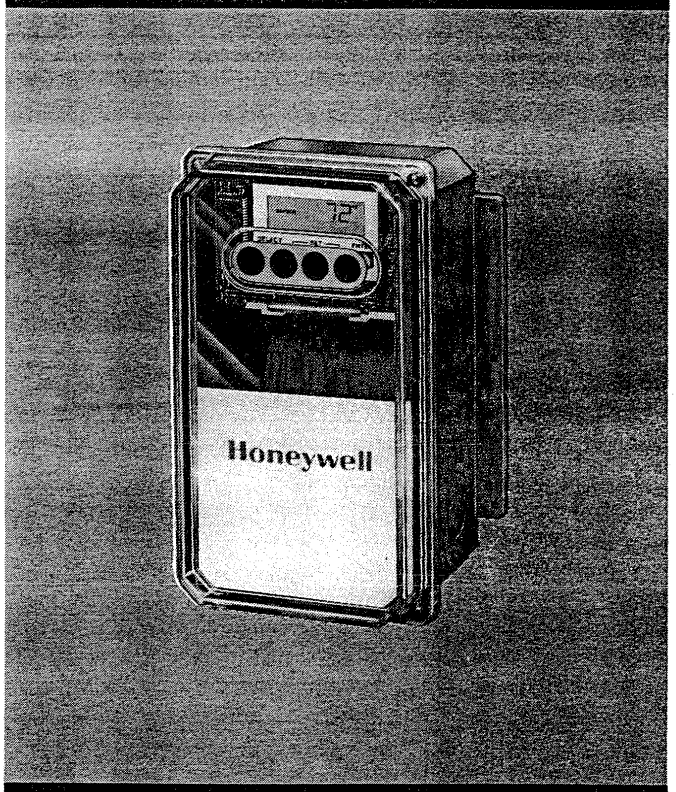
Honeywell

ELECTRONIC REMOTE TEMPERATURE CONTROLLERS



T775G

THE T775 FAMILY OF ELECTRONIC REMOTE TEMPERATURE CONTROLLERS PROVIDES 135Ω, 4-20 mA, or 0-18 Vdc PROPORTIONAL + INTEGRAL MODULATING CONTROL FOR HOT WATER, STEAM, OR CHILLED WATER VALVES, DAMPERS, IN AGRICULTURAL CONFINEMENT BUILDINGS, STORAGE AREAS, AND HEAVY INDUSTRIAL APPLICATIONS.

☐ Typical applications include barns, broader houses, poultry houses, hog houses, pump houses, and crop storage houses.

☐ NEMA 4X enclosure resists oil, water, dust and corrosion.

☐ T775G models provide P+I modulating control with 1 temperature input and either 4-20 mA, 0-18 Vdc, or Electronic Series 90* modulating output and 0 to 3 relay output stages.

☐ T775G meet National Electric Code (Article 547) requirements for animal confinements buildings.

☐ Clear plastic cover reveals LCD display for temperature indication and output status.

☐ Tin-plated linear platinum sensor.

☐ Thru-the-cover keypad provides adjustable temperature range and differential.

☐ -20° F to 240° F temperature set point range.

☐ -30° F to +125° F ambient temperature range.

☐ +/- 1° F Accuracy.

☐ Spdt relay outputs.

☐ Stage(s) independently programmed for heating or cooling.

*NOTE: This Electronic Series 90 output will not drive electromechanical slidewire devices.

P.B.
Rev. 1-91

Form Number 63-2247—2

SPECIFICATIONS

Models: The T775G family of electronic remote temperature controls provides 4-20 mA, 0-18 Vdc , or Electronic Series 90 Proportional + Integral modulating control for hot water, steam, or chilled water valves, dampers in agricultural confinement buildings, storage areas, and heavy industrial applications..

T775G: P+I modulating control with 1 temperature input and either 4-20 mA, 0-18 Vdc, or Electronic Series 90 modulating output and 0 to 3 relay output stages. Includes one 193987GA sensor.

MODEL NUMBER	TEMPER-ATURE INPUTS	OUTPUTS	
		MODULATION TYPE	NUMBER OF RELAY OUTPUTS
T775G1005	1	Series 90	3
T775G1013	1	4-20 mA	3
T775G1021	1	0-18 Vdc	3

ELECTRICAL RATINGS:
Voltage Input: 24/120/240 Vac, 50/60 Hz.
Power Consumption:
13VA max. at 60 Hz
20VA max. at 50 Hz

CONTACT RATINGS:
- 1/2 HP; 9.8 FLA 58.8 LRA @ 120 Vac
- 1/2 HP; 4.9 FLA 29.4 LRA @ 240 Vac
- 125 VA pilot duty at 120/240 Vac
- 10A @ 24 Vac (resistive)

SENSOR: Positive coefficient platinum type, 4.8 ohms/° F, 1000 ft. maximum distance between sensor and solid state controller (calibrate over 400 ft.). To maintain NEMA 4X rating, use environmental proof cable and sensor.

TEMPERATURE ACCURACY: +/- 1° F.

DISPLAY RESOLUTION: Sensed temperature and other operating parameters are displayed via a liquid crystal display (LCD) with a resolution of 1° F or 1° C.

SET POINT ADJUSTMENT RANGE: -20 to 240° F [-29 to 116° C].

OPERATING AMBIENT TEMPERATURE:
CONTROLLER: -30 to 125° F [-34 to 52° C].
SENSOR: -20 to 240° F [-29 to 116° C].

THROTTLING RANGE: Adjustable 2 to 30° F or C.

OPERATING HUMIDITY: 5 - 95 % RH Noncondensing.

APPROVALS:
Underwriters Laboratories Inc. Listed, File No. E4436.
Canadian Standards Association Certified, File No. LR47125.

MOUNTING: Mounts on any suitable horizontal or vertical surface (see Fig. 5 for mounting hole locations).

ACCESSORIES:
121371E—Stainless Steel Well
107408—Heat Conduction Compound, 4 oz.

ORDERING INFORMATION

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

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 AND BUILDING CONTROLS SALES OFFICE (CHECK WHITE PAGES OF YOUR PHONE DIRECTORY).**

2. **RESIDENTIAL AND BUILDING CONTROLS DIVISION CUSTOMER SATISFACTION**
   HONEYWELL INC., 1885 DOUGLAS DRIVE NORTH
   MINNEAPOLIS, MINNESOTA 55422-4386 (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.

CONTROLLER DESCRIPTION/OPERATION

CONTROL ALGORITHM

Proportional + Integral Modulating Control

Proportional + Integral control provides fast, responsive operation of the controlled devices in reacting to temperature changes by providing an output signal proportional to the deviation between set point and actual temperature. An Integral proportion also provides a time dependent output signal which is dependent on the length of time the deviation between actual set point and sensed temperature existed.

The P+I algorithm places the control set point in the middle of the throttling range. A deadband around set point exists and is proportional to the throttling range. For the T775, this deadband is 1/8 of the throttling range.

Modulating Control

There are three modulation options available for the T775. These options are:

- Electronic Series 90: This output is intended for use with an Electronic Series 90 actuator and provides an electronic signal equivalent to a 135 ohm potentiometer for control of dampers and valves. This electronic signal will not drive electromechanical slidewire devices.
- 4-20 mA: This is a general purpose current mode output which can drive a 600 ohm maximum load without output current degradation. This modulation output can be used with Honeywell Modutrol™ or other motors that accept an input signal of 4-20 mA. (M744S,T,Y and the M745S,T, and Y) or other Honeywell motors with the use of resistor kits.
- 0-18 Vdc (voltage ranging): This output module is intended as a general purpose voltage output and can drive a 2000 ohm load minimum The span of voltage output is user selectable via a DIP switch (see Fig. 3). The spans offered are 3, 8, 14, and 17 volts. A zero adjustment dial is provided allowing the user to select starting voltages for common ranges such as 4-7 Vdc, 6-9 Vdc, 2-10 Vdc,10.5-13.5 Vdc, 14.5-17.5 Vdc, 1-15 Vdc, and 1-18 Vdc. This modulation output can be used with Honeywell Modutrol™ motors that accept a voltage span comparable to any of the above. The device is factory set at the 2-10 Vdc range.

The T775G operates with one (1) temperature input supplied by the remote sensor. The T775G is capable of providing up to four outputs, one of which is modulating. Each stage of the T775G has its own independent set point which can be configured to operate in the cooling or heating mode. The mode of operation for each stage is user determined by the programming keys.

CONTROLLER DESCRIPTION OPERATION

Heating Operation Mode

- The throttling range is centered around the set point.
- Modulating outputs are at their minimum or closed position at set point **plus** 1/2 of the throttling range.
- Modulating outputs are at their maximum or open position at set point **minus** 1/2 of the throttling range.
- Relay outputs are energized at set point **minus** differential and are de-energized at set point.

Cooling Operation Mode

- The throttling range is centered around the set point.
- Modulating outputs are at their minimum or closed position at set point **minus** 1/2 of the throttling range.
- Modulating outputs are at their maximum or open position at set point **plus** 1/2 of the throttling range.
- Relay outputs are energized at set point **plus** differential and de-energized at set point.

Contact Closure Override Input

A two terminal input is provided to allow the user to override a relay energized condition of any output. When used with modulating devices, a Contact Closure override input causes the output to return to its minimum position. This function is generated by a contact closure between terminal pins 3 and 4 of the terminal block for sensor input. (Shown in Fig. 5).

When Contact Closure override is active, the display will show the numbers of stages that would have been energized and the words "STAGE ENERGIZED" will flash.

°F/°C Selection

A single jumper plug controls °F/°C indication of the displayed temperature value. The location of this jumper is shown in Fig. 5. The unit is shipped with the jumper installed in the °F mode. To operate the device in the °C mode, remove the jumper.

DIP Switch Selections

DIP switches are present for voltage range selection on 0-18 Vdc modulating devices. On the printed wiring board below each switch is the span corresponding to each switch. Fig. 2 shows the location of this switch, zeroing dial, and how to set the voltage span.

