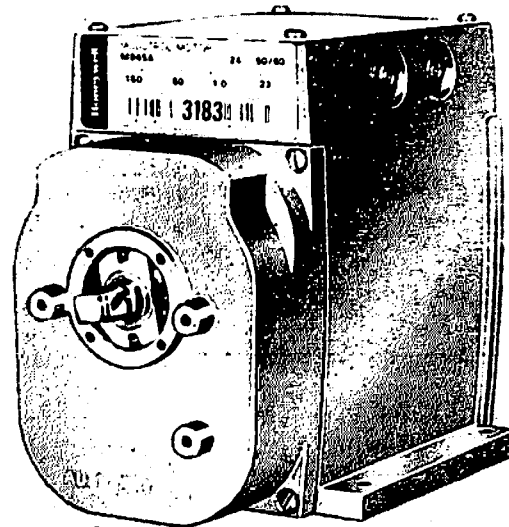


Honeywell

THE M945 IS A 24 V, MODULATING, SPRING-RETURN MOTOR USED TO OPERATE DAMPERS AND VALVES.

- ☐ M945A,B available with 90° or 160° stroke and 30 or 60 second timing.
- ☐ M945C,D,F,G 160° fixed stroke, 60 second timing.
- ☐ Factory-installed helical spring returns motor shaft to normal position (full open or full closed) when power is interrupted.
- ☐ Return spring mechanism is field replaceable.
- ☐ Available with or without internal control circuit.
- ☐ Die-cast aluminum housing.
- ☐ Available with 2 internal auxiliary switches.
- ☐ Interchangeable with previous motors—use existing accessories.
- ☐ Oil-immersed gear train.
- ☐ Accessories include weatherproofing kit, internal transformer, W859 Economizer, and explosion-proof housing.

MODUTROL MOTORS



M945A-D,F,G

SPECIFICATIONS

TRADELINE 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 except as noted below.

TRADELINE MODELS AVAILABLE:
M945A Modutrol Motors.

ADDITIONAL FEATURES:

TRADELINE pack with cross reference label and special instruction sheet.

STANDARD MODELS

MODELS:

M945 Modutrol Motor—24 V, modulating spring-return motor. M945A-D normally closed, M945F,G normally open.

	INTERNAL CONTROL CIRCUIT	AUXILIARY SWITCHES
M945A	yes	—
M945B ^b	no	—
M945C ^b	no	2
M945D	yes	2
M945Fa	yes	—
M945Ga,b	no	—

^aFor normally open applications.

^bRequires external control circuit. See Figs. 4, 5.

ELECTRICAL RATING: 24 V, 50/60 Hz.

ELECTRICAL CONSUMPTION:

M945A,D,F—23 W, 1 A.

M945B,C,G—20 W, 0.86 A.

AUXILIARY SWITCH RATING (A):

M945C,D

	120 V	240 V	277 V
Full load	7.2	3.6	—
Locked rotor	43.2	21.6	—
Resistive	11.0	11.0	11.0

40 VA pilot duty at 120/24 Vac.

CRANK SHAFT: Double-ended, 3/8 in. [10 mm] square.
STROKE: Fixed—90° or 160°.

TIMING: 30 or 60 sec (90° stroke has 30 sec timing).

LOAD RATING: 50 lb.-in. [5.6 N·m] (may be divided between the 2 shaft ends provided no more than 25 lb.-in. [2.8 N·m] are applied to the auxiliary end).

DEAD WEIGHT LOAD ON SHAFT:

Power end—200 lb. [91 kg].

Auxiliary end—10 lb. [4.6 kg].

AMBIENT TEMPERATURE RATINGS:

Maximum—130 F [54 C] at 25% duty cycle.

Minimum—-35 F [-37 C].

ACCESSORIES:

W859A-C Economizer Controls—include change-over, mixed air, and minimum position controls, and transformer. Mount on top of Modutrol motor.

W859D—same as above except less changeover control. For use with H205 Enthalpy Controller.

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

Q605 Damper Linkage—connects motor to damper. INCLUDES MOTOR CRANK ARM.

Transformers—mounted internally. Include mounting screws and barrier.

7640PK—120 Vac; 50/60 Hz.

7640PL—220 Vac; 50/60 Hz.

7640PN—120/208/240 Vac; 50/60 Hz.

Q601 Linkage—connects Modutrol motor to water or steam valve.

Q618 Linkage—connects Modutrol motor to water or steam valve.

(continued on page 3)

ORDERING INFORMATION

WHEN PURCHASING REPLACEMENT AND MODERNIZATION PRODUCTS FROM YOUR TRADELINE WHOLESALER OR YOUR DISTRIBUTOR, REFER TO THE TRADELINE CATALOG OR PRICE SHEETS FOR COMPLETE ORDERING NUMBER OR SPECIFY—

1. Model number; specify TRADELINE, if desired.
2. Accessories, if required.

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 RESIDENTIAL SALES OFFICE (CHECK WHITE PAGES OF YOUR PHONE DIRECTORY).
2. RESIDENTIAL DIVISION CUSTOMER SERVICE
HONEYWELL INC., 1885 DOUGLAS DRIVE NORTH
MINNESOTA, MINNESOTA 55422 (612)542-7500

(IN CANADA—HONEYWELL LIMITED/HONEYWELL LIMITEE, 740 ELLESMERE ROAD, SCARBOROUGH, ONTARIO M1P 2V9) INTERNATIONAL SALES AND SERVICE OFFICES IN ALL PRINCIPAL CITIES OF THE WORLD.

