

ML4465, ML8465, ML7475 Direct Coupled Spring- Return Actuators

The ML4465, ML8465 and ML7475 electronic Direct Coupled Spring-Return Actuators are designed for control of building HVAC dampers. They are suitable for use with spdt controllers (ML4465 and ML8465) or electronic modulating systems (ML7475).



- ML4465 and ML8465 provide on/off control; have space available for fitting double auxiliary switch.
- ML7475 operates on 0 to 10 Vdc or 2 to 10 Vdc signal, depending on model; for use with W7600 or other configurable DDC controller.
- Adjustable zero and span on ML7475 2 to 10 Vdc model.
- Mounts directly on damper shaft; no additional linkage required.
- Die-cast aluminum housing.
- Spring-return, maintenance-free electric motor protected against locking and overloading for entire range of rotation.
- Maximum 90° angular rotation manually adjustable using 5/32 in. (4 mm) hex wrench.
- Provides 105 lb.-in. torque.
- Spring return time approximately 30 seconds.
- Actuator time of 70 seconds for 90° stroke at 60 Hz.
- Visible indication of angular rotation on actuator body.
- Symmetrical body mountable for clockwise (cw) or counterclockwise (ccw) spring-return.
- Optional crank arm available for attaching linkage, when required.

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Specifications

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.*

MODELS: ML4465/ML8465A/ML7475 Direct Coupled Spring-Return Actuators. Include 3 ft, plenum rated connection cable with 6 in. leadwires for easy hookup.

ML7475A: Models operate on 0 to 10 or 2 to 10 Vdc signal; specify when ordering. Adjustable zero and span on 2 to 10 Vdc model.

ML4465 and ML8465A: On/off control inputs; have space available for optional double auxiliary switch.

Model	Control Input
ML8465A	On/Off input 24 Vac.
ML7475A	0-10 Vdc signal from controller. 2-10 Vdc signal from controller. With adjustable zero and span.
ML4465A	On/Off control input 115 Vac.

ELECTRICAL RATINGS:

Input Voltage: 24 Vac +/-20%, 50/60 Hz.; 115 Vac +/-20%, 50/60 Hz.

Power Consumption:

Opening: 1.04A, 25 VA

Holding Open: 0.25A, 6 VA

Input Impedance: 100K ohms.

AUXILIARY SWITCH RATINGS (ML4465A and ML8465A only):

Switch Load: 3A at 24 Vac and 115 Vac

Switch points: 12 and 80 degrees angular rotation.

Electrically selective NO or NC (not simultaneously).

SIGNAL RATINGS:

0 to 10 Vdc Model:

Input Signal leadwire: SIG wire.

Voltage: 0 to 10 Vdc.

Current: 0.1 mA maximum.

2 to 10 Vdc Adjustable Zero and Span Model:

Position output signal leadwire: U wire.

Voltage: 2 to 10 Vdc.

Current: 0.5 mA maximum.

AMBIENT TEMPERATURE RANGES: -22°F to +122°F [-30°C to +50°C].

ACOUSTIC NOISE: 60 dBA at one meter.

HUMIDITY: 10 to 95 percent relative humidity, non-condensing.

TORQUE RATING: 105 lb.-in. [12 N•m].

STROKE: 90° nominal, 94° maximum.

RUNNING TIME FOR 90° STROKE:

Opening:

60 Hz: 70 seconds.

50 Hz: 80 seconds.

Closing (on Power Loss) with Spring Return: 30 seconds.

DAMPER SHAFT MOUNTING:

- Suitable for mounting onto 3/8 in. (10 mm) to 13/16 in. (21 mm) round or 3/8 in. (10 mm) to 5/8 in. (16 mm) square damper shafts with adjustable 203416 U-Bolt Clamp Assembly secured by two screws.
- Damper shaft must extend 13/16 in. (21 mm) beyond damper housing to connect to actuator. If damper shaft is not long enough, use 203406 Extension (ordered separately) for damper drive shaft.
- 203415 Mounting Bracket included to secure actuator to mounting surface. Can be used as supplied or bent to any shape required.
- Motor may be mounted with damper shaft in any position.

APPROVALS: Underwriter's Laboratories Listed (UL873).

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, or specify—

1. Model number.
2. Model with adjustable zero and span (ML7475A only).
3. Auxiliary switch (ML8465 only), if desired.
4. Accessories, if desired.

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

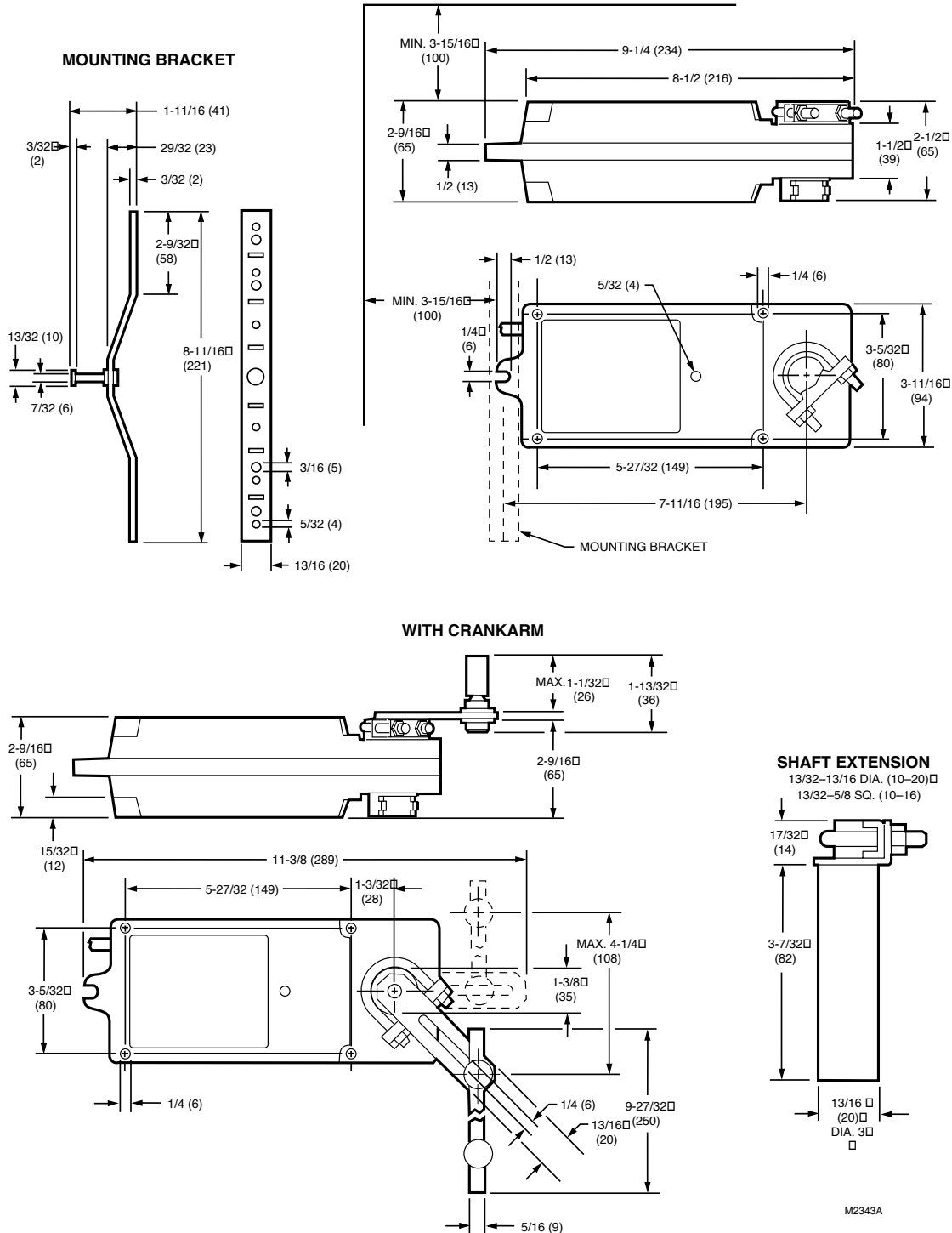
1. Your local Honeywell Home and Building Control Sales Office (check white pages of your phone directory).
2. Home and Building Control Customer Logistics
 Honeywell Inc., 1885 Douglas Drive North
 Minneapolis, Minnesota 55422-4386 (612) 951-1000

