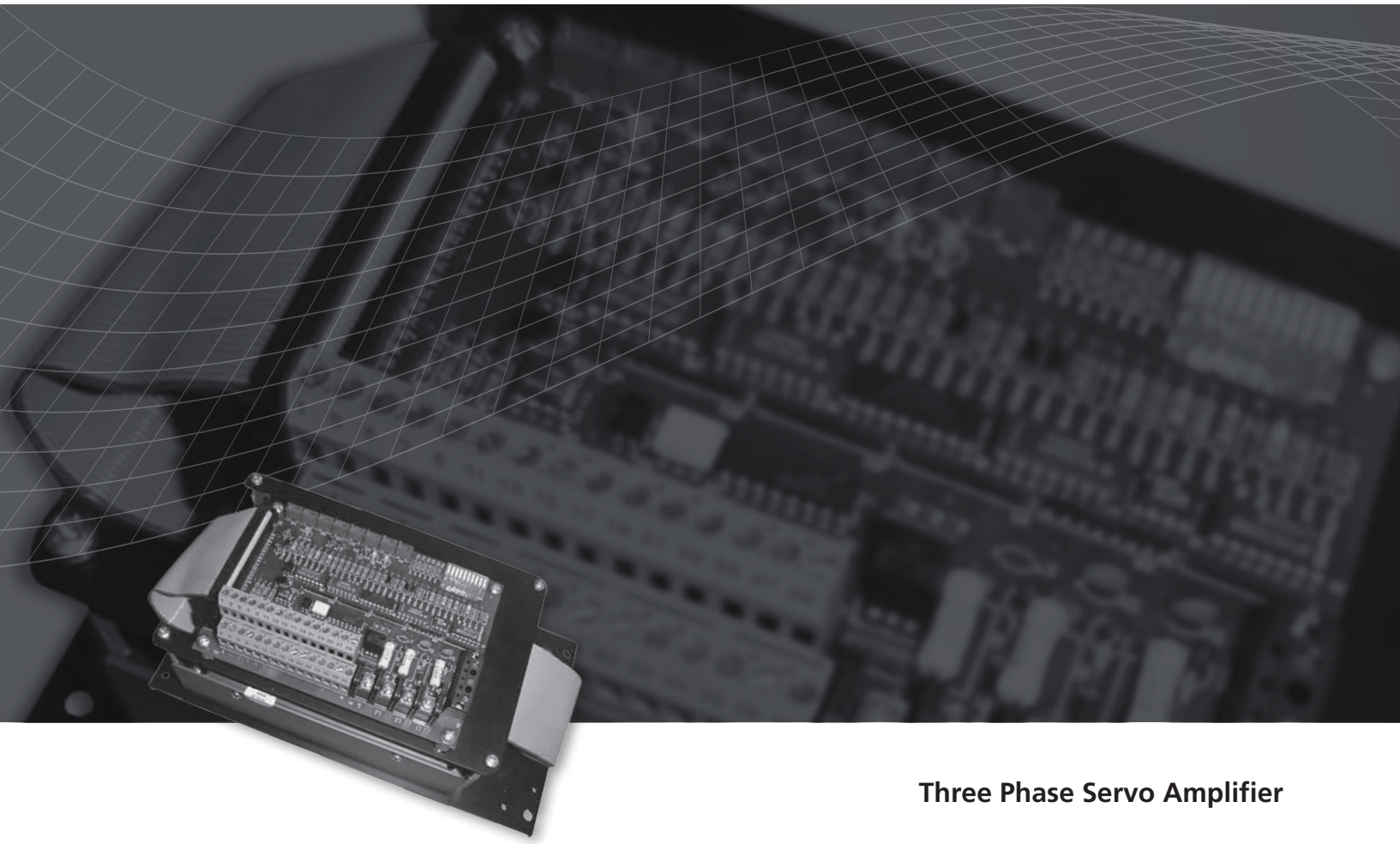
rotork®

Process Controls

AD-8900 Series

Installation Manual



Three Phase Servo Amplifier

Redefining Flow Control

rotork®
Process Controls

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DUE TO WIDE VARIATIONS IN THE TERMINAL NUMBERING OF ACTUATOR PRODUCTS, ACTUAL WIRING OF THIS DEVICE SHOULD FOLLOW THE DRAWING SUPPLIED WITH THE UNIT.

General Information

INTRODUCTION

Rotork Process Controls 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 Rotork Process 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 the Rotork Process Controls Service Department 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 Rotork Process 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 Rotork Process Controls. Substitutions may result in fire, electrical shock, other hazards, or improper equipment operation, and will void product warranty.

