

ML6984, ML7984 Series 4000 Direct Coupled Valve Actuators

PRODUCT DATA



FEATURES

- Self-contained, motorized valve linkage
- NEMA 3R cover for outdoor installation
- Linkage self-adjusts to valve stroke from 13 mm (1/2") to 25 mm (1")
- DIP switches select various input configurations
- LED status indication
- Floating models compatible with 3-wire control systems
- Strong valve seat closing force 710 N (160 lbs.)
- Electronic current sensing provides internal protection and positive fully closing force
- Compact size for easy installation in confined area
- Allows the use of one common transformer power supply for multiple actuators and controllers
- One device for either 24 V_{ac} or 28 V_{dc} power supply application
- Field-addable auxiliary switches available
- Field-addable position feedback option available

APPLICATION

The ML6984 and ML7984 are self-contained, self-adjusting, linear motorized valves that mount directly onto V5011 two-way and V5013 three-way globe valves, providing linear travel (stem lift) between 13 mm (1/2") and 25mm (1").

ML6984 is for use with low voltage SPDT Series 20 (on-off) and Series 60 (floating) electro-mechanical or electronic controllers. ML7984 is for use with Series 70 2-10 V_{dc}, 4-20 mA, electronic series 90, 135 Ω and modulating controllers.

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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.

Ambient Rating:

Operating Temperature:
0°C to 55°C (32°F to 130°F)
Shipping Temperature:
-40°C to +65°C (-40°F to 150°F)
Relative Humidity:
15% to 95% at 40°C (104°F) non-condensing
NEMA-3R/IP54 cover for outdoor installation

Acoustic Noise:

55 dBA max. Sound Pressure Level at 1 m (39") distance.

Electrical Ratings:

Power supply/consumption:
24V (+10%, -15%), 50/60 Hz or 28 Vdc +/- 10%
6VA(Running), 12 VA(Valve seating)
Inputs:
M7984 - 2 -10 Vdc (1 mA)
M6984 - 25 mA 24 Vac
Input Impedance for the ML7984:
Voltage Model — 20 K Ω
Current Model — 237 Ω

Shipping Weight:

Approx. 1 kg (2.2 lbs)

Accessories/Parts:

272630A—Auxiliary switch assembly (1-SPDT)
272775—Replacement motor brush kit
40003793-005—Mounting hardware bag assembly
272630D—Electronic low voltage auxiliary switch, position feedback assembly
272822—Resistor kit for multiple Series 90 application and for ML7984 to replace the old ML784 (4-20 mA)
43196000-001 High temperature kit
272629A mounting adapter for V5045 valves

Mechanical Ratings:

Stroke—Between 1/2" (13 mm) and 1" (25 mm), self-adjusting
Bonnet—1 3/8" (35 mm)
Stroke timing—Nominal 63 seconds for 3/4" stroke, proportional to stroke length at 24 Vac
Closing Force—710 N (160 lbs.) minimum at 24V ac.
Force varies 22 N/V (5 lbs./volt).

Performance Specifications:

Minimum Signal Input Duration: 200 ms
Life Expectancy — (at rated load and power conditions)
50,000 full stroke cycles plus 1,000,000 repositions of 10% stem travel or 10 years, whichever occurs first.
Hysteresis — 5%



Short and rapid cycling/repositioning will result in possible device lock-up or reduced service life.

ORDERING INFORMATION

When purchasing replacement and modernization products from your wholesaler or distributor, refer to the price sheets for complete ordering number, or specify—

1. Model number.
2. Valve body type and model number.
3. 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. Honeywell Customer Care
1885 Douglas Drive North
Minneapolis, Minnesota 55422-4386

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

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

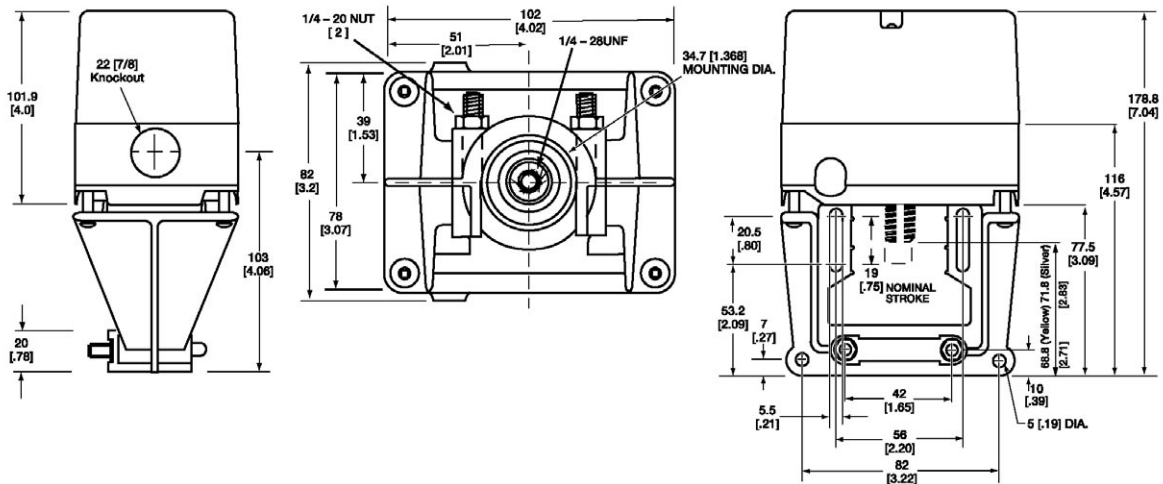


FIG. 1 -- DIMENSIONS OF ML6984 VALVE ACTUATOR IN MM (INCHES).