In Canada— Honeywell Limited/Honeywell Limitée, 740 Ellesmere Road, Scarborough, Ontario M1P 2V9. 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.

DIMENSIONS: See Fig. 1.
HOUSING: Die-cast aluminum.
ACCESSORIES INCLUDED:
 203415 Mounting Bracket
 203416 Shaft U-Bolt Clamp Assembly

OPTIONAL ACCESSORIES:
 203405 Linear Crankarm Set
 203406 Extension for Damper Drive Shaft
 203407 Angular Rotation Limiter
 203409 Double Auxiliary Switch (for use with ML4465 or ML8465 actuator only)
 203901 Conduit Connector (included on ML4465)

Fig. 1—Approximate dimensions of ML4465/ML8465/ML7475 Direct Coupled Actuators in in. (mm).



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 and description given 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 the applicable specifications.

CAUTION

1. Disconnect power before installation to prevent electrical shock or equipment damage.
2. To prevent damage to the gear train, never turn the motor shaft by hand or with a wrench.
3. Do not install actuator in areas with acid fumes or other deteriorating vapors that might attack the metal parts of the motor.
4. Do not install actuator in areas with escaping gas or other explosive vapors that could be ignited by a spark from the actuator or attached accessories.

LOCATION

Install the motor in a location free from acid fumes or other deteriorating vapors that might attack the metal parts of the motor. Also, make sure that the location is free from escaping gas or other explosive vapors that could be accidentally ignited by a spark from the motor or its attached parts.

Install the motor in a location that allows enough clearance for mounting accessories and for servicing.

MOUNTING

General

The ML4465, ML8465 and ML7475 are designed to operate a damper by driving the damper shaft either cw or ccw, depending on damper design. All actuators are shipped in the fully ccw position.

A mounting bracket (see Fig. 1) is included with each actuator to be used for installing the actuator. It can be bent to any shape needed to provide the proper support height for the actuator.

The mounting bracket pin must be inserted into the groove in the actuator mounting ear slot. See Fig. 2. When correctly mounted, the mounting bracket pin slides freely in the groove to compensate for any off-center rotation of the damper shaft. Fig. 3 shows the actuator correctly mounted on the damper.

CAUTION

Do not use the actuator as a shaft bearing. The actuator must be used to provide rotational torque only. To prevent damage to the actuator, avoid any side loads to the actuator output coupling bearings.

Fig. 2—Correct use of mounting bracket pin.

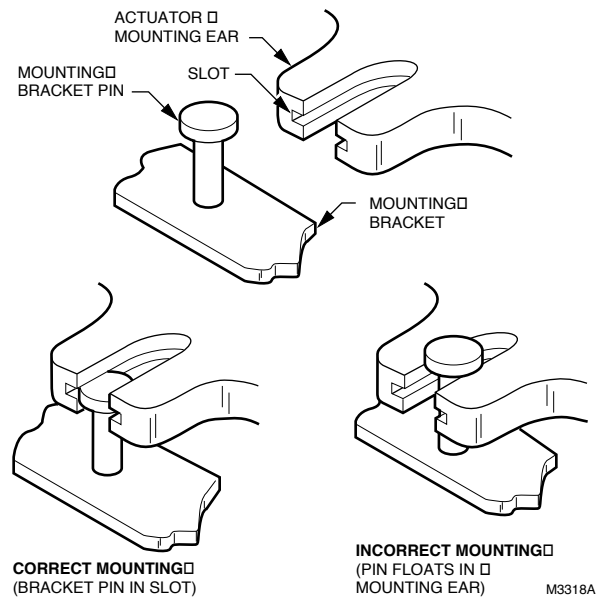
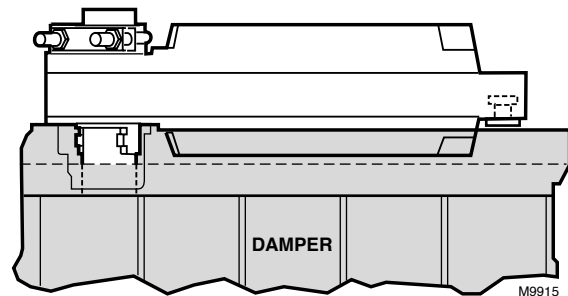


Fig. 3—Correct use of mounting bracket provides stability while allowing for any off-center damper rotation.



Preparation

Before installing the ML4465/ML8465/ML7475 on the damper shaft, determine the opening direction of the damper shaft, either cw or ccw (see Fig. 4). This information is needed to correctly attach the U-bolt clamp assembly (see Fig. 5). The actuator may be mounted to the damper shaft with either side facing the damper housing. Refer to the faceplate of the actuator for the correct side to use. If the side chosen requires that the U-bolt clamp assembly be installed on the inner side (between the actuator and the

damper housing), the damper shaft must extend a minimum of 13/16 in. (21 mm) beyond the damper housing to allow clearance for accessibility to the clamp bolts. Outside mounting requires 2-3/4 in. minimum damper shaft length beyond the damper housing (see Fig. 6). If the damper drive shaft is too short, mount with the damper shaft extension, see Extending the Damper Drive Shaft.

Fig. 4—Determining direction of damper rotation.

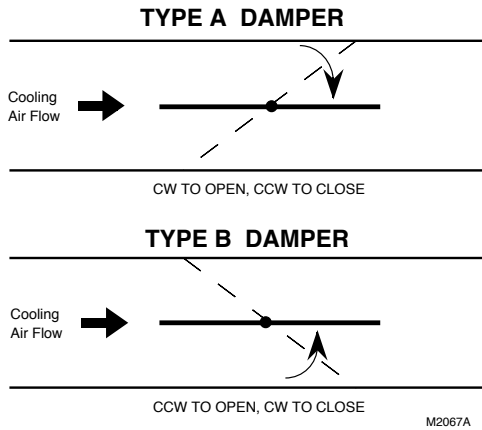


Fig. 6—Outside and inside clearances for U-bolt clamp mounting.

