



B Optional Features

To complement the standard capabilities found in the **Mpac**, various options are available to fulfill specific applications.

B.1 POSITION TRANSMITTER

The transmitter can be field retrofitted in less than one-half hour.

The position transmitter provides a two-wire 4-20 mA signal that is proportional to actuator position. The transmitter's output is optically isolated from the electronics. The transmitter is similar to other two-wire devices in that an external DC power source is required.

Also included in the transmitter is an Alarm Relay. The Alarm Relay will change state (de-energize) anytime the actuator is unable to follow the applied control signal.

SPECIFICATIONS

Transmitter:

Accuracy:

Linear <1.0% of full stroke

Rotary <1.0% of 90° rotation

Resolution: <0.5% of full stroke or 90° rotation

Maximum External Load: 1000 ohms

Power Requirements:

Minimum Supply Voltage = 10 vdc + (.02 × external load resistor)

Maximum Supply Voltage = 36 vdc + (.004 × external load resistor)

Maximum external load resistor @ nominal 24 vdc = 700 ohms



Alarm Relay:

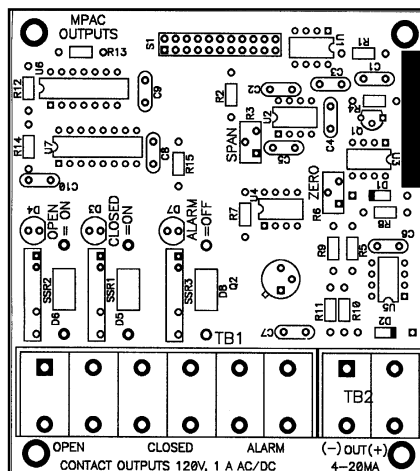
See section B.4 for details concerning the alarm relay.

Response: ½ second of any “fail to operate condition”
 Alarm Contacts: SPDT
 Rating: 1 amp @ 30 vdc, 0.3 amp @ 120 vac – resistive

CONNECTION

The position transmitter mounts atop the multiple input auxiliary board. All wiring connections are made directly to this board.

Determine the minimum and maximum supply voltage to power the external load. Insure that the actual supply voltage is between these values. Connect the negative side of the loop power to the “OUT (-).” Complete the loop by connecting the positive side of the loop power to the “OUT (+).”



B.2 AUXILIARY CONTROL

Configuration and local operation is accomplished by means of the three button keypad which is located on the base circuit board. Manual operation without access to the control compartment is provided by either the external or remote option.

B.2.1 External Control Option

ANALOG OR MANUAL OPERATION

Two rotary switches, a two position and a three position momentary, are installed on the back plate of the control compartment. The two-position AUTO/MAN switch is provided to override the control signal and place the actuator in manual control. While in MANUAL, the three position switch allows actuator movement.

When placed in the local mode, the alarm relay (see section B.4), will change state.



TWO POSITION

A single three position switch is installed on the back plate of the control compartment. Rotation of the switch will toggle the actuator from one position to the other or allow control (Auto) from a remote contact.

B.2.2 Remote Manual Control

ANALOG OPERATION

The actuator may be equipped to a remotely located manual station. Operation of this option requires three contacts; one is required for AUTO/ MANUAL switching and the other two for OPEN and CLOSE signaling. Power for the contacts is supplied by the actuator. Actual position indication is available through the position transmitter.

When placed in the manual mode, the alarm relay (see section B.4) will change state.

The user may provide the manual station, or two types of NEMA 4 manual stations are available from REXA:

BB: Material: Fiberglass

one AUTO/MAN switch, two position

three position rotary—OPEN, OFF, CLOSED

Connection: Terminal strip

Dx: Material Fiberglass

one AUTO/MAN switch, two position

three position rotary—OPEN, OFF, CLOSED

Position indicator, 0–100%

Connection: Terminal strip

Figure B.2A (page 5) shows the wiring connections between the control compartment and the manual station.