INSTALLATION

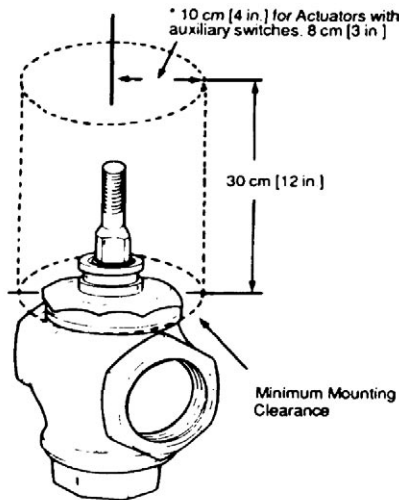


FIG.2 -- MINIMUM MOUNTING CLEARANCE.

When Installing This Product...

1. Read this instructions carefully. Failures to follow them could damage the product or cause a hazardous condition.
2. Check ratings given in instructions and on the product to ensure the product is suitable for your application.
3. The installer must be a trained, experienced service technician.
4. After installation is complete, check out product operation as provided in these instructions.
5. **DO NOT electrically operate the actuator before assembly to the valve because damage not apparent to the installer may occur.**

IMPORTANT

- Before installing the valve, raise and lower the valve stem to make sure that the valve stem operates freely. Impaired stem operation can indicate that the stem was bent by rough handling. This condition can require replacing the valve.
- Protect the stem from damage due to bending or scratching.

Proper Use

The valves are to be installed by skilled personnel and in strict accordance with the installation instructions and local regulations. Honeywell assumes no responsibility for damages or injuries resulting from non-compliance with installation instructions or standard good practice when mounting, operating, or maintaining the valves, even if not explicitly mentioned in the installation instructions. Observe all safety practices when working with steam systems.

Mounting:

1. Ensure that the valve body is installed correctly, that is, the arrow points in the direction of the flow.
2. Although the actuator can be mounted in any position, it is preferable that it is mounted above the valve body. This will minimize the risk of damage to the actuator in the event of condensation or a valve gland leak.

NOTE: NEMA 3R rainproof rating only applies to actuators mounted vertically. Cover has been treated with UV stabilizers for outdoor applications. Weather-proof conduit fittings approved for outdoor and wet locations must be used to maintain NEMA 3R rating.

3. Remove the stem button (Fig. 3) from the valve stem. Save the set screw inside the stem button for later installation. The button itself is not needed.
4. Slide the position indicator (plastic disk or rubber Oring) over the valve stem. (See inset, Fig. 3) Indicator will self-align to the marking on the yoke after complete operating cycle.

Assembly of ML_984 Actuator to the valve:

1. The drive shaft of the ML_984 Actuator has a 1/4-28 UNF threaded hole to link with the valve stem. Slide the yoke over the valve bonnet (Fig. 4)
2. Thread the ML_984Actuator drive shaft onto the valve stem all the way, until it is completely attached (with no threads showing), by turning the valve actuator in a clockwise direction, as viewed from above (depending on the valve models, use a pin or wrench to keep valve stem from turning). Note that the valve actuator is shipped with drive shaft in the mid-position.
3. Care should be exercised when using tools on the valve stem during tightening. (Fig.4) DO NOT damage the threads or other parts of the stem.
4. Orient the conduit hole to the most desirable direction, then tighten the LOCKNUTS on the U-bolt.

5. Remove the plastic cover from the ML6984 by loosening the two screws located on the top (Note: These screws are captive. Rotate three complete revolutions to remove cover). Drop either Slot Headed or Allen Hex type of set screw (both are included in the plastic bag) into the top of the shaft, slotted/ Hexed side up. Or use the set screw from the valve stem button.

6. Depending on which type of set screw was used, with a 5 mm (3/16") Slotted screwdriver or 1/8"x 6" Allen wrench (included in the plastic bag), **tighten the set screw to lock valve stem in place** (Fig. 6).

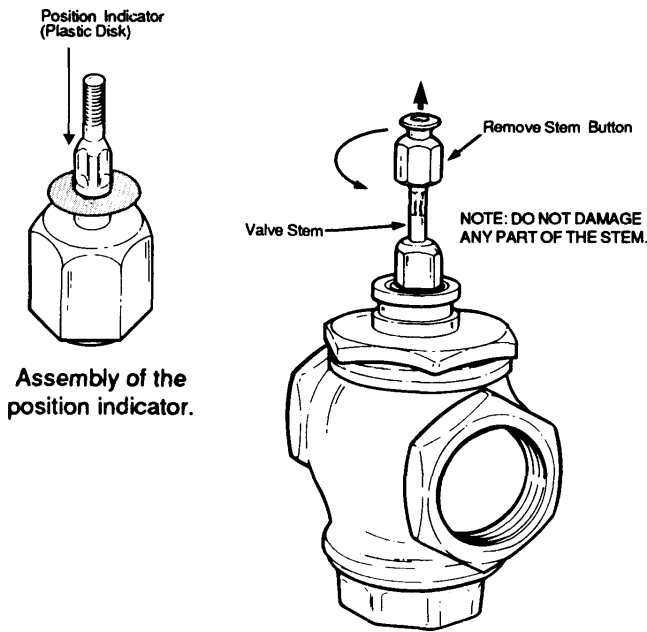


FIG. 3 — PREPARATION FOR VALVE ASSEMBLY

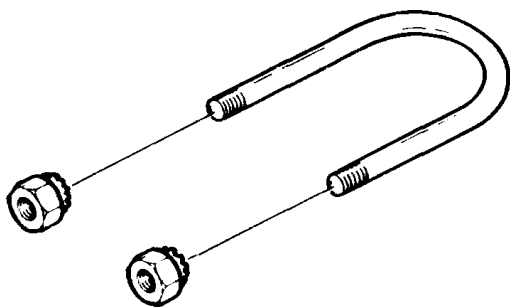


FIG. 5 — U-BOLT ASSEMBLY

! CAUTION

For proper valve operation, valve stem must be **threaded into the actuator all the way (with no threads showing) and locked in place** with the set screw provided.