KEYPAD PROGRAMMING AND DISPLAY:

The T775 utilizes a Liquid Crystal Display for interactive prompting during programming and display of sensed and assigned set point and differential values. User programming of the T775 is accomplished through the use of four programming keys.

Programming Keys

The four programming keys are the Select, Up arrow, Down arrow, and Enter keys.

- **Select** key sequentially prompts the user as to what parameter is being displayed: set point, differential, stage energized, heat or cool (operation mode), 1,2,3,4 (indicating assigned stage). Once the last parameter value has been viewed, pressing the **Select** key will display the control values again from the beginning of the display loop.
- **Up** and **Down** arrow keys allow the displayed parameter to be increased or decreased. After pressing the **Select** key, a control value can be changed by using the arrow keys. Control values will be increased or decreased by 1° F or 1° C each time the arrow keys are depressed.
- **Enter** key places the new value into the memory of the microprocessor. **A control value or operation will not be effective in the memory of the microprocessor until the Enter key is pressed.** Control values and operation selection will remain in the device memory even after power is removed.
- Simultaneously pressing the **Select** and **Enter** keys is required to change the control algorithm from

heating to cooling or from cooling to heating. These parameters (heat and cool) are not displayed during normal **Select** key sequences. The only parameters displayed after pressing the **Select** and **Enter** keys at the same time will be stage indication and the word "heat" or "cool". To change the operation from heating to cooling or vise versa for a desired output stage, use the arrow keys as required. Once the mode has been changed, depression of the **Enter** key is necessary to enter this change into the microprocessor memory. The next stage of heat or cool assignment will appear after the **Select** key is pressed. When all stages have been programmed, the display will revert back to showing the sensed temperature and load energized status.

Display

Once power is applied or restored to the device, the display will countdown from 210 until the display reads zero during which time any previously energized outputs will be de-energized. This is intended to protect compressors in the event of a power outage.

To **avoid viewing this entire countdown**, press the Select key. The LCD display will now show what it normally reads: sensed temperature and stages energized. At any time during the programming procedure, the display will revert back to showing the sensed temperature and stage status indication 60 seconds after the last key closure.

Error Messages

There are seven error messages that can be displayed in response to software or hardware problems with the T775. The error codes that may be seen flashing on the display are listed below:

SF—Sensor Failure
If display flashes (SF), this indicates an out of range sensor. Determine if the sensor is connected properly. All loads will be de-energized or returned to their minimum position when this error message is flashing.

EF—EEPROM Failure
The values read back from the EEPROM are not the same as what was written into the EEPROM. This error cannot be field repaired. Replace device.

CF—Calibration Failure
A calibration resistor reading was not within the range of the Analog to Digital convertor. This error cannot be field repaired. Replacement of device is necessary.

OF—Stray interrupt failure
An unused interrupt occurred. This error cannot be field repaired. Replace device.

CE—Configuration Error
The device hardware has been configured to a nonexistant device. This error cannot be field repaired. Replacement of device is necessary.

OE—ROM Error
The internal ROM of the microprocessor is defective. This error cannot be field repaired. Replacement of device is necessary.

AE—RAM Error
The internal RAM of the microprocessor is defective. This error cannot be field repaired. Replacement of device is necessary.

Set Point Calibration

To maintain temperature accuracy, sensor wires should be 18 AWG two-conductor. If the length of the sensor wire exceeds 400 ft. recalibration will be necessary to maintain accuracy. The chart below shows the corresponding temperature offset that should be used for different sensor wire lengths. This temperature offset should be added to the desired temperature set point for these applications.

SENSOR WIRE LENGTH	CALIBRATION OFFSET
0-399 ft.	none required
400-599 ft.	1 degrees
600-799 ft	2 degrees
800-1000 ft	3 degrees

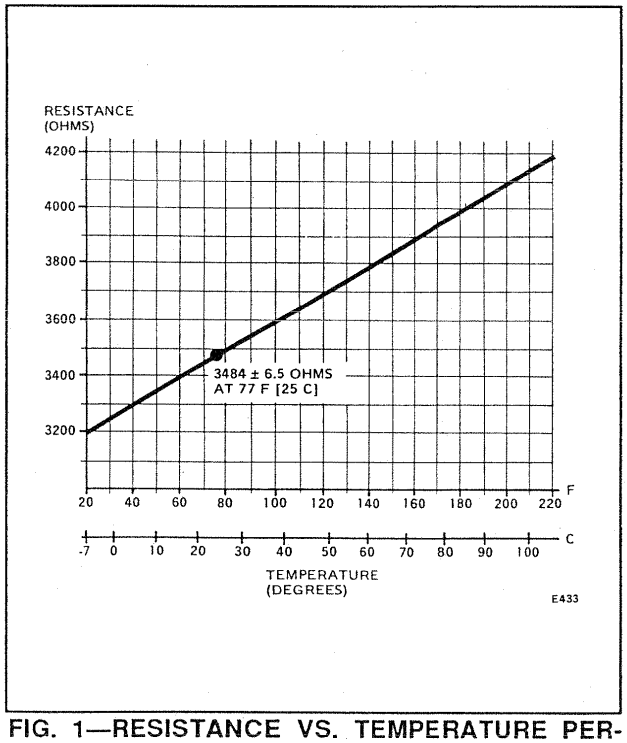


FIG. 1—RESISTANCE VS. TEMPERATURE PERFORMANCE CHARACTERISTICS.

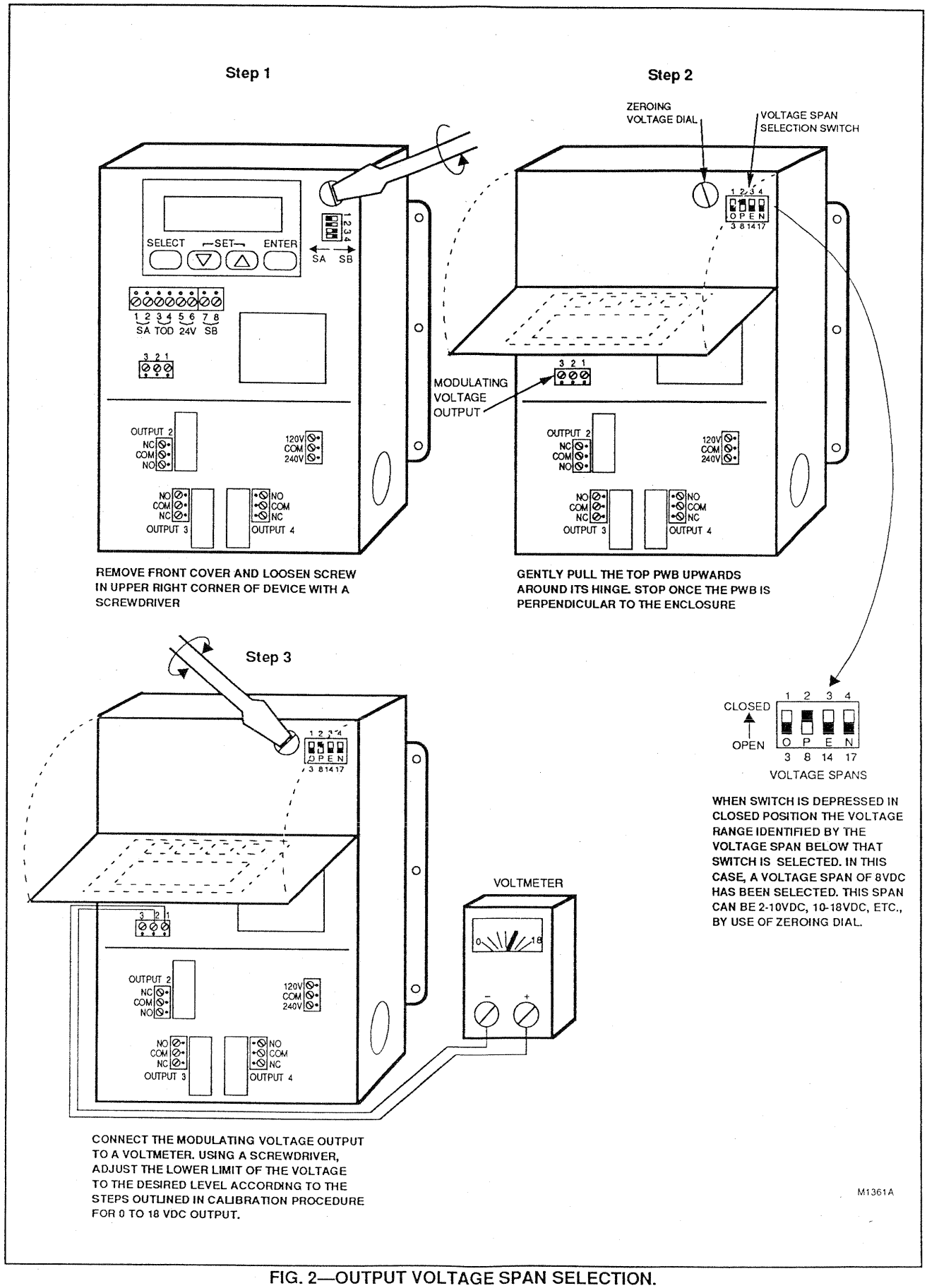


FIG. 2—OUTPUT VOLTAGE SPAN SELECTION.

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 the product operation as provided in these instructions.

WARNING

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

LOCATION AND MOUNTING

Mount the controller on any convenient interior location using the sixmounting holes provided along the sides of the NEMA 4X enclosure (mounting screws are not included). Controller dimensions in Fig. 3 may be used as a guide.

WIRING

Disconnect external power before installation to prevent electrical shock or equipment damage. All wiring must comply with applicable codes and ordinances.

The T775 is not intended for safety limit applications. It is an operating control, not a safety control.

