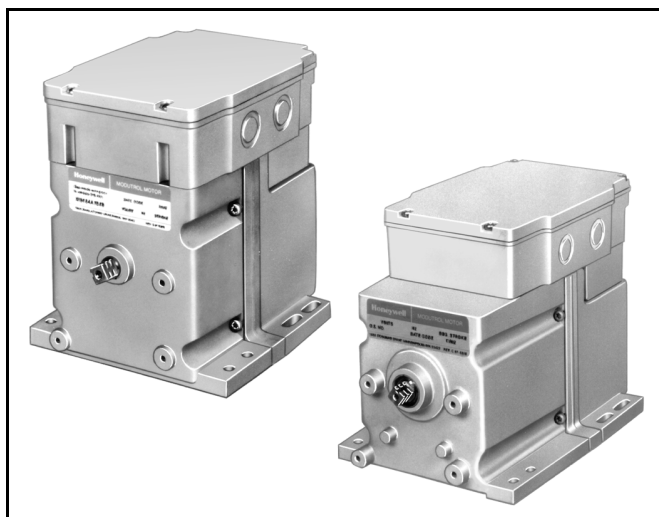


## Series 72 Modutrol IV™ Motors

### PRODUCT DATA



### APPLICATION

The Series 72 Modutrol IV Motors are used to control dampers and valves. The motors accept a current or voltage signal from an electronic controller to position a damper or valve at any point between open and closed.

### FEATURES

- Replaces M744S,T,Y and M745S,T,Y Motors.
- M7261, M7274, M7281, M7284, and M7294 are non-spring return motors; M7272, M7282, M7285, and M7286 are spring return motors.
- Oil immersed motor and gear train for reliable performance and long life.
- Wiring box provides NEMA 3 weather protection.
- Actuator motor and circuitry operate from 24 Vac. Models available with factory installed transformer or an internal transformer can be field added.
- Quick connect terminals standard—screw terminal adapter available.
- Adapter bracket for matching shaft height of older motors is standard with replacement motors.
- Nominal timing of 30 seconds for 90° stroke and 60 seconds for 160° stroke.
- Valve and damper linkages, explosion-proof housing, and auxiliary switches available as accessories.
- Spring return motors are rated for 25 lb.-in. and 60 lb.-in torque.
- Non-spring return motors are rated for 35 lb.-in., 75 lb.-in., 150 lb.-in., and 300 lb.-in. torque.
- Models available with adjustable start (zero) and span.
- Models available with 4 to 20 mA input signal.
- Models available with 2 to 10 Vdc input signal.
- Die-cast aluminum housing.

### Contents

Application .....	1
Features .....	1
Specifications .....	2
Ordering Information .....	2
Installation .....	5
Settings and Adjustments .....	10
Operation and Checkout .....	12



## SPECIFICATIONS

**Models:** TRADELINE models are selected and packaged to provide ease of stocking, ease of handling and maximum replacement value. TRADELINE model specifications are the same as those of standard models unless specified otherwise. TRADELINE models have auxiliary switch cams.

**NOTE:** Auxiliary switches can only be added to motors that include auxiliary switch cams. (These cams cannot be field-added.)

### IMPORTANT

*The specifications given in this publication do not include normal manufacturing tolerances. Therefore, an individual unit may not exactly match the listed specifications. Also, this product is tested and calibrated under closely controlled conditions and some minor differences in performance can be expected if those conditions are changed.*

**Modutrol IV Order Number Guide:** See Table 1.

**Dimensions:** See Fig. 1.

**Table 1. Modutrol IV Order Number Guide.**

M		Motor											
		72		4-20 mA or 2-10 Vdc Control <sup>a</sup>									
		6		—		35 lb-in. Non-Spring Return							
		7		25 lb-in. Spring Return		75 lb-in. Non-Spring Return							
		8		60 lb-in. Spring Return		150 lb-in. Non-Spring Return							
		9		—		300 lb-in. Non-Spring Return							
				1		Single-ended shaft		Non-Spring Return					
				2				Normally Closed <sup>b</sup> Spring Return					
				4		Dual-ended shaft		Non-Spring Return					
				5				Normally Closed <sup>b</sup> Spring Return					
				6				Normally Open <sup>c</sup> Spring Return					
						A		0 Auxiliary Switches		Fixed Stroke			
						B		1 Auxiliary Switch		Normally Closed <sup>b</sup>			
						C		2 Auxiliary Switches					
						D		0 Auxiliary Switch					
						F		2 Auxiliary Switches		Adjustable Stroke			
						G		0 Auxiliary Switch		Fixed Stroke			
						L		1 Auxiliary Switch		Adjustable Stroke			
						Q		2 Auxiliary Switches		Fixed Stroke			
										Normally Open <sup>c</sup>			
										Normally Closed <sup>b</sup>			
M		61		8		4		A		XXXX			
										See Catalog for Complete O.S. Number			

<sup>a</sup> Adjustable zero and span.

<sup>b</sup> Electrically normally closed. Shaft rotates clockwise (viewed from the power end) with increase in control signal. Motor drives to normally closed position when powered with control wiring not connected.

<sup>c</sup> Electrically normally open. Shaft rotates counterclockwise (viewed from the power end) with increase in control signal. Motor drives to normally open position when powered with control wiring not connected.

## ORDERING INFORMATION

When purchasing replacement and modernization products from your TRADELINE® wholesaler or distributor, refer to the TRADELINE® Catalog or price sheets for complete ordering number.