Q100 Linkage—connects Modutrol motor to butterfly valve.
 Q209C Potentiometer—limits minimum position of motor.
 Q68 Dual Control Potentiometer—controls 2 through 5 additional motors.
 Q181A Auxiliary Potentiometers—controls 1, 2 or up to 4 additional motors.
 7640JT Weatherproofing Kit—weatherproofs M945 Modutrol Motor.

7616BR Motor Crank Arm—included with Q605 but not with motor.

7640PP Screw Terminal Adapter—use to convert M945A,D,F quick-connect terminals to screw terminals.

7640PW Screw Terminal Adapter—use to convert M945B,C,G quick-connect terminals to screw terminals.

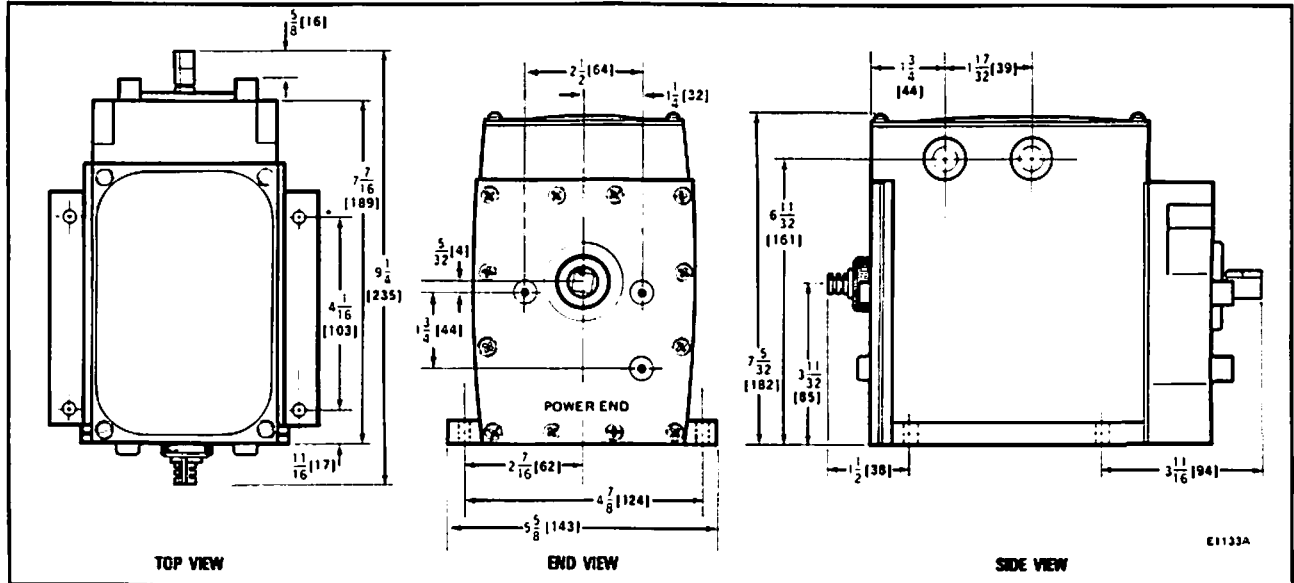


FIG. 1—APPROXIMATE DIMENSIONS OF THE M945 MODUTROL MOTOR IN in. [mm IN BRACKETS].

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

1. Disconnect power supply before beginning installation to prevent electrical shock or equipment damage.
2. Never turn the motor shaft by hand or with a wrench, as damage to the gear train will result.

LOCATION

Install the motor in any location except where acid fumes or other deteriorating vapors might attack the metal parts of the motor, or in atmospheres of escaping gas or other explosive vapors.

Choose a location for the motor which allows enough clearance for mounting accessories and servicing.

MOUNTING

The motor has a flange on the bottom for mounting. The mounting holes are sized for 1/4 in. machine screws or bolts. The motor may be mounted in any position as long as the shaft is horizontal.

All M945 Modutrol Motors (except the M945F and G) are shipped in the *closed* position. The closed position is the limit of counterclockwise rotation as viewed from the power end of the motor (Fig. 2).

The M945F and G are shipped in the *open* position. The open position is the limit of clockwise rotation as viewed from the power end of the motor.

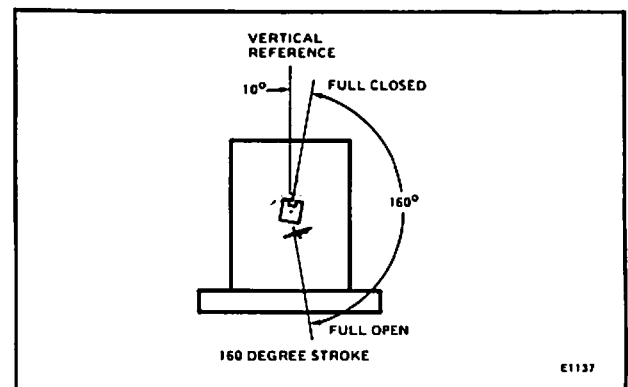


FIG. 2—LIMITS OF MOTOR SHAFT ROTATION VIEWED FROM POWER END.

LINKAGES

The motor comes without a crank arm. The motor crank arm is included in the Q605 Damper Linkage or may be ordered separately (Part No. 7616BR).

For detailed instructions on the assembly of specific linkages, refer to the instruction sheet packed with each individual linkage.

Do not turn the motor shaft manually or with wrench as damage to the gear train will result.