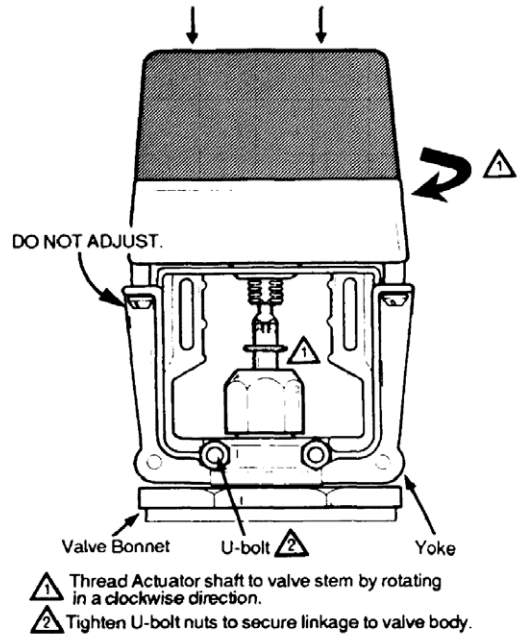


FIG. 4 — ASSEMBLY OF ML6984A TO

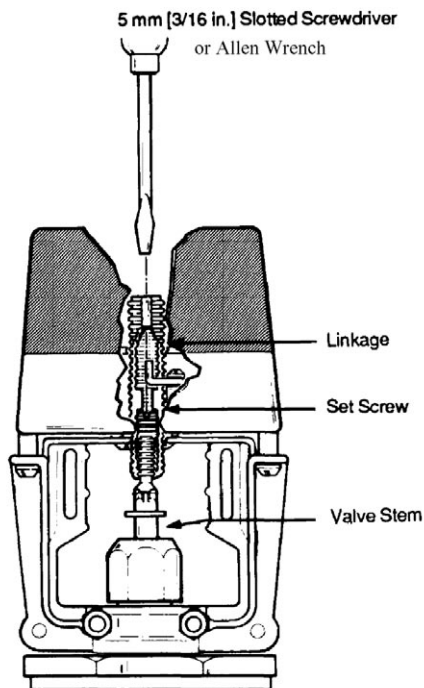


FIG. 6. — LOCKING ML6984A DRIVE SHAFT TO VALVE STEM

Wiring

ML_984 actuators are designed to operate from a Safety Extra Low Voltage, Class II power source. A 7/8" wiring hole is provided for attaching flexible conduit where required by local codes. When installing outdoors, weatherproof conduit fittings approved for outdoor and wet locations must be used.



Caution:

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

Disconnect power supply to the actuator to prevent electrical shock and equipment damage, or remove and cap the air line to the actuator.



Caution: (in all cases when wiring a ML_984 Actuator)

In multiple actuators connection, power supply to all actuators must be connected in a TRUE parallel fashion to reduce excessive voltage drop. DO NOT "daisy chain" i.e. connected to one actuator then branched to another.

Operation

The recommended valve actuator power source is a Safety Extra-Low Voltage (SELV) Class II, 24V transformer or regulated 28Vdc across terminals T5 & T6. Internal circuitry provides dc power for the electronic sensing and drive motor circuits.

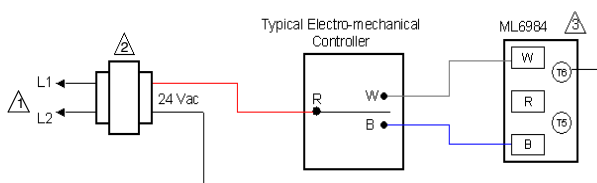


FIG. 7A — 3-WIRE CONTROL OF ML6984 WITH SERIES 60 CONTROLLER

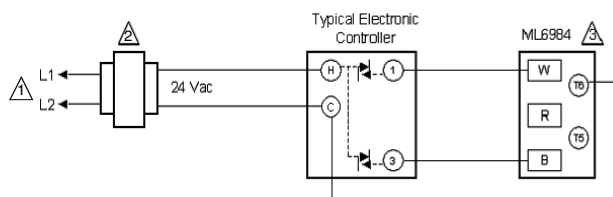


FIG. 7A — 3-WIRE CONTROL OF ML6984 WITH ELECTRONIC CONTROLLER

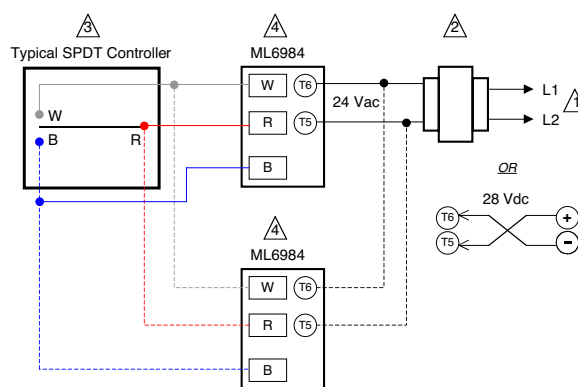


FIG. 7B — 5-WIRE CONTROL OF ML 6984

For Figures 7A, 7B and 7C the following apply:



Power supply provides overload protection and disconnect means.