If you have additional questions, need further information, or would like to comment on our products or services, please write or phone:

1. Your local Home and Building Control Sales Office (check white pages of your phone directory).
2. Home and Building Control Customer Relations  
Honeywell, 1885 Douglas Drive North  
Minneapolis, Minnesota 55422-4386 (800) 328-5111

In Canada—Honeywell Limited/Honeywell Limitée, 35 Dynamic Drive, Scarborough, Ontario M1V 4Z9.

International Sales and Service Offices in all principal cities of the world. Manufacturing in Australia, Canada, Finland, France, Germany, Japan, Mexico, Netherlands, Spain, Taiwan, United Kingdom, U.S.A.

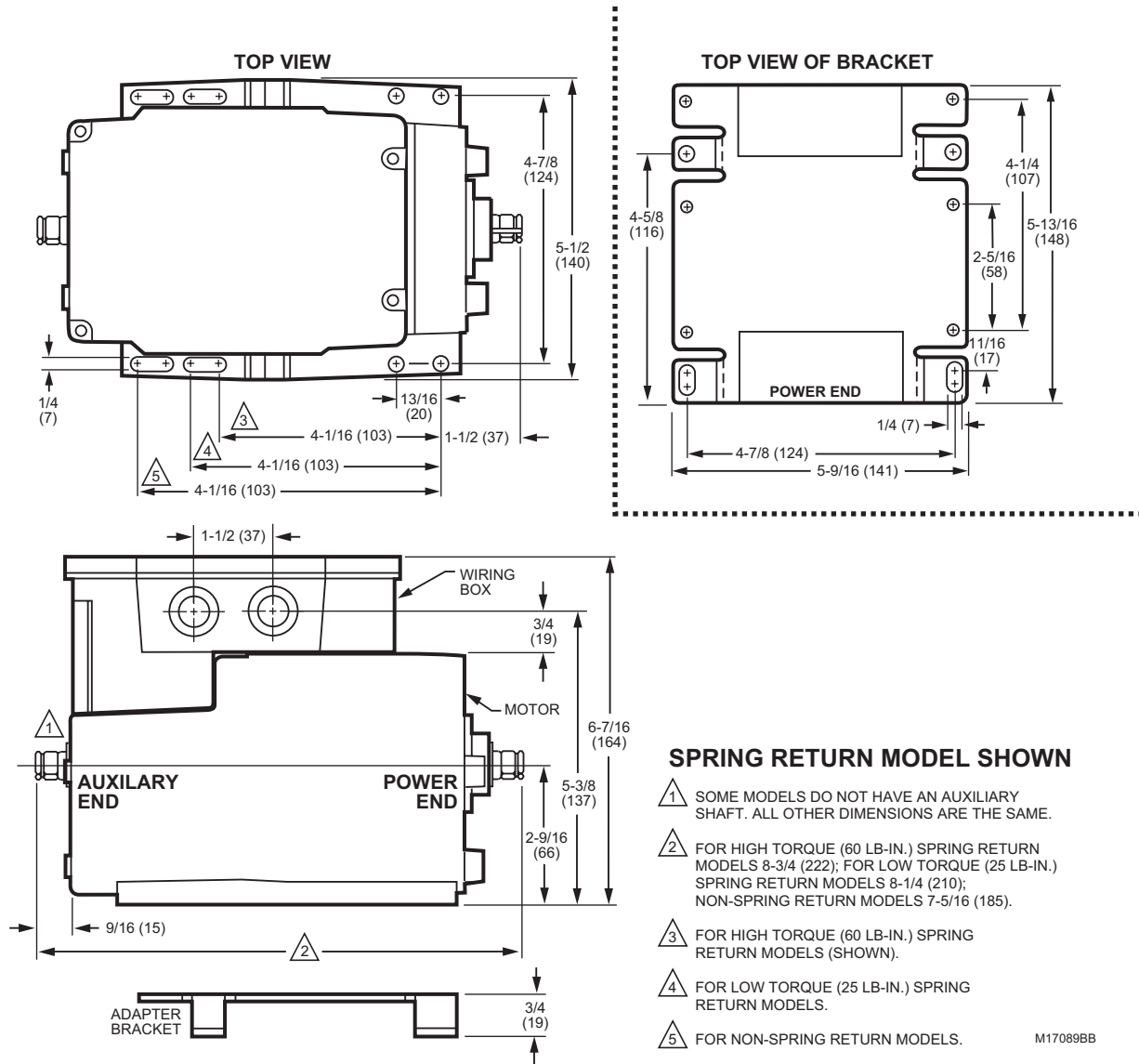


Fig. 1. Series 72 Modutrol IV Motor dimensions in in. (mm).

**Controller:** These motors can be used with any electronic controller that provides a stable noise-free proportional current output as specified in Electrical Ratings, Input Range below.

**Electrical Ratings:**

Power Consumption: See Table 2.

Input Range:

Current, Nonadjustable: 4 to 20 mA nominal, 25 mA maximum.

Current, Adjustable: 4 to 20 mA adjustable, 50 mA maximum.

Zero/Null (Motor Closed): 0.08 to 18 mA.

Span: 1.8 to 18 mA.

Voltage, Nonadjustable: 2 to 10 Vdc.

Input Impedance:

4 to 20 mA Input: 100 ohms.

2 to 10 Vdc Input: 400K ohms.

Table 2. Series 72 Modutrol IV Motor Power Consumption Ratings (at 120 Vac, 50/60 Hz).