When planning and installing a motor and linkage, check the following points of operation:

1. Attach the valve or damper linkage to the motor shaft so the motor crank arm travels through its full range while the drive mechanism moves through only its required maximum distance (Fig. 2).
2. The motor must be stopped at the end of its stroke by the limit switch and must not be stalled by the damper or valve.
3. Do not exceed the load and torque ratings in any application.

WIRING

Disconnect power supply before 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 M945 Modutrol Motor must correspond to the characteristics of the power supply and those of the motor.

See Figs. 3 through 13 for typical wiring hookups.

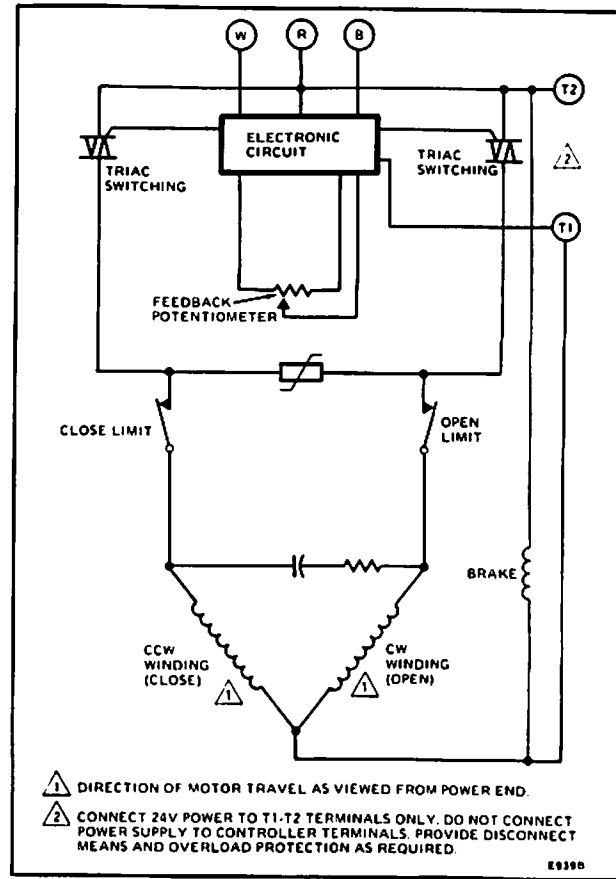


FIG. 3—M945A,D,F INTERNAL SCHEMATIC.

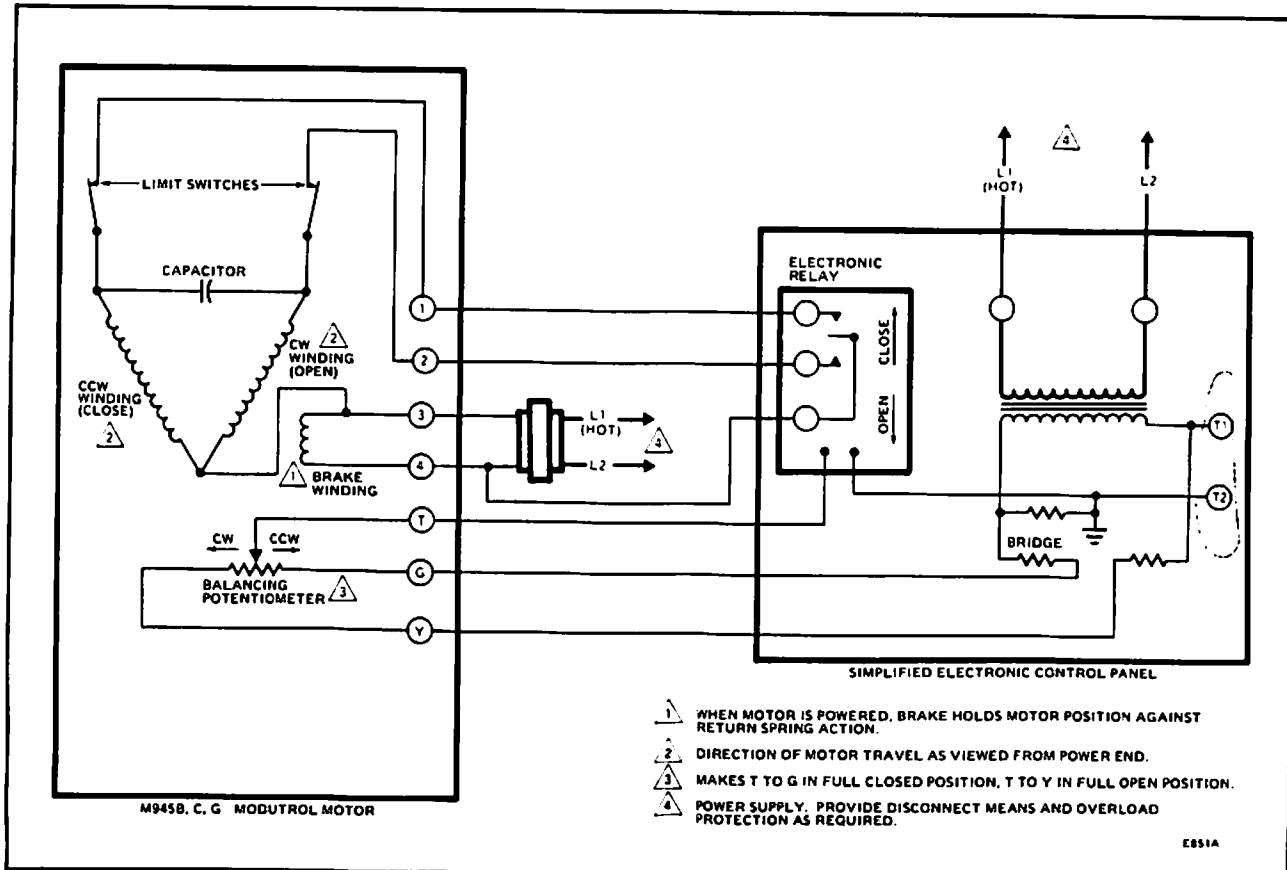


FIG. 4—M945B,C,G INTERNAL SCHEMATIC AND CONNECTIONS TO TYPICAL ELECTRONIC PANEL.

