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INTRODUCTION

- Read and save all instructions prior to installing, operating and servicing this product.
- 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 the 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 factory replacement parts. 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 - 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. Unpack the product and information packet—taking care to save the shipping carton and any packing material should return be necessary.

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.

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.

DESCRIPTION

The EVA-100 & EVA-200 are multi-featured actuators with the capability to accept analog control signals. The design provides smooth, highly accurate positioning, with positive position-lock when not in motion. These rugged actuators will withstand the most adverse environmental conditions. The EVA-100 & EVA-200 were developed specifically to fit all RESEARCH CONTROL

Valves including the larger Model 9000 & 9100. Their accurate positioning and high thrust makes them well suited for all research and process applications.

The unit features:

- Microprocessor-controlled, linear stepper motor
- 4-20 mA, 0-5 VDC, 0-10 VDC analog inputs
- Position 4-20 mA analog output
- Incremental Control Input (On/Off control)
- Choice of 100 pound or 200 pound thrust units
- Accurate and repeatable positioning
- Adjustable split range
- Quick and simple zero and span input and output adjustments
- Adjustable stroke up to 1"
- User selectable; direct or reverse action
- Controlled seating force to prevent innervalve damage
- Rugged epoxy coated aluminum housing
- 120VAC, 240VAC operation

OPERATION

The Model EVA-100/200 consists of a microprocessor-controlled, stepper motor. The stepper motor produces torque, which is transmitted to the output shaft through a non-rotating drive screw. This allows the low torque, high speed motor output to be converted to high thrust 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 and 4-20 mA transmitter.

RATINGS

NEMA 4: Watertight

EXPLOSION PROOF: Class 1, Division 1, Group C & D

Standard models approved by CSA.

Stroke Length: up to 1.0" (adjustable)

Thrust: 200 lbs. at minimum step rate for EVA-200

Thrust: 100 lbs. at minimum step rate for EVA-100

SPECIFICATIONS

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

Frequency: 50/60 Hz

Power: 120/240 VAC operation - 36VA

Signal Inputs: 4-20 mA, 0-5 VDC, 0-10 VDC

Incremental Control Input (On/Off control): Two isolated dry contact closures required.

Position Transmitter: 4-20 mA isolated, loop powered with 12-36 VDC external power supply.

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

Loss-of-Signal: Fail to Zero, Span or Lock Last (user selectable).

Adjustable Limit Switches: 4 available, open transistor low level logic outputs, adjustable over stroke range. Rating: 40 VDC at 40 mA maximum.

Weight: 16 lbs. (7.3 kg).

Conduit Entry: Two 1/2 NPT.

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

Enclosure: Explosion-proof for Class I, Division 1, Groups C and D. Type 4 (IP65), indoor or outdoor. (Vertical mounting only on outdoor installations)

Position Accuracy: 1% of full range.

Deadband: Factory preset to 1%. Field adjustable.

Stroke: 1 inch (25.4 mm) maximum.

Stroke

Model	Sizes	Stroke (in)
RCV	1/4"	0.438
RCV	1/2", 3/4" & 1"	0.562
9000	ALL	0.750
9100	1/2", 3/4", 1"	0.750
9100	1-1/4", 1-1/2", 2"	1.000

Stroke Speeds

Thrust (lbs.)	Speed (in/s)	0.438	0.562	0.75	1	Valve Stroke (in.)
200	0.13	3.4	4.3	5.8	7.7	Stroke (sec.)
150	0.19	2.3	3.0	3.9	5.3	Stroke (sec.)
100	0.25	1.8	2.2	3.0	4.0	Stroke (sec.)

GENERAL INSTALLATION

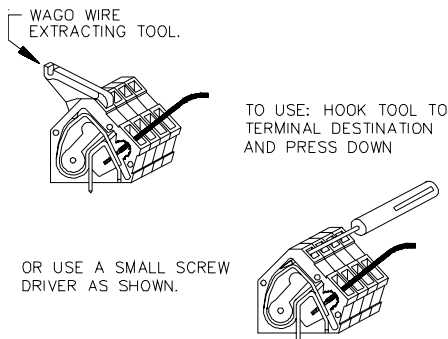
All wiring should be done in accordance with prevailing codes by qualified personnel. Typical wiring diagrams are shown on page 8.

Fusing must be installed in line power, and should be of the slow blow type. Recommend 1 amp for AC input models and 5 amp for DC 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 screwdriver as shown below.