Model	Power Consumption	
	Watts	Amps
M7261	19	0.20
M7272	26	0.26
M7274	15	0.71
M7281	23	0.24
M7282	28	0.28
M7284	23	0.24
M7285	28	0.28
M7286	23	1.00
M7294	23	0.24

**Auxiliary Switch Ratings (in Amps):** See Table 3.

**Table 3. Auxiliary Switch Ratings (in Amps).**

One Contact Rating <sup>a</sup>	120V	240V
Full Load	7.2	3.6
Locked Rotor	43.2	21.6

<sup>a</sup> 40 VA pilot duty, 120/240 Vac on opposite contact.

**Stroke:** Fixed 90° or 160° models available. Other models available with field adjustable strokes from 90° to 160°. Stroke adjusted by means of cams located in the wiring compartment.

**Timing:** Nominal 30 seconds for 90° stroke and 60 seconds for 160° stroke.

**Dead Weight Load On Shaft:** 200 lb (91 kg) on motor power or auxiliary end; maximum combined load of 300 lb (136 kg).

**Motor Rotation:**

Closed: Counterclockwise rotation limit as viewed from motor power end.

Open: Clockwise rotation limit as viewed from motor power end.

Mechanically Normally Closed: Spring return. Normally closed motors rotate to closed position on power loss.

Mechanically Normally Open: Spring return. Normally open motors rotate to open position on power loss.

Electrically Normally Closed: Both spring return and non-spring motors return to closed position on minimum signal.

Electrically Normally Open: Both spring return and non-spring return motors return to open position on minimum signal.

**Ambient Temperature Ratings:** -40 to 150°F (-40 to 66°C).

**Shaft:** 3/8 in. [9.5 mm] square.

**Approvals:**

Underwriters Laboratories Inc. Listed: File No. E4436; Guide No. XAPX.

Canadian Standards Association Certified: General listed File No. LR1620; Guide No. 400-E.

**Accessories:**

198162AA Internal Transformer 120/208/240 Vac 50/60 Hz primary, 24 Vac secondary.

198162EA Internal Transformer; 120 Vac 50/60 Hz primary, 24 Vac secondary.

198162GA Internal Transformer; 220 Vac 50/60 Hz primary, 24 Vac secondary.

198162JA Internal Transformer; 24 Vac 50/60 Hz primary, 24 Vac secondary (for electrical isolation).

220736A Internal Auxiliary Switch Kit; one switch, can be field-installed on TRADELINE models.

220736B Internal Auxiliary Switch Kit; two switches, can be field-installed on TRADELINE models.

220738A Adapter Bracket raises motor shaft height by 19 mm to match that of previous Modutrol® Motor models.

220741A Screw Terminal Adapter converts the standard quick-connect terminals to screw terminals.

221455A Infinitely Adjustable Crank Arm, can rotate through downward position and clear motor base without requiring an adapter bracket.

4074ERU Weatherproofing Kit provides NEMA 3 rating for Modutrol IV Motors mounted in position other than upright.

4074EZE Bag Assembly with parts that can provide CE compliance.

7617ADW Crank Arm, can rotate through downward position and clear motor base without requiring an adapter bracket.

ES650-117 Explosion-Proof Housing encloses motor for use in explosive atmospheres. Not for use with Q5001 (or any other valve linkages). Order separately from O-Z/Gedney Inc. To order, contact: O-Z/Gedney, Nelson Enclosures and Controls,

(918) 641-7381 or (918) 641-7374; or write to: O-Z/Gedney, Nelson Enclosures and Controls  
P.O. Box 471650

Tulsa, OK 74147-1650

(Requires Honeywell 7617DM Coupling.)

Q100 Linkage connects Modutrol® Motor to V51 Butterfly Valve. Requires the 220738A Adapter Bracket.

Q181 Auxiliary Potentiometer for sequence or unison control of 1 to 4 additional modulating (Series 90) motors.

Q5001 Bracket and Linkage Assembly connects Modutrol IV Motor to water or steam valve.

Q605 Damper Linkage connects motor to damper. Includes motor crank arm.

Q607 External Auxiliary Switch controls auxiliary equipment as a function of motor position.

# INSTALLATION

## When Installing this Product...

1. Read these instructions carefully. Failure to follow them could damage the product or cause a hazardous condition.
2. Check the ratings given in the instructions and on the product to make sure the product is suitable for your application.
3. Installer must be a trained, experienced service technician.
4. After installation is complete, check out product operation as provided in these instructions.



## CAUTION

**Electrical Shock or Equipment Damage Hazard.**  
**Can shock individuals or short equipment circuitry.**

Disconnect all power supplies before installation.  
Motors with auxiliary switches can have more than one disconnect.



## CAUTION

**Equipment Damage Hazard.**  
**Can damage the motor beyond repair.**  
Never turn the motor shaft by hand or with a wrench.  
Forcibly turning the motor shaft damages the gear train and stroke limit contacts.

### IMPORTANT

*Always conduct a thorough checkout when installation is complete.*

## Location

Allow enough clearance for accessory installation and motor servicing when selecting a location (see Fig. 1). If located outdoors, use liquid-tight conduit connectors with the junction box to provide NEMA 3 weather protection. If mounted outdoors in a position other than upright, install a 4074ERU Weatherproofing Kit and liquid-tight connectors to provide NEMA 3 protection.