MANUAL AND TWO POSITION OPERATION

A remote station for contact input is available. These stations make use of the dry contact. Actual position indication is available through the position transmitter (MANUAL) or the electronic limit relays (TWO POSITION).

The standard NEMA 4 stations are:

MANUAL

BB: Material: Fiberglass

one three position rotary switch—OPEN, OFF, CLOSED

Connection: Terminal strip



Dx: Material: Fiberglass
 one three position rotary switch—OPEN, OFF, CLOSED
 POSITION INDICATOR, 0–100%
 Connection: Terminal strip

TWO POSITION

BB: Material: Fiberglass
 one two position rotary switch
 Connection: Terminal strip

Dx: Material: Fiberglass
 one two position rotary switch
 TWO INDICATOR LIGHTS—OPEN, CLOSED
 Connection: Terminal strip

Figure B.2A (page 5) shows the wiring connections between the control compartment and the manual station.

B.3 LIMIT SWITCHES

Limit Switches provide a contact closure when an actuator or drive reaches a predetermined point in its stroke. Two types are available: an electronic switch or an independent mechanical switch. Although the electronic switches will only indicate the end of stroke, the mechanical switches may be set at an intermediate position.

B.3.1 Electronic (not available on 115 vac ESD units)

The electronic limit switches (2) are contained on the multiple output board. All wiring connections are made directly to this board. An LED indicator shows the status (energized ON) of each relay. The switches will only change state at the end of user defined travel.

A third relay is included. This is for alarm indication. See section B.4 for details.



GENERAL SPECIFICATION

Quantity: 2
 Type: Single Pole, Single Throw (SPST), normally open
 Rating: 1 amp @ 30 vdc, 0.3 amp @ 120 vac or vdc—resistive
 Accuracy: 1%
 Differential Travel (Hysteresis): 0.5%
 Connection: terminal strip on the auxiliary board

CONNECTION

The multiple output board mounts to the top of the base circuit board. All wiring connections are made directly to this auxiliary board.

**Figure B.2A: Manual Station Connections**

CONTROL COMPARTMENT	RECOMMENDED CABLE WIRE COLORS	MANUAL STATION TERMINAL #
ANALOG OPERATION		
TB1—SINGLE CONTACT BOARD		
LINE OUT	Blue/Black	1
SIG IN	Blue	2
TB2 contact signal inputs—Multiple Input Auxiliary Board		
LINE OUT	Green/Black	3
CLOSE IN	Red	4
OPEN IN	Green	5
Dx only (Position Transmitter)		
TB2 4-20mA out—MULTIPLE OUTPUT AUXILIARY BOARD		
NEUT OUT	Yellow/green	6
OUT (+)	White	7
OUT (-)	Black	8
MANUAL OPERATION		
TB2 contact signal inputs—MULTIPLE INPUT AUXILIARY BOARD		
LINE OUT	Green/Black	1
CLOSE IN	Red	2
OPEN IN	Green	3
Dx only (Position Transmitter)		
TB2 4-20mA out—MULTIPLE OUTPUT AUXILIARY BOARD		
NEUT OUT	Yellow/Green	4
Out (+)	White	5
Out (-)	Black	6
Two Position		
TB1—Single Input Board		
LINE OUT	Blue/Black	1
SIG IN	Blue	2
Dx only (Position Transmitter)		
TB1 contact outputs—MULTIPLE OUTPUT AUXILIARY BOARD		
NEUT OUT	Yellow/Green	3
OPEN	Green	4
OPEN	Green/Black	5
CLOSED	Red	6
CLOSED	Red/Black	7



On ESD linear actuators with 115 vac power, two limit switches are mounted in the feedback area opposite the output shaft.

B.3.2 Mechanical

The mechanical limit switches are independent devices and will provide a limit indication regardless of the electric power status of the unit. Up to four switches may be installed. On linear actuators (except 115 vac ESD units), they are go style mounted adjacent to the feedback housing.

For complete details refer to Appendix E.