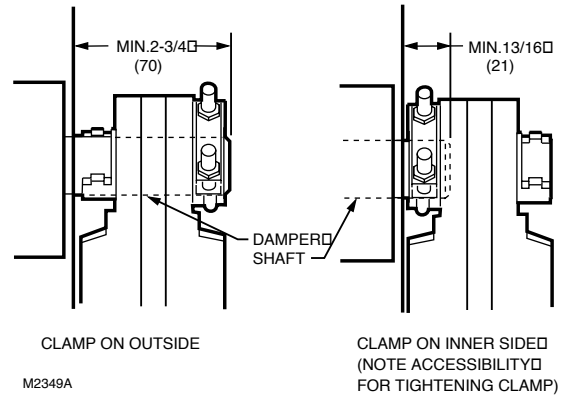
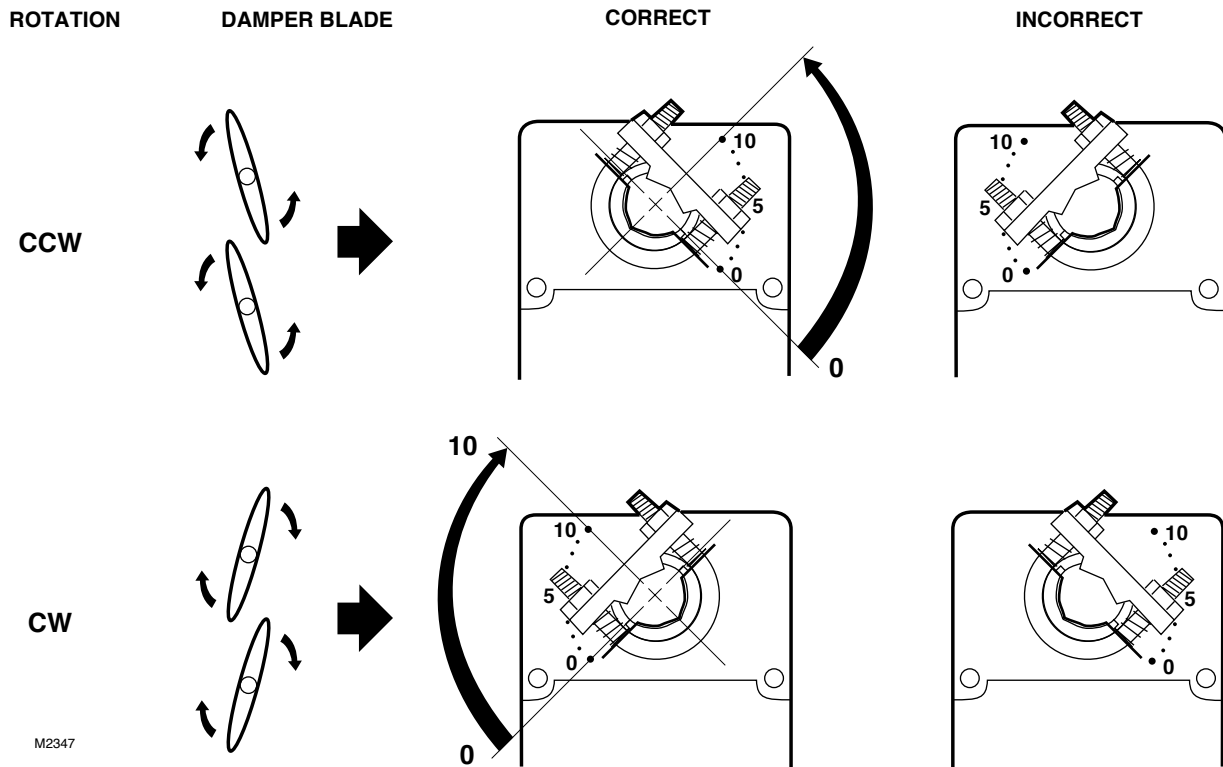


Fig. 5—Actuator mounting direction and U-bolt clamp assembly attachment.



Installation

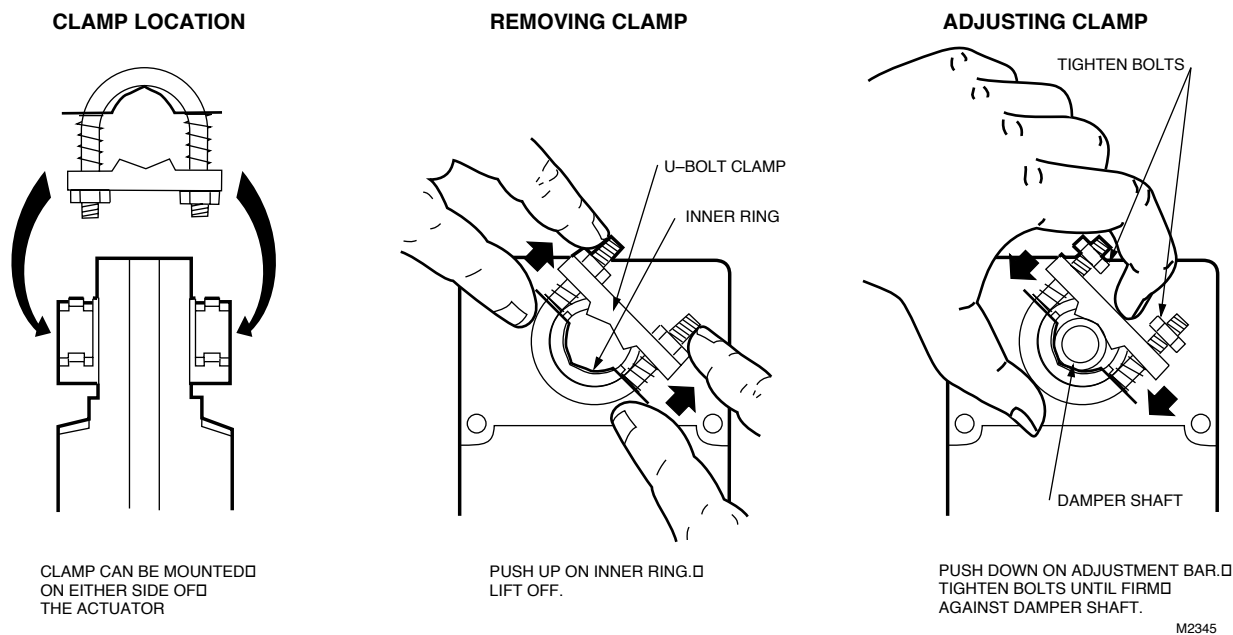
Once the direction of damper shaft rotation has been determined, proceed as follows:

1. Place the actuator on the damper shaft.
2. With the actuator in place on the damper shaft, position the actuator for best access to the U-bolt clamp tightening nuts.
3. Install the mounting bracket on the actuator with the pin correctly placed and adjust the mounting bracket to provide the correct height support for the actuator. Mark

the damper housing for the screw holes to attach the mounting bracket.

4. Remove the mounting bracket and actuator.
5. Centerpunch or drill starting holes for installing the mounting bracket.
6. Replace the actuator, then position and install the mounting bracket.
7. Adjust the shaft U-bolt clamp to meet the damper shaft size and tighten the two nuts against the damper shaft (see Fig. 7).

Fig. 7—Adjusting U-bolt clamp assembly.