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 line, and terminal 2 is neutral. 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. For DC models, terminal 1 is positive (+), and terminal 2 is negative (-). Terminal strip tabs are pressed down to insert wires.

WIRING TO TB2

LS1 and LS2 is factory-wired as end of travel limit switches.

Note: Because amplifier ZERO and SPAN setpoints are always active, LS1 and LS2 must be set within ZERO and SPAN of the amplifier.

Current command (4-12 mA, 12-20 mA, or 4-20 mA) wires terminate at terminal 3 (-) and to terminal 4 (+). Voltage command (0-5 VDC or 1-10 VCC) wiring terminates on terminals 5 (+) and 6 (-).

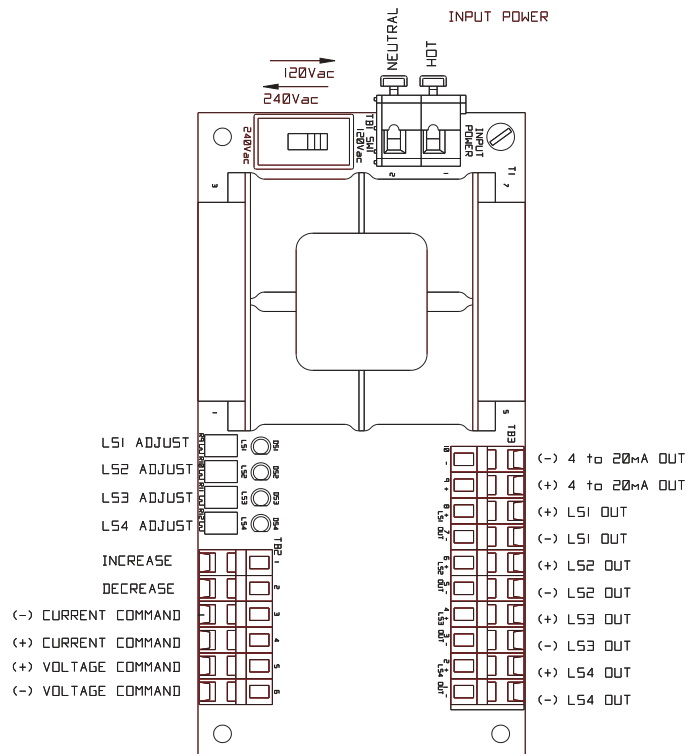
WIRING TO TB3

If 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. 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 positive load connected in series with one lead from the power supply

WIRING TO TB4

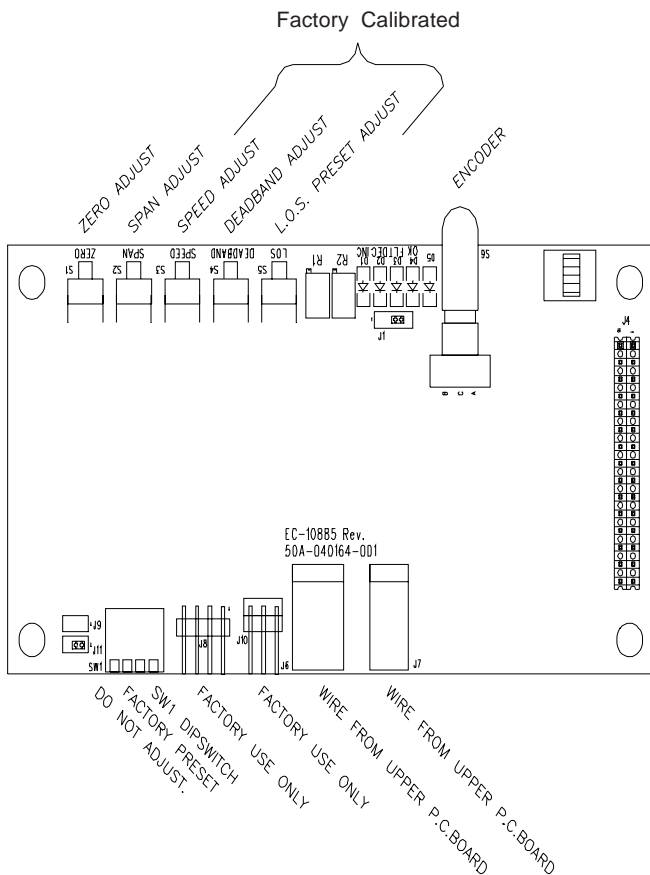
This terminal strip is only used on models with 3W option (3 wire, 120 or 240 VAC incremental control), and is located near the top of the PC board assembly.