## CAUTION

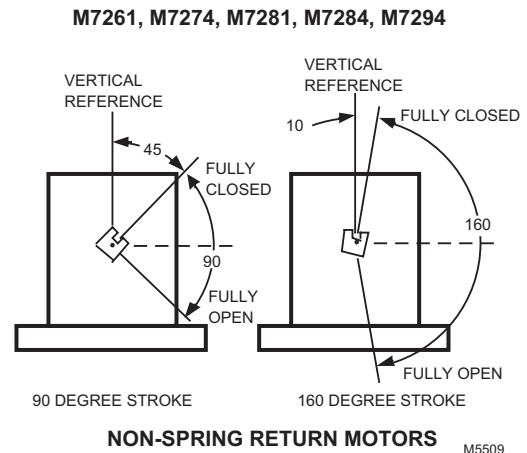
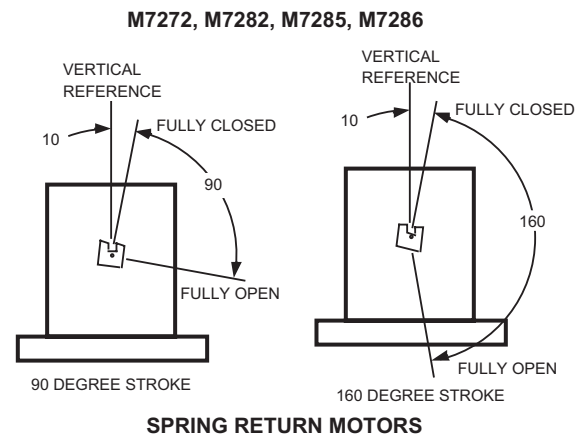
**Motor Damage Hazard.**  
**Deteriorating vapors and acid fumes can damage metal parts.**  
Install motor in areas free of acid fumes and other deteriorating vapors.

In excessive salt environments, mounting base and screws should be zinc or cadmium plated, not stainless steel or brass. Use the 220738A Adapter Bracket for mounting on these surfaces.

## Mounting

Use the following guidelines for proper motor mounting:

- Always install motors with the crankshaft horizontal.
- Mounting flanges extending from motor housing base are drilled for 1/4 inch (6.4 mm) machine screws or bolts.
- Non-Spring Return Motors are shipped from the factory in the closed position (at the counterclockwise rotation limit, as viewed from the motor power end).
- Spring Return Motors are shipped from the factory in their normal position.
- Normally closed models are shipped at the counterclockwise rotation limit, as viewed from the motor power end.
- Normally open models are shipped at the clockwise rotation limit, as viewed from the motor power end.



**Fig. 2. Motor shaft position at limit of rotation (viewed from motor power end).**

## Adapter Bracket

The 220738A Adapter Bracket, positioned between the motor and the equipment, raises motor shaft height by 0.75 in. (19 mm) to match that of previous Modutrol® Motor models.

The following applications require this bracket:

- Q607 External Auxiliary Switch.
- Damper linkage applications requiring added clearance to allow:
  - Crank arm rotation through the downward position.
  - Sufficient damper linkage to reach the motor shaft.
- All valve linkages except the Q5001.

**NOTE:** When the bracket is not used in a replacement application, the damper linkage requires adjustment for the new shaft position.

To mount the motor with the bracket:

1. Mount the bracket to the equipment with existing or standard bolts.
2. Using the provided bolts, mount the motor to the bracket threaded holes. See Fig. 3.

For valve linkage applications (other than the Q5001):

1. Mount the bracket to the linkage.
2. Position the motor on the bracket to align the motor shaft with the linkage.
3. Attach the motor to the bracket with the four bolts provided. See Fig. 4.

## Damper Linkages

The motor does not include a crank arm. Order the crank arm separately (see Accessories in the Specifications section). For detailed instructions on the assembly of specific linkages, refer to the Installation Instructions packed with the linkage.



### CAUTION

**Equipment Damage Hazard.**

**Stalling a motor can damage the drive shaft.**

Ensure installation of motors and linkages allows the motor to drive through full stroke without obstruction.

## Valve Linkages

The Q100 Linkage requires a 220738A Adapter Bracket for all valve applications. Applications with the Q5001 Valve Linkage do not require the 220738A Adapter Bracket (see Fig. 4).

For detailed instructions on specific linkage assemblies, refer to the instruction sheet packed with the linkage. In general, check the following points when installing a motor and linkage:

- Adjust valve and louver-type damper linkages so the damper or valve moves through only the maximum required distance while the motor moves through its full stroke.
- With modulating control, maximum damper opening should be no more than 60 degrees. Little additional airflow is provided beyond this point.
- Do not exceed load and torque ratings in any application.

## Junction Box

When used with liquid-tight conduit connectors, the junction box provides NEMA 3 weather protection for the motor. The junction box, standard with replacement motors, encloses the terminals and provides knockouts for wiring conduits. Housing an internal transformer or internal auxiliary switches requires using a junction box.