B.4 ALARM INDICATION

The multiple output board contains an alarm relay. If the actuator is unable to follow the applied control signal, this relay will change state (de-energize). This includes error codes (see Section 9), placing the actuator in local or setup and loss of power.

A red LED indicates the status of the alarm relay. The **Mpac** immediately energizes the relay upon entering the Auto mode. If the LED is illuminated, it indicates that the unit is in the Auto mode and responding to the applied control signal.

SPECIFICATION

Response: ½ second of any “fail to operate” condition.

Type: Single Pole, Single Throw (SPST)

Rating: 1 amp @ 120 vac or vdc – resistive

CONNECTION

All wiring connections are made directly to the auxiliary board mounted to the top of the base circuit board.

B.5 MANUAL OVERRIDE

The **Mpac** has available two types of manual operators: Declutchable Handwheel/9/16" Hex Drive or Geared Hand Crank. These make use of the actuator's hydraulic circuit and will only function if this system is in working order. For standard actuators, clockwise rotation of the manual operator will retract the stem on a linear unit and clockwise rotate the shaft (looking at the feedback housing) on a rotary unit.

*Operation of the spring failure inhibits movement by the manual override. Depress the button on top of the power module to manually close the solenoid. The solenoid must be in its normally open position before returning the **Mpac** to automatic operation. See section 4.2.3.*



Before operating any manual override, make sure that the electric power is OFF or that the control is in local or setup.

B.5.1 Declutchable Handwheel/ $\frac{9}{16}$ " Hex Drive

The handwheel is mounted at the back of the motor. To operate, push the handwheel in and turn. Since the handwheel must contact a slot on the outboard end of the motor shaft, up to one-half revolution may be required before proper engagement. The handwheel will declutch by moving outwards when released.

<u>Power Module</u>	<u>HANDWHEEL REVOLUTIONS</u>		
	<u>Linear</u> (to move one inch/ 1000 lbs of rated thrust)	<u>Rotary</u> (90° of rotation/ 1000 in.-lbs. of rated torque)	<u>Recommended Drill Size</u>
B	~75	~200	.1hp@500 RPM
C	~25	~65	.25hp@500 RPM

B.5.2 Geared Hand Crank

The geared hand crank consists of a separate power module with a 5:1 gear reducer and crank arm replacing the motor. To operate, simply turn the crank. No clutch or engagement mechanism is required.

<u>HAND CRANK REVOLUTIONS</u>	
<u>Linear</u> (to move one inch/ 1000 lbs. of rated thrust)	<u>Rotary</u> (90° of rotation/ 1000 inch-lbs. of rated torque)
5	13

B.6 SEPARATE CONTROL COMPARTMENT

For installations that subject the actuator to aggressive environments such as excessive temperature, vibration or shock, the control compartment may be separated from the power module by up to 100 feet. The actuator is installed on the driven device, while the control compartment is remotely mounted. Connecting them are the module cable and the feedback cable. Although these cables may be run within the same conduit, preferred wiring procedures recommend that power voltages be kept separate from low level signal lines (feedback).

User connections of electric power and control signals are made at the control compartment per sections 5 and 6.

A wall mount angle bracket attaches to the control compartment back plate. Three $\frac{3}{8}$ " holes are provided to allow mounting at a convenient location.



B.6.1 Module Cable

The standard cable consists of 3 twisted pairs and a twisted triad. A pair consists of a colored wire and a colored/black striped wire. Each individual wire is 14 AWG. These wires are used for the motor (triad and red pair), for the cartridge heater (green pair) included in most actuators and for the optional by-pass solenoid (blue pair). A separate green/yellow striped wire is provided for actuator ground.