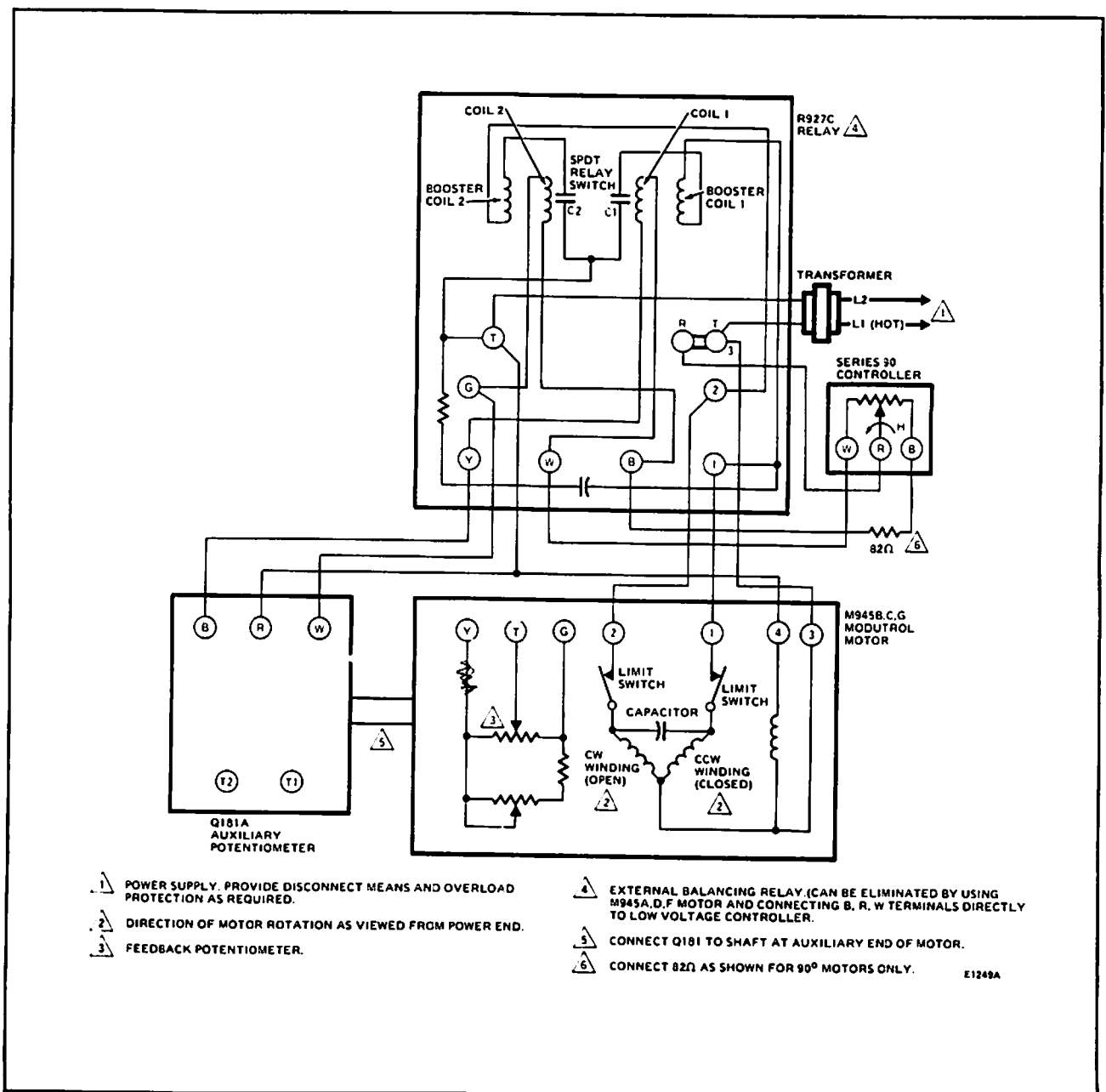


FIG. 5—M945B,C,G INTERNAL SCHEMATIC AND CONNECTIONS TO R927C RELAY.

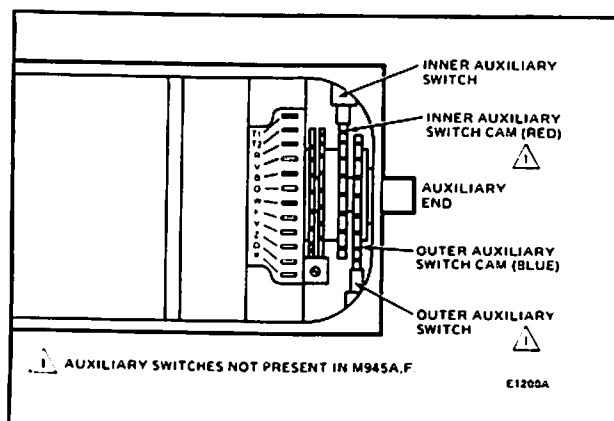


FIG. 6—M945A,D,F WIRING TERMINALS.

