

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 installing accessories 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



CAUTION

Equipment Damage Hazard.
Can damage the motor beyond repair.
 Always install motors with the crankshaft horizontal. Improper motor mounting can result in inadequate motor gear train lubrication.

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 limit of counterclockwise rotation, as viewed from the power end of the motor).
- Spring Return Motors are shipped from the factory in their normal position:
 - Normally closed models: shipped at limit of counterclockwise rotation, as viewed from the power end of the motor.

NOTE: Refer to Fig. 2 for graphical representation of full open and full closed.

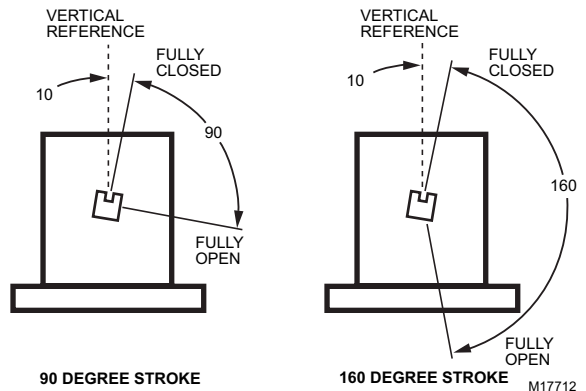


Fig. 2. Motor shaft positions at stroke limits (viewed from power end of motor).

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 the former Modutrol Motor.

The following applications require this bracket:

- Q607 External Auxiliary Switch.
- Damper linkage applications require 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 no bracket is used in replacement applications, damper linkages require adjustment for the new shaft position.

To mount the motor with the bracket (see Fig. 3):

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.

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.

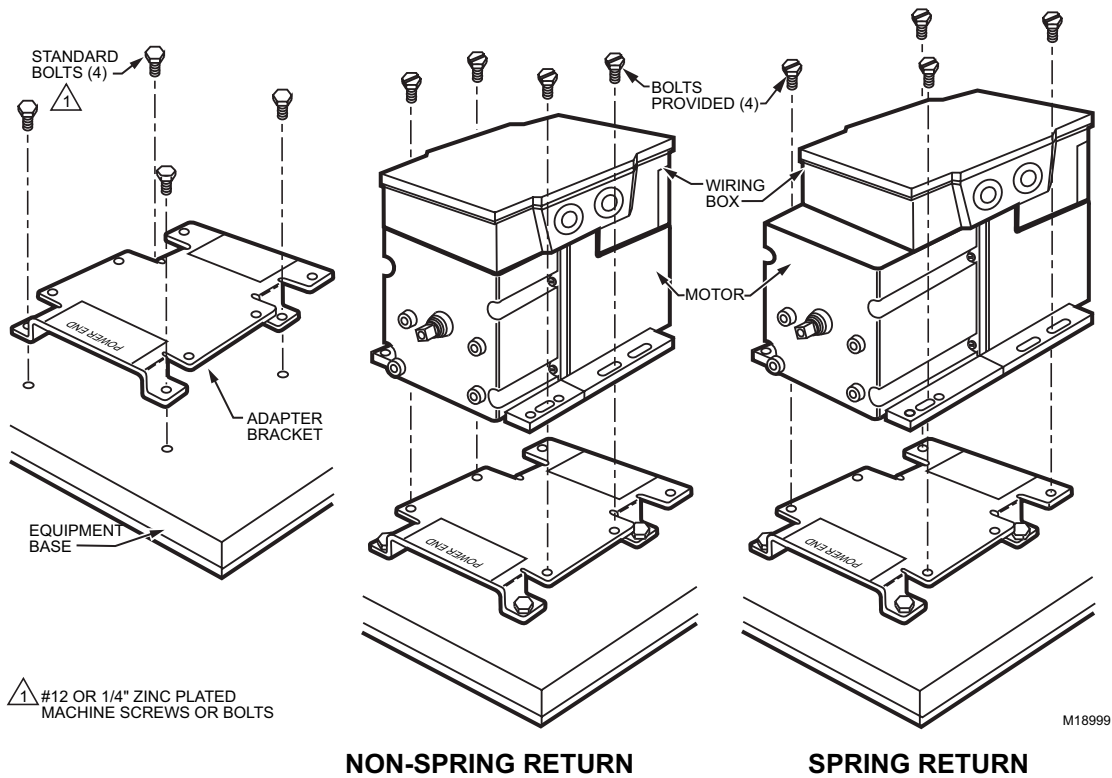


Fig. 3. Mounting the motor with an adapter bracket.