Refer to Fig. 4 and 5 for locating the appropriate power inputs, remote sensor input, relay, and modulating output terminals, Contact Closure input. Access to the terminals can be gained through standard conduit knockouts (A-C) located around the perimeter of the enclosure. NOTE: Hole "A" should only be used for remote sensor wiring, low voltage wiring, TOD input, and access to modulating output. When wiring the input power, only one source of power can be applied to the T775 (e.g. 24 Vac or 120 Vac or 240 Vac). Knockouts "B" and "C" can be used to gain access to 120 Vac or 240 Vac input terminals and the load relay output terminals.

Refer to Fig. 6 for modulating output temperature diagram. Refer to Fig. 7 for temperature/load diagram. The T775 can be used to control damper and valve actuators that accept 4-20 mA, 0-18 Vdc, or Electronic Series 90 modulating inputs, as well as controlling up to three on/off loads. Depending on the application and the motor or actuator used, the T775 can control up to six Modutrol™ motors by utilizing resistor kits that are available as accessory parts for existing motors. Using specified resistor kits can also allow the user to control a Series 90 motor or actuator with a 4-20 mA controller. Information regarding these kits can be found in either the Tradeline catalog, motor specification sheets, or from your local distributor.

Refer to Figs. 7-15 for T775 typical wiring and applications.

IMPORTANT

Erratic temperature readings from a 198212CA sensor can be caused by poor wiring practices described below. These *must be avoided* to ensure proper operation.

a. Temperature sensor wiring routed with building power wiring.

b. Temperature sensor wiring located next to control contactors.

c. Temperature sensor wiring located near electric motors.

d. Temperature sensor wiring located near welding equipment.

e. Bad wiring connections.

f. Sensor in poor temperature environment (review mounting and location instructions).

If these conditions can not be avoided, use shielded wiring.

CAUTION

The green wire by the sensor terminal block must be connected to earth ground through hole A (see Fig. 0) or the device warranty will be void.

DEVICE SETUP

1. Determine the loads to be controlled and the operating mode (heat or cool) and enter into the worksheet at the end of this section:

For Example: Load 2: Compressor 1 (cool)
SetPt 1 _____ On at _____
Diff 1 _____ Off at _____

2. Determine the set point (SetPt) and the switching differential (Diff) for each load and enter into the worksheet below.

For Example: Load 2: Compressor 1 (cool)
SetPt 1 __78__ On at _____
Diff 1 __4__ Off at _____

3. Refer to the Control Algorithm section (page 3) to calculate the load on and off temperatures and enter into the worksheet below. Remember that on/off outputs are off at set point regardless of whether in the heating or cooling operating mode. When in cooling the load will be turned on at set point plus the differential. When in heating the load will be turned on at set point minus the differential.

For Example: Load 2: Compressor 1 (cool)
SetPt 1 __78__ On at __82__
Diff 1 __4__ Off at __78__

CAUTION

The T775 will not allow the user to program for both heating and cooling loads to be energized simultaneously. If this situation results, Cooling loads will be energized and heating loads will be prevented from also energizing. The number (1,2,3,4) of these non-energized loads will flash, along with the word "HEAT" to indicate a call for both heating and cooling loads controlled by one sensor has occured and to alert the user to re-program the affected control values.

4. Remove the T775 cover and enter the values listed on the worksheet and the date in the 1st column on the label inside the T775 cover.

Device Programming Worksheet			
Load 1:	_____		
SetPt 1	_____	On at	_____
Thr. Range	_____	Off at	_____
Load 2:	_____		
SetPt 2	_____	On at	_____
Diff 2	_____	Off at	_____
Load 3:	_____		
SetPt 3	_____	On at	_____
Diff 3	_____	Off at	_____
Load 4:	_____		
SetPt 4	_____	On at	_____
Diff 4	_____	Off at	_____

DEVICE PROGRAMMING

DEFAULT VALUES: When power is initially applied to the T775 the control points will be at their default values set at the factory. Default values are as follows:

	SET POINT	DIFFERENTIAL/ THROTTLING RANGE	OPERATING MODE
Stage 1	72° F	2° F	Heat
Stage 2	70° F	2° F	Heat
Stage 3	68° F	2° F	Heat
Stage 4	66° F	2° F	Heat

1. Before programming the T775 verify that the °F/°C selection jumper is properly installed. The T775 is shipped form the factory with the jumper installed in the °F position. If °C is desired the jumper should be removed.
2. Apply power to the device. The device will begin counting down from 210. This countdown sequence will last for approximately 3-1/2 minutes.
3. To avoid this time delay, press **Select**.
4. Press **Select** and **Enter** keys simultaneously to begin programming the load operating mode (Heat or Cool).

The display will indicate Heat or Cool and the stage number.

5. Press the **Set (Down Arrow)** to change to cooling. The **Set (Up Arrow)** will change back to heating.
6. Press **Enter** to program the displayed mode into memory.
7. Press **Select** to go to the next stage.
8. Repeat steps 5 thru 7 for additional stages.
9. Pressing **Select** after the last stage has been setup will return the sensed temperature.

PROGRAMMING STAGE CONTROL VALUES

1. If you have a 0 to 18 VDC output T775 go to CALIBRATION PROCEDURE FOR 0 TO 18 VDC OUTPUT T775 (page 7) before continuing to program the stage control values.

The Series 90 and 4-20 mA output devices require no calibration - proceed to step 2.

IMPORTANT

When programming all stages the first stage designated on the LCD display is always the modulating output.

2. Press **Select** to display the current stage set point.
3. Press **Set (Up Arrow)** to increase or **Set (Down Arrow)** to decrease to the desired set point.
4. Press **Enter** to enter the displayed value into memory.
5. Press **Select** to display the current stage throttling range or switching differential.
6. Press **Set (Up Arrow)** to increase or **Set (Down Arrow)** to decrease to the desired throttling range or switching differential.
7. Press **Enter** to enter the displayed value into memory.
8. Repeat steps 2 thru 7 to program each additional stage.
9. Press **Select** to return to stage 1 parameters.
10. Before replacing the cover on the T775 check to see that the control values have been recorded on the label on the backside of the cover.

NOTE: The control values programmed into memory will not be lost because of a power failure.

IMPORTANT

After initial programming, altering the set point for stage 1 up or down will result in a change in set points 2, 3 and 4 by the same number of degfrees and in the same direction. If increasing or decreasing the set point for stge 1 results in exceeding the control limits (-20° to +240° F) for subsequent stages, the control will not allow the user to enter a value for stage 1 higher or lower than this limit. This will allow for easy sequential output staging to be modified, while keeping the margin between set points intact.

CALIBRATION PROCEDURE FOR 0 TO 18 VDC OUTPUT T775

NOTE: THE 0-18 Vdc Output models have field selectable starting voltages and spans and will require calibration. The Series 90 and 4-20 mA output devices require no calibration.

1. Disconnect power to the device.
2. Remove the device cover and disconnect the load from the plus and minus outputs. Connect a DC voltmeter to the plus and minus modulating outputs of the T775 (See Fig. 2).
3. Loosen the screw in the upper right corner of the T775 approximately 6 turns with a screw driver (See Fig. 2).
4. Rotate the display printed wiring board outward form the device until it is approximately perpendicular to the enclosure (See Fig. 2).
5. The T775 is factory set to a span of 8 Vdc. To select a different span (3 Vdc, 14 Vdc, or 17 Vdc) change the switch positions on the voltage selection switch by opening

the switch for 8 VDC and closing the switch for the chosen span (See Fig. 2).

6. Apply power to the device.

7. Record the sensed temperature.

8. Determine the operating mode for stage 1 (Heat or Cool). Chose the appropriate example to follow below. Calculate the set points to be used for calibrating the device in column "B" following the example in column "A". See Fig. 6 for illustration.

Calibration Set point for Cooling Mode:

See Fig. 6 for explanation.

Set point for calibrating the lower voltage level (closed position):

	"A"	"B"
Sensed Temperature:	78°	
Add 3° F or C to above:	+3°	
Calibration Set point:	81°	

Calibration Set point for Heating Mode:

See Fig. 6 for explanation.

Set point for calibrating the lower voltage level (closed position):

	"A"	"B"
Sensed Temperature:	78°	
Subtract 3° F or C to abov e:	-3°	
Calibration Set point:	75°	

Calibrate the lower voltage level (closed position)

1. Read displayed temperature of sensor which is controlling stage 1.

2. Press **Select** until the set point for stage 1 is displayed.

3. If stage 1 is in the HEAT mode, press **Set (down arrow)** until the set point is at least 3 degrees below the temperature in step 1.

4. If stage 1 is in the COOL mode, press **Set (up arrow)** until the set point is at least 3 degrees above the temperature in step 1.

5. Press **Enter** to enter this value in memory.

6. Press **Select** once so the throttling range is displayed.

7. Press **Set (up arrow)** or **Set (down arrow)** until the throttling range is 2 degrees.

8. Press **Enter** to enter this value into memory.

9. Press **Select** until Sensor A is displayed (if the sensed temperature has drifted from step 1, you may need to repeat steps 2-8.)

10. Using a screwdriver turn the zeroing voltrage potentiometer (see Fig. 2 until the desired lower voltage (i.e., 2V; 6V; etc.) is displayed on the voltmeter.

11. Confirm upper voltage level:

- Record the sensed temperature for sensor controlling stage 1.
- Press **Select** until stage 1 set point is displayed.
- If stage 1 is in the HEAT mode, press **Set (up arrow)** until set point is at least 3 degrees above the sensed temperature.
- If stage 1 is in the COOL mode, press **Set (down arrow)** until set point is at least 3 degrees below the sensed temperature.
- Press **Enter** to enter this value into memory.
- Record the upper voltage level (this should be the desired voltage value).
- If the value is not correct, check to make sure the correct span switch is depressed, the stage is in the correct mode of opoeration (HEAT or COOL), and verify which sensor is controlling stage 1.