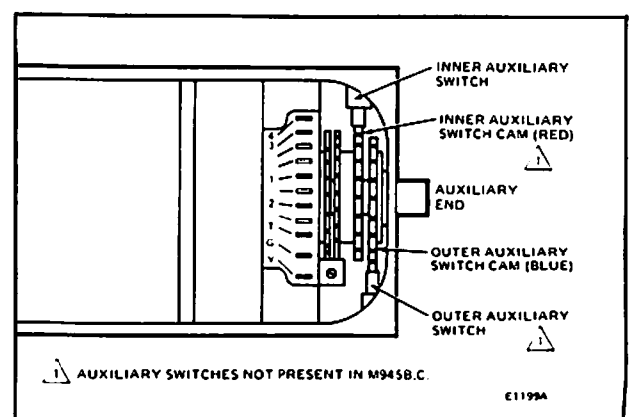


FIG. 7—M945B,C,G WIRING TERMINALS.

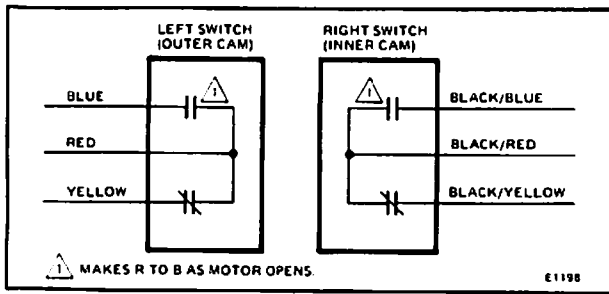


FIG. 8—AUXILIARY SWITCH WIRING—M945C,D ONLY.

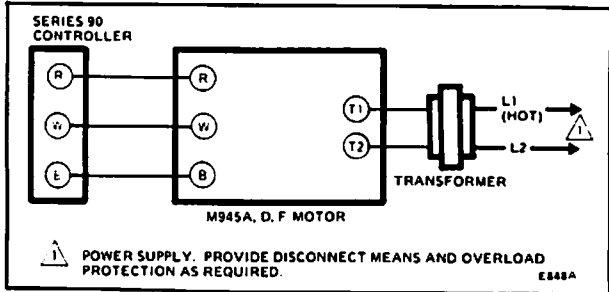


FIG. 9—TYPICAL HEATING SYSTEM HOOKUP FOR M945A,D,F.

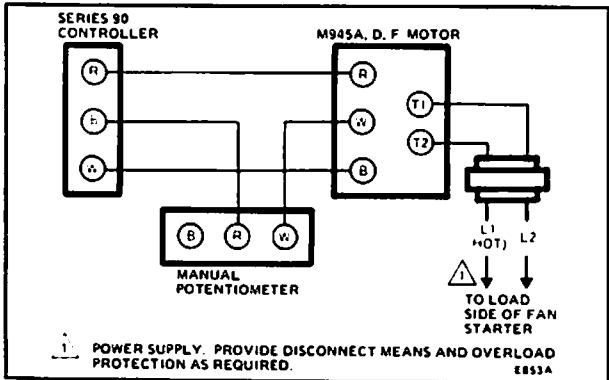


FIG. 10—TYPICAL HOOKUP WHEN MANUAL POTENTIOMETER IS USED TO LIMIT MINIMUM POSITION OF MOTOR. MOTOR CLOSES COMPLETELY ON LOSS OF POWER.

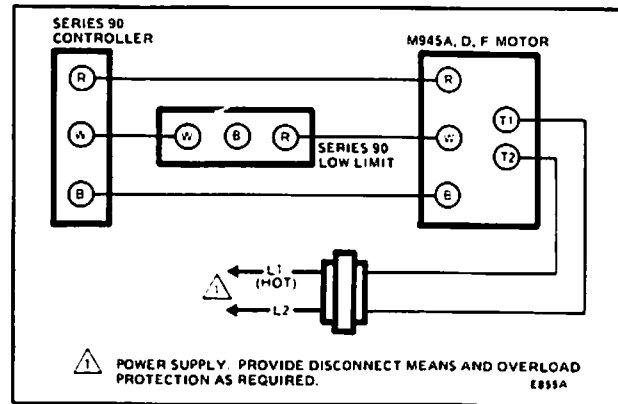


FIG. 11—TYPICAL UNIT VENTILATOR HOOKUP USING MODULATING LOW LIMIT. MOTOR OPENS WHEN TEMPERATURE DROPS INTO LIMIT RANGE (maximum open position—50% with one 135 ohm potentiometer, 100% with two 135 ohm potentiometers in series or one 270 ohm potentiometer).

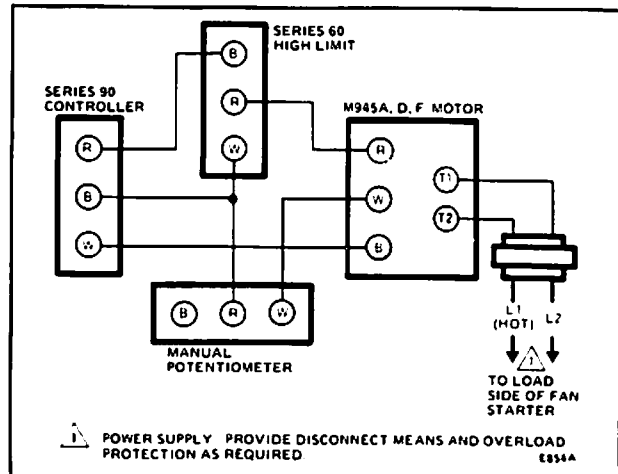


FIG. 12—TYPICAL COOLING OR VENTILATING SYSTEM HOOKUP USING SPDT HIGH LIMIT AND MANUAL POTENTIOMETER TO LIMIT MINIMUM POSITION OF MOTOR.