Allow 0.5 amps maximum for each device. Actuators and controller can share same transformer providing the VA rating of the transformer is not exceeded and proper phasing is observed.



SPDT controller can be a low voltage Series 20 "on-off" or Series 60 "floating" (tri-state) type.



Multiple actuators controlled by a common controller in parallel must be wired so that they all travel in the same direction. Reverse acting actuators will NOT operate reliably in combination with direct acting units.



5-wire installation is required with the 272630E feedback/auxiliary relay accessory.

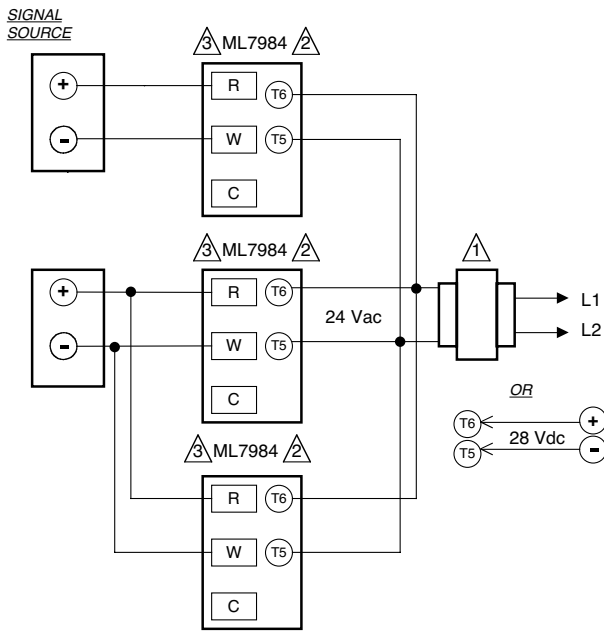


FIG. 8 — ML7984 WIRING WITH 10 VDC ANALOG CONTROL SIGNAL

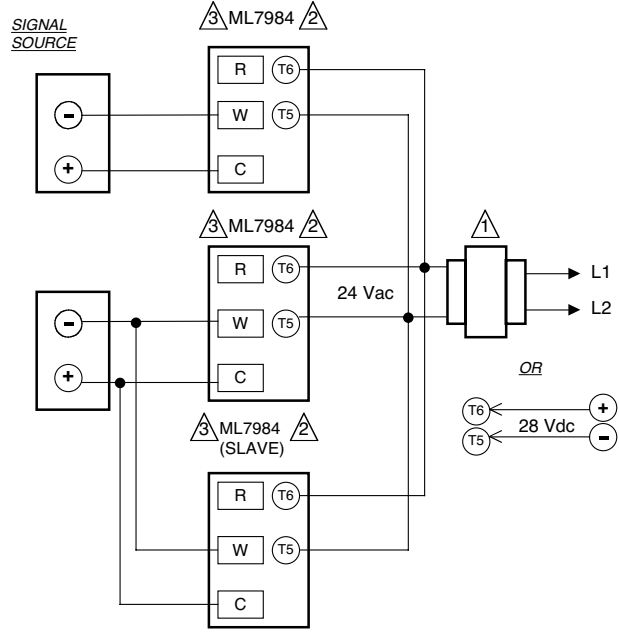


FIG. 9 — ML7984 WIRING WITH 20mA ANALOG CONTROL SIGNAL

FUNCTION	DIP SWITCH CONFIGURATION										
1000 2-10 Vdc Direct Acting	<table border="1"> <tr> <td>↑</td> <td>↓</td> <td>↓</td> <td>↓</td> <td>On (1)</td> </tr> <tr> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>Off (0)</td> </tr> </table>	↑	↓	↓	↓	On (1)	1	2	3	4	Off (0)
↑	↓	↓	↓	On (1)							
1	2	3	4	Off (0)							
1010 10-2 Vdc Reverse Acting	<table border="1"> <tr> <td>↑</td> <td>↓</td> <td>↑</td> <td>↓</td> <td>On (1)</td> </tr> <tr> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>Off (0)</td> </tr> </table>	↑	↓	↑	↓	On (1)	1	2	3	4	Off (0)
↑	↓	↑	↓	On (1)							
1	2	3	4	Off (0)							

FUNCTION	DIP SWITCH CONFIGURATION																
X000 4-20 mA Direct Acting	<table border="1"> <tr> <td>↓</td> <td>Master actuator →</td> <td>↑</td> <td>↓</td> <td>↓</td> <td>↓</td> <td>↓</td> <td>On (1)</td> </tr> <tr> <td>1</td> <td>← Slave actuator</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>Off (0)</td> <td></td> </tr> </table>	↓	Master actuator →	↑	↓	↓	↓	↓	On (1)	1	← Slave actuator	1	2	3	4	Off (0)	
↓	Master actuator →	↑	↓	↓	↓	↓	On (1)										
1	← Slave actuator	1	2	3	4	Off (0)											
X010 20-4 mA Reverse Acting	<table border="1"> <tr> <td>↓</td> <td>Master actuator →</td> <td>↑</td> <td>↓</td> <td>↑</td> <td>↓</td> <td>↓</td> <td>On (1)</td> </tr> <tr> <td>1</td> <td>← Slave actuator</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>Off (0)</td> <td></td> </tr> </table>	↓	Master actuator →	↑	↓	↑	↓	↓	On (1)	1	← Slave actuator	1	2	3	4	Off (0)	
↓	Master actuator →	↑	↓	↑	↓	↓	On (1)										
1	← Slave actuator	1	2	3	4	Off (0)											