Damper Linkages

The motor does not include a crank arm. Order the crank arm, included in the Q605 Linkage, separately (see Accessories in the Specifications section). For detailed instructions on the assembly of specific linkages, refer to the instruction sheet 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 the 220738A Adapter Bracket for all valve applications. Applications with the Q5001 Valve Linkage do not require the 220738A Adapter Bracket (see Fig. 4).

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 use of the junction box.

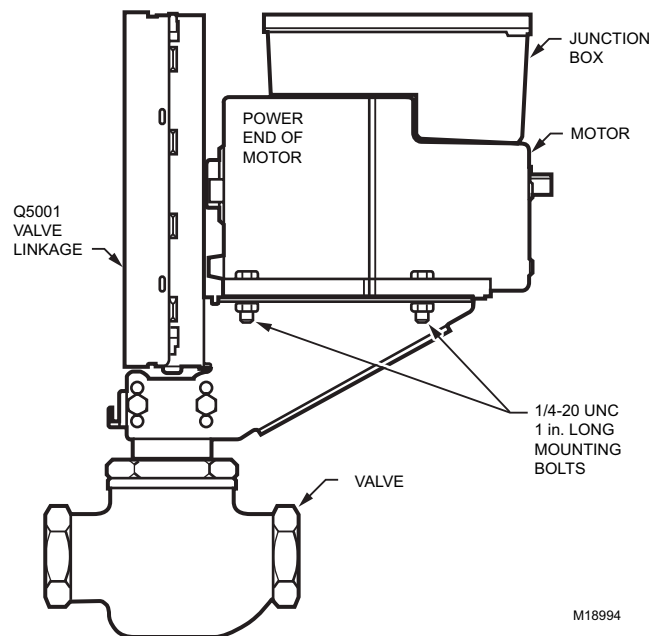


Fig. 4. Mounting the motor on a Q5001 Valve Linkage.

Wiring



CAUTION

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

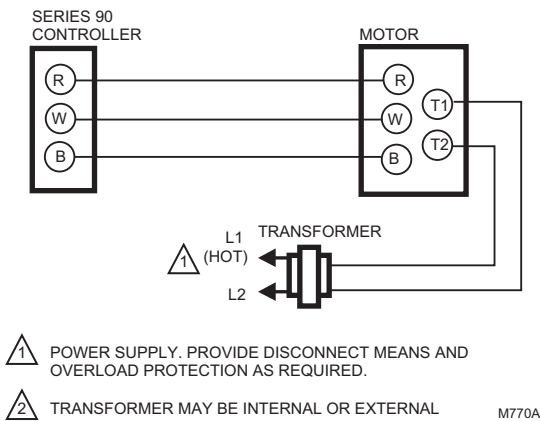
Disconnect power supply before installation.

IMPORTANT

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

1. Ensure that the voltage and frequency stamped on the motor correspond to 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. 9 shows that the 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. Refer to Fig. 5 for typical wiring, and Fig. 7 for internal auxiliary switch connections.

NOTE: Reverse motor rotation by switching wires at either the motor or the panel. Reverse rotation on the Series 90 models by reversing the wires at terminals W and B.

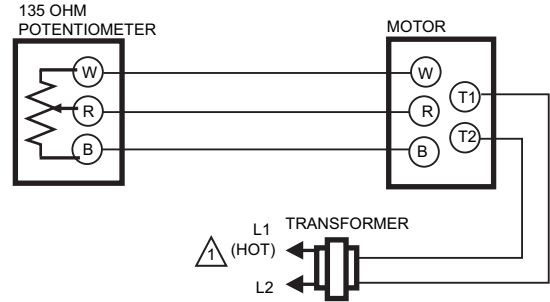


1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2 TRANSFORMER MAY BE INTERNAL OR EXTERNAL

M770A

Fig. 5. Typical Series 90 wiring.