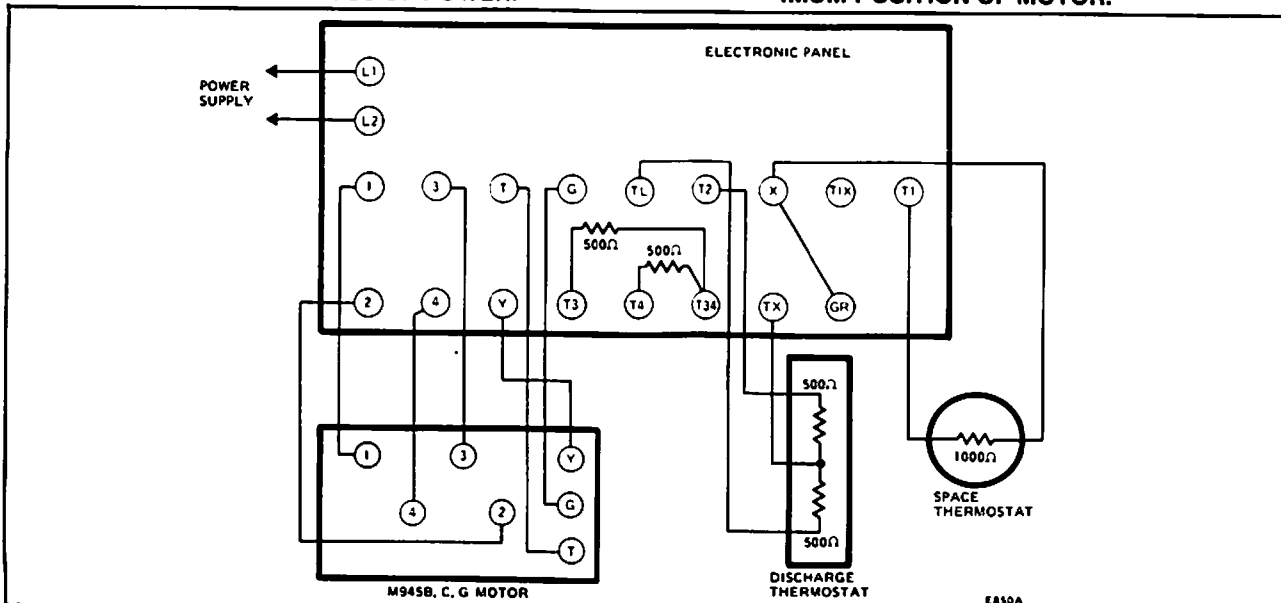


FIG. 13—TYPICAL HOOKUP FOR MOTOR AND ELECTRONIC PANEL USED IN HEATING APPLICATION.