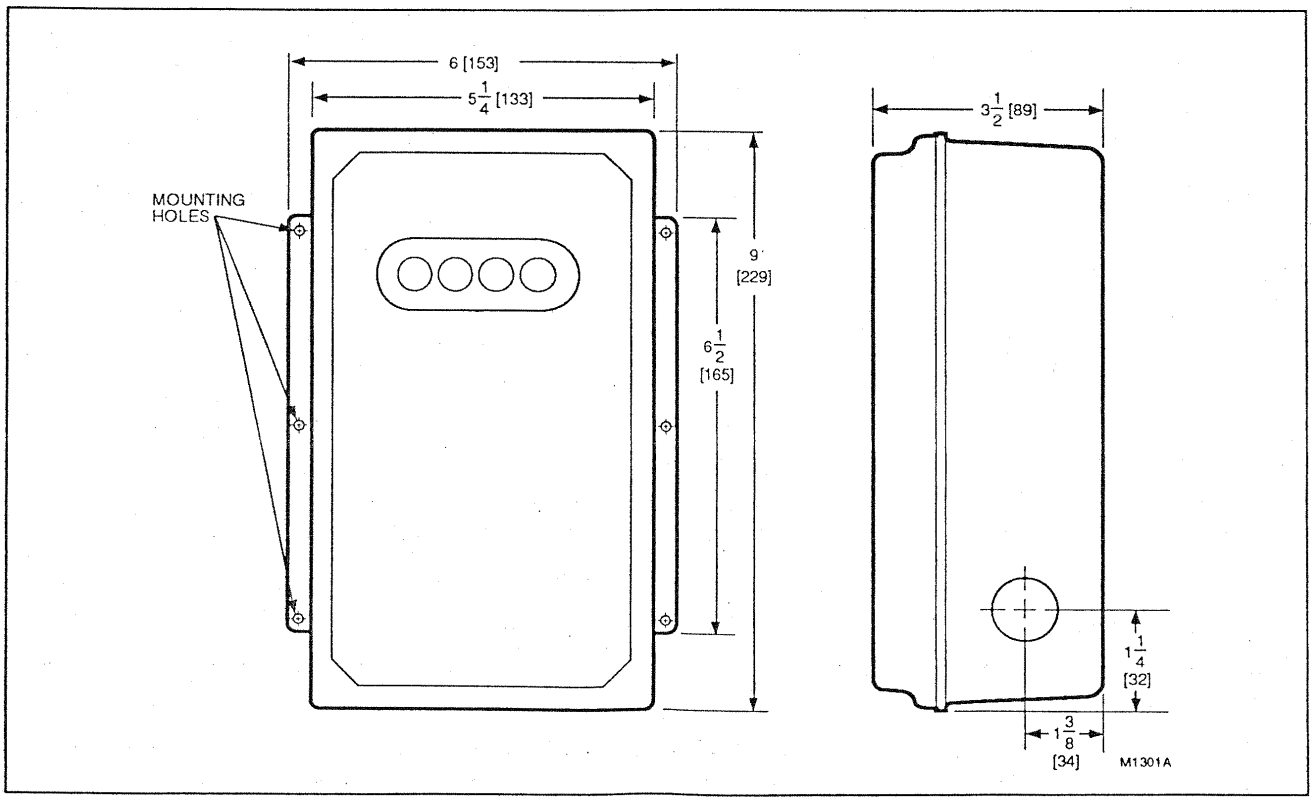


FIG. 3— DIMENSIONS OF T775 IN in. [mm IN BRACKETS].

12. Rotate the display printed wiring board back into the device and tighten the screw in the upper right corner.

13. Disconnect the voltmeter form the modulating outputs and connect the load to the plus and minus terminals of the modulating terminal block.

14. Return to PROGRAMMING STAGE CONTROL VALUES to enter in the desired stage control values (page 6).

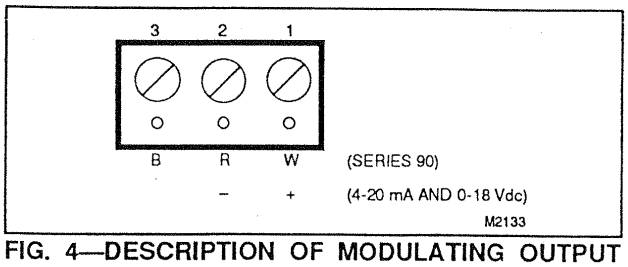


FIG. 4—DESCRIPTION OF MODULATING OUTPUT TERMINAL.

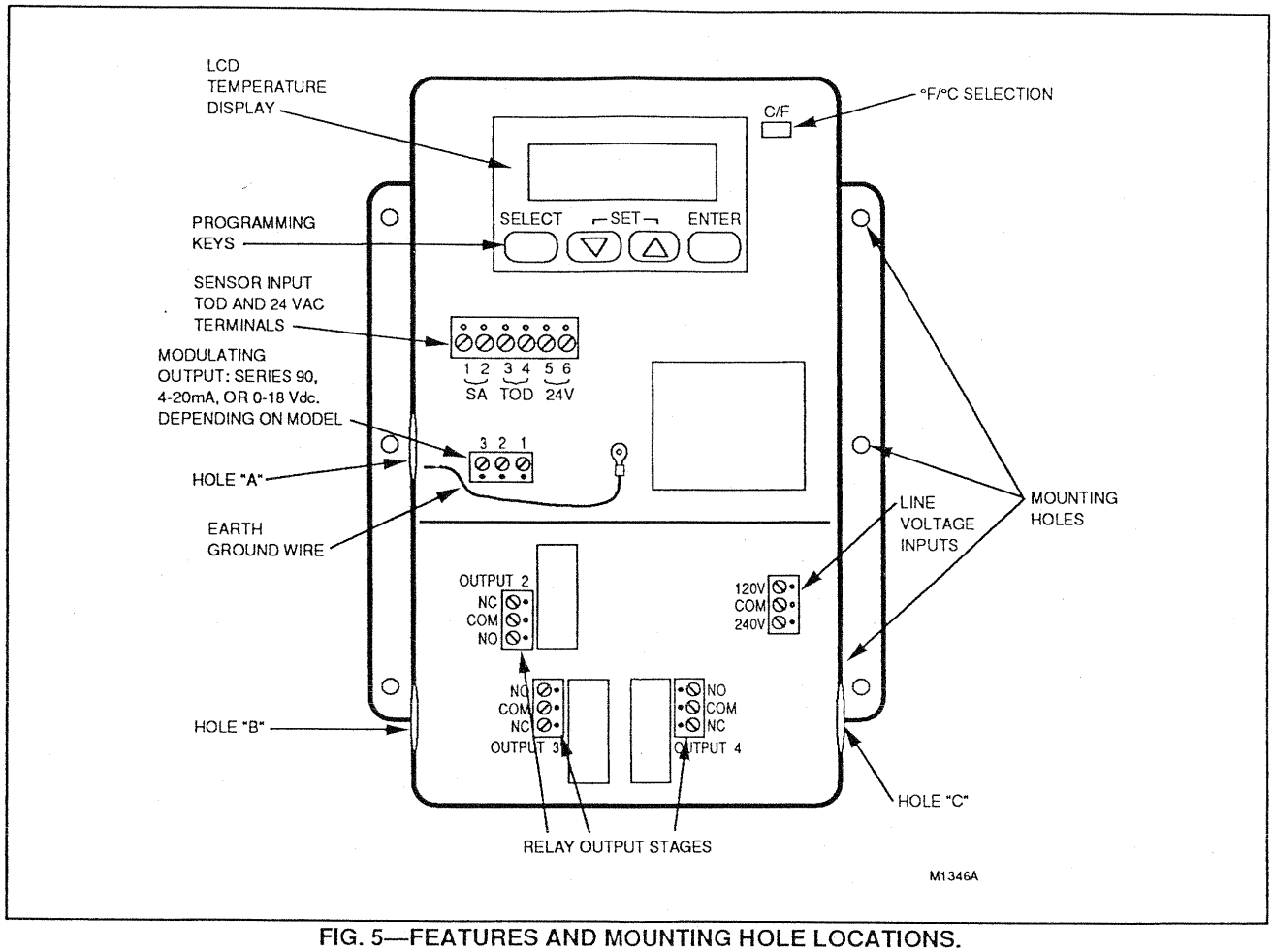


FIG. 5—FEATURES AND MOUNTING HOLE LOCATIONS.

CHECKOUT

After the controller is installed and wired, apply power. Using the programmed control values, device operation may be verified after completing the table on the next page.

1. As illustrated in the Example, record the sensed temperatures for Sensor A as displayed on the device. Using the Select key, advance through the programming loop to determine and then write on the Checkout Table which loads are controlled by each sensor.

2. Write the sensed temperature for each load on the "sensed temp." line.

3. Plot the "on" and "off" (open/closed) values at which the device will energize and de-energize each output load by referring to the Device Programming Worksheet (page 6).

4. Verify which loads are energized by using the Checkout Table. As shown in the Example, the display will indicate which stages are energized in the lower right hand corner. (NOTE: if no stages are energized, the words "stage energized" will not appear.)

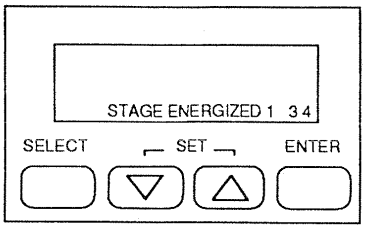
NOTE: If the sensed temperature is between the "on" and "off" temperatures, the load may be either energized or de-energized. Refer to the Control Algorithm section for further explanation.

5. If an error message flashes, refer to the description of these messages on page 4. If (SF) flashes, check the sensor connections. If they are properly connected and "SF" continues to flash, check the sensor location to insure it is located in an ambient condition that is within the sensors ambient capability (-20° F to +240° F).