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 - 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 Rotork Process Controls.

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 and in a non-corrosive environment.

EQUIPMENT RETURN

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

Rotork Process Controls
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
Address
Repair Purchase Order Number
Brief description of the problem

ABBREVIATIONS USED IN THIS MANUAL

AC	Alternating Current
DC	Direct Current
DIP	Dual Inline Package (switch)
Hz	Hertz
LED	Light Emitting Diode
LOS	Loss of Signal
mA	Milliamp
NC	No Connection
RG	Return of Goods
VAC	Volts AC
VDC	Volts DC

General Description

The AD-8900 series servo amplifiers are full-featured, three-phase AC triac devices designed to control a variety of Rotork Process Controls electric actuators for closed loop control. They incorporate a differential input, servo control and a static output driver stage in a common package. The servo amplifier is all solid state with no moving contacts. Dynamic braking, acheived by motor plugging, is switch selectable and independantly adjustable in both actuating directions for varying and offset loads. Other features include loss-of-phase and triac cross-firing protection, loss of current command signal function, and a two-wire 4 to 20 mA loop-powered actuator position output signal.

ACTUATOR COMPATIBILITY

The AD-8900 series servo amplifiers can be mounted integral to all Rotork Process Controls SM-5000 series three-phase actuators or installed remotely for all other three-phase actuators.

BASIC MODELS:

AD-8910
240 VAC, three phase, 50/60 Hz input power for integral actuator mounting.

AD-8910-P
Sames as above, designed for remote mounting.

AD-8920
380 VAC, three phase, 50 Hz input power for integral actuator mounting.

AD-8920-P
Sames as above, designed for remote mounting.

AD-8930
480 VAC, three phase, 50/60 Hz input power for integral actuator mounting.

AD-8930-P
Sames as above, designed for remote mounting.

AD-8940
208 VAC, three- phase, 50/60 Hz input power for integral actuator mounting.

AD-8940-P
Sames as above, designed for remote mounting.

SPECIFICATIONS

Input Power:

AD-8910 - 240 VAC, 50/60 Hz three phase, 6.3 amps

AD-8920 - 380 VAC, 50 Hz three phase, 4.2 amps

AD-8930 - 480 VAC, 50/60 Hz three phase, 2.1 amps

AD-8940 - 208 VAC, 50/60 Hz three phase, 7.0 amps

Voltage Output: Identical to voltage input

Fault Output: Triac going low on loss of input or output phase or loss of current command signal. Triac output rated 120/240 VAC, 2 amp

Fuse Protection: Customer supplied and sized based on actuator controlled

Auto Phasing: Allows proper actuator rotation or stroke regardless of how the incoming phases are connected.

Command Signal Inputs: Field selectable
4 to 20 mA current command into a 200 ohm impedance
0 to 5 VDC, 0 to 10 VDC command into a 100 ohm impedance -10 to +10 VDC (using EC-10844 signal conditioner) command into a 100k ohm impedance.

Position Feedback Signal:1000 ohm potentiometer or 4 to 20 mA, switch selectable (normally used for remote amplifier installation).

Position Output Signal: Loop powered, isolated 2 wire, 4 to 20 mA signal.

Other Inputs:
End-of-travel limit switches (from actuator)

Over torque or over thrust limitswitches (from actuator)

Auto/Manual switch - Selects between Automatic and Manual mode

Automatic Mode - 4-20 mA command input controls actuator position

Manual Mode - Increase and Decrease inputs control actuator position

Increase (INC)- Commands actuator to increase when in manual mode.

Decrease (DEC)- Commands actuator to decrease when in manual mode.

Other Outputs:

LED Indication:	Loss of Signal (LOS)
	Increase direction
	Decrease direction
	Phase A, B & C input
	Phase A, B & C output
	Micro OK

Ambient Temperature Range:
-40 to 150 °F (-40 to 65 °C)

Commissioning

INSTALLATION WIRING

Most installations locate the servo amplifier inside a Jordan actuator, for ease of mounting and to protect the amplifier. This is the preferred mounting arrangement. For remote mounting, the servo amplifier and actuator should be as close to each other as possible. Consult factory when this distance exceeds 50 feet.

Ensure all connections are correct and tight before applying power. Power, command signal, feedback signal, and motor output are the minimum required connections.