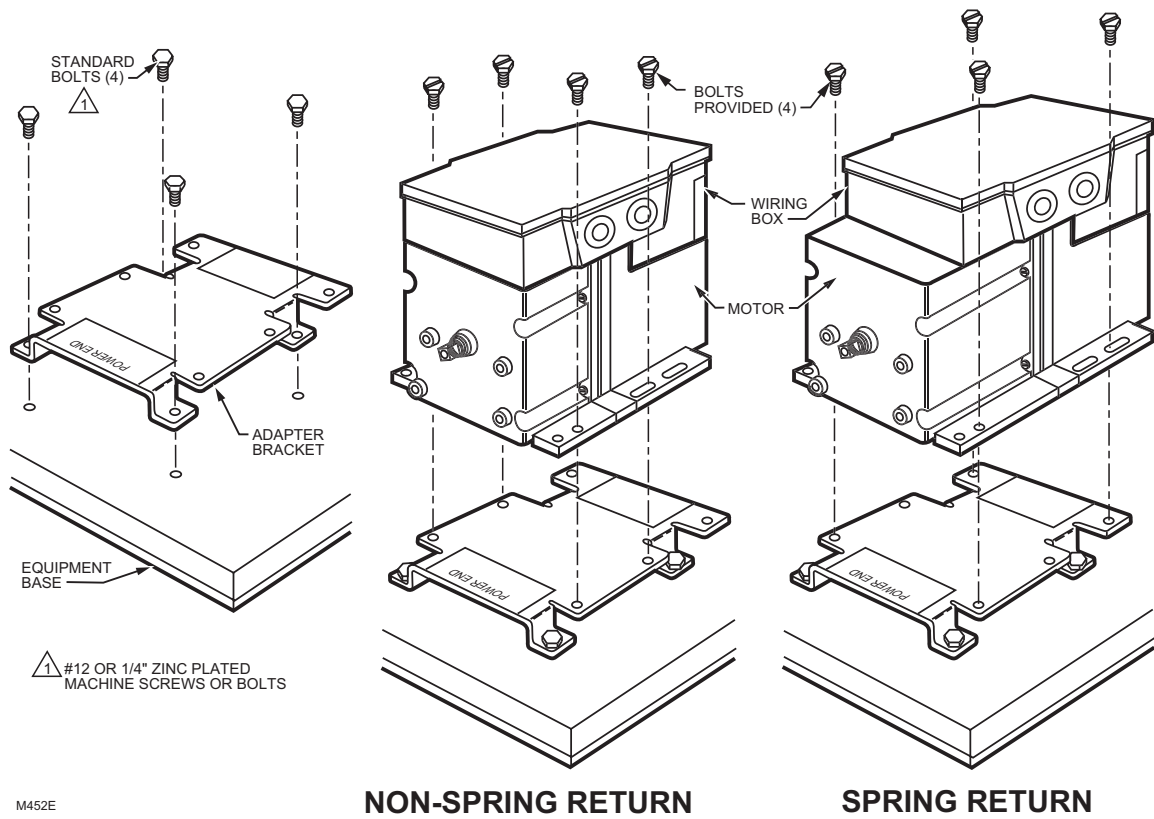


Fig. 3. Mounting the motor with an adapter bracket.

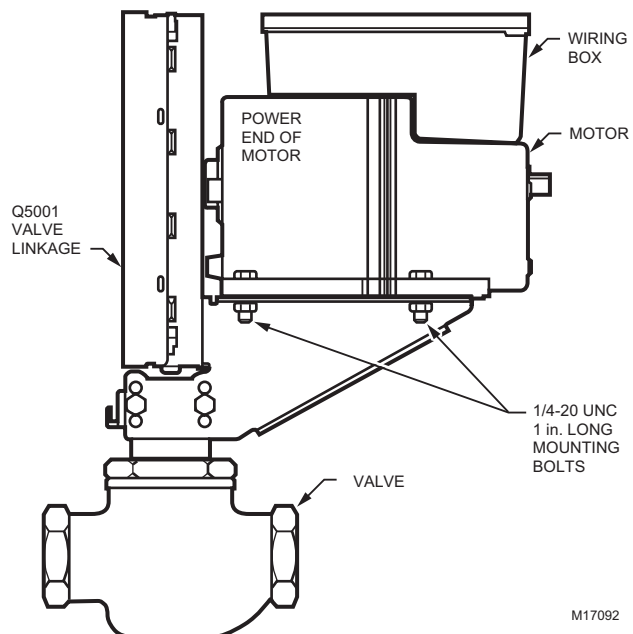


Fig. 4. Mounting the motor on a Q5001 Valve Linkage.

## Wiring

### ⚠ CAUTION

**Electrical Shock or Equipment Damage Hazard.**  
Can shock individuals or short equipment circuitry.  
Disconnect all power supplies before installation.  
Motors with auxiliary switches can have more than one disconnect.

### IMPORTANT

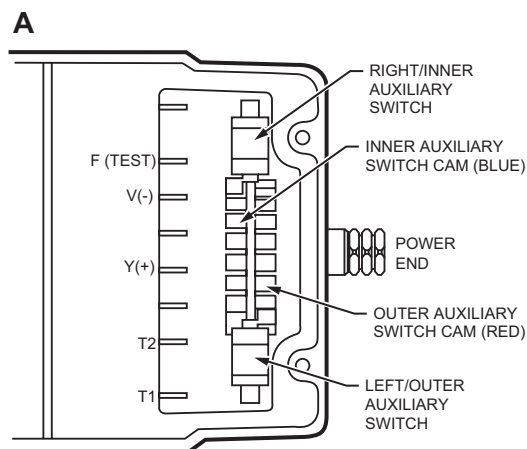
*All wiring must agree with applicable codes, ordinances and regulations.*

1. Ensure that the voltage and frequency stamped on the motor correspond with the power supply characteristics.
2. When connecting several motors in parallel, ensure that the power supply VA rating is large enough to provide power to all motors used without overloading.

