Automax INC.
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Installation & Operating Instructions

Automax electric actuators with servo control are factory adjusted for 90 degree operation and shipped in the full clockwise position as viewed from the motor side.

ESP-DC Configuration

The ESP-DC board provides a variety of options for the user. These options are made available with the configuration of the jumpers JP1-JP6. See the table at the bottom of this page for a summary of the available configurations.

Servo Control Input Options

1 Connect input signal to terminals marked +IN and -IN on the junction block J3.

- A 4-20mA Current Input (100 Ohm sink) - JP1 set to "A" (left) position. This is supplied as standard.
- B 2-10 Vdc Input - JP1 set to "B" (right) position.

Direct or Reverse Acting

1 Standard units are direct acting:

Low input (e.g. 4 mA) = CW*

High input (e.g. 20 mA) = CCW*.

2 To make reverse acting, move jumper JP2 to the 'R' (right) position.

Fault Detection and Action

1 FAULT conditions occur when the torque of the DC motor exceeds a preset maximum value. This feature is used to protect the valve hardware, the actuator hardware, and alert the user that there may be an obstruction in the valve. When a fault occurs, the LED labeled 'FLT' will be lit, and the actuator will stop. The actuator must receive a signal to drive in the opposite direction in order to reset the FAULT condition.

2 By running a wire to the FLT terminal strip location on junction block J3, a signal can be returned to indicate if a FAULT occurs. Jumper JP3 can be used to set the FLT terminal output to the following:

- A High - Jumper JP3 set to "P" (left) connects the FLT terminal to the Power Supply "+" when a FAULT condition occurs.
- B Low - Jumper JP3 set to "N" (right) shorts the FLT terminal to the Power Ground "-" when a FAULT condition occurs.

Low Power Operation

1 The factory configures the ESP-DC for full functionality. If low power consumption is required, the FLT output and the LED's may be disabled.

- A FLT - to disable the FLT output, move JP4 to the "N" (right) position.
- B LED's - to disable the LED's, move JP5 to the "N" (right) position.

Loss of Input Signal

1 If the input signal to the actuator is lost, the ESP-DC is configured to turn full CW* as a safety precaution.

2 The Loss of Input action above can be disabled by setting JP6 to the "S" (lower) position. In this case the actuator will simply stop if the Input Signal is lost.

ESP-DC Jumper Configuration

JUMPER	Factory Setting	Option
JP1 - INPUT	A : 4-20mA	B : 2-10 Vdc
JP2 - ACTION	D : Direct	R : Reverse
JP3 - FLT output	P : +Vcc	N : GND
JP4 - FLT enable	Y : Enable	N : Disable
JP5 - LED enable	Y : Enable	N : Disable
JP6 - Loss of Input	R : Full CW*	S : Stop

*** For Reverse Acting, the CW and CCW directions marked with a * are reversed.**

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ESP-DC Electronic Servo Positioner

Valve Alignment and Servo Calibration

1 Connect DC power to terminals marked '+' and '-' to junction block J3. The DC power supply should be the same voltage as the actuating motor (12 or 24 Vdc).

2 Safety overtravel switches disconnect the motor if the actuator overtravels approximately 5 degrees past the full CW or CCW position. On valves with mechanical stops, the safety overtravel switches need to be set so that the motor will disconnect prior to hitting a mechanical valve stop. See note 3 under "Trouble Shooting" on page 3 before adjustment.

3 Minimum Position Adjustment:
Apply minimum input signal to ESP-DC terminals +IN and -IN and adjust zero 'Z' potentiometer until actuator stops at full CW* position and CW* LED turns off. Turn the 'Z' adjustment CW to move actuator CW* .

4 At the minimum signal position, the voltage from test point TP1 to TP5 should be approximately 0.15 Vdc. If not, see note 4 under "Trouble Shooting".

5 Maximum Position Adjustment:
Apply maximum input signal to ESP-DC and adjust span 'S' potentiometer until actuator stops at full CCW* position and CCW* LED turns off. Turn the 'S' adjustment CCW to move the actuator CCW.

6 Due to zero-span interaction, repeat steps 3 and 5 until actuator positions repeat at both ends of travel (usually 2 to 3 times).

SPEED and TORQUE adjustments

1 The SPEED potentiometer can be adjusted to increase (CW) or decrease (CCW) the Speed of the actuator.

2 The TORQUE potentiometer can be adjusted to Lower (CCW) or Raise (CW) the maximum torque output of the actuator before a FAULT condition occurs. The factory setting is full CW (maximum Torque).

ESP-DC Transmitter (optional)

Note: If the ESP-DC Transmitter is used, the valve alignment and servo calibration must be completed with the 4-20mA transmitter installed. Servo calibration should be performed before transmitter calibration.