For Figures 8 and 9 the following apply:

- 1 Allow 0.5 amps maximum for each device. Actuators and controller can share same transformer providing the VA rating of the transformer is not exceeded and proper phasing is observed.
- 2 "T5" and "W" terminals are factory connected internally. Device is compatible with the 3-wire control system.
- 3 **Use configuration DIP switches to select device functions:** Direct acting function (actuator stem moves upwards with signal increases) or Reverse acting function (actuator stem moves downwards with signal increases).

NOTE:

Always turn power off before setting the DIP switches.

FIG. 10 — ML7984 WIRING WITH 135Ω (SLIDEWIRE) CONTROLLERS

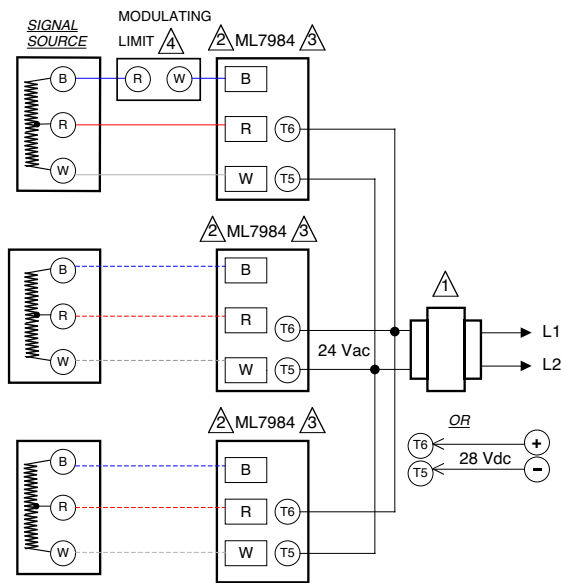


FIG. 10A — ML7984 WIRING WITH COMMON TRANSFORMER, INDIVIDUAL CONTROLLERS

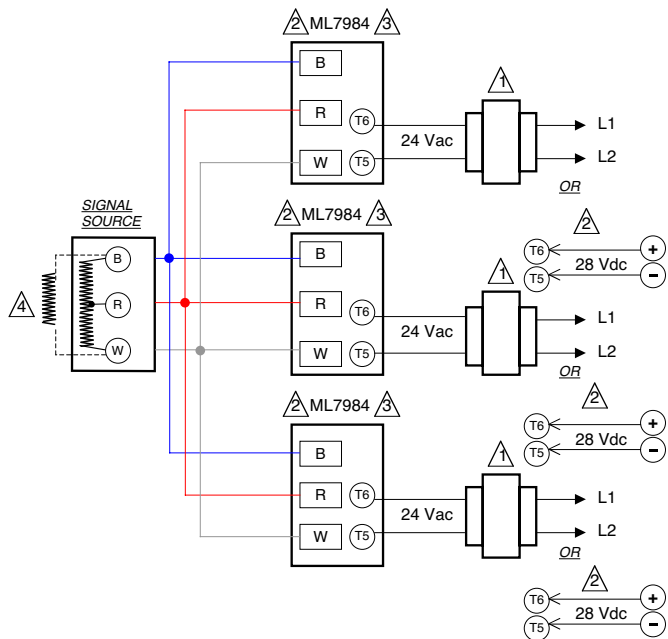


FIG. 10B — ML7984 WITH INDIVIDUAL TRANSFORMERS, COMMON CONTROLLER

FUNCTION	DIP SWITCH CONFIGURATION
1010 Direct Acting	 On (1) Off (0)

RESISTOR SELECTION CHART		
NO. OF ACTUATORS	RESISTOR VALUE	
1	RESISTOR NOT REQ'D.	ALL RESISTORS
2	133 OHM	1/4WATT
3	68.1 OHM	1% M.F.
4	45.3 OHM	

For Figures 10A, 10B, 11A and 11B the following apply:

Allow 0.5 amps maximum for each device.

Do not mix M984/6 or Modutrol Motors with the ML7984 in the same circuitry.

Use configuration DIP switches to select device functions: Direct acting function (actuator stem moves upwards with signal increases) or Reverse acting function (actuator stem moves downwards with signal increases).

*Series 90 (mech/electronic) operation can be reversed without changing wiring by using DIP switch #3 (opposite as shown).

NOTE:

1) Turn power off before setting the DIP switches.

2) For common transformer and common controller application, please consult the factory.

For Figure 10A only:

Maximum resistance per control circuit of 280 Ω.