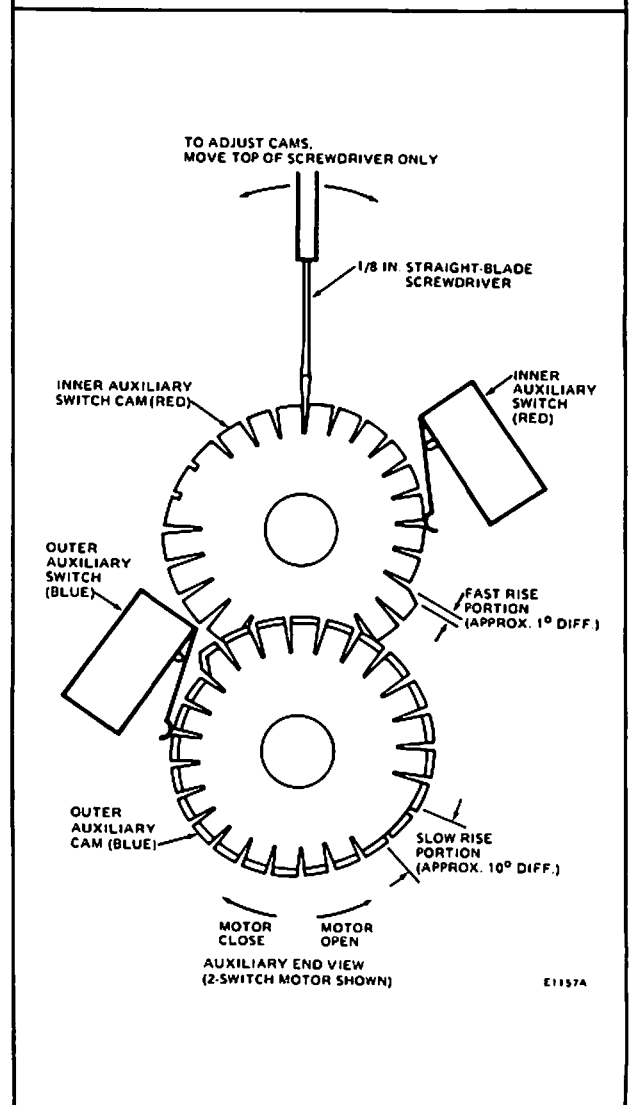
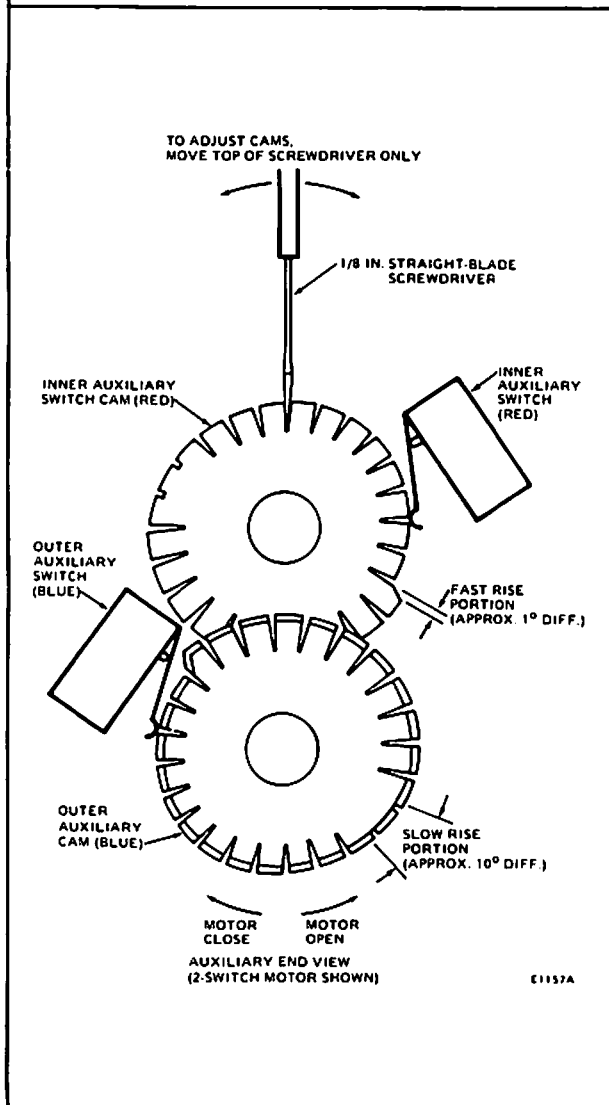
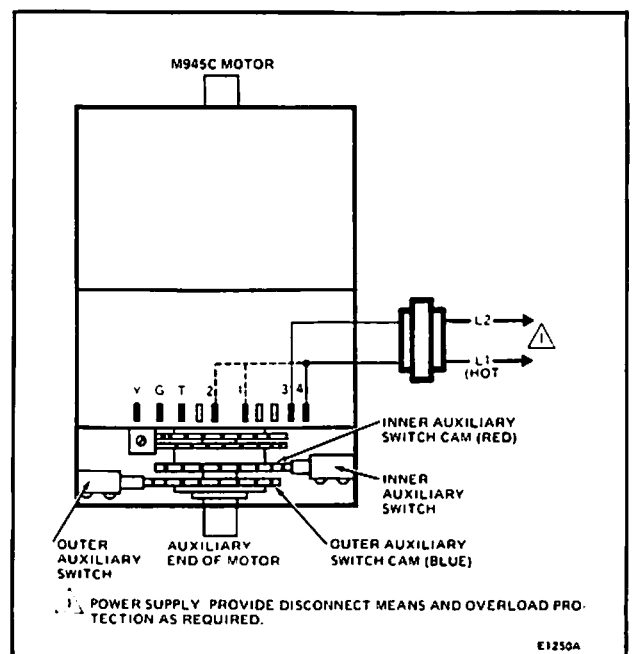
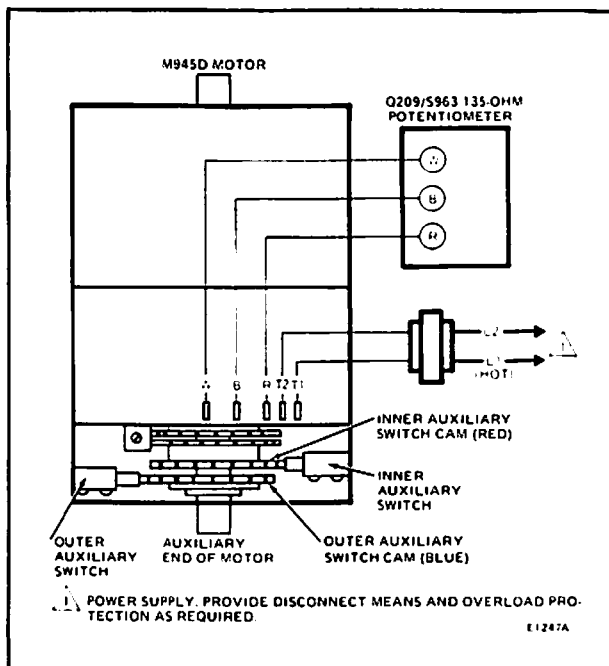


FIG. 14—AUXILIARY SWITCH ADJUSTMENT SETUP—M945D.

FIG. 15—AUXILIARY SWITCH ADJUSTMENT SET-UP—M945C.

AUXILIARY SWITCH

The auxiliary switches in M945C,D motors are actuated by adjustable cams. These cams can be set to actuate the switches at any angle within the stroke of the motor. Also, switch differentials of 1° or 10° can be selected.

Motors are shipped in the closed position with auxiliary cams set to actuate switches 30° from the closed position, and to provide 1° differential. With motor in closed position, auxiliary switch breaks R-B and makes R-W.