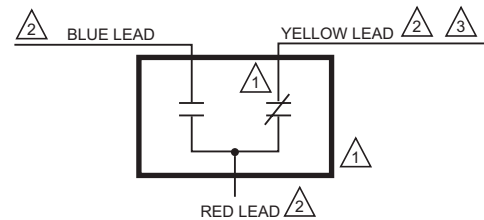


1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2 TRANSFORMER MAY BE INTERNAL OR EXTERNAL

M1370B

Fig. 6. Wiring for potentiometer control.



1 USE NEC CLASS 1 WIRING UNLESS POWER SUPPLY MEETS CLASS 2 REQUIREMENTS. TAPE UNUSED LEADS. ENSURE THE CURRENT DRAW OF THE EXTERNAL CIRCUIT IS LESS THAN SWITCH CONTACT RATING.

2 ON TWO-SWITCH MOTORS, SECOND SWITCH HAS BLACK LEADS WITH BLUE, YELLOW, AND RED TRACERS.

3 SOME AUXILIARY SWITCH ASSEMBLIES INCLUDE ONLY RED AND YELLOW LEADS. SOME OTHERS DO NOT INCLUDE THE YELLOW LEAD.

M17099

Fig. 7. Auxiliary switch schematic.

SETTINGS AND ADJUSTMENTS



Before Setting Stroke

1. Remove the top cover from the motor.
2. Disconnect the controller from the motor.
3. Connect a potentiometer to the motor as shown in Fig. 6.

IMPORTANT

Detach linkage from motor before adjusting stroke.

Adjustable Stroke

The stroke adjustment is made by means of two potentiometers, the stroke and sensitivity potentiometers. When viewing from the power end of the motor, the stroke potentiometer is to the far left and sensitivity potentiometer is to the far right (see Fig. 8). To set the stroke to 160° (maximum position) turn the both potentiometers fully clockwise , using a 1/8 in. straight-blade screwdriver. To set the stroke at 90° (minimum position) turn both potentiometers fully counter-clockwise .

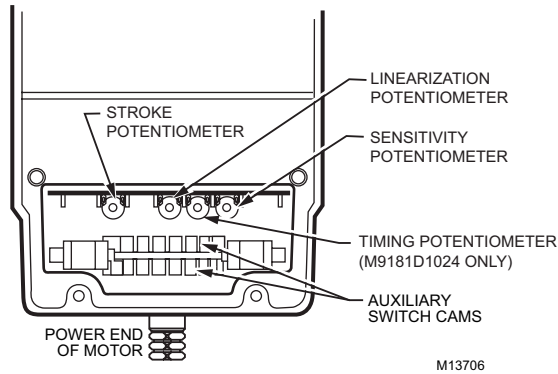


Fig. 8. Potentiometer location and stroke adjustment setup for non-spring return Series 90 Motors

To set the stroke between 90° and 160° follow the procedure below:

1. Turn the stroke potentiometer fully CW , using a 1/8 in. straight-blade screwdriver to set 160° stroke.
2. Set the maximum position using an external 135 Ohm potentiometer.
3. Turn the sensitivity potentiometer, so that the shaft reaches the final position of selected stroke.
4. Turn the stroke potentiometer CCW until the shaft begins to move. Then turn potentiometer back slightly to have the position correspond to the sensitivity potentiometer.
5. Make sure the minimum position corresponds, as well.

Linearization Potentiometer

Series 90 motors use a linearization potentiometer. This potentiometer should be adjusted only when Series 90 is used with an interface module, which converts the control from series 90 to series 70. If you use an interface module, set the linearization potentiometer according to the switch on the interface module. Turn the potentiometer fully CW for driving the motor CW, turn the potentiometer fully CCW for driving the motor CCW. Table 6 summarizes the modules and the positions of the linearization potentiometer.

