

# 220736A,B Internal Auxiliary Switches

## INSTALLATION INSTRUCTIONS



## APPLICATION

The 220736A,B Internal Auxiliary Switch kits can be installed in TRADELINE models of Modutrol IV motors to control auxiliary equipment as a function of motor shaft position.

## SPECIFICATIONS

**Models 220736A,B Internal Auxiliary Switches for TRADELINE Modutrol IV Motors:** Switches are actuated by cams in the motor. The cams can be set to operate the switches at any point in the motor stroke.

**220736A:** Includes one spdt Micro Switch V3 snap-acting switch, mounted on left side and operated by outer cam.

**220736B:** Includes two spdt Micro Switch V3 snap-acting switches.

**Switch differential (difference between switch make and break points):** Approximately 1 or 10 degrees, determined by cam setting.

**Mounting:** Switches are factory installed on bracket.

## FEATURES

- The 220736A includes one spdt Micro Switch V3 precision switch.
- The 220736B includes two spdt Micro Switch V3 precision switches.
- Either kit can be installed in any TRADELINE Modutrol IV motor.
- Kits provide switch mounting bracket for easy installation internal to motor.
- The auxiliary switches are actuated by adjustable cams inside the motor. These cams can be set to actuate the switches at any angle within the stroke of the motor. Only Modutrol IV TRADELINE models are equipped with the cam assemblies for actuating field-addable auxiliary switches. Switch adjustment procedures are the same as those for switches that come factory installed in Modutrol IV motor models.
- Switch differentials of 1 or 10 degrees can be selected.
- Leadwires are color coded to ease correct wiring of auxiliary equipment.

**Wiring:** Color-coded, 15 in. (381 mm) leadwires.

**Electrical ratings:**

One contact <sup>a</sup>	120 Vac	240 Vac
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.



## INSTALLATION

### CAUTION

Disconnect power supply before beginning installation to prevent electrical shock or equipment damage.

NOTE: The wire colors of the 220736A,B auxiliary switches are different from those of factory-installed auxiliary switches (see Tables 1–3 and Fig. 2).

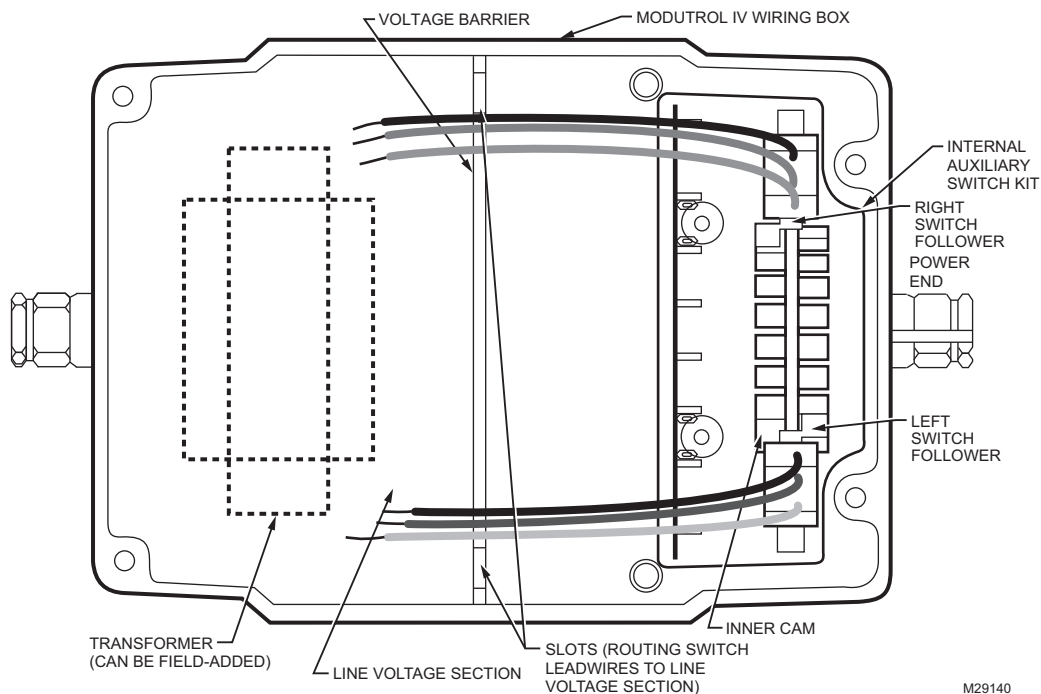
1. When replacing a Modutrol motor, determine original motor model number and refer to Tables 1–3.
2. From the appropriate table, determine switch leadwire color coding and configuration (N.O. and N.C. contacts).
3. For wiring convenience, make note of the difference between the replaced motor and field addable switch color coding.
4. Disconnect and remove the motor to be replaced.
5. Remove the cover from the wiring box of the TRADELINE Modutrol IV motor.
6. Check motor for proper stroke setting. Adjust stroke as needed. Refer to motor specification sheet.