- All wiring should be done in accordance with prevailing codes by qualified personnel.
- A typical wiring diagram is shown on page 10. **Actual wiring should follow the print supplied with the actuator, because of wide variations in terminal numbering of various actuator products.**
- Fusing must be installed in line power, and should be of the slow blow type.
- After installation, it is required that all conduits be sealed to prevent water damage.
- All low level signal wiring should be a shielded type with the shield grounded at source common.

SET-UP & CALIBRATION

(See dip switch table on page 7 and component locations on page 8 for reference).

When placing the amplifier and actuator into service, the amplifier must be calibrated for the application. The servo amplifier is supplied factory calibrated when ordered with a Jordan Actuator and should require only minor adjustment.

Read and follow the instructions carefully before attempting to make adjustments to the servo amplifier.

1. First, be sure that the line power to the amplifier matches the amplifier and actuator nameplate. Improper input voltage will cause product failure.

   Phase connection can be made in any sequence. The AD-8900 Series has automatic phase detection which corrects the incoming phasing for proper operation of the amplifier and actuator.

2. Check connections. POWER SHOULD BE OFF AND ACTUATOR LOAD DISCONNECTED FOR INITIAL SET UP. Check that the amplifier is properly mounted, that all connections to the actuator are in accordance with the correct Rotork Process Controls wiring diagram, and that the unitis properly grounded in accordance with all prevailing Electric Codes. Incorrect wiring may cause permanent damage to the servo amplifier and actuator. Verify that the command signal is connected to the proper terminals. Using a voltmeter, confirm that the command signal is present and properly polarized.
3. Dynamic braking is standard on this amplifier and, when used, reduces coasting and improves positioning accuracy by applying a braking action to the motor during stopping. Dynamic braking must be selected "on" or "off" prior to making any amplifier adjustments. The AD-8900 amplifier dynamic brake operates by plug-reversing the motor windings for a fraction of a second to rapidly slow the motor speed. Select either "on" or "off" using the appropriate dip switches. The dynamic brake must then be adjusted for the specific load being moved using the two on-board pots supplied. Refer to the section below on dynamic brake adjustment prior to attempting to use the dynamic brake on the AD-8900 amplifier.
4. Verify settings. The DIP SWITCH is located on the servo amplifier. Refer to the dip switch table on page 7. Confirm that the switches are properly set for the intended application. For special applications not listed, consult factory. Incorrect DIP SWITCH settings will prevent proper operation. **Again, refer to the wiring diagram supplied with the actuator for correct switch configuration.**
5. Set **ZERO** and **SPAN**. Set the auto/manual input to MANUAL. Apply command signal at minimum input value. For 4-20 mA systems this would be 4 mA. Give 4 mA command signal on it. Adjust the potentiometer ('pot') and turn **ZERO** adjustment until both directional LED lights are out. Next, apply command signal at maximum output value, for 4-20 mA systems this would normally be 20 mA. Run actuator in manual to other end of travel. Adjust pot labeled **SPAN** until LED goes out. Repeat these steps until the LED lights do not turn on. Re-set the auto/manual input to AUTO. Apply 4 mA and the actuator drives back to zero. Apply 20 mA runs to **SPAN**. Run the actuator to determine if you need to adjust the deadband.
6. Set **DEADBAND**. Deadband prevents unstable operation, or "hunting". Clockwise rotation of the **DEADBAND** pot will increase the deadband, preventing "hunting". Counterclockwise rotation of the pot will decrease the deadband, improving accuracy. The correct setting is the point where no "hunting" is observed AND when both the green and yellow LED's go out when the actuator stops. **The preset and sealed factory setting should not normally need field readjustment.**

   CAUTION: The deadband must NEVER be adjusted to allow both the yellow and green LED's to be on at the same time. This would result in dangerous motor and amplifier overheating and burnout.

Commissioning

7. Adjust **DYNAMIC BRAKE**. The dynamic brake works by applying a short plug-reversal to the actuator motor causing it to stop. The adjustment procedure requires that the two pots labeled **BRAKE INC**. and **BRAKE DEC**. be trimmed for the specific customer load. Each pot sets the braking time for one direction of travel only. The more these pots are turned clockwise, the longer the plug-reversal time will be.

   Adjust these pots until the motor stops when traveling in either direction, but do not overadjust or the motor will begin to rotate in the opposite direction, overshoot the deadband and cause motor overheating. If visible, watching the motor shaft while adjusting these two pots simplifies set-up.