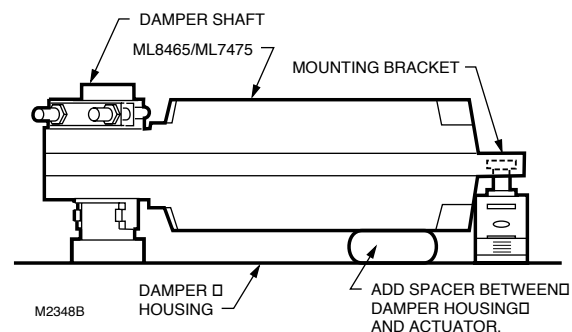
The actuators may be installed with the damper shaft in any position if the actuator housing is parallel with the damper housing. If the housings are not parallel, uneven actuator gear wear could result, causing early failure of the actuator. If the actuator cannot be installed flush against the damper housing, adjust the mounting bracket until the housings are parallel (see Fig. 8). Use a spacer to provide additional stability.

The ML4465, ML8465 and ML7475 actuators can be manually adjusted through the full 90° of angular rotation, to match the shaft position. Refer to Settings and Adjustments section.

CONNECTING THE ACTUATOR AND DAMPER WITH A LINKAGE

If conditions require that a damper be connected to an actuator through a linkage setup rather than directly, use the 203405 Linear Crankarm Set to connect the actuator to the damper crankarm. The set includes a lever, rod, two ball

Fig. 8—Mounting ML8465 and ML7475 Direct-Coupled Actuators when actuator is not flush against damper housing.



joints and mounting screws for the actuator. The damper must be equipped with a damper crankarm (obtained separately). The actuator can be mounted directly to an appropriate surface and the damper will be driven by the linkage. To install the linear crankarm set, follow Fig. 9.

EXTENDING THE DAMPER DRIVE SHAFT

Use the 203406 Extension for Damper Drive Shaft for applications with short damper drive shafts or poor accessibility. The drive shaft extension can be fitted to either round damper drive shafts of 3/8 in. (10 mm) to 13/16 in. (21 mm) diameter or to square damper drive shafts measuring 3/8 in (10 mm) to 5/8 in. (16 mm). Install the damper drive shaft extension as shown in Fig. 10.

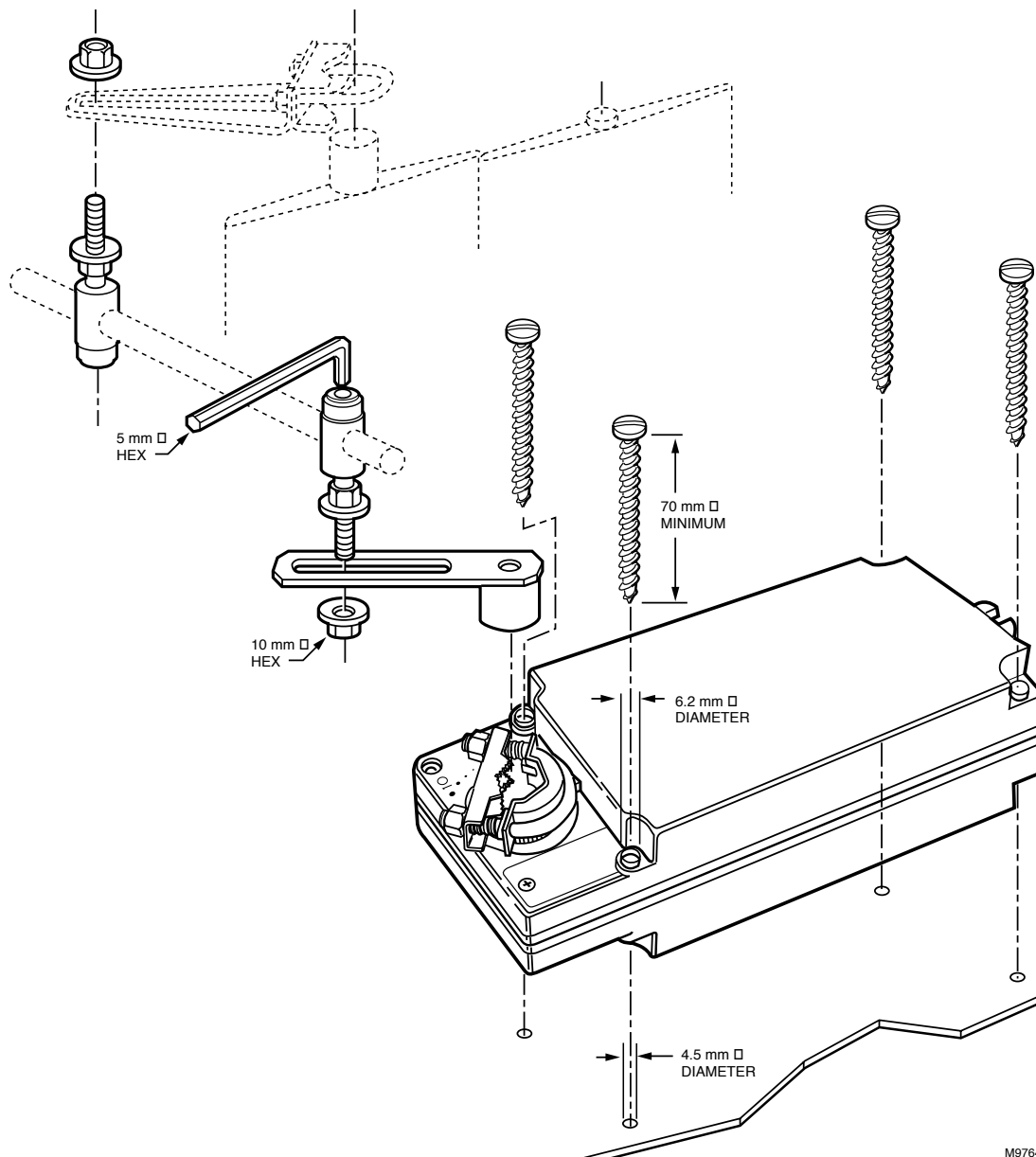
INSTALLING AN ANGULAR ROTATION LIMITER

Use the 203407 Angular Rotation Limiter to mechanically limit the rotation of the ML4465/ML8465/ML7475 in increments of 4° (for example, 4°, 8°, 12°, 16°, ... , 88°). Install the angular rotation limiter as follows (see Fig. 11):

1. Remove the U-bolt clamp assembly.
2. Place the angular rotation limiter on the actuator so that the maximum rotation desired is aligned with the groove on the edge of the actuator shaft ring (45° is shown in the example).
3. Replace the U-bolt clamp assembly.

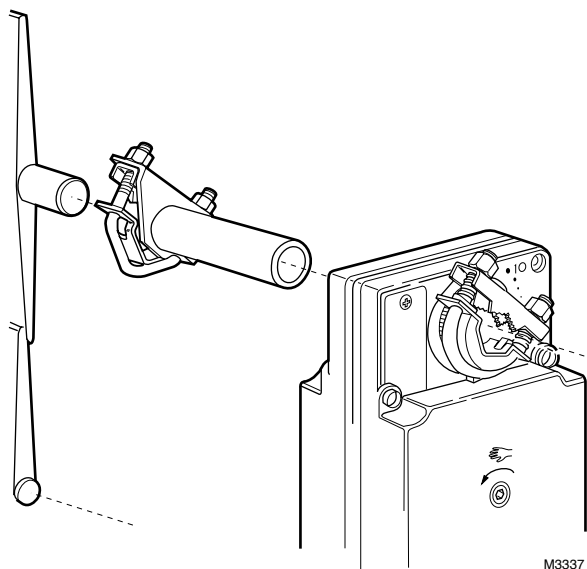
The angular rotation limiter may be used on either side of the actuator for both cw and ccw operation.