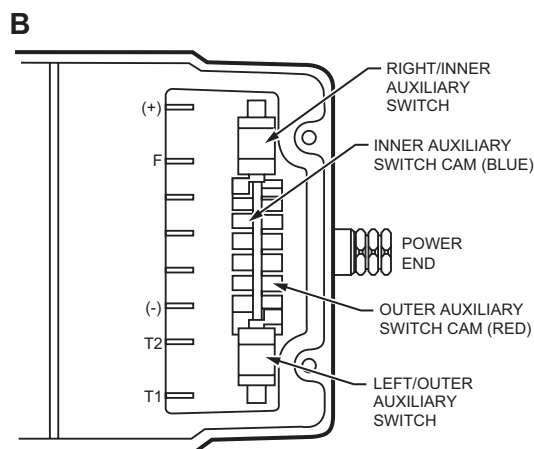
3. Fig. 5 shows that motor terminals are quick-connects located on top of the printed circuit board.
4. To access the wiring compartment:
  - a. Remove the four screws from the junction box top.
  - b. Lift off the cover.
5. Fig. 6 shows the internal wiring schematic.
6. Refer to Fig. 7 and 8 for typical wiring.

Wire the motor as follows:

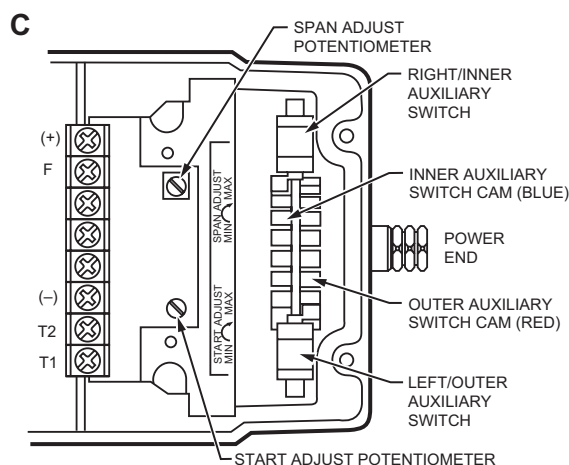
1. Remove the wiring box cover by removing the four screws holding the cover to the motor.
2. Wire motor to system using quick-connect terminals in wiring box.
3. Replace wiring box cover.



NOTE: FEATURES AVAILABLE ON SOME MODELS ONLY.  
2 TO 10 VDC INPUT MOTORS



NOTE: FEATURES AVAILABLE ON SOME MODELS ONLY.  
4 TO 20 mA NONADJUSTABLE INPUT MOTORS

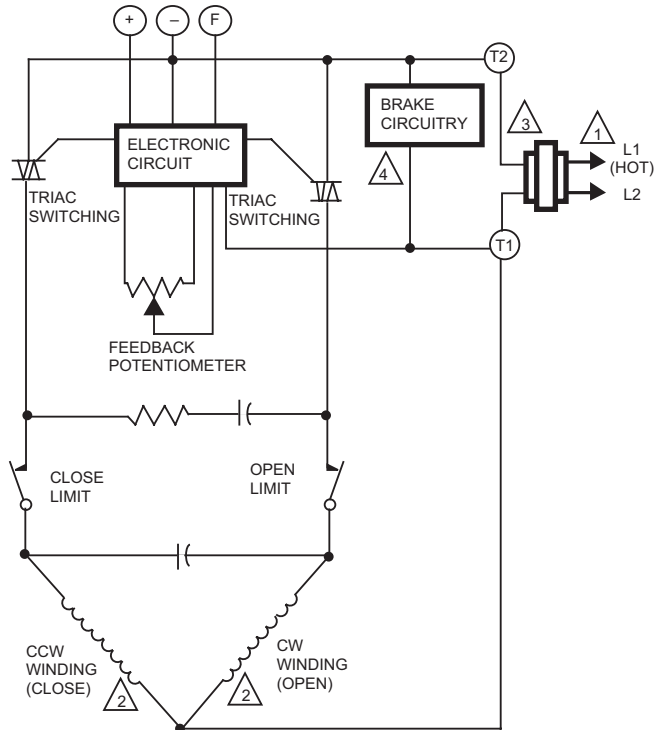


NOTE: FEATURES AVAILABLE ON SOME MODELS ONLY.  
4 TO 20 mA ADJUSTABLE INPUT MOTORS

M5777

**Fig. 5. Terminals and adjustments.**

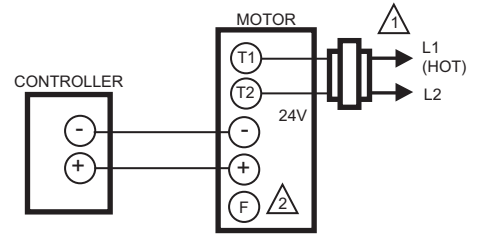




- 1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.
- 2 DIRECTION OF MOTOR TRAVEL AS VIEWED FROM POWER END.
- 3 INTERNALLY MOUNTED TRANSFORMER. DO NOT CONNECT POWER SUPPLY TO T1 AND T2.
- 4 BRAKE CIRCUITRY ONLY ON SPRING RETURN MODELS.