START UP FOR LOW LEVEL CURRENT OR VOLTAGE COMMAND SIGNALS

- 1) **Power.** Before applying AC power to TB1 of the upper power supply board, set slide switch to the correct voltage.
- 2) **Auto Switch.** Place DIP Switch 1 to ON (Down) to place actuator in AUTO mode.
- 3) **Setpoints.** These are the end of travel extremes corresponding to the actuator output shaft positions for low (typically 4 mA) and high (typically 20 mA) command signal levels. They are set by the ZERO and SPAN push buttons and encoder. All settings require the holding of a push button *and* the turning of the encoder.
 - A) Set the command signal to lowest level, normally 4 mA.
 - B) Adjust LO setpoint (ZERO) by holding ZERO push button (S1) and turning encoder to move actuator output shaft to desired position. Turn the encoder clockwise (CW) to extend the output shaft and counter-clockwise (CCW) to retract the output shaft. Release button.
 - C) Set the command signal to highest level, normally 20 mA.
 - D) Adjust HI setpoint (SPAN) by holding SPAN push button (S2) and turning encoder to move actuator output shaft to desired position. Turn the encoder CW to extend the output shaft and CCW to retract the output shaft. Release button.

- 4) **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 encoder CW until oscillation stops. Release button.
- 5) **Speed Adjust.** Speed is preset at the factory. To adjust speed, hold the speed push button (S3) and turn the encoder CW to increase or CCW to decrease actuator speed. *Note that actuator torque and speed are related, see speed/torque curve on page 4.*
- 6) **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 encoder CW to set the preset position.
- 7) **Auxiliary 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 adjacent red LEDs indicate state. The auxiliary limit switches **are not** part of the internal servo control.
- 8) **Verify all settings** by running the actuator through its travel range several times.



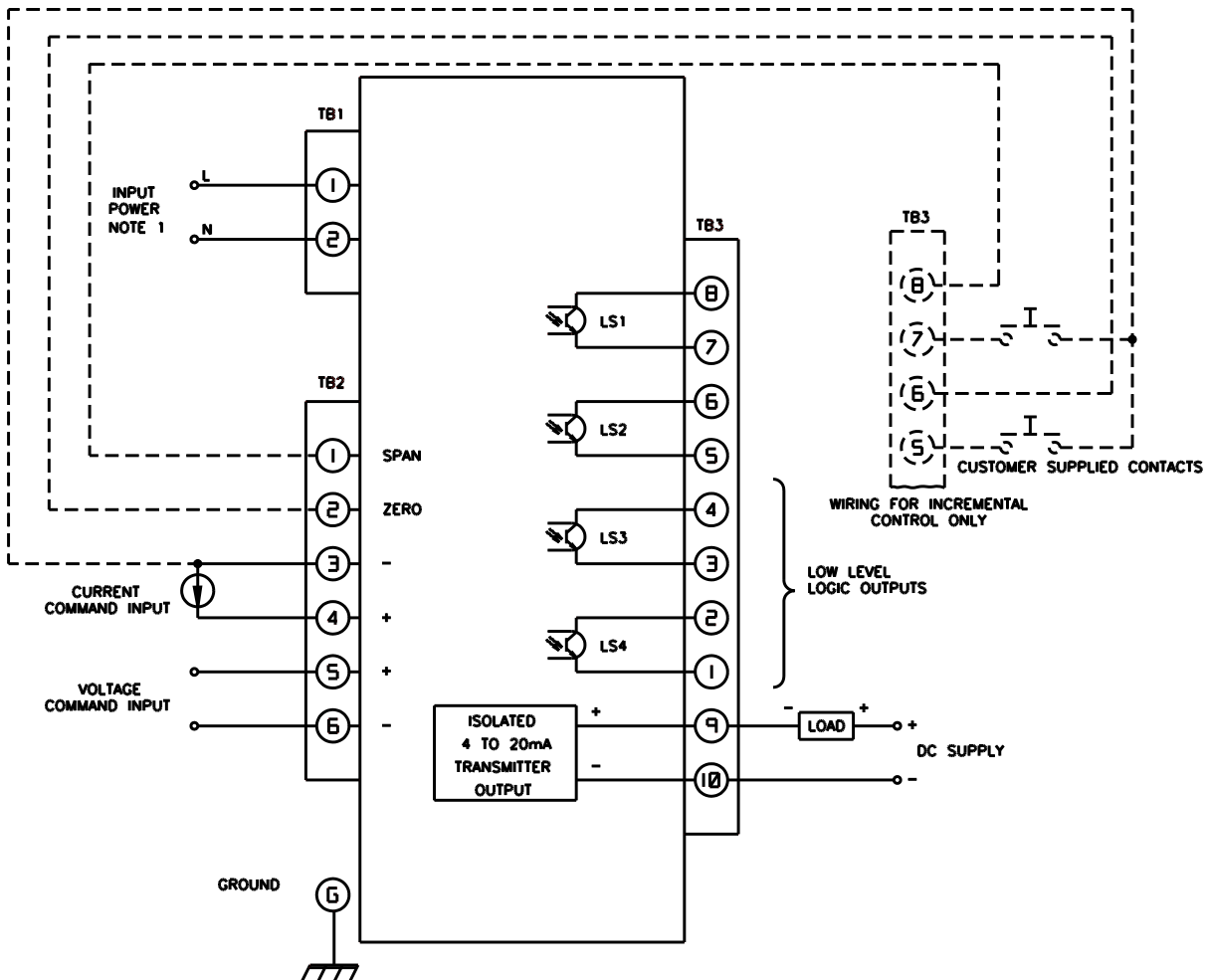
Dip Switch Configuration SW1		
Switch	Switch Position	Function
1	ON (DOWN)	AUTO
	OFF (UP)	MANUAL
2	ON (DOWN)	LOS-LOCK IN PLACE
	OFF (UP)	LOS-GO TO PRESET
3	ON (DOWN)	4-20mA, 0-5 VDC
	OFF (UP)	0-10VDC
4	ON (DOWN)	SPLIT RANGE ENABLED
	OFF (UP)	SPLIT RANGE DISABLED
5	ON (DOWN)	12-20mA (IF ENABLED)
	OFF (UP)	4-12mA (IF ENABLED)
6	ON (DOWN)	NOT USED
	OFF (UP)	EVA-100/200