Fig. 9—Connecting ML4465, ML8465 or ML7475 Actuator to damper crankarm using 203405 Linear Crankarm Set.



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Fig. 10—Installing the 203406 Extension for Damper Drive Shaft.



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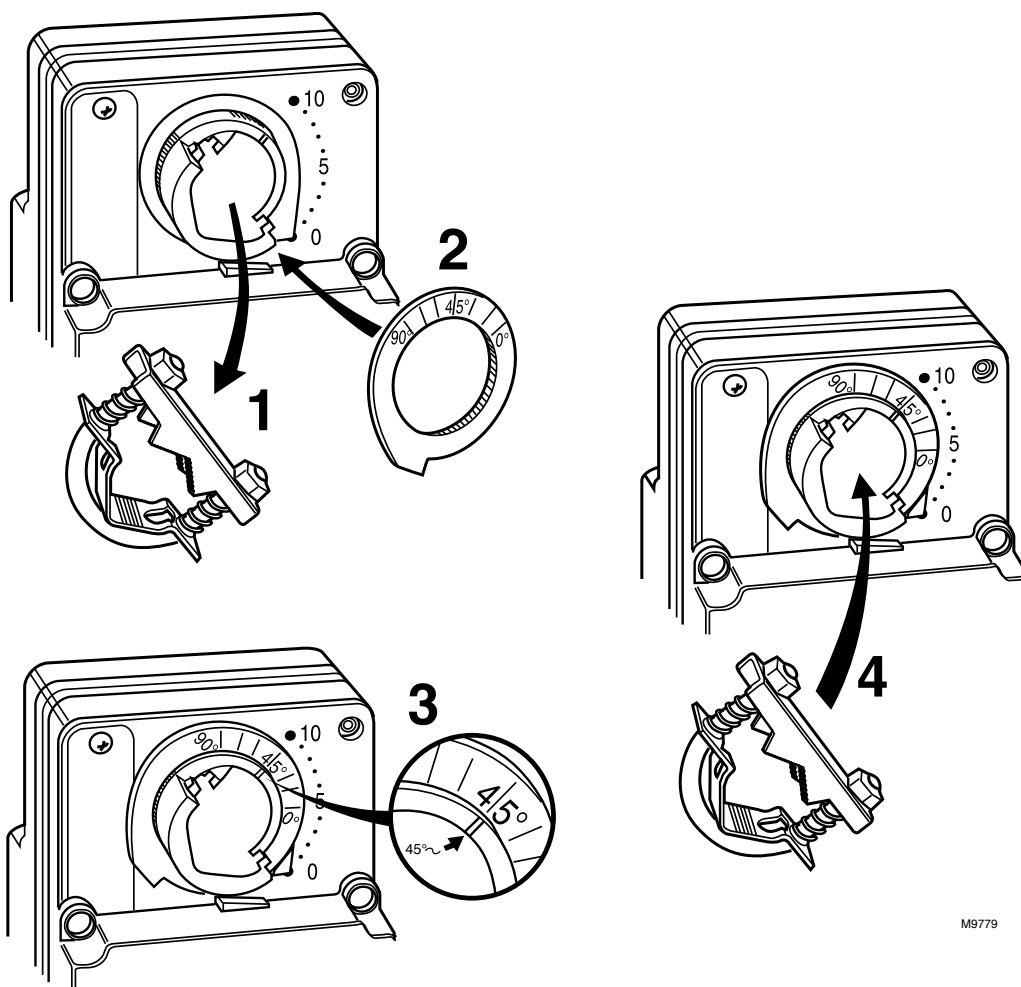
INSTALLING THE 203409 DOUBLE AUXILIARY SWITCH (ML4465 and ML8465 Only)

Use the optional 203409 Auxiliary Switch to provide control of external equipment at two fixed points in the stroke (12° and 80°) of the actuator.

The switch can only be mounted with the switch contacts pointed to the top of the motor. Install the auxiliary switch as follows (see Fig. 12):

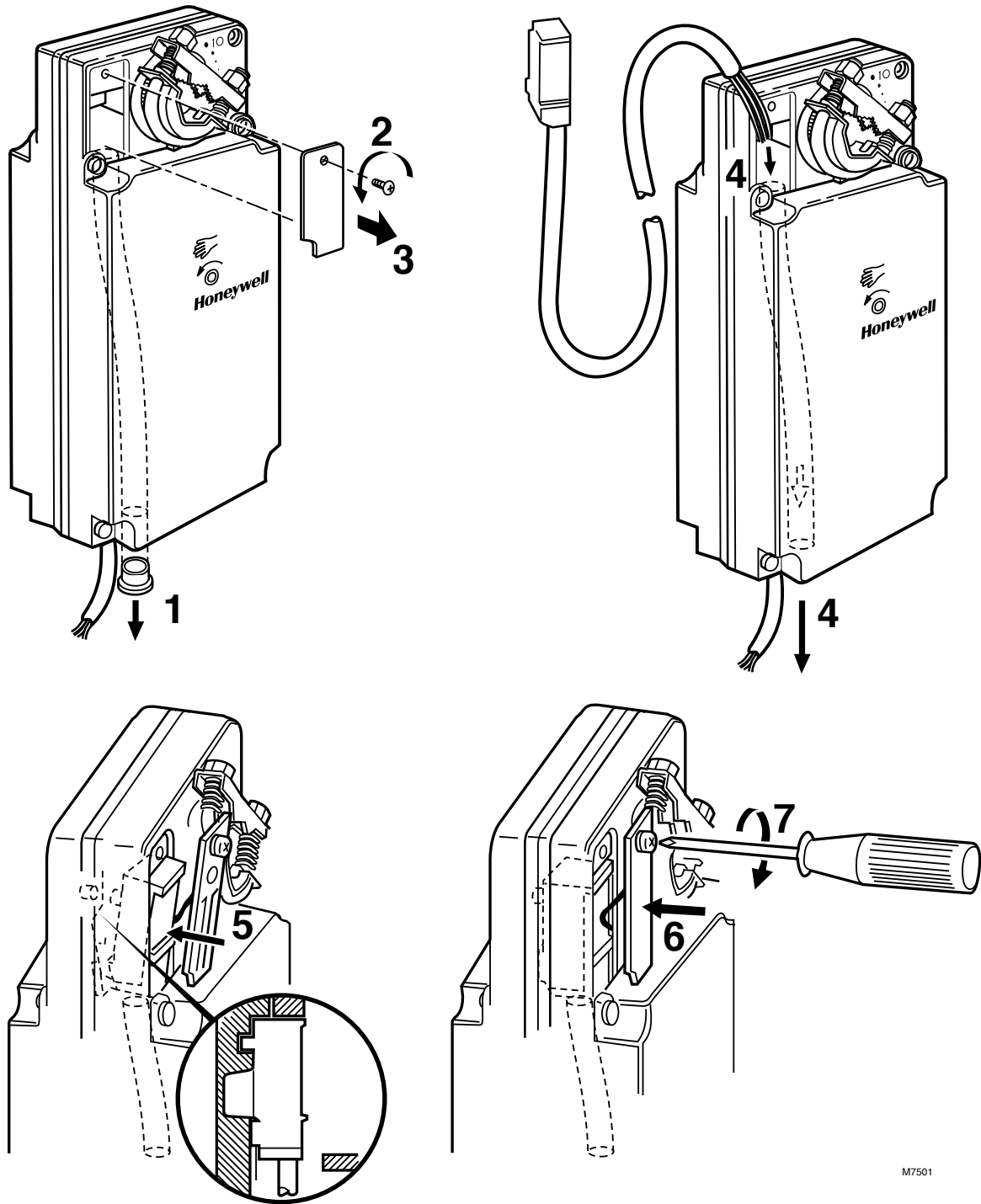
1. Remove the plastic cap from the bottom of the actuator.
2. Remove the cover screw on the front of the actuator.
3. Remove the cover from the front of the actuator.
4. Insert the auxiliary switch package with the attached cable in the opening under the cover. Pull cable down through actuator until auxiliary switch is flush inside the actuator.
5. Align auxiliary switch package mounting tabs with holes on actuator. Press firmly into place.
6. Replace cover on actuator.
7. Attach cover securely using screw removed in step 2.

