

rotork[®]
Controls



AD-8140 & AD-8240
Instruction Manual



**Digital Servo
Amplifiers**

Redefining Flow Control

Instruction Manual IM-0665

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AD-8140 & AD-8240 ***Digital Servo Amplifiers***

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

Rotork 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 in-stalled and maintained. The following instructions must be followed and integrated with your safety program when installing, using, and maintaining Rotork 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 Rotork 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 Rotork 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 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 Controls, Inc. Unpack the product and information packet—taking care to save the shipping carton and 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 is not installed immediately, it should be stored in a clean, dry, non-corrosive environment.

EQUIPMENT RETURN

A Returned Goods (RG) authorization number is required to return any equipment for repair. This must be obtained from Rotork Controls (414/461-9200).

The equipment must be shipped, freight prepaid, to the following address after the RG number is issued:

Rotork Controls,
5607 West Douglas Avenue
Milwaukee, Wisconsin 53218
Attn: Service Department

To facilitate quick return and handling, include:

RG Number on outside of box
Your Company Name, Contact Person, Phone, Fax
Address
Repair Purchase Order Number
Brief description of the problem



General Information

GENERAL ACTUATOR DESCRIPTION

The AD-8000 series of digital servo amplifiers are on/off triac output AC servo amplifiers suitable for operating a variety of Rotork Controls actuators.

Standard features include: onboard switch selectable command input for 0-5Vdc, 0-10Vdc, or 4-20mA; selectable loss of command signal operation; 4-20mA isolated output transmitter tracking actuator shaft position; dynamic motor braking; 120 to 240Vac, 50/60Hz input power depending on actuator motor being used; and on-board LED's and encoder adjusting knob for ease of set-up.

The customer's command signal is isolated from both the ac line and the electric motor in the actuator. In addition, the AD-8240 servo amplifiers feature an isolated, "null" output for customer use.

WARRANTY INFORMATION

Warranty: Subject to the following, Jordan expressly warrants the products manufactured by it as meeting the applicable Rotork 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. Rotork 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 Rotork's General Conditions of Sale - Product, for complete warranty information.

Installation Wiring

Most installations locate the servo amplifier inside a Rotork Controls 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.

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

To connect optional features refer to wiring diagram for the specific amplifier and actuator.

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

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

Typical wiring diagrams are shown on page 7. **Actual wiring should follow the print supplied with the actuator.**

Fusing must be installed in line with input power, and should be of the slow blow type. After installation, it is recommended 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.

Specifications

Standard Line Voltage: 120/240Vac, $\pm 10\%$, 50/60 Hz (Slide switch select) **(Voltage input MUST match the actuator motor voltage rating).**

Power Consumption: Less than 20 watts for amplifier functions only.

Voltage Output: Identical to voltage input.

Current Output: 10 amps max. at 120 or 240 Vac.

Fuse protection: Customer supplied. Size based on actuator controlled and local codes.

Null output (AD-8240): Rated 2 amperes @120/240Vac, 50/60Hz.

Command Signal Inputs:

- 4-20mA, 4-12mA, 12-20mA into a 200 Ω shunt resistor
- 0-5Vdc into 100,000 Ω impedance
- 0-10Vdc into 100,000 Ω impedance

Position Feedback Signal: 1000 Ω potentiometer 4-20mA (optional on AD-8240 models only).

Position Output Signal: Isolated 4-20mA, loop powered with 12-36Vdc external power supply.

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

Command Signal Monitor: The 8000 series loss-of-signal circuitry monitors the command signal input. If the command signal drops below or above the rating, the actuator will either lock in place or run to a preset position (user selectable).

Limit Signals: *Internal:* Part of servo control.

Output Shaft Motion: All models can go either direction on an increasing command signal. This is determined by the ZERO and SPAN settings.

Temperature Limits: -40° to 150° F (-40° to 65° C).

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

Position Accuracy: 1% of full range.

Deadband: Factory preset to 1%. Field adjustable.

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.

LED	Function
MICRO OK	This LED flashes when the microprocessor is running. If this is not on, verify power to the board.
INC	This LED is on when the actuator is extending the output shaft for linear actuators, or rotating the output shaft CW for rotary actuators.
DEC	This LED is on when the actuator is retracting the output shaft for linear actuators, or rotating the output shaft CCW for rotary actuators
L.O.S.	1 Flash - Indicates loss of 4-20 mA signal (LOS).
	2 Flashes - Indicates loss of the feedback signal.
	3 Flashes - Indicates a stall condition.