Table 6. Position of Linearization Potentiometer

Interface Module	Control signal	Linearization Potentiometer	Notes
Q7130	4-7V; 6-9V; 10.5-13.5V; CW or CCW	CW or CCW according to the CW/CCW switch on the module	
Q7230	Voltage/current could be adjust by Span and Zero potentiometer on module CW or CCW	CW or CCW according to the CW/CCW switch on the module	Customer is able to adjust the range of input signal the same way Series 70 units with adjustable span and zero.
Q7630	14-17V; CW or CCW	CW or CCW according to the CW/CCW switch on the module	
221508A with shunt resistor	Series 90 controller; more Series 90 units as slaves CW or CCW	Middle point (no linearization)	Customer is able to select the number of slave units to connect together
221508A used as a converter to Series 70 with no slaves	4 - 20mA	Just CW	Only one unit (no slaves)
221508A used as a converter to Series 70 with 1 or more slaves	4-20mA	Middle point (no linearization)	Customer is able to select the number of slave units to connect in parallel
Q7330A1004	W936 controller	Only CW	Voltage range is approximately 0.7 (fully closed) to 1.9 Vdc (fully open)

Adjustable timing for M9181D1024

The timing potentiometer (the second from the right, see Fig. 8) sets the timing to 1minute, if turned fully CCW , 2 minutes if turned to its middle point and 4 minutes if turned fully CW .



CAUTION

Careless Installation Hazard.
Use of excessive force while adjusting cams damages the motor.

To avoid damaging motor end switches, set cams by moving only the top of the screwdriver.



CAUTION

Careless Installation Hazard.
Forcibly turning the motor shaft damages the gear train and stroke limit contacts.

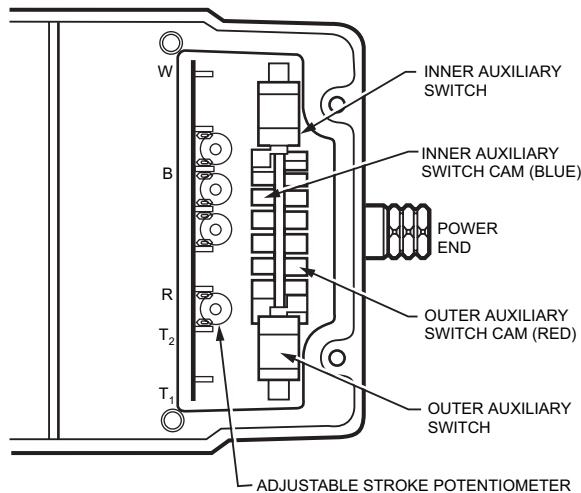
Never turn motor shaft manually (by hand or with a wrench).



CAUTION

Equipment Damage Hazard.
Can damage the motor beyond repair.

Set cams by moving the top of the screwdriver only. Pressing screwdriver against cam slot sides or use of excessive force can damage motor end switches.



NOTE: NOT ALL FEATURES AVAILABLE ON ALL MODELS. M13707

Fig. 9. Terminals and adjustments.

Auxiliary Switches

Adjustable cams actuate the auxiliary switches. These cams can be set to actuate the switches at any angle within the stroke of the motor. 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 power end). Auxiliary cam default actuates the switches 30° from full open with a 1° differential. With the motor in the closed (fully counterclockwise) position, the auxiliary switch breaks contacts R-B. See Fig. 7 (or the auxiliary switch Instruction Sheet) for auxiliary switch wiring.

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

NOTE: Series 2 Motors are shipped with auxiliary switch cams that permit acceptance of 220736A,B Internal Auxiliary Switch Kits. Refer to Form no. 63-2228 for 220736A,B Installation Instructions.

Auxiliary Switch Adjustment

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 potentiometer to the motor as shown in Fig. 6.
4. Using the potentiometer, drive the motor to the position where the auxiliary equipment is to be switched.
5. For a 1° switch differential, check continuity of the 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 10° switch differential:
 - a. Spring return models: rotate the cam approximately 180° so that the slow-rise portion of the cam actuates the switch. Then check continuity of the auxiliary switch contacts R-B.
 - b. Non-spring return models: check continuity of the auxiliary switch contacts R-B.
7. 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.
8. Check for proper auxiliary equipment differential and switching by driving the motor through the full stroke in both directions.
9. Disconnect the potentiometer, reconnect the controller, and replace the motor top cover.

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.