   - Apply a 4 mA command signal and the actuator moves to the corresponding position.
   - Turn pot labeled **BRAKE INC**. fully counterclockwise 20 turns to start.
   - Turn pot one full turn clockwise to begin brake calibration.
   - Apply 5 mA command signal while watching motor shaft direction of rotation. Actuator will move to corresponding position and stop.
   - Advance pot clockwise one full turn. Increase command signal by 1 mA while watching motor shaft. Actuator will move to new position and stop. When actuator is stopping, the motor shaft should begin to show a braking effect caused by the clockwise rotation of the pot.
   - Continue the process of increasing the pot one full rotation and increasing the command signal by 1 mA until the motor shaft comes to an abrupt stop each time. Be careful not to adjust the pot beyond this point or the actuator will begin to travel in reverse and will oscillate.

   After the **BRAKE INC**. pot is adjusted, adjust the **BRAKE DEC**. pot as follows.

   - Turn pot labeled **BRAKE DEC**. fully counterclockwise 20 turns to start.
   - Turn pot one full turn clockwise to begin brake calibration.
   - Apply 20 mA command signal while watching motor shaft direction of rotation. Actuator will move to corresponding position and stop.
   - Advance pot clockwise one full turn. Following a similar procedure to the adjustment of the **BRAKE INC**. pot earlier, adjust this pot until brake operation in this direction is properly adjusted. Be careful not to adjust the pot beyond this point or the actuator will begin to travel in reverse and will oscillate.

8. In the event of a loss of command signal ("LOS"), the servo amplifier can be programmed to either lock in place or go to a customer adjusted preset position. Loss of signal feature is only available when using 4-20 mA command signal. This feature is normally factory supplied in the lock-in-place selection. A signal level below approximately 3.7 mA results in a loss of signal detection by the servo-amplifier. Referring to the DIP **SWITCH** table below, select one option. Then, with the servo amplifier in normal operation, apply a command signal below the minimum position, approximately 2 mA. If lock in place was selected the actuator should stop and the red **LOS LED** should light. If "move to preset" was selected, rotate the LOS pot until the actuator moves to the desired position and stops. Reapply and then remove the command signal several times to verify correct operation. Adjustment is complete.
9. This amplifier is equipped with an on-board loop powered transmitter that can transmit the true actuator output shaft position in 4-20 mA units. The transmitter requires an external 12-36 VDC regulated power supply, load resistor, and indicator; available from Rotork Process Controls at extra charge. After wiring is completed per the wiring diagram shipped with the actuator, adjustment is as follows: Apply a command signal to the actuator at the minimum value. For 4-20 mA systems this would normally be 4 mA. After the actuator moves to position and stops, adjust the pot labeled 4 mA until the indicator displays 4 mA. Then apply a 20 mA command signal and wait for the actuator to move and stop. Then adjust the pot labeled 20 mA until the indicator displays 20 mA. Some interaction of the above pot settings will require repeating this procedure until proper accuracy is achieved. Adjustment is complete.

AD-8900 Dip Switch Table

Switch	Position	Function
1	On	4-20 mA VDC COMMAND INPUT
	Off	0-5 VDC OR 0-10 VDC VOLTAGE COMMAND INPUT
2	On	0-5 VDC OR 4-20 mA COMMAND INPUT
	Off	0-10 VDC VOLTAGE COMMAND INPUT
3	On	4-20 mA VDC COMMAND INPUT
	Off	0-5 VDC OR 0-10 VDC COMMAND INPUT
4	On	VOLTAGE COMMAND
	Off	CURRENT COMMAND
5	On	DISABLE LOSS OF SIGNAL FUNCTIONS
	Off	ENABLE LOSS OF SIGNAL FUNCTIONS
6	On	LOSS OF SIGNAL - MOVE TO PRESET POSITION
	Off	LOSS OF SIGNAL - LOCK IN PLACE
7	On	LOSS OF SIGNAL - LOCK IN PLACE
	Off	LOSS OF SIGNAL - MOVE TO PRESET POSITION
8	On	ENABLE DYNAMIC BRAKE
	Off	DISABLE DYNAMIC BRAKE
9	On	ENABLE DYNAMIC BRAKE
	Off	DISABLE DYNAMIC BRAKE
10	On	REMOTE 4-20 mA FEEDBACK FROM ACTUATOR
	Off	POTENTIOMETER FEEDBACK FROM ACTUATOR