7. Position the switch assembly above the motor as shown in Fig. 1.
8. Lower the switch assembly into place and tighten the two mounting screws, making sure the switch followers are properly aligned with the inner and outer cams in the motor.
9. Run all switch leadwires through slots to line voltage section (at auxiliary end of motor), where connections to auxiliary equipment should be made with solderless connectors.

### CAUTION

The auxiliary switches in the Series 91 low and medium torque TRADELINE Modutrol IV motors operate opposite to those in the Modutrol motors listed in Tables 1 and 2.

When wiring the switches, connect the new switches to the controlled equipment as shown in the appropriate table.



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Fig. 1. Position of auxiliary switch(es) in motor.

**Table 1. Auxiliary switch leadwire colors for low and medium torque Series 91 motors with one auxiliary switch**

	Factory-installed auxiliary switch leadwire color <sup>a,b</sup>					Replace with 220736A,B leadwire
<b>Left auxiliary switch</b>						
N.O.	Yellow	W/Yellow				Orange
N.C.	Blue	W/Blue				Purple
Com.	Red	W/Red				Red
<b>Right auxiliary switch</b>						
N.O.			B/Yellow		B/Yellow	B/Orange
N.C.			B/Blue	B/Yellow		B/Purple
Com.			B/Red	B/Red	B/Red	B/Red
<b>Motor</b>	M9171B1012 M9171B1020 M9174B1019 M9174B1027 M9174B1035 M934D1026 M934D1059	M734D1053 M9164B M934A1565	M7161B M7164B M734J1072 M934A1433	M9171B1004 M9174B1001 M9174B1043 M934D1000	M9172W M9175W M975B1021 M975B1039	M9164D1009 M9174D1007 M9175D1014 Motors with 220736A,B Auxiliary Switch Kit

- <sup>a</sup> Wiring should be NEC Class 1 unless power supply meets Class 2 requirements. Tape unused leads. Make certain the current draw of the external circuit is less than contact rating of switch.
- <sup>b</sup> *W/color* = white wire with colored tracer.  
*B/color* = black wire with colored tracer.  
*color* = solid color wire.

**Table 2. Auxiliary switch leadwire colors for low and medium torque Series 91 motors with two auxiliary switches**

	Factory-installed auxiliary switch leadwire color <sup>a,b</sup>				Replace with 220736A,B leadwire
<b>Left auxiliary switch</b>					
N.O.	Yellow	W/Blue	W/Yellow	W/Yellow	Orange
N.C.	Blue		W/Blue		Purple
Com.	Red	W/Red	W/Red	W/Red	Red
<b>Right auxiliary switch</b>					
N.O.	B/Blue		B/Yellow	B/Yellow	B/Orange
N.C.	B/Yellow	B/Yellow	B/Blue		B/Purple
Com.	B/Red	B/Red	B/Red	B/Red	B/Red
<b>Motor</b>	M9171C M9174C1017 M9174C1025 M9174C1041 M934D1034 M934D1042	M9174C1009 M9174C1033 M934D1018	M9161C M9164C M9172C M934A1243 M934A1250 M934A1268 M934A1276 M934A1292 M934A1318 M965B1030	M9175Y M975B1047 M975B1062	M9164D1009 M9174D1007 M9175D1014 Motors with 220736A,B auxiliary switch kit

- <sup>a</sup> Wiring should be NEC Class 1 unless power supply meets Class 2 requirements. Tape unused leads. Make certain the current draw of the external circuit is less than contact rating of switch.
- <sup>b</sup> *W/color* = white wire with colored tracer.  
*B/color* = black wire with colored tracer.  
*color* = solid color wire.

