, must be commenced within one (1) year after the cause of action accrued.





Terminal Point	Description
①	Modulation Enable; 120 v AC
②	Common
③	Drive Motor Decrease (Retract); 120 v AC Hot
④	Drive Motor Increase (Extend); 120 v AC Hot
⑦	Retracted Position Auxiliary Switch; Common
⑧	Retracted Position Auxiliary Switch; Normally Ope
⑪	Extended Position Auxiliary Switch; Common
⑫	Extended Position Auxiliary Switch; Normally Open
Ⓑ	No Field Wiring
Ⓡ	No Field Wiring
⑬	Internal Positioner Decrease (Retract) signal <sup>1</sup>
⑭	Internal Positioner Increase (Extend) signal <sup>2</sup>
–	4–20 milliampere DC command signal input <sup>3</sup>
+	4–20 milliampere DC command signal input <sup>3</sup>

Notes:

<sup>1</sup> To be jumpered to terminal point #3 directly or through external manual/auto switch, as required

<sup>2</sup> To be jumpered to terminal point #4 directly or through external manual/auto switch as required.

<sup>3</sup> Or, 1–5 v DC command signal input.

Figure 1: Field Wiring



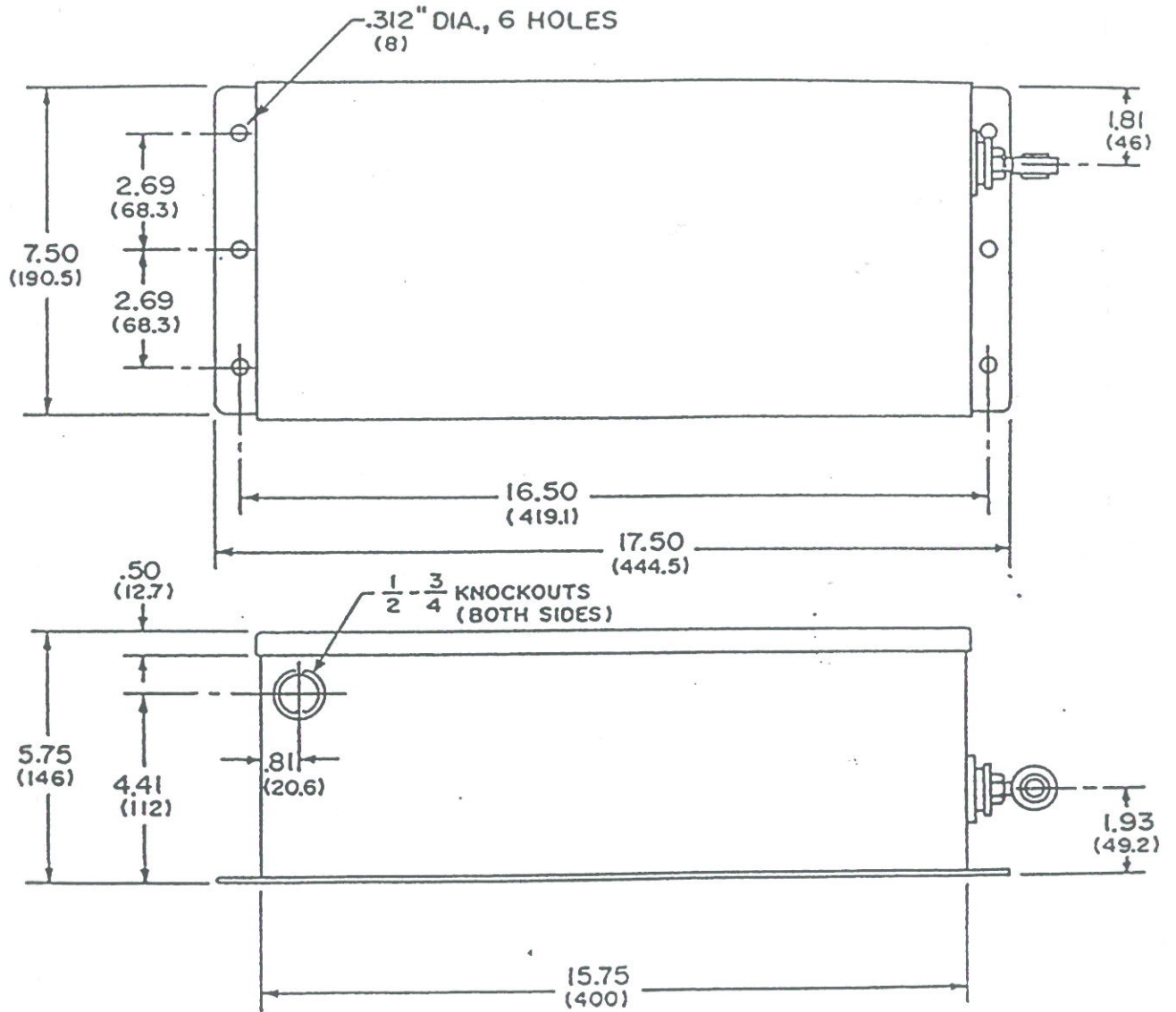
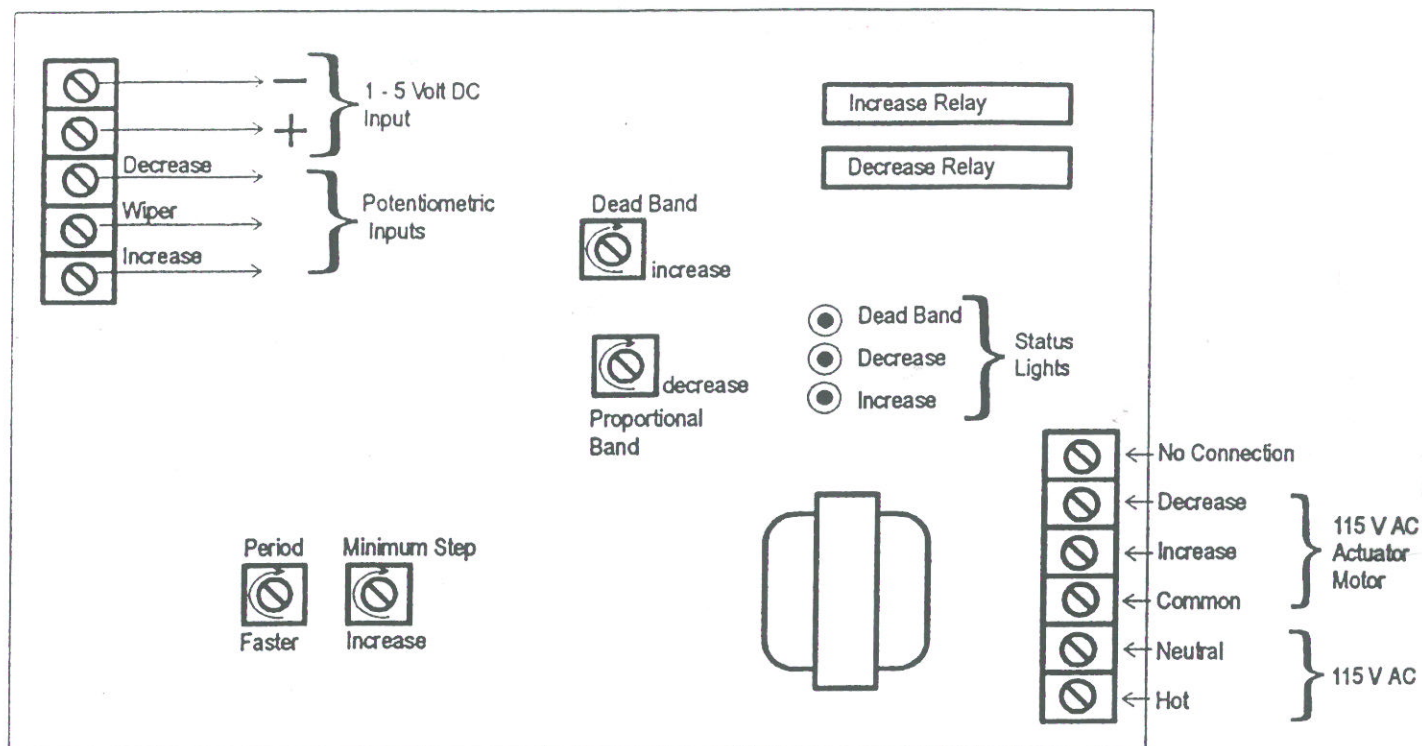