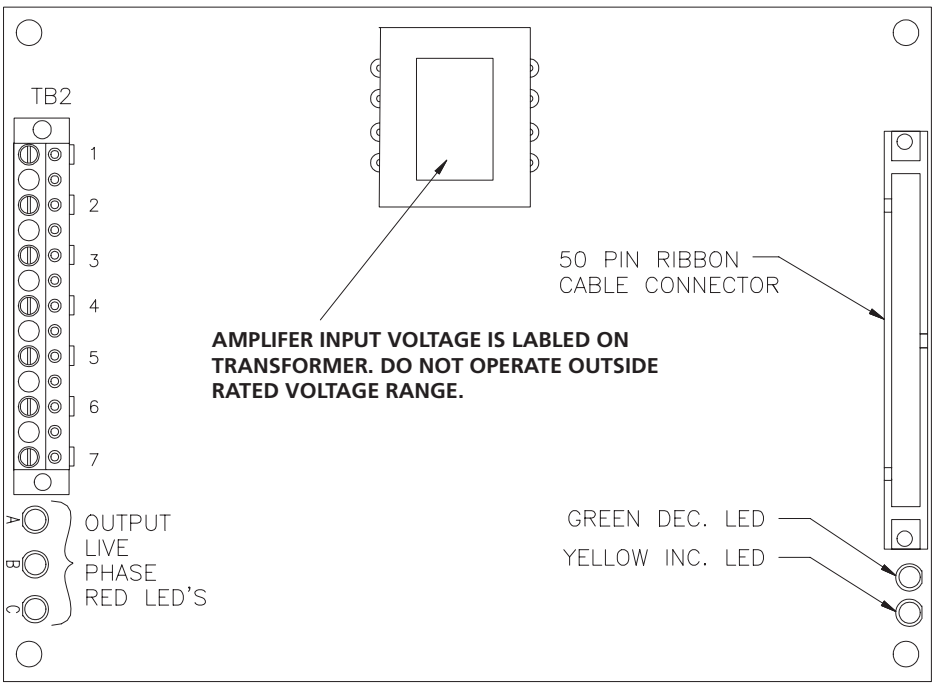
Parts List (Refer to drawings on page 8)

1	Interface Board		68C-035990-001
2	Ribbon Cable		25A-035285-002
3	AD-8910	(240 VAC three phase)	68C-037844-001
	AD-8920	(380 VAC three phase)	68C-037844-002
	AD-8930	(480 VAC three phase)	68C-037844-003
	AD-8940	(208 VAC three phase)	68C-037844-004