Fig. 11—Mounting 203407 Angular Rotation Limiter.



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Fig. 12—Mounting 203409 Auxiliary Switch on ML8465 Direct Coupled Actuator.



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WIRING

Disconnect power supply before beginning wiring to prevent electrical shock or equipment damage. All wiring must comply with local electrical codes, ordinances and regulations. Voltage and frequency of the transformer used with the actuator must correspond to the characteristics of both the power supply and the motor. A three-foot nonplenum rated connect cable with six-inch leadwires is provided for easy connection. The actuator leadwires are labeled *COM*, *AC*, *SIG* and *U* (*SIG* and *U* on ML7475 only). If the connector cable is cut, strip the insulation of the wire jacket to identify conductor labeling. See Fig. 13 through 16 for typical wiring connections. Fig. 17 shows auxiliary switch operation.

Fig. 13—Connecting ML8465 Direct Coupled Actuator to on/off controller.

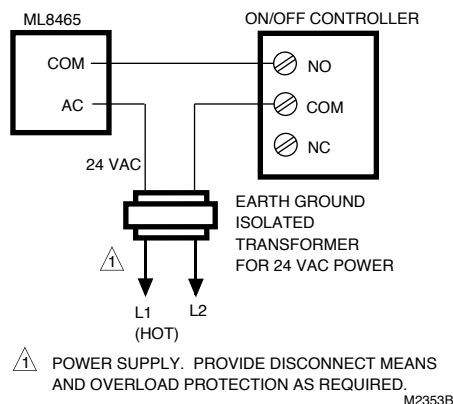


Fig. 14—Connecting ML7475 Direct Coupled Actuator with 0 to 10 Vdc T775 Controller.

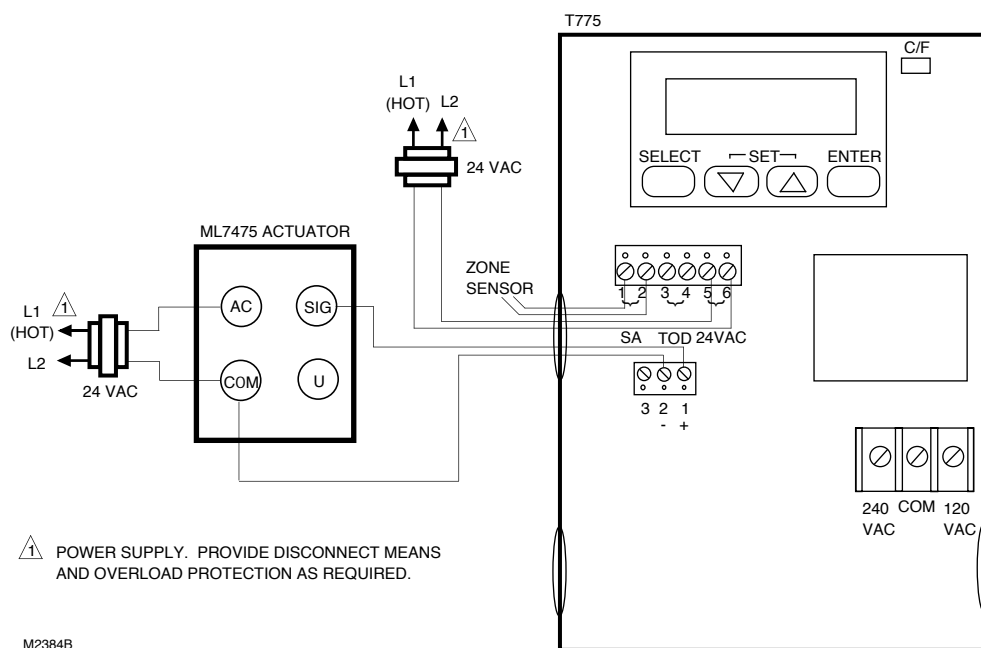
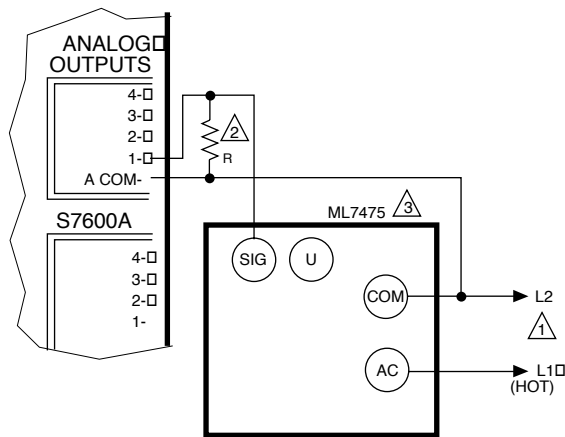


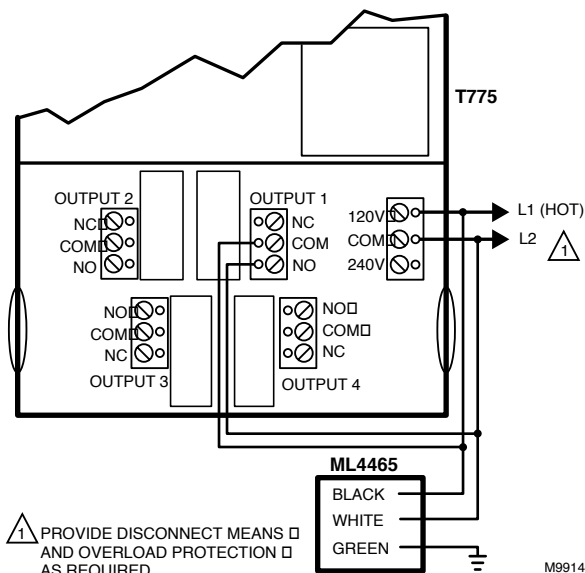
Fig. 15—Connecting ML7475 Adjustable Zero/ Span Direct Coupled Actuator to W7600 Controller.



- 1 POWER SUPPLY, PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED. USE SEPARATE TRANSFORMERS FOR W7600 AND ACTUATOR.
- 2 THE W7600 ANALOG OUTPUT MUST BE CONFIGURED FOR 4-20 MA OUTPUT R=500 OHM, 1/8 WATT, 5%.
- 3 ML7475 MUST BE 2-10 VDC MODEL.