SHOCK HAZARD

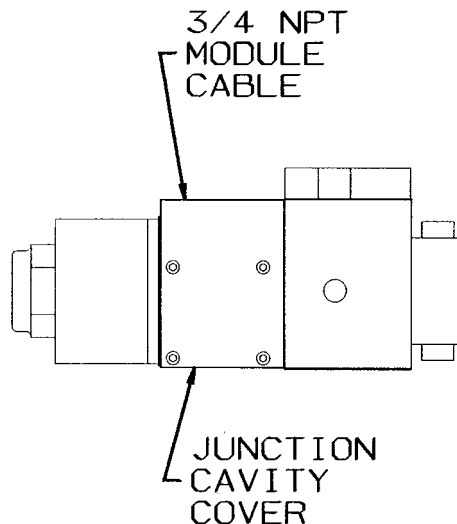
Hazardous voltage levels are present in the module cable. Insure that the electrical power to the actuator is off before connecting the module cable.

ACTUATOR TERMINATION

The module cable is terminated in the junction cavity by means of bullet connectors. The feed-through for the connections is a $\frac{3}{4}$ inch NPT.

Remove the four cap screws that retain the junction cavity cover (figure B.6A). Feed the module cable through the $\frac{3}{4}$ inch NPT opening and into the cavity. Figure B.6B (page 11) shows the wiring connections to the actuator. After insuring that the wires are not pinched by the cover, securely fasten the cover to the module.

Figure B.6A





SHOCK HAZARD

Hazardous voltage levels are present in the module cable. Insure that the electrical power to the actuator is off before connecting the module cable.

CONTROL COMPARTMENT TERMINATION

B size module

The heater and by-pass solenoid (spring fail units only) wires connect to the base circuit board on terminal block TB2 (figure B.6C, page 12). The motor power wires connect to the base circuit board on terminal block TB4 (figure B.6C, page 12). The separate ground wire should be connected to the ground lug on the base plate. A ¾" NPT port is provided on the back of the control compartment to allow feed through of the module cable.

C size module

The heater and by-pass solenoid (spring fail units only) wires connect to the base circuit board on terminal block TB2 (figure B.6C, page 12). The motor power wires connect to terminal block TB1 of the C relay board (figure B.6D, page 12). The red/black wire connects to the motor capacitor located under the base circuit board. The separate ground wire should be connected to the ground lug on the base plate. A ¾" NPT port is provided on the back of the control compartment to allow feed through of the module and motor power cables.

For 2C power modules, two module cables are required. Connect one set of motor wires to each relay board.

B.6.2 Feedback Cable

The standard cable consists of a red, white and black wire and a tinned copper ground wire. Each individual wire is 18 AWG.

For best noise immunity, the feedback ground wire should be kept as short as is practical within the control compartment. Do not terminate the ground wire at the actuator.

ACTUATOR TERMINATION

For ML series actuators, there are two types of feedback termination. On units with tie rod hydraulic cylinders (thrusts greater than 10,000 lbs or strokes greater than 6 inches), the connection is made in the right angle junction box located on the cylinder by means of bullet connectors. The feed through for the cable is a ½ inch NPT. Figure B.6B (page 11) shows the wiring connections in the junction box.

The o-ring should be properly seated with no cuts or other discontinuities.

On ML series actuators with thrust of 10,000 lbs or less and strokes of 6 inches or less, the feedback connection is made to bullet con-



nectors under the feedback cover. Remove the four cap screws that hold the upper cover. Carefully lift the cover in the direction away from the cylinder until it clears the internal components. Feed the cable through the ½ inch NPT opening. Wiring connection is made per figure B.6B (page 11). Replace the cover on the cylinder and securely fasten.

Termination for the MR or MD series actuators is made through a ¾ inch NPT opening in the feedback housing. The wiring connection is made to the bullet connectors. Figure B.6B (page 11) outlines the wiring connections at the actuator.

CONTROL COMPARTMENT TERMINATION

The feedback cable connects to the base circuit board on terminal block TB5 (figure B.6C, page 12). The ground wire must be connected to the green grounding screw located beneath TB5 on the base plate. A ¼" NPT port is provided on the back of the control compartment to allow feed through of the feedback cable.