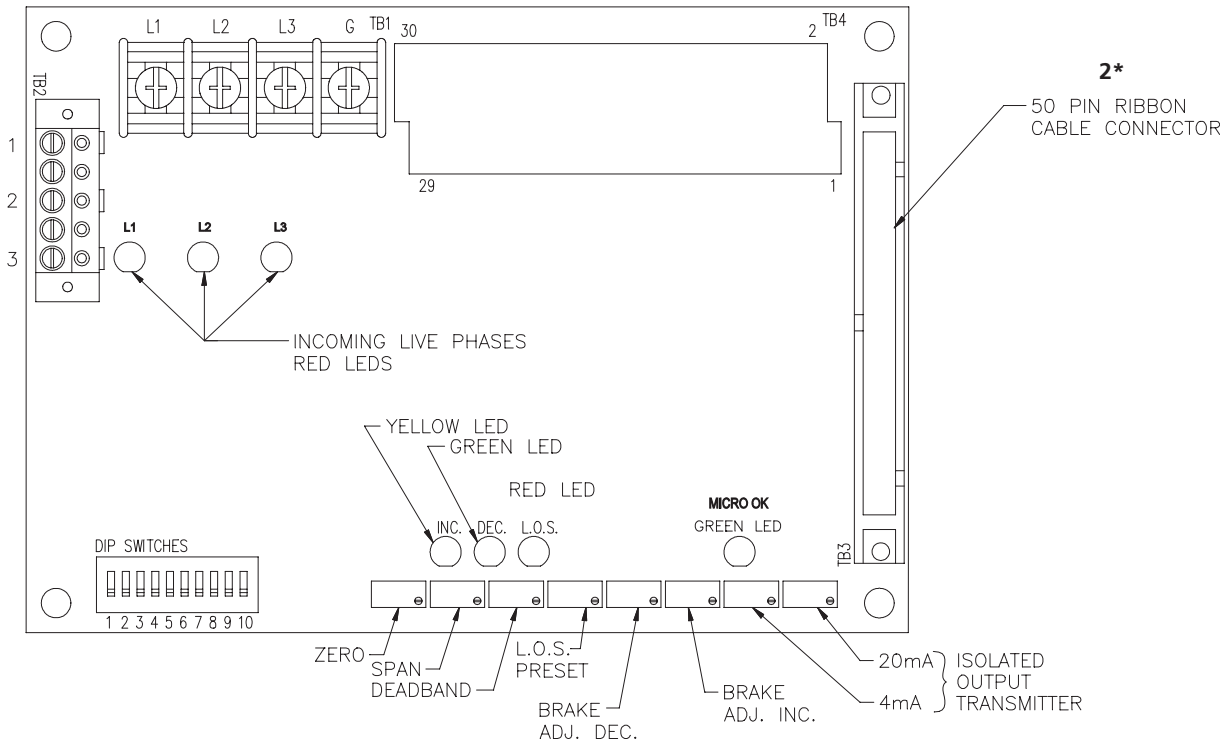
Blue Box Only

Component Location

3* Amplifier Power Board (Enclosed in Metal Case)



1* Customer Interface Board



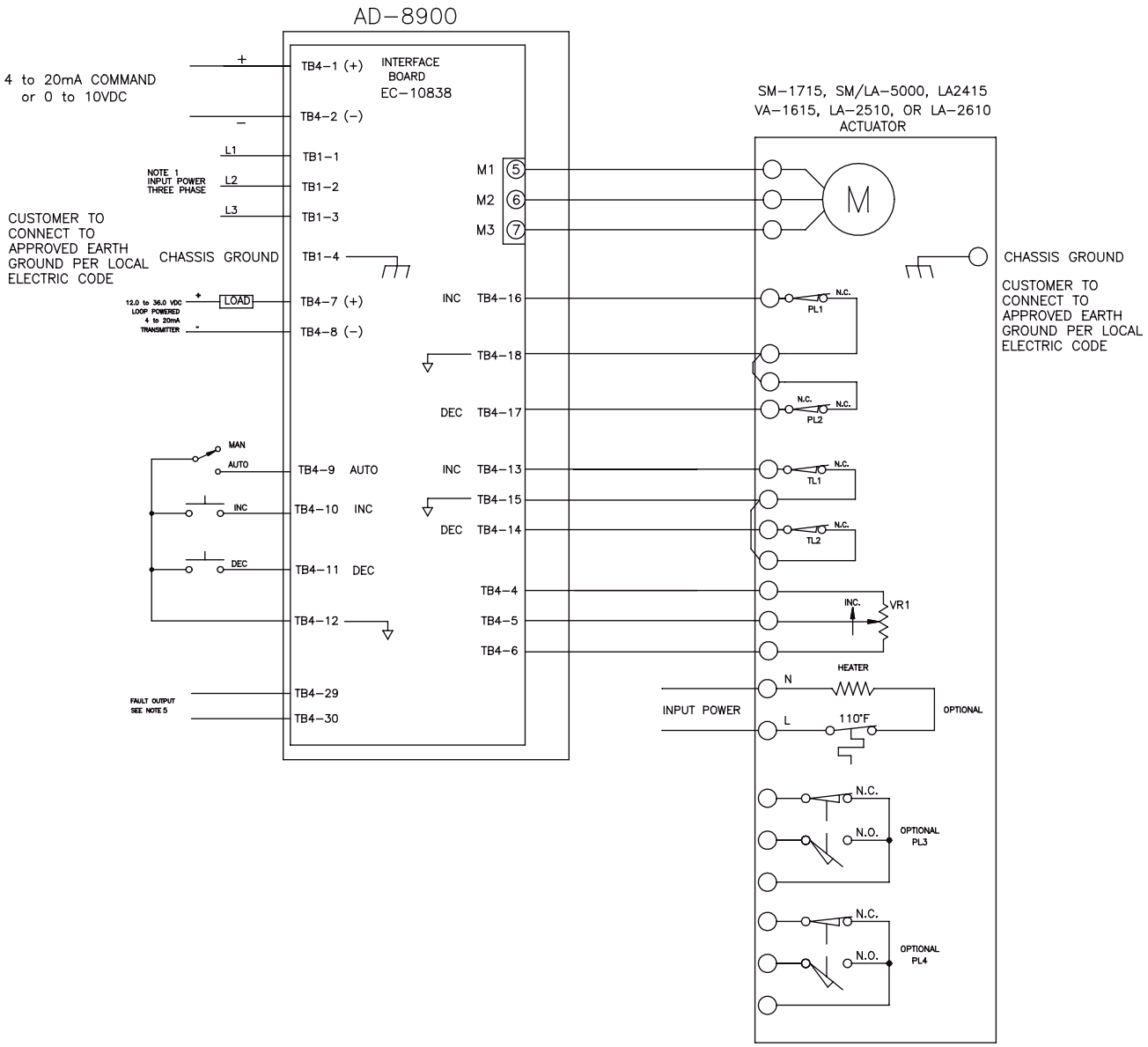
* Refer to Parts List on page 9.