**Table 3. Auxiliary switch leadwire colors for all motor series except low and medium torque Series 91 (See tables 1 and 2).**

	Factory-installed Auxiliary Switch Leadwire Colors <sup>a,b</sup>			Replace with 220736A,B Leadwire	
<b>Left Auxiliary Switch</b>					
N.O.	Blue	Blue		W/Yellow	Purple
N.C.	Yellow	Yellow		W/Blue	Orange
Com.	Red	Red		W/Red	Red
<b>Right Auxiliary Switch</b>					
N.O.		B/Blue	B/Yellow		B/Purple
N.C.		B/Yellow			B/Orange
Com.		B/Red	B/Red		B/Red
<b>Motor</b>	M445A M644E M644L M845A M845E M941C M944B M944C M944G M944H M954C M955C M955E  M4182B M4185B M4185E M4186H M4186L M6161B M6184B M6191B M6194B M6194E M6282B M6282E M6284B M6285B M6294B M8182B M8185B M9181B M9184B M9184E M9185B M9185E M9194E M9481E M9484E	M644D M744T M744Y M745T M745Y M941D M944D M944E M944S M945C M945D M954B M954D M955F  M6181F M6182F M6184F M6194F M6281F M6284C M6284F M6285C M7281C M7281Q M7284C M7284Q M7285C M7285Q M9181C M9182C M9184C M9184F M9185C M9481F M9484F	M9182W	M8175B M865B	M6184D1035 M6194D1017 M6284D1000 M6285A1005 M6285A1013 M6294D1008 M8185D1006 M9184D1013 M9184D1021 M9185D1004 M9194D1003 Motors with 220736A,B Auxiliary Switch Kit

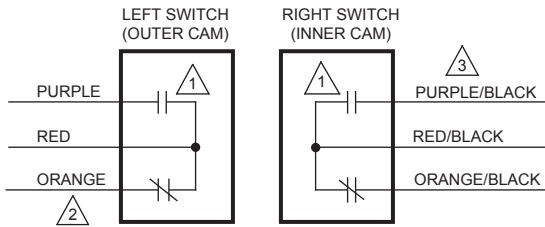
<sup>a</sup> Wiring should be NEC Class 1 unless power supply meets Class 2 requirements. Tape unused leads. Make certain the current draw of the external circuit is less than contact rating of switch.




<sup>b</sup> *W/color* = white wire with colored tracer.  
*B/color* = black wire with colored tracer.  
*color* = solid color wire.

# WIRING

## CAUTION

**Disconnect all power supplies to de-energize auxiliary switch before servicing.**  
All wiring must comply with local codes and ordinances. Do not exceed switch ratings of auxiliary switches.



-  WIRING SHOULD BE NEC CLASS 1 UNLESS POWER SUPPLY MEETS CLASS 2 REQUIREMENTS. TAPE UNUSED LEADS. MAKE CERTAIN THE CURRENT DRAW OF THE EXTERNAL CIRCUIT IS LESS THAN CONTACT RATING OF SWITCH.
-  SWITCH LEADS ON 220736A SINGLE-SWITCH KIT SAME AS LEFT SWITCH ABOVE.
-  COLORS ARE TRACERS ON BLACK BACKGROUND.

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Fig. 2. Auxiliary switch wiring diagram.

# SETTING AND ADJUSTMENTS

## Auxiliary Switches

The auxiliary switches are spdt switches that are actuated by adjustable cams. The cams are factory mounted on the motor shaft at the power end of the motor. The settings of the cams determine the point in motor shaft rotation at which the auxiliary equipment will be switched on or off. These cams can be set to actuate the switches at any angle within the stroke of the motor. All TRADELINE motors include auxiliary switch cams which permit installation of this auxiliary switch kit (220736A, 220736B).

NOTE: When the slow-rise portion of the cam is used, the switching differential is approximately 10° of rotation. When the fast-rise portion of the cam is used, the switch differential is approximately 1° of rotation. Do not use the fast rise portion of the cam if fast cycling of auxiliary equipment is undesirable.

## Auxiliary Switch Adjustment Procedure

### WARNING

**Fire or explosion hazard. Can cause severe injury or death.**

When auxiliary switches control combustion equipment, incorrect wiring of the switches can allow the burner to come on at high fire. Check auxiliary switch wiring and cam adjustment before turning on the system. Watch the controlled equipment through one complete cycle. Shut the system down immediately if switches do not correctly sequence the equipment.