For Figure 10B only:

Use Resistor Kit part # 272822

FIG. 11 — ML7984 WIRING WITH ELECTRONIC SERIES 90 “SUPERMOD” CONTROLLERS

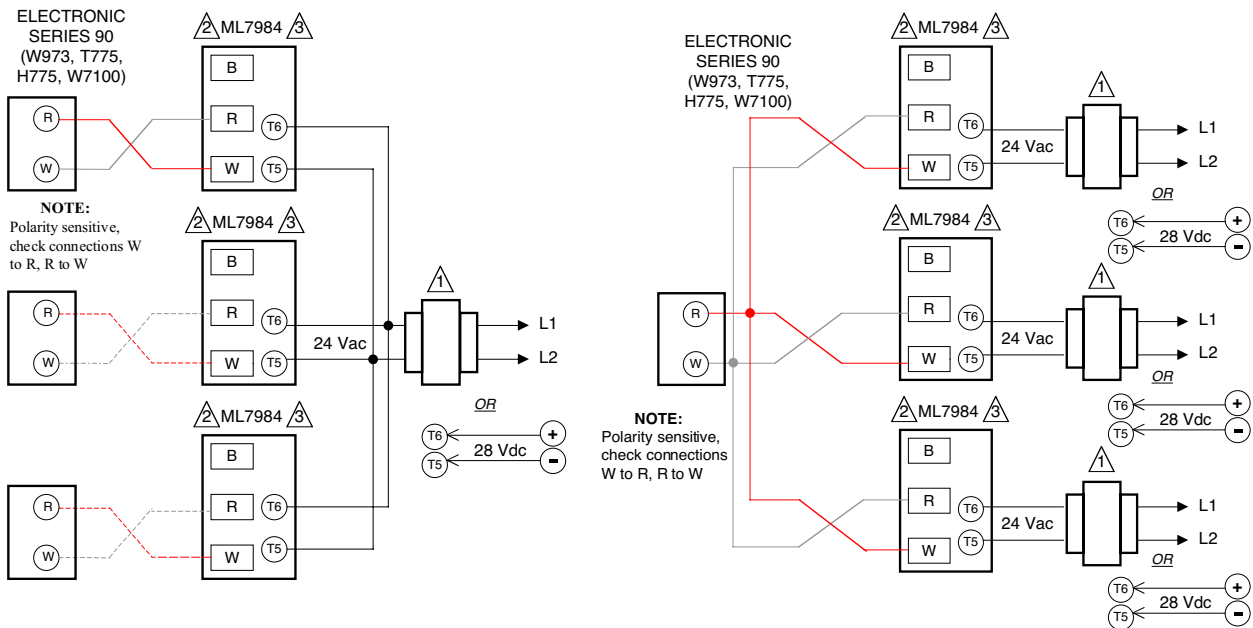


FIG. 11A — ML7984 WITH COMMON TRANSFORMER, INDIVIDUAL CONTROLLERS

FIG. 11B — ML7984 WITH INDIVIDUAL TRANSFORMERS, COMMON CONTROLLER

FUNCTION	DIP SWITCH CONFIGURATION
1000 Direct Acting	 On (1) Off (0)
1010 Reverse Acting	 On (1) Off (0)

*Series 90 (mech/electronic) operation can be reversed without changing wiring by using DIP switch #3 (opposite as shown).

For Figure 11A and 11B only:

- Allow 0.5 amps maximum for each device.
- Do not mix M984/6 or Modutrol Motors with the ML7984 in the same circuitry.
- Use configuration DIP switches to select device functions:** Direct acting function (actuator stem moves upwards with signal increases) or Reverse acting function (actuator stem moves downwards with signal increases).

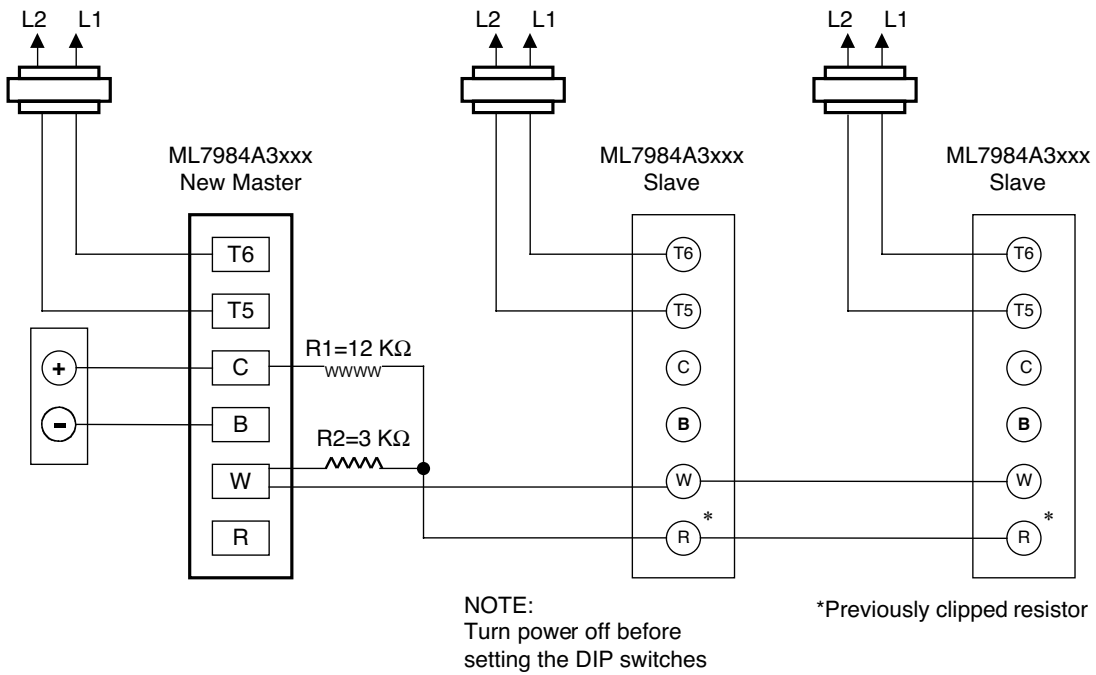


Fig. 12 Wiring for replacing the MASTER motor in 4-20 mA multiple-actuator application. (Use Resistor Kit part # 272822)