Troubleshooting Guide

Trouble	Possible Cause	Remedy
Motor does not operate	a. No power to amplifier	a. Restore power
	b. Loss of phase (all three incoming live phase red LEDs not illuminated	b. Correct power supply
	c. Amplifier is defective	c. Replace amplifier
	d. Amplifier is in Loss of Signal mode (Red LOS LED is on)	d. Restore command signal
	e. Actuator/amplifier is wired incorrectly	e. Correct per wiring diagram furnished with unit
	f. Amplifier deadband is too wide	f. Reduce deadband setting
	g. Dip Switches not properly set	g. Set Dip Switches per Dip Switch table
	h. Limit switches not properly set	h. Readjust limit switches
Actuator does not go full stroke	a. Zero and span pots not properly adjusted	a. Adjust per set-up and calibration instructions
	b. Actuator position limit switch activated	b. Limit switches must be set to trip just outside of zero and span set points
	c. Dip Switches not properly set	c. Set Dip Switches per Dip Switch Table
	d. Actuator torque or thrust limit switch activated	d. Determine cause for overload and correct
	e. Mechanical linkage is misaligned	e. Realign linkage
Yellow and Green LEDs stay on around null or at null	a. Deadband is too narrow	a. Increase deadband setting
	b. Command signal is too noisy	b. Command signal wiring should be shielded with shield grounded at source command only
Actuator does not pull load	a. Mechanical binding in actuator or driven load	a. Repair/replace as needed
	b. Output LED not lit when driving, but all input LEDs are lit	b. Defective triac driver. Replace amplifier power board
	c. Loss of phase (all three incoming live phase red LEDs not illuminated	c. Correct power supply
Amplifier burned up at power-up	a. Wrong input voltage	a. Replace amplifier with correct input voltage and ensure actuator voltage corresponds
	b. Power connected to wrong terminals	b. Replace amplifier and wire per wiring diagram furnished with equipment
Motor gets hot	a. Wrong voltage to motor	a. Incoming line voltage must match motor nameplate
	b. Actuator runs too often	b. Reduce the number of actuator starts/hour
	c. Dynamic brake time too long	c. Reset brake according to procedure

Typical Wiring Diagram

(For integral or remote mounting)

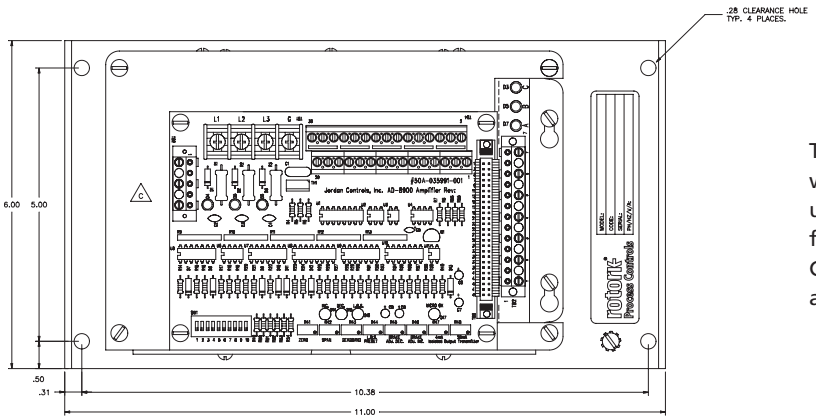


Notes:

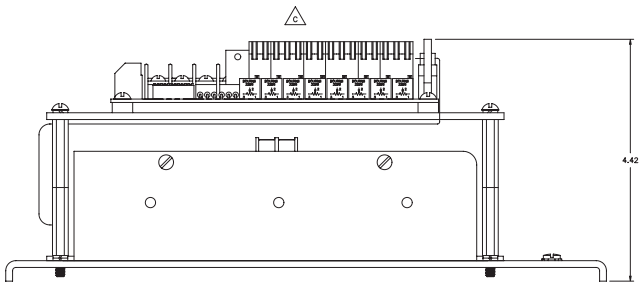
1. When the AD-8900 series amplifier is remotely located, consult factory when distance to actuator exceeds 50 feet.
2. Shielded wiring is required with the shield grounded at source common for all low level circuits. This includes command & feedback signals and position torque limit switches.
3. Integral mounting of the amplifier within the SM/LA-5000 series is preferred.
4. Wire size must allow for minimal voltage drop in wiring to the actuator motor, but not smaller than 14 AWG.
5. Triac goes low on loss of input or output phase or loss of current command signal.