1 Connect 4-20mAdc output leads to transmitter terminals marked '+' and '-'.

2 For 90` operation, the two jumpers on the transmitter should be set to connect pins 1 and 3 , and pins 2 and 4. For 180` rotation, the jumpers should connect pins 1 and 2, and pins 3 and 4.

3 Drive actuator to the full CCW position and adjust 'S' span adjustment of the ESP-DC Transmitter for 20mA output.

4 Drive actuator to the CW position and adjust 'Z' zero adjustment of the ESP-DC Transmitter for 4mA output.

5 Repeat steps 3 and 4 until the desired output is achieved at both positions. If there is difficulty achieving the desired range, see note 4 under Trouble Shooting on page 3.

6 Standard ESP-DC Transmitters are direct acting.

Important Notes About Reverse Acting ESP-DC with Transmitter

Note: Reverse acting transmitter means a 4mA output for full CCW, and a 20mA output for full CW position.

7 If you are using a positioner that is not factory calibrated for reverse acting with a transmitter, you will need to order an Adapter Kit #108921.

8 If you have specified a reverse acting ESP-DC with a transmitter, JP2 is to be set on the 'D' right position.

A The feedback potentiometer voltages as measured from test points TP1 to TP5 on the ESP-DC card are as follows:

FULL CCW ~ 0.15 Vdc
FULL CW ~ 1.42 Vdc

The drive LED's will now indicate the opposite of the actual drive travel.

*** For Reverse acting, the CW and CCW directions marked with a * are reversed.**

Trouble Shooting

Note: **All of the Test Point voltage measurements are taken in reference to test point TP5 labeled "REF."**

1 Actuator does not respond to the input signal.

- A Verify proper input configuration and signal polarity connections. Measure voltage at TP4 and verify it's in the range .4 to 2.0 Vdc.
- B Verify the proper power connections. Refer to the schematic on page 4.

2 Actuator does not travel when CW or CCW LED is lighted.

- A Check the safety overtravel cams and overtravel switches, and adjust as needed (see note 3).
- B If actuator exceeds full CW or CCW positions, check the feedback potentiometer voltage (see note 4).

3 Safety overtravel switches need adjustment. Note: On valves with mechanical stops, the safety overtravel switches must be set so that the motor will disconnect prior to hitting the mechanical valve stops.

- A Disconnect the actuator power connector J1 from the ESP-DC.
- B Drive the motor to 5 degrees past full CW by placing DC power directly on the terminal of the actuator electric motor. To drive the motor CW, place +DC on the terminal with the red wire. *Be careful not to drive the actuator into any mechanical stops. This may damage the actuator and the valve.* Set the CW cam so the overtravel switch trips.
- C While setting CW safety overtravel switch, ensure a voltage between 0.10Vdc and 0.20Vdc is measured at test point TP1 when switch is tripped. Otherwise see note 4 in this section.
- D Drive the actuator CCW until approximately 5 degrees past the standard full CCW position by applying power to the motor terminals, this time with the opposite polarity from B. Adjust CCW cam (bottom) until switch trips.

4 With the actuator in full CW position, the feedback potentiometer voltage should read approximately 0.15 Vdc at TP1. If the feedback potentiometer is not set correctly, the "dead spot" at the end of the pot's rotation may cause over/under travel or a lack of transmitter range.

- A Loosen potentiometer drive gear and rotate potentiometer until approximately 0.15 Vdc is measured at TP1, and then re-tighten drive gear.
- B Recalibrate ESP-DC Zero and Span adjustments, starting with Step 3 on page 2.

5 Actuator is oscillating or is not responsive to small input changes, the Dead Band 'DB' potentiometer may need adjusting.

- A Drive actuator to mid position and turn DB CCW until both LED's energize, then immediately turn CW until both LED's de-energize. Turn adjustment CW an additional 1/4 turn and operate actuator over full range in small increments to check operation. Voltage from test point TP2 should measure approximately 0.10 Vdc.

6 The FLT LED is lit and the actuator won't move: The FLT LED indicates a FAULT condition, where the actuator is drawing too much current. Check the TORQUE potentiometer setting, turning CW to increase the FAULT current limit, Drive the actuator in the reverse direction to reset . If this doesn't work, there may be an obstruction in the valve.

7 Special precautions for operating the ESP-DC.

- A It is always necessary to limit actuator from repeated safety overtravel switch trippage.
- B Always remove DC power to actuator, prior to removing input signal, and apply signal prior to applying DC power to actuator.