### CAUTION

1. Live circuits are exposed during auxiliary switch adjustment procedure. Always turn off power before adjusting switch cams.
2. Do not turn motor shaft by hand or with wrench as damage to the motor can result.

NOTE: The following instructions are for normally closed motors (motor shaft rotates clockwise, as viewed from the power end of the motor, on an increase in signal).

Additional instructions may also be found in the Auxiliary Switch Adjustment section in the specification sheet included with the Modutrol IV Motor.

Review Table 4 and Fig. 3 before adjusting cams. Table 4 applies to both the left and right switches.

To turn the cams, insert a small screwdriver (1/8" or 3 mm blade) through wiring box into slot on cam and move the screwdriver at the top. Refer to Fig. 3. Each division on the cam represents 15° of motor rotation.

Table 4. Auxiliary switch position with motor shaft rotated to either side of auxiliary switch operating point, as viewed from power end.

Motor type	Cam arrangement	Switch differential	Auxiliary switch contact positions			
			N.O. contact (red and purple leads)		N.C. contact (red and orange leads)	
			Shaft rotated CCW of switch operating point	Shaft rotated CW of switch operating point	Shaft rotated CCW of switch operating point	Shaft rotated CW of switch operating point
All other TRADELINE motors	Blue inner cam, red outer cam	1°	Open	Closed	Closed	Open
		10°	Closed	Open	Open	Closed