6. If an error message other than "SF" flashes, the device cannot be field repaired. Return and replace the device.

CHECKOUT EXAMPLE WITH SENSOR A = 68° AND SENSOR B = 73°

	LOAD 1 (HEAT)	LOAD 2 (HEAT)	LOAD 3 (HEAT)	LOAD 4 (HEAT)
HEAT OR COOL				
SET POINT				
THROTTLING RANGE OR DIFFERENTIAL	2	2	2	2
DESIGNATED SENSOR	A	B	A	B
SET POINT	70 CLOSED		74 OFF	76 OFF
	68 OPEN		72 ON	74 ON
SENSED TEMPERATURE	68	73	68	73
		72 OFF		
		70 ON		
	LOAD 1 IS ON	LOAD 2 IS OFF	LOAD 3 IS ON	LOAD 4 IS ON



NOTE: RELAYS ARE DEENERGIZED AT SET POINT

CHECKOUT TABLE

	LOAD 1	LOAD 2	LOAD 3	LOAD 4
HEAT OR COOL				
SET POINT				
THROTTLING RANGE OR DIFFERENTIAL				
DESIGNATED SENSOR				
SET POINT	(OFF)			
SENSED TEMPERATURE				

M1363A

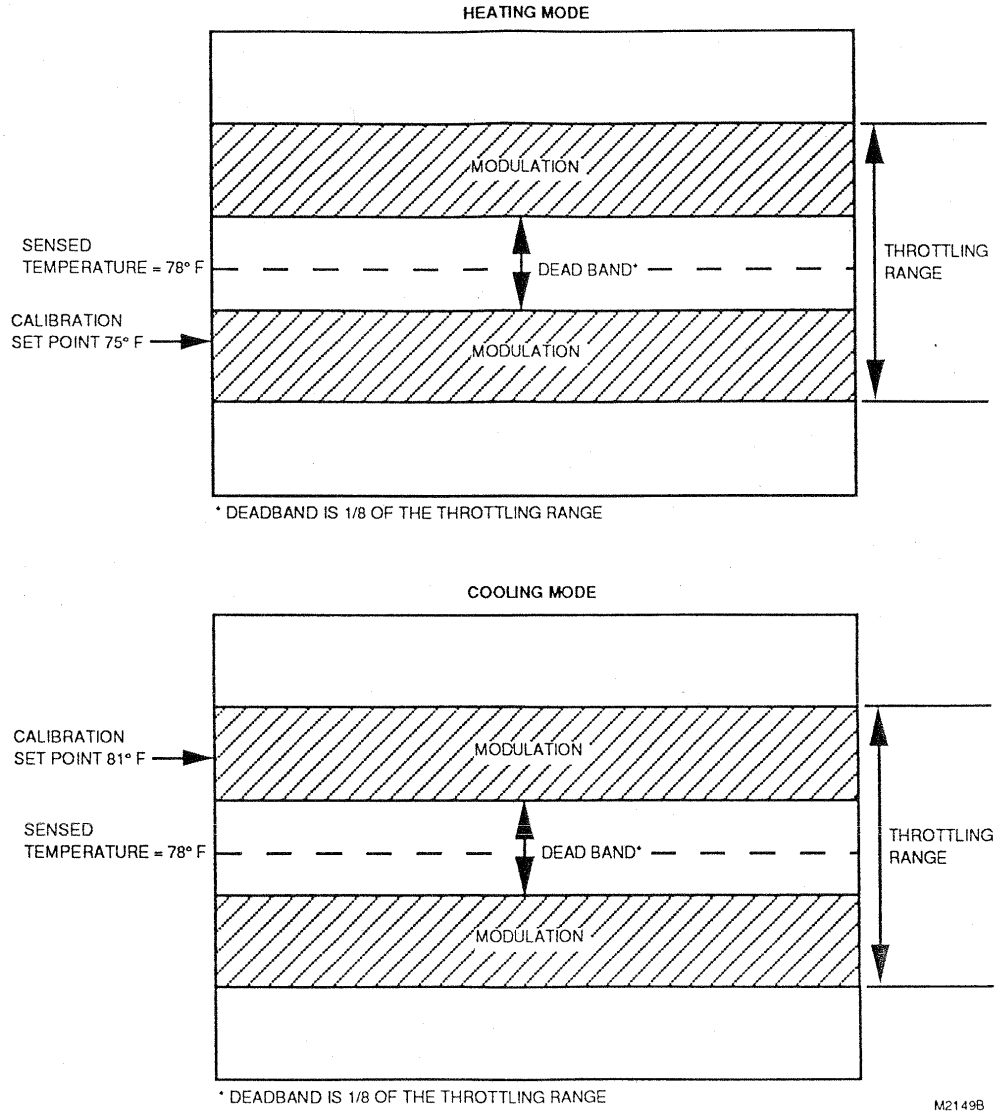


FIG. 6—EXPLANATION OF CALIBRATION SET POINTS FOR HEATING AND COOLING MODES.

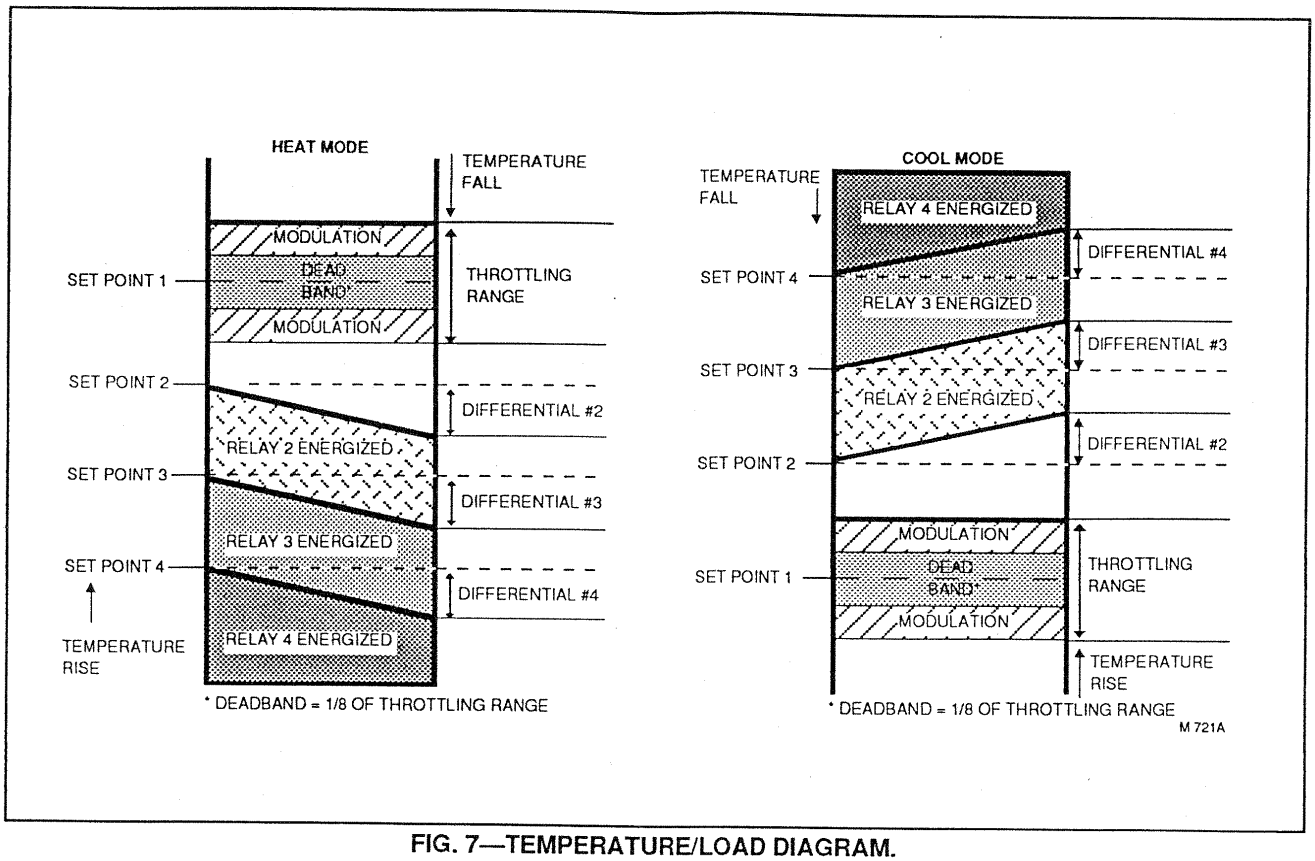


FIG. 7—TEMPERATURE/LOAD DIAGRAM.