Some units only have 4 Dip Switches and should be setup as follows:

Dip Switch Configuration SW1		
Switch	Switch Position	Function
1	ON (DOWN)	AUTO
	OFF (UP)	MANUAL
2	ON (DOWN)	LOS-LOCK IN PLACE
	OFF (UP)	LOS-GO TO PRESET
3	ON (DOWN)	4-20mA, 0-5 VDC
	OFF (UP)	0-10VDC
4	ON (DOWN)	12-20mA (IF ENABLED)
	OFF (UP)	4-12mA (IF ENABLED)

START UP FOR INCREMENTAL CONTROL

- 1) **Power.** Before applying AC power to TB1 of the upper power supply board, as the appropriate model requires, set slide switch to the correct voltage.
- 2) **Two isolated, dry contact closures** are used to position the actuator. These contacts are customer supplied and may be within a remotely located controller or may be push buttons or switches used for manual control. *Do not exceed 50 feet of run length wiring.*
 - A) Close DEC contact. The actuator will move toward the low command position, and the yellow LED will illuminate. Once low command position has been reached, actuator travel will stop.
 - B) Adjust LO setpoint (ZERO) by holding ZERO push button (S1) and turning encoder to move actuator output shaft to desired position. Turn the encoder CW to extend the output shaft and CCW to retract the output shaft. Release button.
 - C) Open DEC contact and then close INC contact. The actuator will move toward the high command position, and the green LED will illuminate. Once high command position has been reached, actuator travel will stop.
 - D) Adjust HI setpoint (SPAN) by holding SPAN push button (S2) and turning encoder to move actuator output shaft to desired position. Turn the encoder CW to extend the output shaft and CCW to retract the output shaft. Release button.
- 3) **Place DIP Switch 1** to OFF (Up) position to place the actuator in manual mode.
 - 4) **Deadband.** The deadband adjustment has no influence in this mode of operation.
 - 5) **Speed Adjust.** Speed is preset at the factory. To adjust speed, hold the speed push button (S3) and turn the encoder CW to increase or CCW to decrease actuator speed.
 - 6) **Auxiliary 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 adjacent red LEDs indicate state.
 - 7) **Verify all settings** by running the actuator through its travel range several times.



NOTES:

NOTES:



Please see our website at
www.badgermeter.com
for specific contacts.

Due to continuous research, product improvements and enhancements, Badger Meter reserves the right to change product or system specifications without notice, except to the extent an outstanding bid obligation exists.



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