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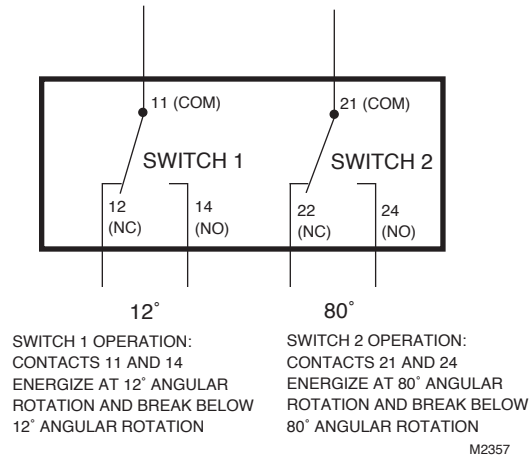
Fig. 16—Connecting ML4465 to T775 for on/off control.



- 1 PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

M9914

Fig. 17—Auxiliary Switch operation.



Connecting Actuators in Parallel

IMPORTANT:

1. Actuators of similar timing may vary slightly in driving speeds, and over a period of time, multiple actuators driving in parallel may not be synchronized with each other. In normal operation, if all actuators are driven to the fully cw or fully ccw position, the actuators will again be synchronized.
2. Parallel actuators must not be stacked on one damper to increase motor torque.

ML4465/ML8465 ACTUATORS IN PARALLEL

Connect COM and AC terminals in parallel. Make certain the connected load does not exceed the current capacity of the controller/thermostat.

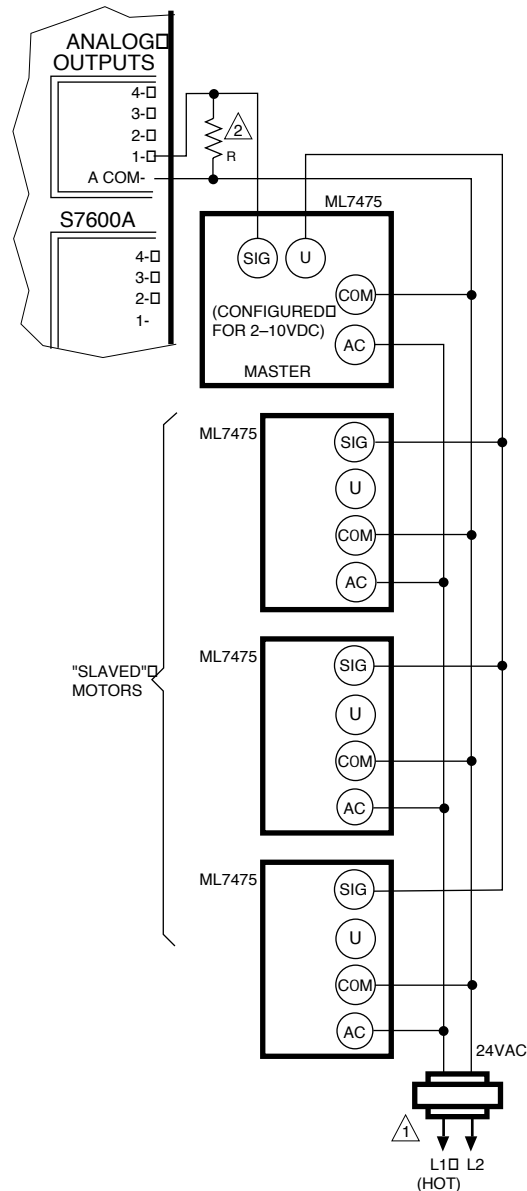
ML7475 ACTUATORS FROM A VOLTAGE INPUT (0 to 10 Vdc) IN PARALLEL

Wire the SIG (0 to 10 Vdc) and COM (-) terminals of each motor in parallel. Up to five actuators can be wired in parallel. Make certain the total connected load does not exceed the current capacity of the input signal source. Input power must be wired in phase for proper operation.

ML7475A ADJUSTABLE ZERO/SPAN MODELS FROM A CURRENT INPUT IN PARALLEL.

Configure the ML7475A master actuator for 2 to 10 Vdc control input and wire a 500-ohm bridging resistor between terminals SIG and COM on the actuator and (+) and (-) on the controller. The U terminal on the master actuator can be used to provide the input signal (2 to 10 Vdc) for up to five additional actuators. Make certain the total connected load does not exceed the current capacity of the input signal source. Input power must be wired in phase for proper operation. (See Fig.18.)

Fig. 18—Connecting ML7475 Adjustable Zero/Span Actuators for parallel operation from 4 to 20 mA controller.



1 POWER SUPPLY, PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED. USE SEPARATE TRANSFORMERS FOR W7600 AND ACTUATOR.

2 THE W7600 ANALOG OUTPUT MUST BE CONFIGURED FOR 4-20 MA OUTPUT R=500 OHM, 1/8 WATT, 5%. M2423A

Setting and Adjustments

VOLTAGE ZERO AND SPAN ADJUSTMENT

On the ML7475 model with adjustable zero and span, the starting voltage or zero point can be adjusted by using a screwdriver to turn the U_0 adjustment dial to the desired voltage (see Fig. 19). The zero voltage can be adjusted between 2 and 9 Vdc.

The voltage span that the actuator will accept can also be adjusted between 1.6 and 8 Vdc by the same technique used for the starting voltage value. See Fig. 19 for further explanation.

Always check the operation of the actuator at the low and high voltage values to make sure that the voltage zero and span are properly adjusted (the motor is driving the damper fully open or fully closed, depending on the voltage signal).

MANUAL STROKE ADJUSTMENT

With the actuator turned off, use a 5/32 in. (4 mm) hex wrench to turn the actuator. (See Fig. 20.) Turning the hex wrench through five and one-half rotations will result in a 90°-actuator rotation.

Fig. 19—ML7475 adjustable zero/span adjustment.

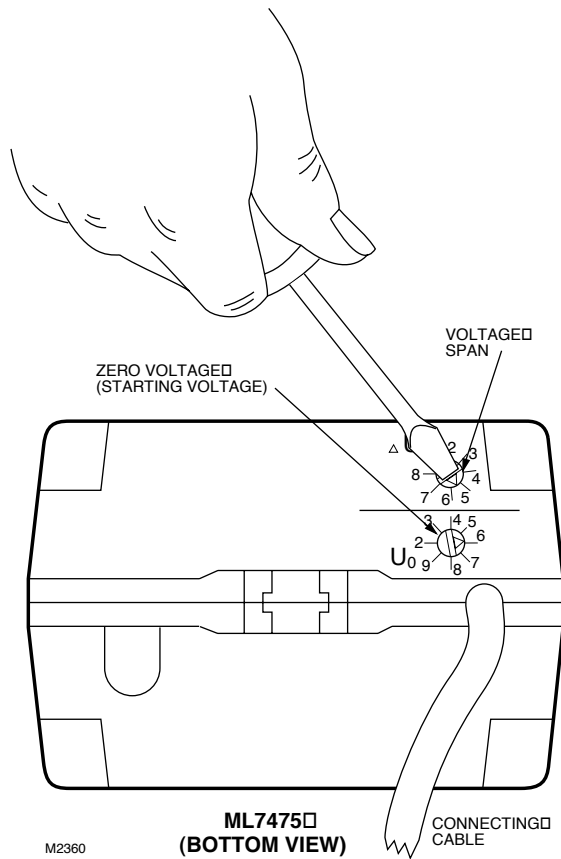
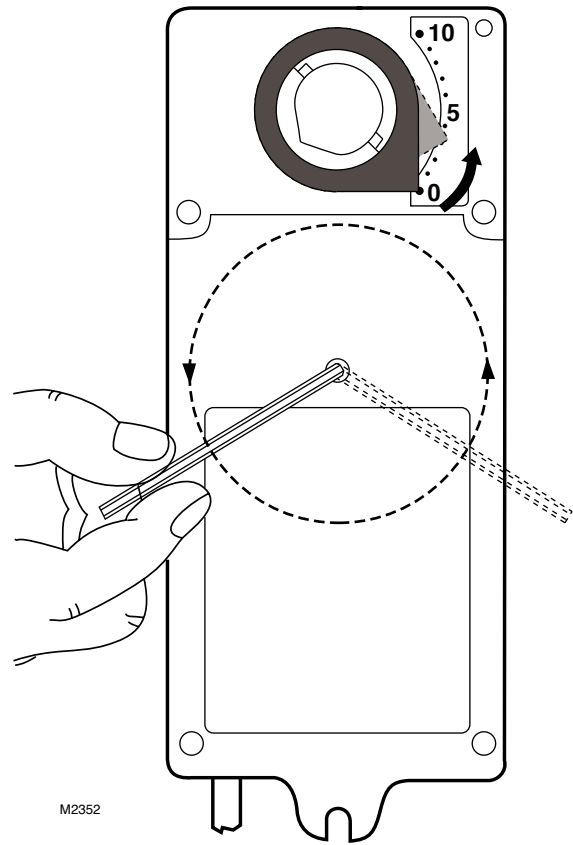