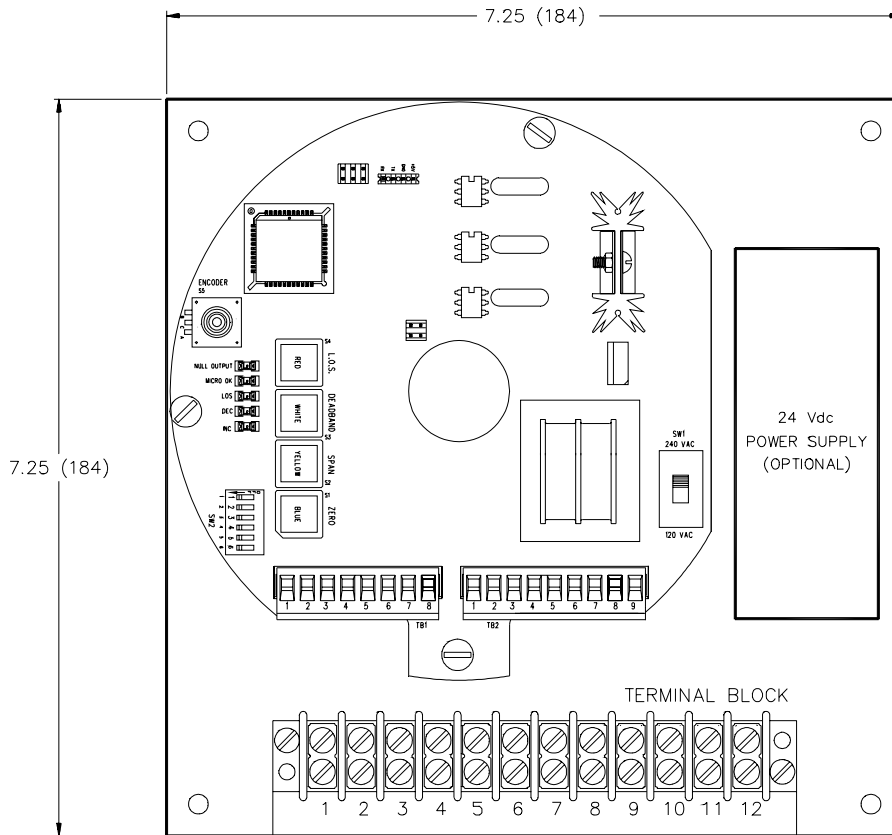
Start-up

- 1) **Power.** Before applying AC power to TB2 set slide switch to the correct voltage (120/240Vac)
- 2) **Command Calibration.** This procedure calibrates the minimum and maximum command to the unit.
 - A) Set command signal to low level, normally 4 mA.
 - B) For AD-8140 amplifiers, depress ZERO pushbutton (S1) and LOS pushbutton (S4) until the SPARE LED illuminates. For AD-8240 amplifiers, depress ZERO pushbutton (S1) and LOS pushbutton (S4) until the LOS LED flashes.
 - C) Set command signal to high level, normally 20 mA.
 - D) For AD-8140 amplifiers, depress SPAN pushbutton (S2) and LOS pushbutton (S4) until the SPARE LED illuminates. For AD-8240 amplifiers, depress SPAN pushbutton (S2) and LOS pushbutton (S4) until the LOS LED flashes.
- 3) **Auto/Manual (Option).** If the unit has the Auto/Manual switch option, place it in the auto position.
- 4) **Setpoints.** These are the end of travel extremes corresponding to the actuator output shaft positions for low (4mA) and high (20mA) command signal levels. They are set by the ZERO and SPAN pushbuttons 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 4mA.
 - B) Adjust LO setpoint (ZERO) by holding ZERO push button (S1) and turning adjusting knob to move actuator output shaft to desired position. Turn the adjusting knob CW to extend the output shaft for linear actuators, or rotate the output shaft CW for rotary actuators. Turn the adjusting knob CCW to retract the output shaft for linear actuators, or rotate the output shaft CCW for rotary actuators. Release button.
 - C) Set the command signal to highest level, normally 20mA.
 - D) Adjust HI setpoint (SPAN) by holding SPAN push button (S2) and turning adjusting knob to move actuator output shaft to desired position. Turn the adjusting knob CW to extend the output shaft for linear actuators, or rotate the output shaft CW for rotary actuators. Turn the adjusting knob CCW to retract the output shaft for linear actuators, or rotate the output shaft CCW for rotary actuators. Release button.
- 5) **Transmitter.** This adjustment sets the endpoints of the 4-20 mA transmitter to account for variations in accuracy of the input command.
 - A) Set command signal to low level, normally 4 mA.
 - B) For AD-8140 amplifiers, depress ZERO pushbutton (S1) and LOS pushbutton (S4) until the SPARE LED illuminates. For AD-8240 amplifiers, depress ZERO pushbutton (S1) and LOS pushbutton (S4) until the LOS LED flashes. While depressing pushbuttons, turn adjusting knob CW to increase the 4 mA point, or CCW to decrease the 4 mA point.
 - C) Set command signal to high level, normally 20 mA.
 - D) For AD-8140 amplifiers, depress SPAN pushbutton (S2) and LOS pushbutton (S4) until the SPARE LED illuminates. For AD-8240 amplifiers, depress SPAN pushbutton (S2) and LOS pushbutton (S4) until the LOS LED flashes. While depressing pushbuttons, turn adjusting knob CW to increase the 20 mA point, or CCW to decrease the 20 mA point.
- 6) **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 (S3) and turning adjusting knob CW until oscillation stops. Release button.