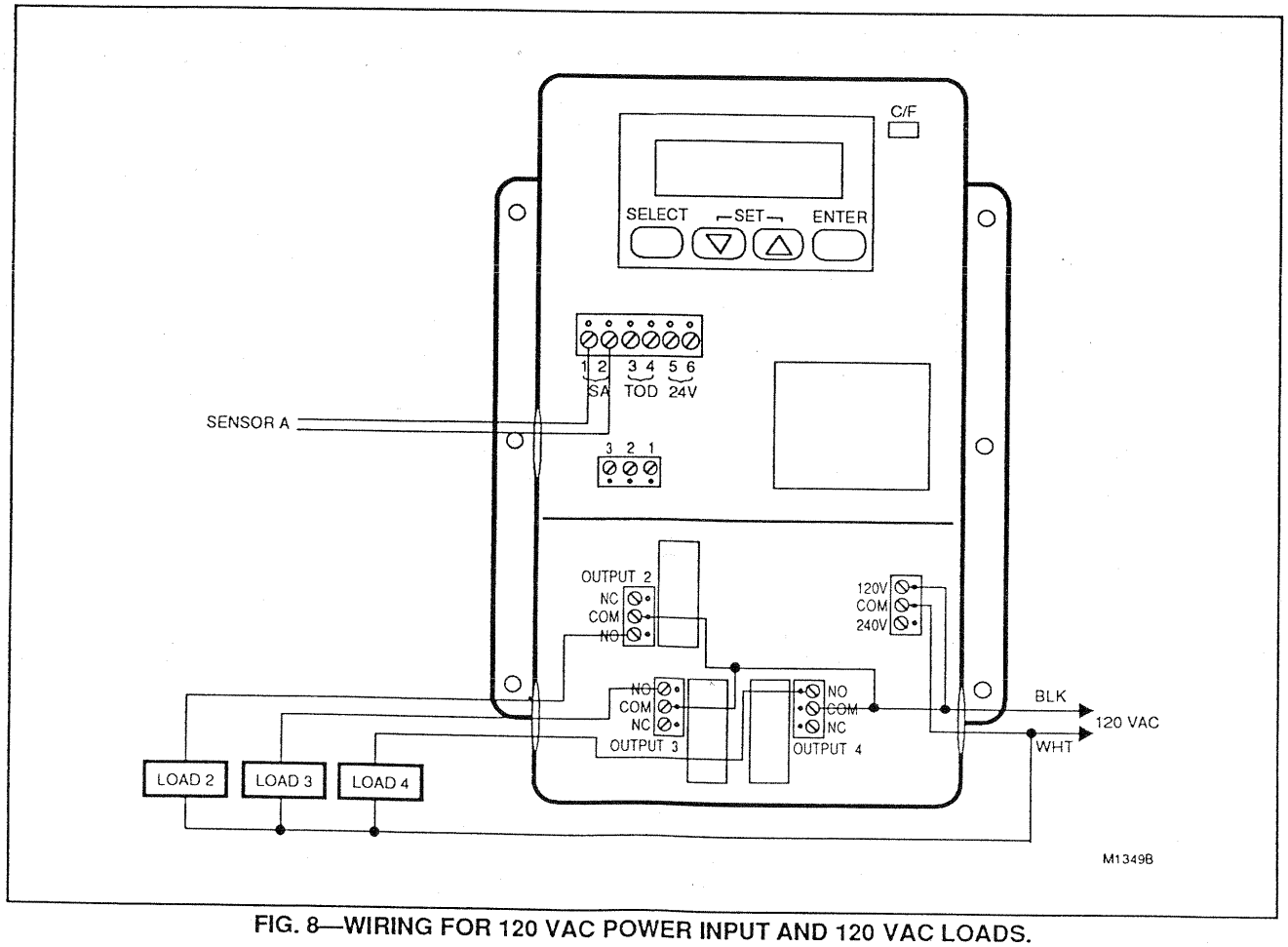


FIG. 8—WIRING FOR 120 VAC POWER INPUT AND 120 VAC LOADS.

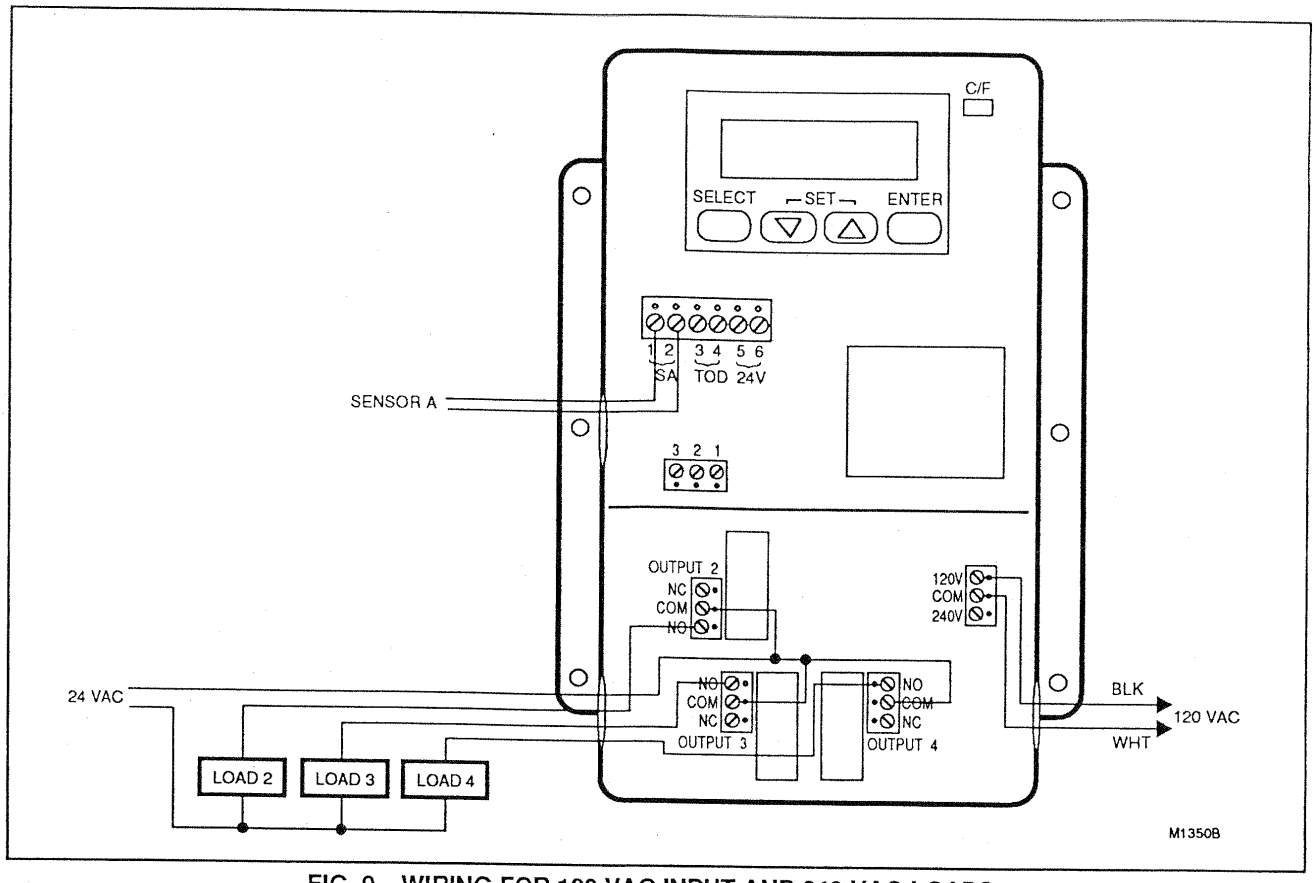


FIG. 9—WIRING FOR 120 VAC INPUT AND 240 VAC LOADS.