Performance Data

LINEARITY	1%
RESOLUTION	1.0 `
DEADBAND	1%
HYSTERESIS	0.5 %

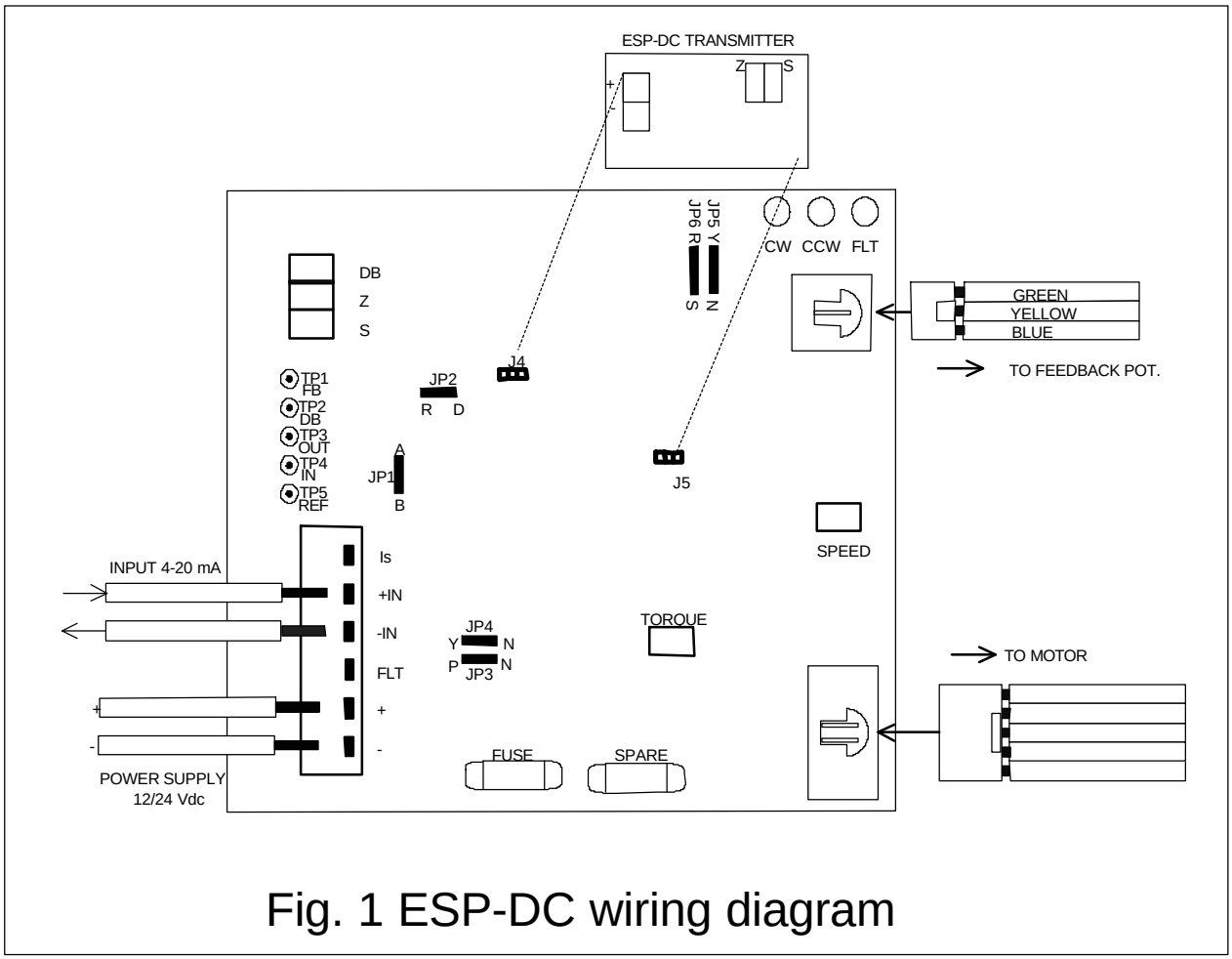

Fig. 1 ESP-DC wiring diagram

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Calibration Voltages

Actuator Angle	TP1 Voltage
-10` Mechanical Stop	0.05
-5` Safety Overtravel Switch	0.10
0` CW Position (4mA Direct) (20mA Reverse)	0.15
90` CCW Position (20mA Direct) (4mA Reverse)	1.42
95` Safety Overtravel Switch	1.50
100` Mechanical Stop	1.57
180` Positioning Option	2.70

Technical Assistance

If technical assistance is required, please have the following information ready before calling:

A) *Actuator model number.*

B) *Actuator serial number.*

C) *Actuator sales order number.*

D) *Input signal configuration used.*