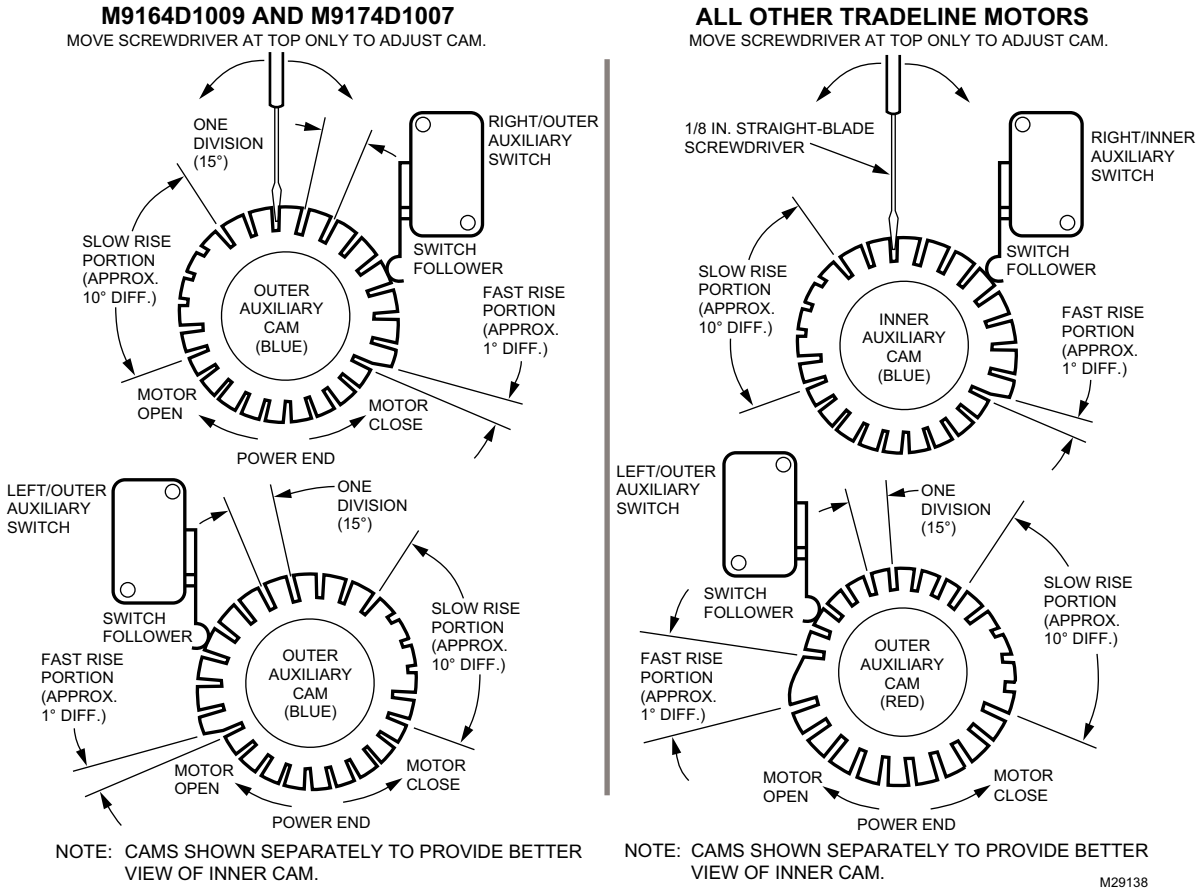


Fig. 3. Auxiliary switch adjustment.

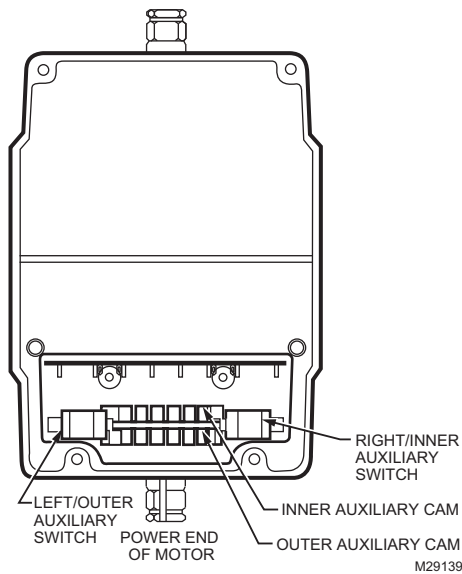


Fig. 4. Auxiliary switch adjustment for M6285 motors.

Table 5. Modutrol IV motor operation.

Motor type	Drive open	Drive closed
M4XX1 and M81XX	Apply power	Remove power
M61XX	R to B	R to W
M62XX	4 to 2	4 to 1
M7XXX	F to (-)	Open terminals +, -, and F
M9XXX	Open W and Short R to B	Open B and Short R to W

1. Turn off power and remove cover of wiring box.
2. Disconnect controller from motor.
3. Connect 24 Vac power and switches to drive motor to position where auxiliary equipment is to be switched. Turn on power. Drive motor in the open direction (see Table 5). To stop the motor at desired position, disconnect jumpers. Motor will remain at this position until connection is restored.
4. For switch differential of 1°, check continuity of auxiliary switch N.O. (red or black/red to purple or black/purple) contacts and rotate cams as follows:

- a. If contacts are open, rotate cam clockwise until N.O. contacts close.
  - b. If contacts are closed, rotate cam counterclockwise until N.O. contacts open.
5. For switch differential of 10°, the cams must be rotated approximately 180° prior to setting the switching action. Refer to Fig. 3. Check continuity of the N.O. contacts and rotate cams as follows:
    - a. If contacts are open, rotate cam counterclockwise until N.O. contacts close.
    - b. If contacts are closed, rotate cam clockwise until N.O. contacts open.
  6. Check for proper switch differential and switching of auxiliary equipment by driving the motor through full stroke (in both directions). If necessary repeat steps 4 and 6 for 1° differential, or 5 and 6 for 10° differential until correct switching action is obtained.
  7. Adjust second switch - if applicable. To stop the motor at desired position, disconnect jumpers. Motor will remain at this position until connection is restored. Proceed with step 8 or step 9 using corresponding wire colors.
  8. Disconnect 24 V power and switches.
  9. Connect auxiliary equipment to auxiliary switch leads. See "Wiring" on page 5.
  10. Reconnect controller and power supply to motor.
  11. Replace cover of wiring box.

## CHECKOUT

### WARNING

**Fire or explosion hazard. Can cause severe injury or death.**

When auxiliary switches control combustion equipment, incorrect wiring of the switches can allow the burner to come on at high fire. Check auxiliary switch wiring and cam adjustment before turning on the system. Watch the controlled equipment through one complete cycle. Shut the system down immediately if switches do not correctly sequence the equipment.

Use the controller to run the motor fully open and then fully closed. Make sure that the auxiliary equipment starts and stops at the desired points in motor rotation. When checkout is complete, return the controller to the desired setting.

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