M5511

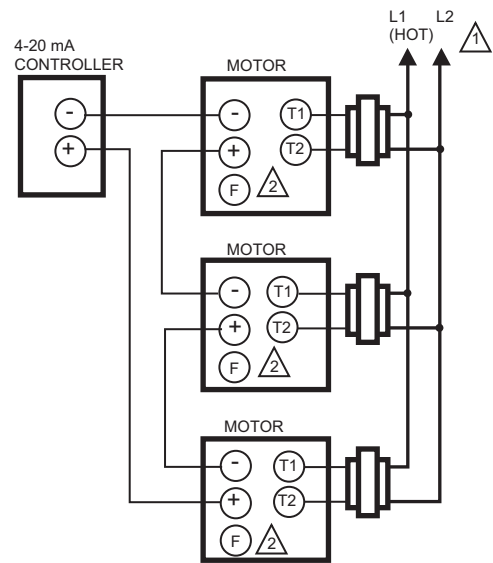
**Fig. 6. Series 72 motor internal wiring schematic.**



- 1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.
- 2 CONNECTING F TO - WILL DRIVE MOTOR TO FULLY OPEN.

M5778

**Fig. 7. Typical system wiring.**



- 1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.
- 2 CONNECTING F TO - WILL DRIVE MOTOR TO FULLY OPEN.

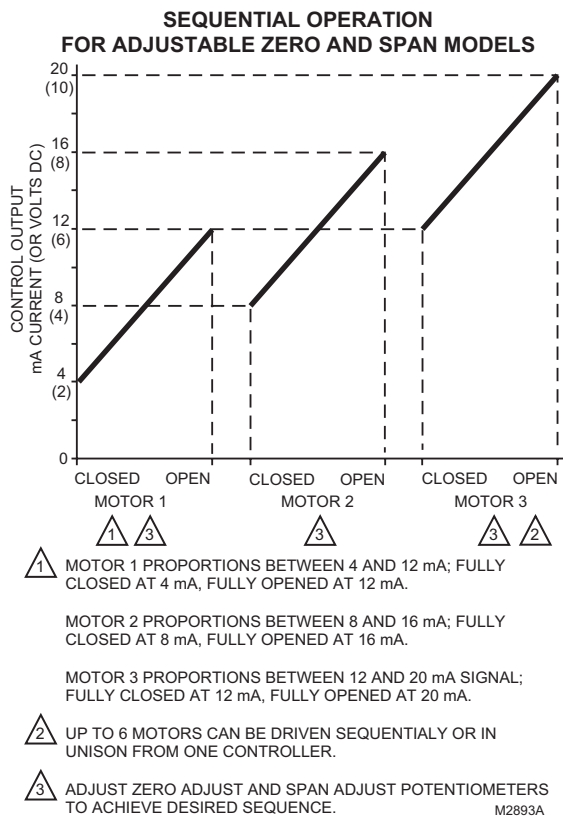
M5774

**Fig. 8. Driving up to six motors from one 4 to 20 mA controller.**

## SETTINGS AND ADJUSTMENTS

### Zero and Span Adjustment for M7284Q and M7285Q Motors (Fig. 5.)

1. Adjust the start potentiometer fully clockwise (maximum zero) and the span potentiometer fully counterclockwise (minimum span).
2. Set the controller current to the value required to drive the motor to the closed position.
3. Turn the start potentiometer slowly counterclockwise until the motor begins to open. This is defined as the start or zero setting.
4. Set the controller current to the value required to drive the motor to the fully open position. The motor will open.
5. Turn the span potentiometer clockwise until the motor starts to close. The difference between the fully open span position current and the zero position current is defined as the operating span.
6. Recheck the start and readjust the span potentiometer P1 if necessary. Turn the start potentiometer clockwise to increase the zero position.
7. Recheck the span and readjust the span potentiometer if necessary. Turn it clockwise to increase the full span position.
8. For sequential operation, as shown in Fig. 9, repeat the above steps for each motor.



**Fig. 9. Sequential operation of motors.**

### Auxiliary Switches



#### CAUTION

**Electrical Shock or Equipment Damage Hazard.**  
**Can shock individuals or short equipment circuitry.**

Disconnect all power supplies before installation. Motors with auxiliary switches can have more than one disconnect.



#### CAUTION

**Equipment Damage Hazard.**

**Can damage the motor beyond repair.**

Never turn the motor shaft by hand or with a wrench. Forcibly turning the motor shaft damages the gear train and stroke limit contacts.

Adjustable cams actuate the auxiliary switches. These cams can be set to actuate the switches at any angle within the motor stroke. Select switch differential of 1° or 10°.

Motors with factory added auxiliary switches are shipped in the closed position (fully counterclockwise, as viewed from the motor power end) with auxiliary cams set to actuate switches 30° from the closed position and to provide 1° degree differential. With the motor in the closed (fully counterclockwise) position, the auxiliary switch breaks contacts R-B. See Fig. 10 for auxiliary switch wiring.

TRADELINE Motors are shipped with auxiliary switch cams that permit acceptance of 220736A,B Internal Auxiliary Switch Kits. Refer to form 63-2228 for 220736A,B Installation Instructions.

## Auxiliary Switch Adjustment

### IMPORTANT

When adjusting the auxiliary switch cams use the following procedure:

1. Insert 1/8 in. screwdriver blade into a slot on cam and move the screwdriver top as far as possible in the required direction. See Fig. 10.
2. Repeat step 1 in successive cam slots until the cam is in the required position.

Use the following procedure to obtain the desired auxiliary switch settings:

1. Remove the top cover from the motor to gain access to the motor terminals and auxiliary cams.
2. Disconnect the controller from the motor.
3. Connect a current source to the positive and negative terminals.
4. Drive the motor to the position where the auxiliary equipment is to be switched by increasing or decreasing the current.
5. For a switch differential of 1°, check continuity of auxiliary switch contacts R-B and rotate the cam as follows:
  - a. If the contacts are open, rotate the cam clockwise until the R-B contacts close.
  - b. If the contacts are closed, rotate the cam counterclockwise until the R-B contacts open.