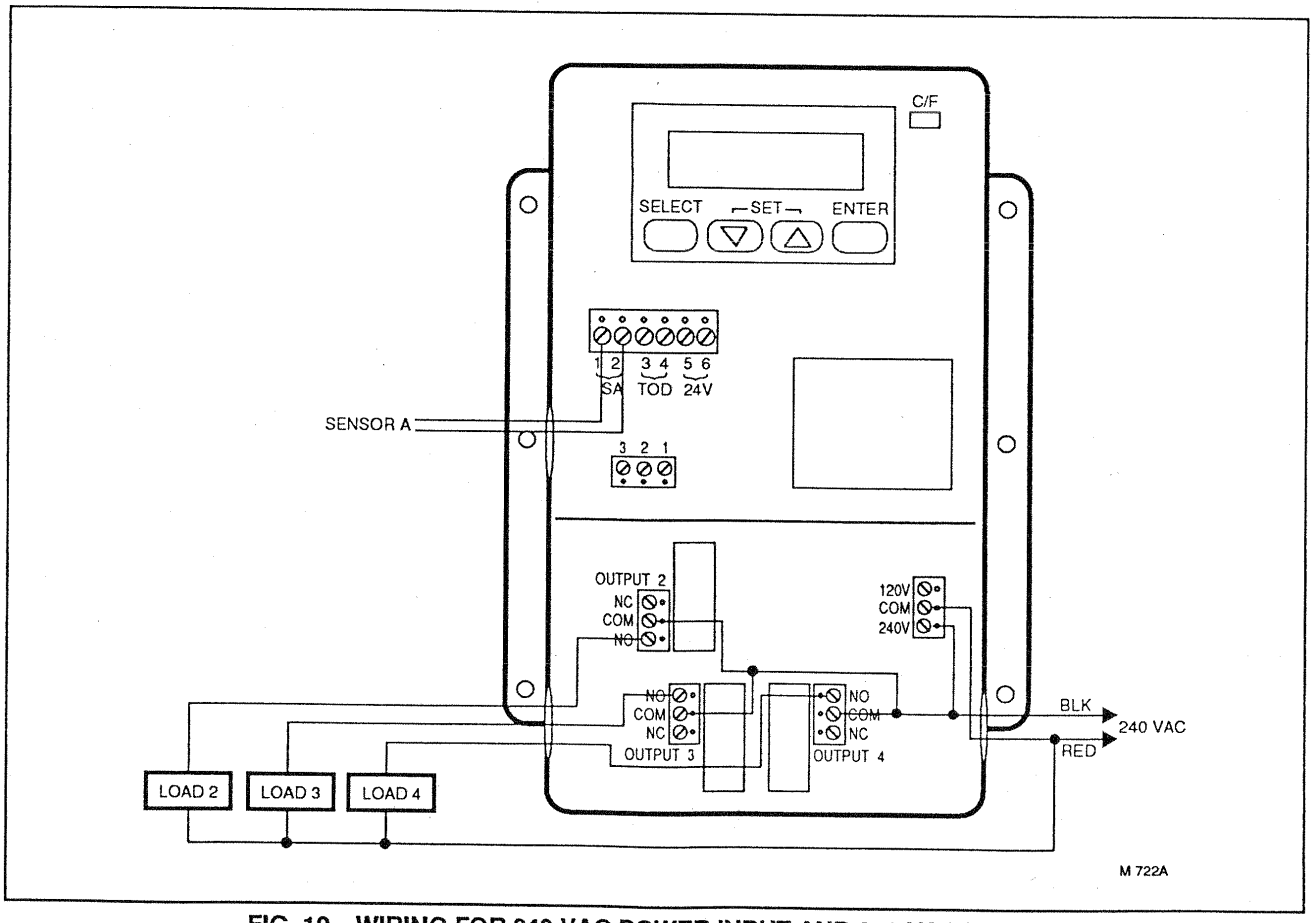
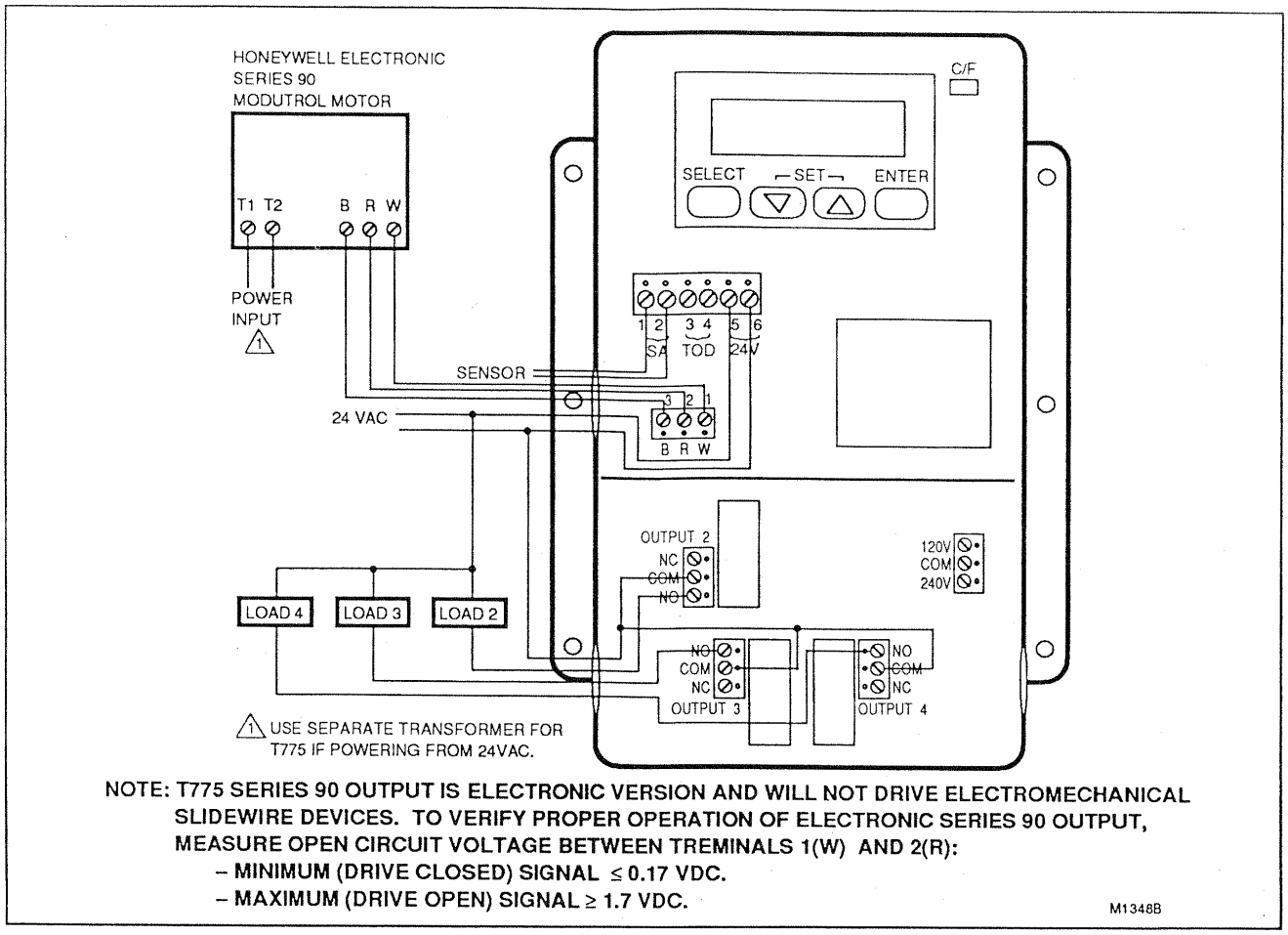


FIG. 10—WIRING FOR 240 VAC POWER INPUT AND 240 VAC LOADS.



NOTE: T775 SERIES 90 OUTPUT IS ELECTRONIC VERSION AND WILL NOT DRIVE ELECTROMECHANICAL SLIDEWIRE DEVICES. TO VERIFY PROPER OPERATION OF ELECTRONIC SERIES 90 OUTPUT, MEASURE OPEN CIRCUIT VOLTAGE BETWEEN TREMINALS 1(W) AND 2(R):

- **MINIMUM (DRIVE CLOSED) SIGNAL ≤ 0.17 VDC.**
- **MAXIMUM (DRIVE OPEN) SIGNAL ≥ 1.7 VDC.**

FIG. 11—SERIES 90 CONTROL WITH 24 VAC POWER INPUT AND 24 VAC LOADS.

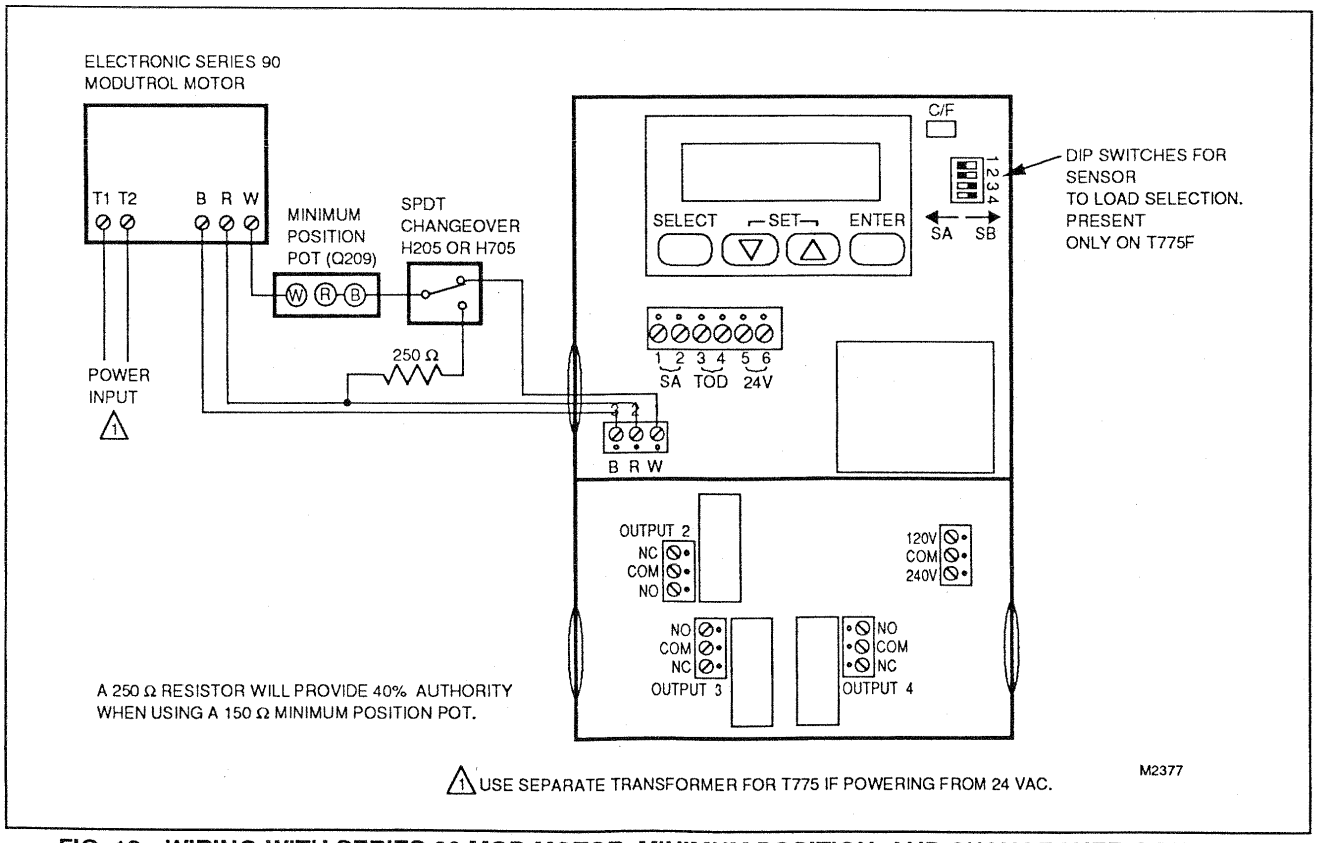


FIG. 12—WIRING WITH SERIES 90 MOD MOTOR, MINIMUM POSITION, AND CHANGEOVER CONTROL.