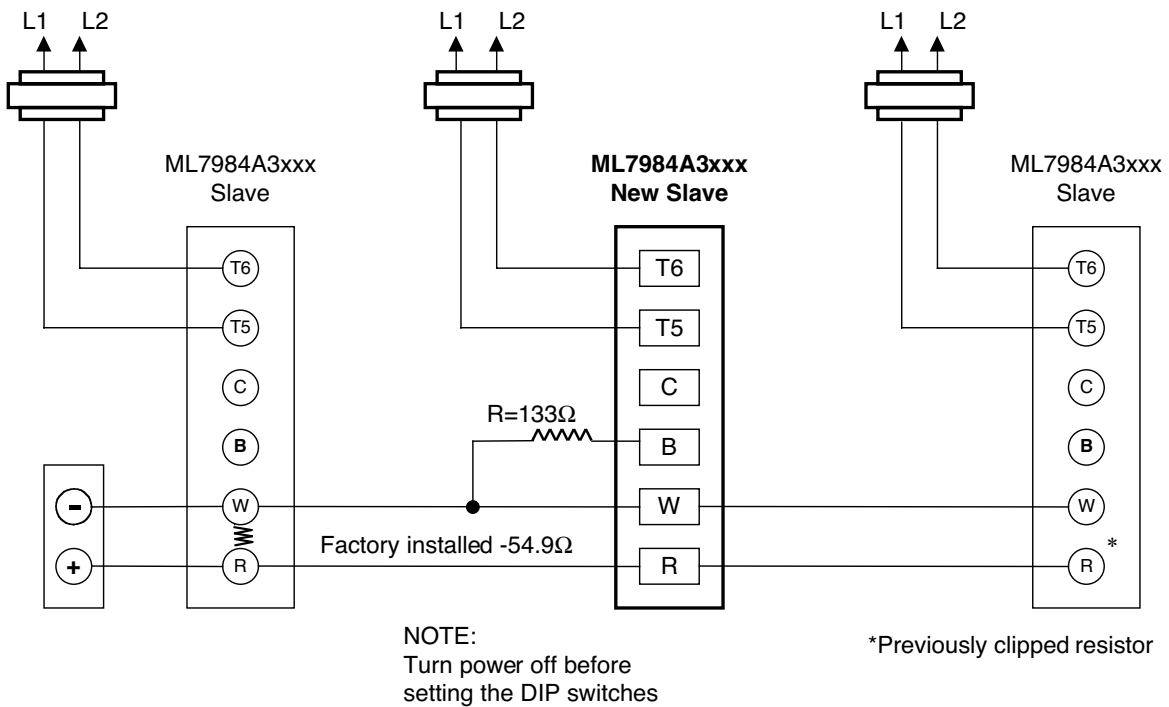


Fig. 13 Wiring for replacing the SLAVE motor in 4-20 mA multiple-actuator application. (Use Resistor Kit part # 272822)

Operation

Each time actuator terminals T5-T6 are (re)powered, the microprocessor will cycle the valve through a full stroke to calibrate its position. Any stroke between 1/2" (13 mm) and 1" (25 mm) will be divided into 30 equal steps. Run time will be proportional to stroke length. The LED lights when terminals T5-T6 are powered, and flash when the actuator is in motion.

ML6984 Operation

The motor is controlled by a microprocessor. Connecting B to R tells the microprocessor to cause the actuator to drive open. Connecting W & R for one second or longer will cause the actuator to drive closed. For "floating" control, if R remains open, the actuator will remain in the last position.

At the end of the valve stroke, the actuator will develop the necessary force for positive valve close-off.

As forces are developed, the current to the motor increases. The microprocessor stops the actuator automatically when the motor current, and forces reach the predetermined level.

ML6984 does not need to be powered on terminals T5-T6, but self-calibration will not occur. The controller must drive the valve through a cycle to calibrate stroke length. Input signals lasting over 3 1/2 minutes will be ignored until the switch cycles off to avoid a motor stall condition.

ML7984 Operation

The sensing circuits respond to the signal across the input terminals based on the configuration DIP switch settings.

When correctly connected to the actuator, control signal between signal input terminals is converted to a digital run time and compared to pulse counts from the first gear in the gear train. When these counts are equal, the drive motor and drive shaft are stationary.

As long as the value of controlled medium remains at the controller setpoint, the circuit is in balance, and the actuator does not run. When the value of the controlled medium changes, the controller output voltage is changed causing the counters to differ. As the actuator moves in the direction to correct the medium change, the counters increment or decrement, and stop the actuator when the input and gear counts agree.

At the end of the valve stroke, the actuator develops the necessary force for positive valve close-off. The motor stops automatically when the motor current reaches the predetermined current and force level. The digital counters are reset and calibrated at each end of stroke.

CAUTION:

1. Disconnect power supply before beginning installation to prevent electrical shock and equipment damage.
2. All wiring must comply with applicable local electrical codes, ordinances and regulations.
3. Make certain that the voltage and frequency of the power supply correspond to the rating of the device.
4. **DO NOT electrically operate the ML_984 actuator before assembly to the valve because damage not apparent to the in staller may occur.**
5. **DO NOT connect 24 Vac between any ML7984 signal input terminals. DEVICE FAILURE WILL RESULT!**

GENERAL NOTE:

1. The ML7984 must be field configured with the DIP switches which are located beside the terminal block. See wiring diagrams for details. Turn power off before setting the DIP switches .
2. There is a short delay in actuator response upon every signal change. This is to screen any unwanted incoming signals.
3. For proper operation, voltage on the T5 and T6 must not be less than 22 Vac or 24Vdc during running or force generating stages.