Oscillations will result in decreased life of the unit. Consult Factory.
- 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, SW3 must be OFF. Adjust the setting by holding the LOS push button (S4) and turning the adjusting knob to set the preset position. Turn the adjusting knob CW to extend the output shaft for linear actuators, or rotate the output shaft CW for rotary actuators. Turn the adjusting knob CCW to retract the output shaft for linear actuators, or rotate the output shaft CCW for rotary actuators.
- 8) **Verify all settings** by running the actuator through its travel range several times.

Major Dimensions

For Remote Mounted AD-8240 Amplifiers



DIMENSIONS = INCHES (MILLIMETERS)

DIP Switch Charts

AD-8140

DIP Switch Configurations SW2		
Switch	Switch Position	Function
1*	ON (Up)	Current Command
	OFF (Down)	0-5V / 0-10V Voltage Command
2*	ON (Up)	0-5V Voltage Command
	OFF (Down)	Current / 0-10V Command
3	ON (Up)	LOS Lock-in-Place
	OFF (Down)	LOS Preset Position
4	ON (Up)	Dynamic Brake On
	OFF (Down)	Dynamic Brake Off

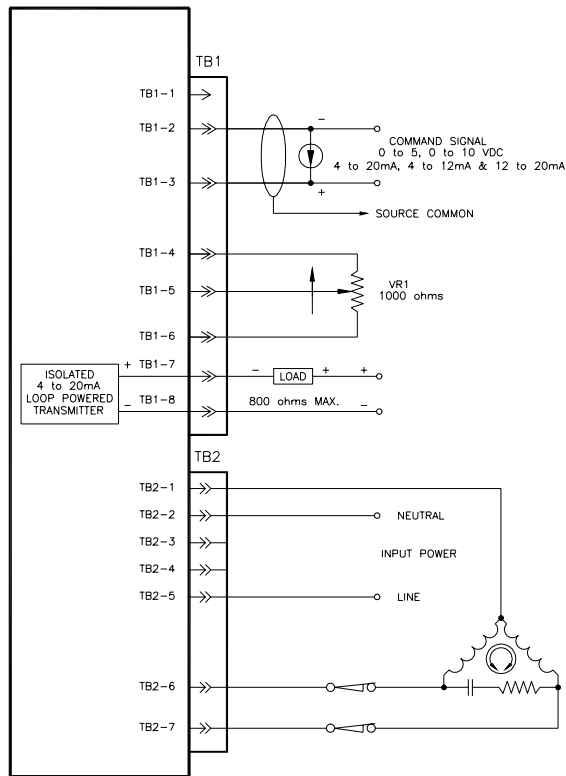
AD-8240

DIP Switch Configurations SW2		
Switch	Switch Position	Function
1*	ON (Up)	Current Command
	OFF (Down)	0-5V / 0-10V Voltage Command
2	ON (Up)	0-5V Voltage Command
	OFF (Down)	Current / 0-10V Command
3	ON (Up)	LOS Lock-in-Place
	OFF (Down)	LOS Preset Position
4	ON (Up)	Dynamic Brake On
	OFF (Down)	Dynamic Brake Off
5	ON (Up)	Null Output is On When Motor is at Idle
	OFF (Down)	Null Output is On When Motor is Running
6	ON (Up)	4-20 mA Feedback (not transmitter output)
	OFF (Down)	Voltage Feedback