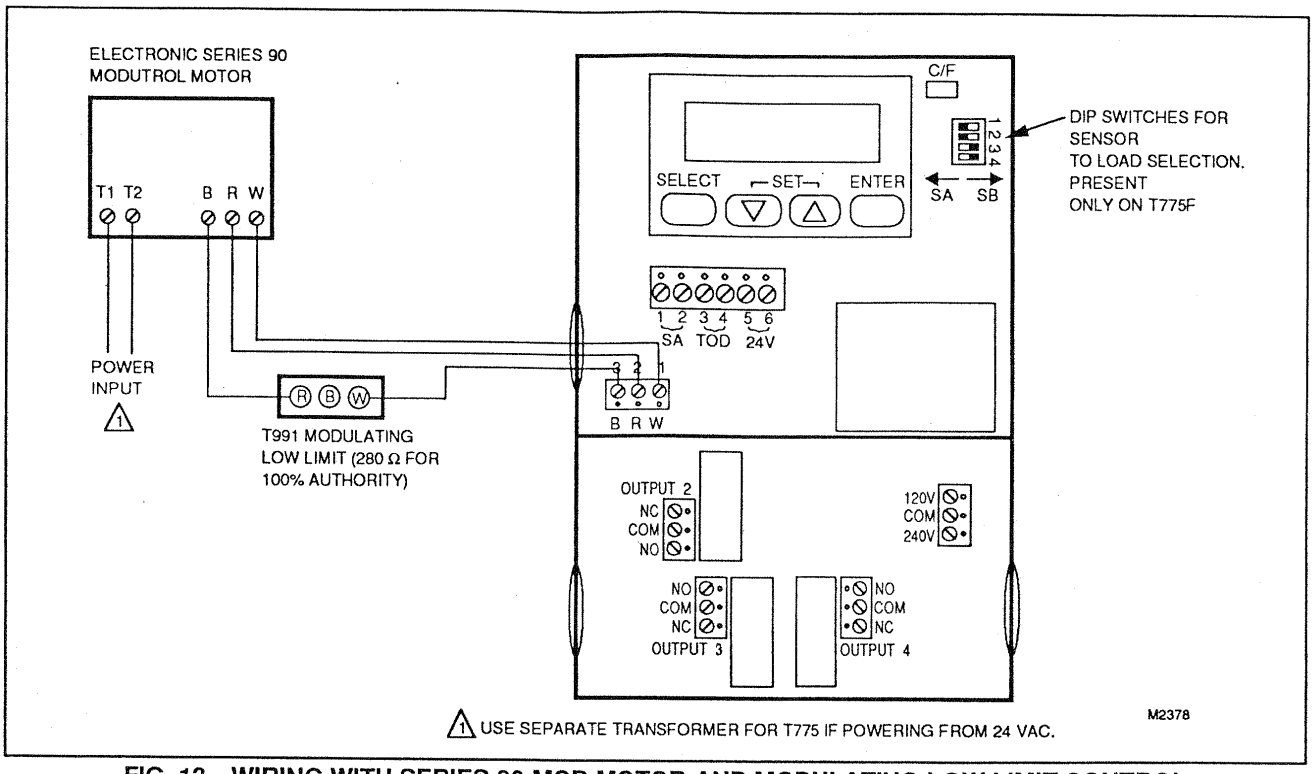


FIG. 13—WIRING WITH SERIES 90 MOD MOTOR AND MODULATING LOW LIMIT CONTROL.

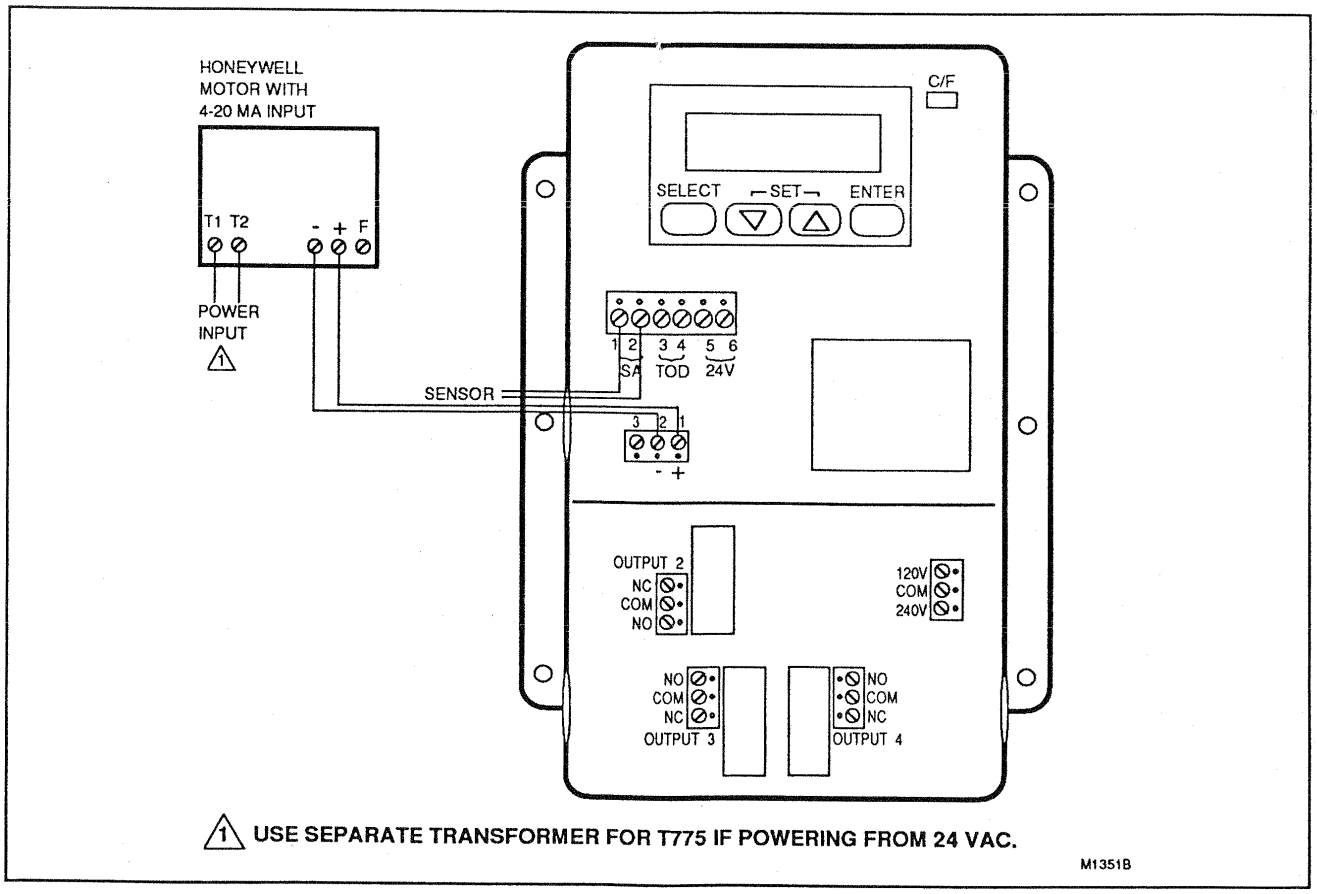


FIG. 14—WIRING TO 4-20 mA MOTOR.

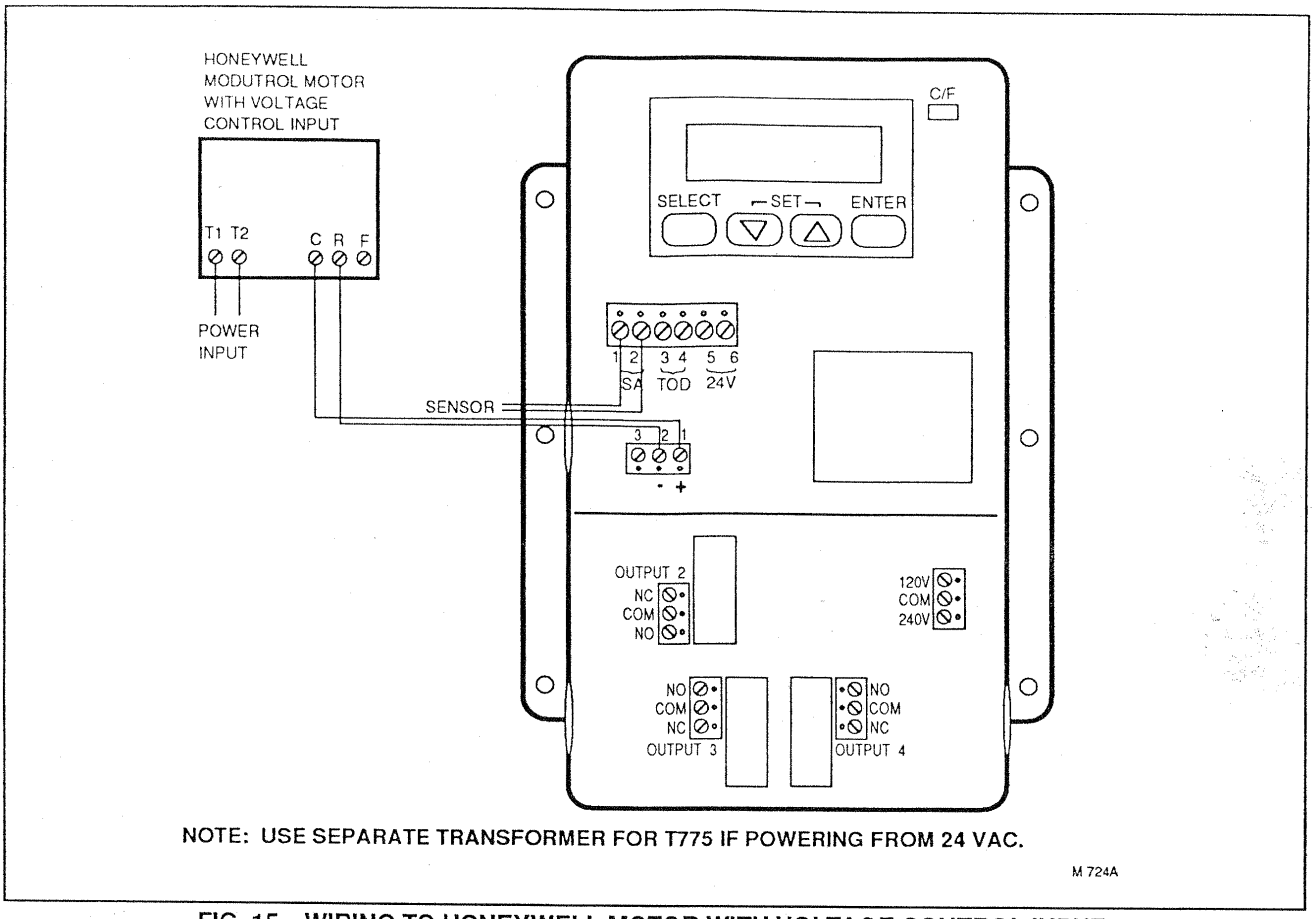


FIG. 15—WIRING TO HONEYWELL MOTOR WITH VOLTAGE CONTROL INPUT.

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