REPLACEMENT NOTES

To replace ML684

1. The new ML6984 is a direct replacement for the old ML684A in single actuator or parallel multiple actuators hook-up. The old and new actuators can be mixed in the same electrical circuit. For multiple actuators controlled by a common controller in parallel, these actuators must be wired so that they all travel in the same direction.
2. When replacing the ML684A1009 (80 lbs) with this new ML6984 on the V5045 valve. The already installed valve adaptor (part # 272629A) on the valve stem and actuator assembly is still needed.

To replace ML6874

1. The ML6984 is a direct replacement for the old ML6874 in single actuator hook-up.
2. For parallel multiple old ML6874 actuators applications, an isolation relay must be used (isolation relay contacts should be placed in the new ML6984 actuator signal input "W" and "B" circuit).

TO REPLACE ML784 or ML984:

1. The old ML784 or ML984 actuators cannot be used with new ML7984 valve actuators in the same circuitry, unless the old models are each powered by their own transformer to prevent cross-talking.
2. The ML7984 is a direct replacement for all old ML784 and ML984, except:
 - a) When replacing the old reverse acting models, the signal input wires to the new devices no longer need to be reversed. Just follow the terminal polarity designations and DIPswitch settings.
 - b) When replacing the old actuator which has an Electronic Series 90 controller, i.e., T775, W973, H775, W7100, the old interface resistor must be removed. The new ML798 will work directly with the controller without the external 240W resistor.
 - c) When replacing the old ML784 (mA model) in multiple-actuator installations, resistor(s) will be needed. Use Resistor Kit part # 272822 and set DIP switches accordingly. See Figure 12 & 13.

CHECKOUT

1. Make sure the valve stem is completely screwed into the actuator drive shaft with no threads showing before applying power.
2. Make sure the valve stem is locked in place with the set screw.

ML6984 - 5-Wire Installation

3. Connect 24 Vac or 28 Vdc power to T5 and T6.
4. Jumper R & B. The valve stem should move up.
5. Jumper R & W. The valve stem should move down.
6. For Floating operation, open R connection Valve stem should remain in position.
7. Re-connect all control wiring.
8. Operate the system (valve, actuator and controller) for several cycles to ensure proper installation.
9. When checkout is complete, return the controller to the desired setting.

ML7984

3. Make sure the Configuration DIPswitches are set correctly.
4. With 24Vac or 28Vdc power source connected to T5 and T6, actuator operation can be verified by connecting appropriate control signal (Series 70/90) from controller to the signal input terminals (Fig. 8-11). For direct acting: A modulating action can be obtained simply by increasing the control signal. The actuator will travel from full stem down to full stem up. On signal failure (disconnected /no signal), actuator defaults to closed position. For reverse acting: Decreasing controller signal will drive actuator from full stem down to full stem up. On signal failure (disconnect/no signal), actuator defaults to open position.
5. Operate the system (valve, actuator and controller) for several cycles to ensure proper installation.
6. When checkout is completed, return the controller to the desired setting.

NOTE: Device will ignore any input changes until it has completed its repositioning relative to the initial signal input.

Troubleshooting Guide for ML Valve Actuator

SYMPTOM	POSSIBLE CAUSES	ACTIONS
Valve leaks or will not close off fully.	<ul style="list-style-type: none"> *Wrong actuator used and/or system pressure too high *Actuator not properly installed *Incorrect DIP switch settings 	<ul style="list-style-type: none"> *Check valve close-off rating *Check voltage at actuator terminals *Ensure valve stem is fully threaded into brass drive shaft and locked in place with the set screw. *Check against Product Instruction Sheet
Noisy motor	<ul style="list-style-type: none"> *Bearing failed due to overheat *Brushes worn out 	<ul style="list-style-type: none"> *Check for excessive temperature and replace complete actuator *Use high temperature bit *Check for excessive cycling and replace brushes (Part #272775)
Motor overheats/ smoke/component burnt-out	<ul style="list-style-type: none"> *Current sensing circuit failed or electronic components failed 	Replace actuator. Make sure: <ul style="list-style-type: none"> *Correct actuator used *Properly installed *Do not adjust any calibration pot *Proper voltage supply *Applied according to ML specifications *Use high temperature bit
ML will not respond	LED (on): <ul style="list-style-type: none"> *Incorrect DIP switch settings *No control signal present *Incorrect wiring connections *Incorrect signal polarity *Internal time delay LED (off): <ul style="list-style-type: none"> *No or Low power supply *Error mode 	<ul style="list-style-type: none"> *Check against Product Instruction Sheet *Check controller *Check against Product Instruction Sheet *Check against Product Instruction Sheet *Allow at least 1/2 second for the ML to respond *Check voltage on T5 & T6 terminals *Check valve stroke
Vdc/mA signal drops when connected to ML	<ul style="list-style-type: none"> *Signal degradation due to incompatible load impedance 	<ul style="list-style-type: none"> *Check Controller Output and ML Input Impedance specifications
ML 6984 will not close or lock-up when used with T87	<ul style="list-style-type: none"> *T87 Colling Anticipator caused current shunting to the ML 	<ul style="list-style-type: none"> *Use Series 2-ML6984 (Date Code 0049) or cut T87 Cooling Anticipator resistor

Honeywell

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North York, ON M2H 3N7

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