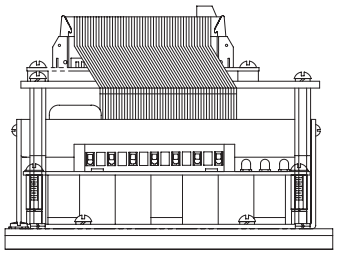
Major Dimensions

AD-8900-P Panel Mounting



These dimensions 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.





Notes:

1. When the AD-8900 series amplifier is remotely located, consult factory when distance to actuator exceeds 50 feet.
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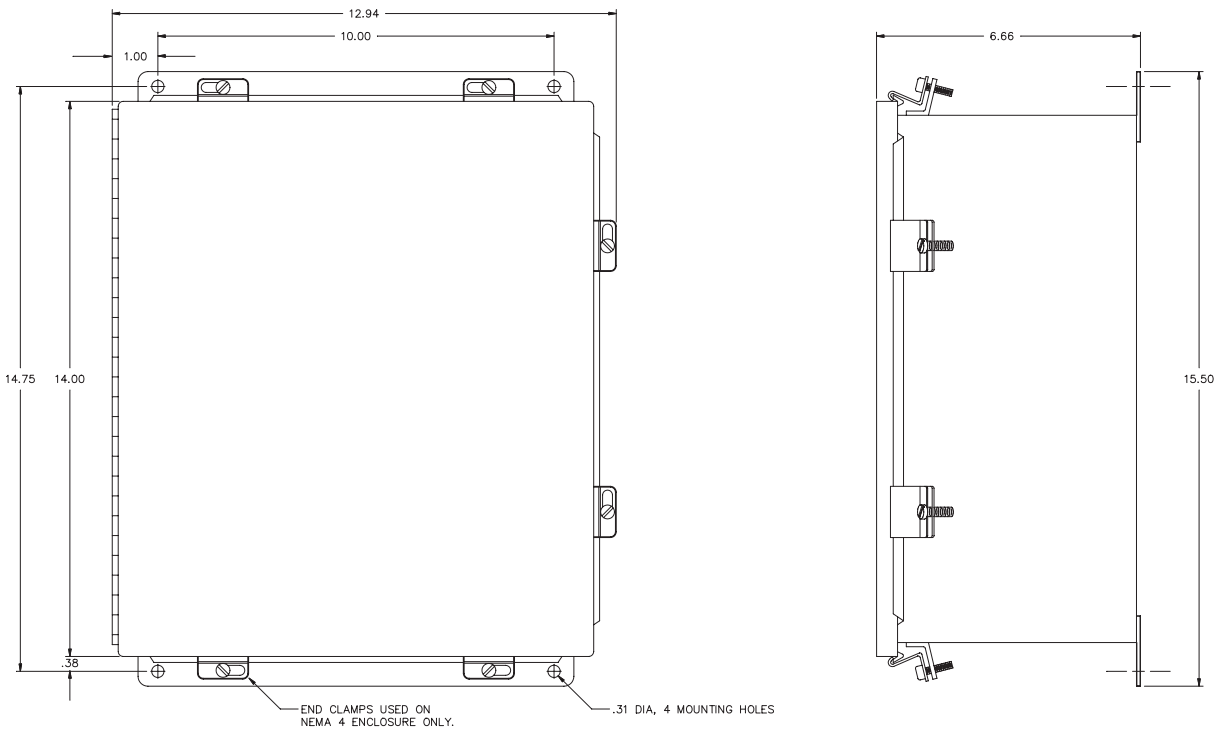
Major Dimensions

AD-8900 installed in remote enclosure

NEMA 4



Notes:

1. When the AD-8900 series amplifier is remotely located, consult factory when distance to actuator exceeds 50 feet.
2. Shielded wiring is required with the shielded at source common for all low level circuits. This includes command & feedback signals and position torque limit switches.
3. Conduits must be sealed to preserve NEMA 4 integrity.

Notes

Notes

Notes

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A full listing of our worldwide sales and service network is available on our website.

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