6. For a switch differential of 10° rotate the cam approximately 180° so the slow-rise portion of the cam actuates the switch.
7. Check continuity of the auxiliary switch contacts R-B.
8. Rotate the cam as follows:
  - a. If the contacts are open, rotate the cam counterclockwise until the R-B contacts close.
  - b. If the contacts are closed, rotate the cam clockwise until the R-B contacts open.
  - c. Make final adjustment in the proper direction to obtain contact make or break at the desired position.
9. Check for the proper differential and switching of the auxiliary equipment by driving the motor through the full stroke in both directions.
10. Disconnect power, remove current source, reconnect the controller, and replace the top cover on the motor.

**NOTE:** Changing the differential from 1° to 10° reverses the switching action. For example, with a 10° differential, switch contacts R-B make and R-W break on a counterclockwise (closed) rotation. With a 1° differential, switch contacts R-W make and R-B break on a counterclockwise (closed) rotation.

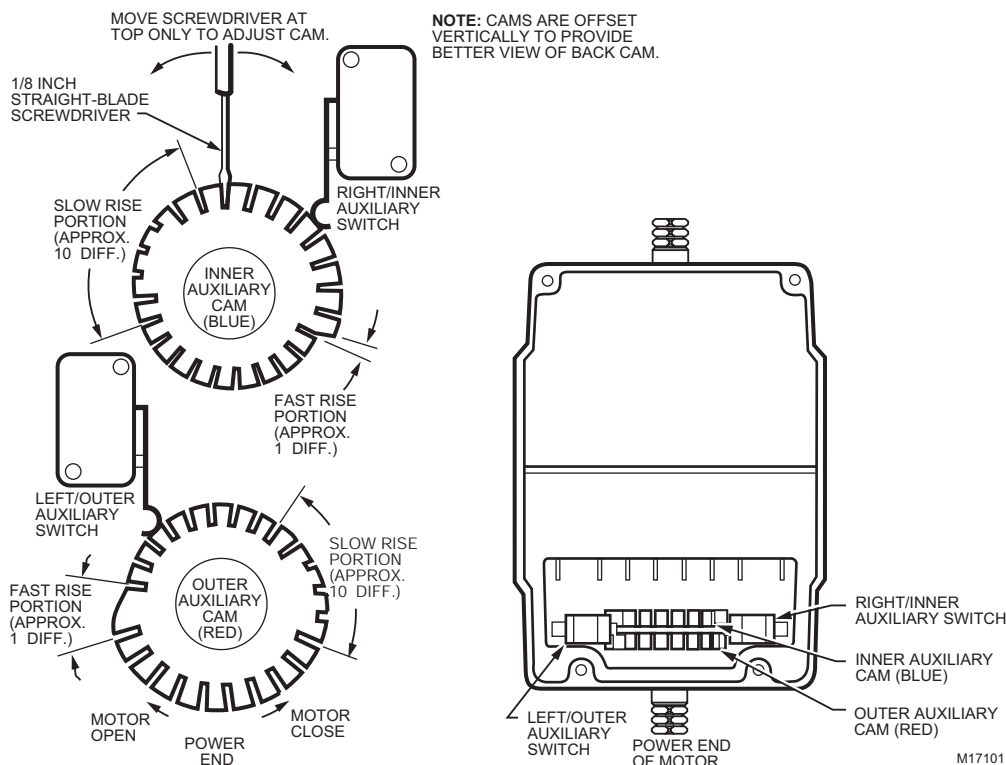


Fig. 10. Auxiliary switch adjustment.

# OPERATION AND CHECKOUT

## Operation

The motor feedback potentiometer and control current input circuit form a bridge circuit. As long as the final control element remains at the position proportional to the input current from the controller, the circuit is balanced, and the motor does not run. When the value of the controlled medium changes, the current from the controller changes, and unbalance is amplified to energize the Triac switching to run the motor in the proper direction to correct the change in the temperature or the pressure. The motor turns the feedback potentiometer to rebalance the circuit and stop the motor.

## Checkout

After installation and linkage adjustment, operate the motor through the controller. Make sure that:

- The motor properly operates the damper or valve.
- The motor responds properly as the input is varied.
- The auxiliary switch, if used, operates at the desired point of motor rotation.

Inspect the motor, linkage, and valve or damper to see that all mechanical connections are correct and secure.

In damper installations, the pushrod should not extend more than a few inches past the ball joints. Check to see that there is adequate clearance for the linkage to move through its stroke without binding or striking other objects.

See controller or system instructions for additional checkout procedures.

## Motor Operation Checkout

Check motor operation as follows:

1. To close the motor, open terminals +, -, and F.
2. To open the motor, connect terminal F to the negative (-) motor terminal.



<b>Home and Building Control</b> Honeywell 1985 Douglas Drive North Golden Valley, MN 55422	<b>Home and Building Control</b> Honeywell Limited-Honeywell Limitée 35 Dynamic Drive Scarborough, Ontario M1V 4Z9	<b>Honeywell Asia Pacific Inc.</b> Room 3213-3225 Sun Hung Kai Centre No. 30 Harbour Road Wanchai Hong Kong	<b>Honeywell Europe S.A.</b> 3 Avenue du Bourget 1140 Brussels Belgium	<b>Honeywell Latin American Region</b> 480 Sawgrass Corporate Parkway Suite 200 Sunrise FL 33325
--	--	--	---	---