Figure 2: Dimensions



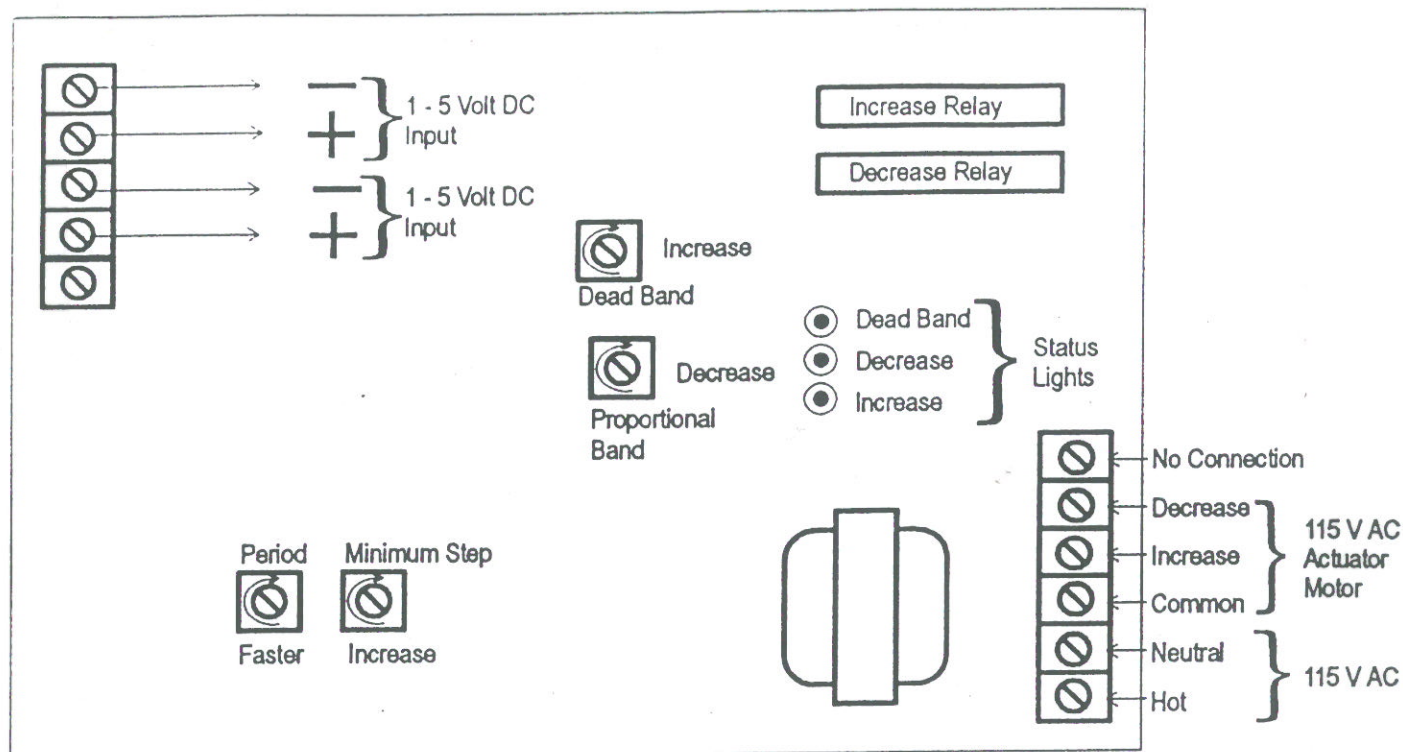




Specifications for Part Number 28113 Positioner Card  
with Potentiometric Input:

- 1) Power: 115 V AC, 3 VA, 50/60 hz, 1 Ph
- 2) Input: 1-5 Volts, nominal
- 3) Position Feedback Potentiometer: 1K ohms to 10K ohms
- 4) Output drive: Solid state, zero switched
  - a) Voltage: 115/230 V AC
  - b) Load current: Minimum = 60 ma;
  - c) Load current: Maximum = 2 amp at 30°C (derate to 1 amp at 75°C)
  - d) Over current: Max. (non-repetitive) -7 A pk for 1 second
  - e) Surge current: Max. (non-repetitive) -28 A pk for 20 ms.
  - f) Off state leakage current: Max. = 8 ma.
- 5) Indicators:
  - a) Increase: Green LED
  - b) Decrease: Green LED
  - c) Dead Band: Red LED
- 6) Adjustments:
  - a) Dead Band: 0 to  $\pm 3\%$  (6% total) of the 6-inch travel of the actuator drive tube.
  - b) Proportional Band:  $\pm 2\%$  to  $\pm 25\%$  of the 6-inch travel of the actuator drive tube.
  - c) Period: 0.1 second to 4.0 seconds
  - d) Minimum step: 0 to 20% of period

Figure 3: Internal Wiring: Positioner Board with potentiometric input.



**Specifications Part Number 30314 Positioner Card  
with Dual 1-5 Volt Inputs:**

- 1) Power: 115 V AC, 3 VA, 50/60 hz, 1 Ph
- 2) Input #1: 1-5 Volts, nominal
- 3) Input #2: 1-5 Volts, nominal
- 4) Output drive: Solid state, zero switched
  - a) Voltage: 115/230 V AC
  - b) Load current: Minimum = 60 ma;
  - c) Load current: Maximum = 2 amp at 30°C (derate to 1 amp at 75°C)
  - d) Over current: Max. (non-repetitive) -7 A pk for 1 second
  - e) Surge current: Max. (non-repetitive) -28 A pk for 20 ms.
  - f) Off state leakage current: Max. = 8 ma.
- 5) Indicators:
  - a) Increase: Green LED
  - b) Decrease: Green LED
  - c) Dead Band: Red LED
- 6) Adjustments:
  - a) Dead Band: 0 to ±3% (6% total) of the 6-inch travel of the actuator drive tube.
  - b) Proportional Band: ±2% to ±25% of the 6-inch travel of the actuator drive tube.
  - c) Period: 0.1 second to 4.0 seconds
  - d) Minimum step: 0 to 20% of period

*Figure 4: Internal Wiring: Positioner with dual 1 to 5 v DC Input.*