AUXILIARY SWITCH SETTING PROCEDURE—M945D (Fig. 14)

1. Remove top cover from motor to gain access to motor terminals and auxiliary cams.
2. Disconnect controller from motor and connect 135 ohm manual potentiometer with R,W,B terminals on pot connected to corresponding terminals on motor.
3. Drive the motor to the desired position where auxiliary equipment is to be switched, by adjusting the 135 ohm pot.
4. For switch differential of 1°, check continuity of auxiliary switch R-B contacts and rotate cam as follows:
 - a. If contacts are open, rotate cam counter-clockwise until R-B contacts close.
 - b. If contacts are closed, rotate cam clockwise until R-B contacts open.
5. For switch differential of 10°, check continuity of auxiliary switch R-B contacts and rotate cam as follows:
 - a. If contacts are open, rotate cam clockwise until R-B contacts close.
 - b. If contacts are closed, rotate cam counter-clockwise until R-B contacts open.
 - c. Final adjustment in the proper direction should be made to obtain contact make or break at the desired position.

6. Check for proper differential and switching of auxiliary equipment by driving motor through full stroke (in both directions), using the 135 ohm pot. If necessary, repeat differential adjustments.

7. Disconnect 135 ohm pot, reconnect controller and replace top cover on motor.

AUXILIARY SWITCH SETTING PROCEDURE—M945C (Fig. 15)

1. Remove top cover from motor to gain access to motor terminals and auxiliary cams.
2. Disconnect controller from motor.
3. Drive motor to the position where auxiliary equipment is to be switched by connecting a jumper between motor terminals 2 and 4 to drive motor open, or between terminals 1 and 4 to drive motor closed.
4. For switch differential of 1°, check continuity of auxiliary switch R-B contacts and rotate cam as follows:
 - a. If contacts are open, rotate cam counter-clockwise until R-B contacts close.
 - b. If contacts are closed, rotate cam clockwise until R-B contacts open.
5. For switch differential of 10°, check continuity of auxiliary switch R-B contacts and rotate cam as follows:
 - a. If contacts are open, rotate cam clockwise until R-B contacts close.
 - b. If contacts are closed, rotate cam counter-clockwise until R-B contacts open.
 - c. Final adjustment in the proper direction should be made to obtain contact make or break at the desired position.
6. Check for proper differential and switching of auxiliary equipment by driving motor through full stroke in both directions.
7. Disconnect jumper, reconnect controller, replace top cover on motor.

OPERATION AND CHECKOUT

M945A,D,F MOTORS (Fig. 3)

The 2 potentiometers, one in the controller and one in the motor, along with resistor network, form a bridge circuit. As long as the value of the controlled medium remains at the controller set point, the circuit is balanced, and the motor does not run.

When the value of the controlled medium changes, the potentiometer wiper in the controller is moved, which unbalances the bridge circuit. This unbalance is amplified, and energizes Triac switching to run the motor in the direction necessary to correct the change in temperature or pressure. The motor turns the feedback potentiometer to rebalance the circuit and stop the motor.

M945B,C,G MOTORS (Fig. 4)

When the M945 is used with an electronic panel the operation is similar to that described above. In this application, however, the temperature is sensed by a temperature sensitive resistance element. With a change in temperature, the resistance changes and unbalances a bridge circuit that actuates the electronic relay. This in turn runs the motor which moves the feedback potentiometer and rebalances the circuit. The motor runs toward the open position when the temperature decreases.

After installation and linkage adjustment, check the entire motor and control hookup. A good checkout proves that:

- The motor operates the damper or valve properly.
- The motor responds properly to the controller.
- The valve or damper returns to its normal position upon interruption of power.

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

M945A,D,F CHECKOUT

If controller is near motor:

1. Adjust the set point of the controller above the ambient temperature.
2. Check the motor and valve or damper for proper operation.
3. Adjust the set point of the controller below the ambient value and again check for proper motor operation.

If controller is remote from motor:

1. Disconnect one transformer lead to the motor. Disconnect the leads to the controller at the motor. In place of these leads connect a 135 ohm potentiometer such as the S963 color-to-color to the motor. Turn the potentiometer all the way clockwise . Reconnect the transformer wire. The normally closed motor should not run (normally open motor will run to closed position).

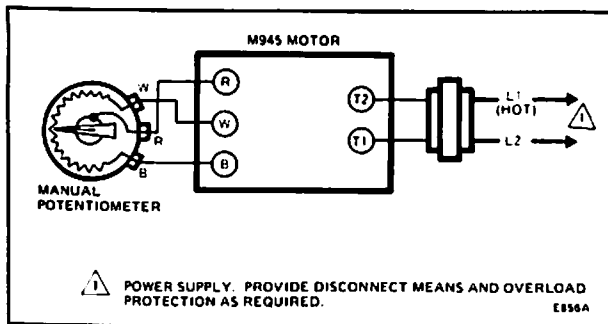


FIG. 16—CONNECTING MANUAL POTENTIOMETER TO MOTOR.

2. Turn the potentiometer all the way counter-clockwise . Motor should run to the open position. Turn the potentiometer clockwise  in 30° to 40° steps. Wait at each step for the motor to travel a similar interval. Position the motor at approximately midstroke.

3. Disconnect one transformer lead from the motor. The return spring should return M945A,D closed or M945F open.

4. Disconnect the potentiometer and reconnect the controller. Reconnect the transformer. Adjust the controller through its range and check for motor operation.

M945B,C,G CHECKOUT

1. Disconnect leads from terminals 1 and 2 on motor (see Fig. 4).

2. Jumper terminals 1 and 4 on motor. Motor will drive closed.

3. Remove jumper from terminal 1 and jumper terminals 2 and 4 on motor. Motor will drive open.

4. Disconnect terminal 3 on motor to remove power. Spring return will drive M945B,C closed or M945G open.

5. Remove jumper and reconnect leads.

If questions arise regarding this product, contact your distributor or local Honeywell representative.