Fig. 20—ML4465, ML8465 and ML7475 Direct Coupled Actuators, manual stroke adjustment.



Checkout

ML4465 CHECKOUT

If the ML4465 is used with an spdt controller:

1. Adjust the setpoint of the controller to call for cooling, then observe the motor operation. If the damper is closed, it should begin to open.
2. If the damper does not open, lower the setpoint of the controller.
3. If the motor does not begin to run, check the control circuit for an open or short, the presence of power, and the voltage at the motor. The voltage at the motor must be at least 98 Vac (85 percent of the rated 115 Vac). Make sure that the maximum net load of the motor is not exceeded.
4. If the actuator does not operate properly, replace it.
5. Verify the spring-return action by setting the controller above room temperature, or interrupt the power to de-energize the actuator. The actuator should spring-return closed.
6. If the actuator does not spring-return closed, check to see that the actuator is not already at the fully closed position.
7. If the ML4465 does not spring-return closed when in an open position with the power removed, replace the ML4465.

If the ML4465 is not used with an spdt controller:

1. Determine the direction the damper shaft moves to open the damper (cw or ccw).
2. Mount the actuator accordingly.
3. Make sure that 115 Vac is connected to terminals L1 and L2.
4. If the motor does not run and the actuator is properly mounted, replace the actuator.

To make sure the spring return action works properly:

1. Place 115 Vac across terminals L1 and L2 to energize the actuator.
2. Allow the actuator to rotate through at least one-half of its full rotation.
3. Remove the 115 Vac applied in step 1.
4. If the actuator does not return to its closed position, replace the actuator.

ML8465 CHECKOUT

If the ML8465 is used with a spdt controller:

1. Adjust the setpoint of the controller to call for cooling, then observe the motor operation. If the damper is closed, it should begin to open.
2. If the damper does not open, lower the setpoint of the controller.
3. If no movement is observed, use a voltmeter to check for the presence of 24 Vac on the *COM* and *AC* input terminals. With proper wiring and 24 Vac present, the actuator should operate properly.

4. If the actuator does not operate properly, replace it.
5. Verify the spring-return action by setting the controller above room temperature. The actuator should spring-return closed.
6. If the actuator does not spring-return closed, check to see that the actuator is not already at the fully closed position.
7. If the ML8465 does not spring-return closed when in an open position with the power removed, replace the ML8465.

If the ML8475 is not used with an spdt controller:

1. Determine the direction the damper shaft moves to open the damper (cw or ccw).
2. Mount the actuator accordingly.
3. Place 24 volts across the actuator terminals *COM* and *AC* to energize the actuator.
4. If the motor does not run and the actuator is properly mounted, replace the actuator.

To make sure the spring return action works properly:

1. Place 24 volts across the actuator terminals *COM* and *AC* to energize the actuator.
2. Allow the actuator to rotate through at least one-half of its full rotation.
3. Remove the 24 volts applied in step 1.
4. If the actuator does not spring-return to its closed position, replace it.

ML7475 CHECKOUT

1. Determine the direction (cw or ccw) the damper shaft moves to open the damper.
2. Check for 24 Vac at *COM* and *AC* terminals.
3. With 24 Vac present, check the motion of the damper/actuator by moving the setpoint up and down to cause the actuator to move from one limit to the other and back (for example, from fully ccw to fully cw and back to fully ccw).

IMPORTANT: *The ML7475 takes approximately 150 seconds to move from one limit to the other.*

4. If the ML7475 is used with an electronic control system such as the W7600, override the control system by programming the controller to open/close the zone damper as appropriate.

To verify the spring return action:

1. Remove the 24 Vac from terminals *AC* and *COM*.
2. If the actuator does not spring-return closed from an open position, replace it.

Operation

GENERAL

The ML4465/ML8465/ML7475 Direct Coupled Spring-Return Actuators are designed to be used in ventilating and air conditioning installations. The actuators can be used to operate dampers, ventilation flaps and louvers requiring up to 105 lb.-in. (12 N•m) torque. These actuators are recommended for control of outdoor air and other damper applications that require safety protection such as low temperature protection. Upon power failure, the actuator will return the damper to the selected open or closed position.

ML8465

The ML8465 is operated by an on/off controller. When the controller receives a call for cooling, the ML8465 energizes 24 Vac (ML4465 energizes 115 Vac) operating switch on the actuator, which drives the actuator toward its fully cw position as viewed from the front. The actuator will drive toward its fully cw position until a call for heating causes the controller to remove power to the actuator, which then spring returns to the fully ccw position.

AUXILIARY SWITCH OPERATION (ML4465 and ML8465 Only)

The switching points of the auxiliary switches are fixed. The contacts for switch 1 operate at 12° angular rotation. The contacts for switch 2 operate at 80° angular rotation. See Fig. 17 for an explanation of the switch operation.

ML7475

The ML7475 operates from a continuous 0-10 Vdc signal to wire *SIG* from a controller. The angle of rotation is proportional to the control signal. A 0-10 Vdc position output signal is available between wire *U* and the system neutral (*COM* terminal) to monitor the position of the actuator.

The ML7475A adjustable zero/span model can be used for operation with the W7600 and other 4-20 mA controllers. For proper operation, the ML7475A must be configured for a 2-10 Vdc control input and a 500-ohm bridging resistor installed across terminals *SIG* and *COM* (see Fig. 15). If the actuator is not configured for 2-10 Vdc input, the actuator will not be fully closed with a 4 mA (fully ccw) signal from the controller.

Honeywell

Home and Building Control

Honeywell Inc.
Honeywell Plaza
P.O. Box 524
Minneapolis MN 55408-0524

Home and Building Control

Honeywell Limited-Honeywell Limitée
155 Gordon Baker Road
North York, Ontario
M2H 3N7