* **NOTE:** When selecting a current command configuration, Jumper on J4 is between pins 3 and 4. When selecting a voltage command configuration, Jumper on J4 is between pins 5 and 6, prior to unit power-up.

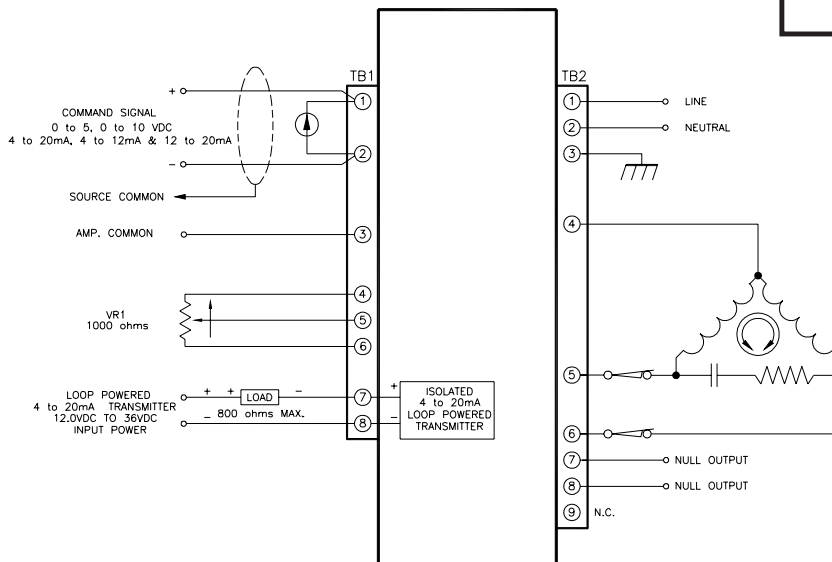
Typical Wiring Diagrams

AD-8140

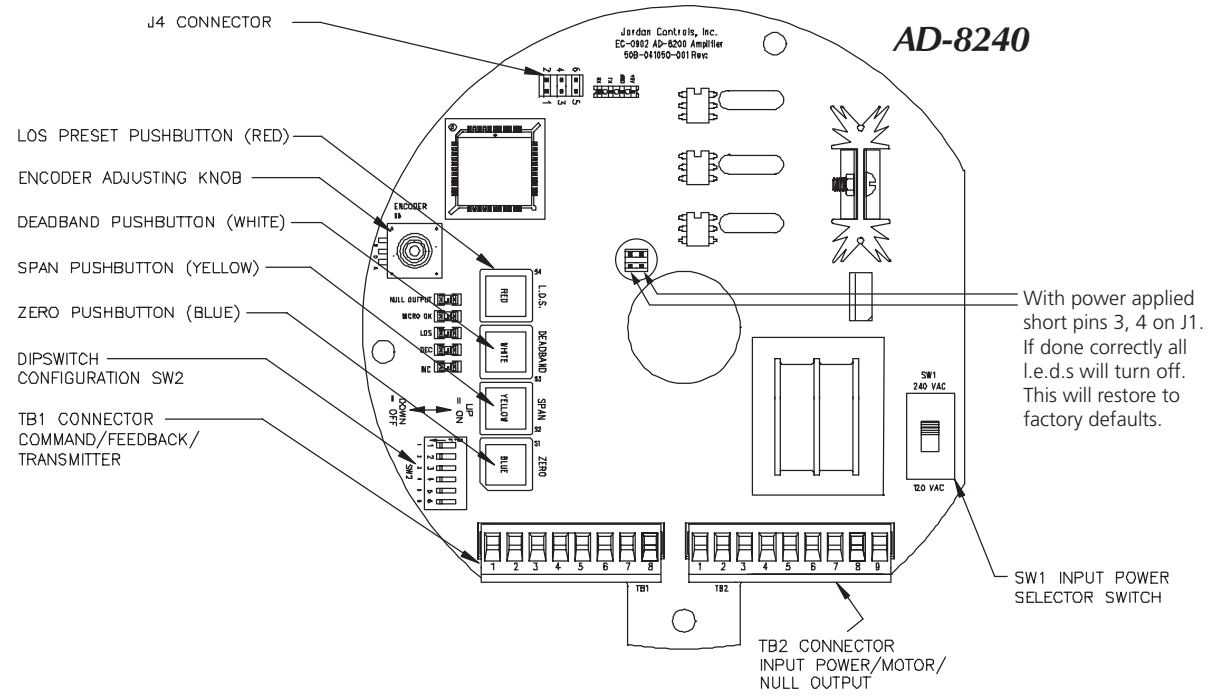
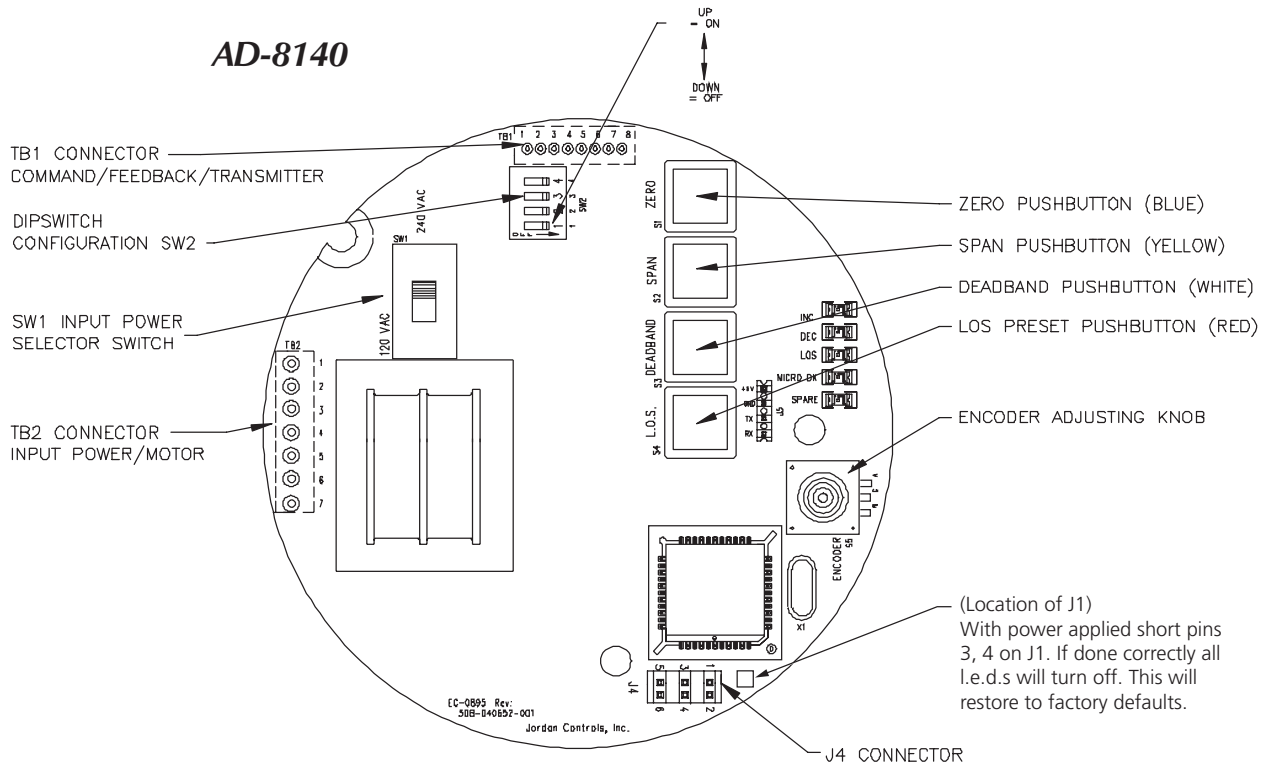


Due to wide variations in terminal numbering of actuator products, actual wiring should follow the print supplied with the unit.

AD-8240



Parts Identification



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IM-0665 04/15

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.

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PUB53-002-00
Issue 04/15

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