Figure B.6B: Separate Control Compartment Connections

CONTROL COMPARTMENT	RECOMMENDED CABLE WIRE COLORS	ACTUATOR WIRE COLORS	
MODULE CABLE —B SIZE			
TB4 B motor—Base Circuit Board			
BLK	Black ²	Black	
YEL	Yellow/Green ²	Yellow	
WHT	White ²	White	
RED	Red ²	Red	
Capacitor Lead	Red/Black ²	Brown/Blue Bullet	
TB2—Base circuit Board			
HTR L	Green/Black ²	Brown/Red Bullet	
HTR N	Green ²	Brown	
SOLND +	Blue/Black ^{2,4}	Blue	
SOLND +	Blue ^{2,4}	Blue	
MODULE CABLE—C SIZE			
TB1—C Relay Driver Board			
BLK	Black ²	Black/Blue Bullet	
YEL	Yellow/Green ²	Yellow	
WHT	White ²	White	
RED	Red ²	Red	
Capacitor Lead	Red/Black ²	Blue	
TB2—Base circuit Board			
HTR L	Green/Black ²	Brown/Red Bullet	
HTR N	Green ²	Brown	
SOLND +	Blue/Black ^{2,4}	Blue	
SOLND –	Blue ^{2,4}	Blue	
GROUND CABLE			
Ground Lug	Yellow/Green ³	Yellow/Green	
FEEDBACK CABLE			
TB5—Base Circuit Board			
RED	Red ¹	L SERIES Red	D SERIES R SERIES Orange
BRN	White ¹	Brown	Red
BLK	Black ¹	Black	Brown
Ground Screw	Bare ¹	—	—

The bare ground wire of the feedback cable must be connected to the green grounding screw located beneath TB5 on the base plate.

Notes: ¹ 3 conductor feedback and groundwire.

² 9 conductor module cable.

³ 1 conductor yellow/green actuator ground.

⁴ When equipped with optional spring failure.



Figure B.6C: Base Circuit Board

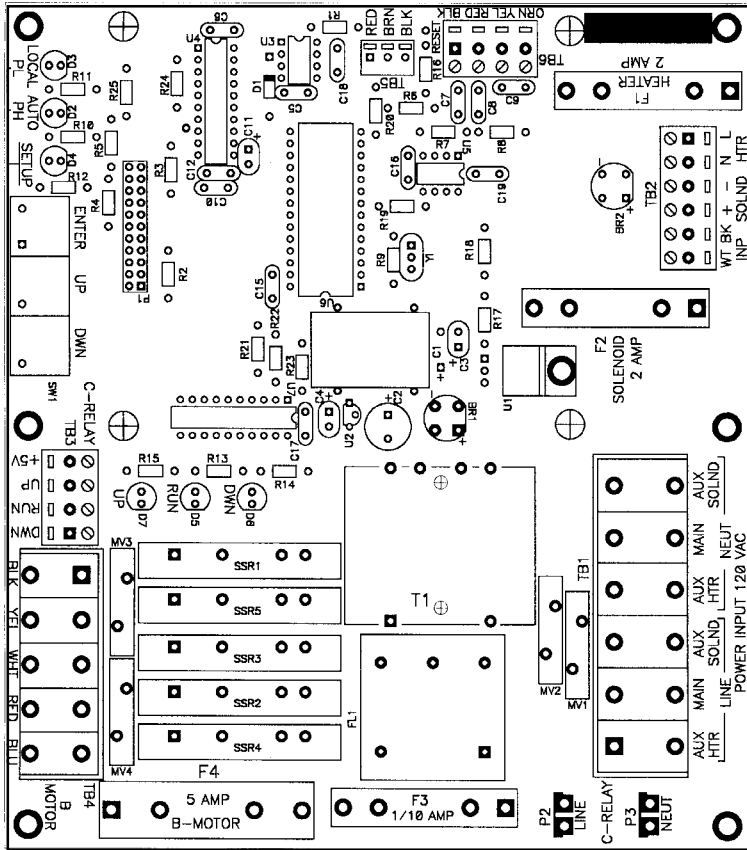


Figure B.6D: C Motor Relay Board

