Honeywell

ELECTRONIC REMOTE TEMPERATURE CONTROLLER

T775C,D

THE T775 FAMILY OF REMOTE TEMPERATURE CONTROLLERS PROVIDES ON/OFF TEMPERATURE CONTROL OF HEATING, COOLING, AND VENTILATING SYSTEMS IN AGRICULTURAL CONFINEMENT BUILDINGS, STORAGE AREAS, AND HEAVY INDUSTRIAL APPLICATIONS.

- ☐ Typical applications include barns, brooder houses, poultry houses, hog houses, pump houses, and crop storage houses.
- ☐ NEMA 4X enclosure resists oil, water, dust, and corrosion.
- ☐ T775C provides On/Off control with 1 temperature input and four relay output stages.
- ☐ T775D provides On/Off control with 2 temperature inputs and four relay output stages.
- ☐ T775C,D meet National Electric Code (Article 547) requirements for animal confinement 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.
- ☐ Set point range is -20° F to +240° F.
- ☐ Ambient temperature range is -30° F to +125° F.
- ☐ +/-1° F accuracy.
- ☐ Spdt relay outputs.
- ☐ Stage(s) independently programmed for heating or cooling.

P.B.
Rev. 1-91

Form Number 63-2245—2

SPECIFICATIONS

MODELS: The T775C,D family of electronic remote temperature controllers provides On/Off temperature control of Heating, Cooling, and Ventilating systems in agricultural confinement buildings, storage areas, and heavy industrial applications.

T775C: Staged On/Off control with 1 temperature input and 4 relay output stages. Mounted in NEMA 4X enclosure. Remote sensor 198212CA included.

T775D: Staged On/Off control with 2 temperature inputs and 4 relay output stages. Mounted in NEMA 4X enclosure. Two remote sensors 198212CA included.

MODEL NUMBER	NUMBER OF INPUTS	NUMBER OF RELAY OUTPUTS
T775C1009	1	4
T775D1008	2	4

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 if 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].

OPERATING HUMIDITY: 5 - 95% RH Noncondensing.

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

MOUNTING: Mounts on any suitable horizontal or vertical surface (see Fig. 2 for mounting hole locations).

ACCESSORIES:
121371E—Stainless Steel Well
107408—Heat conduction Compound, 4 oz.
C7043A1098—Case and Immersion Well for running conduit to sensor
121371A—Copper Immersion Well

(continued on page 3)

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.

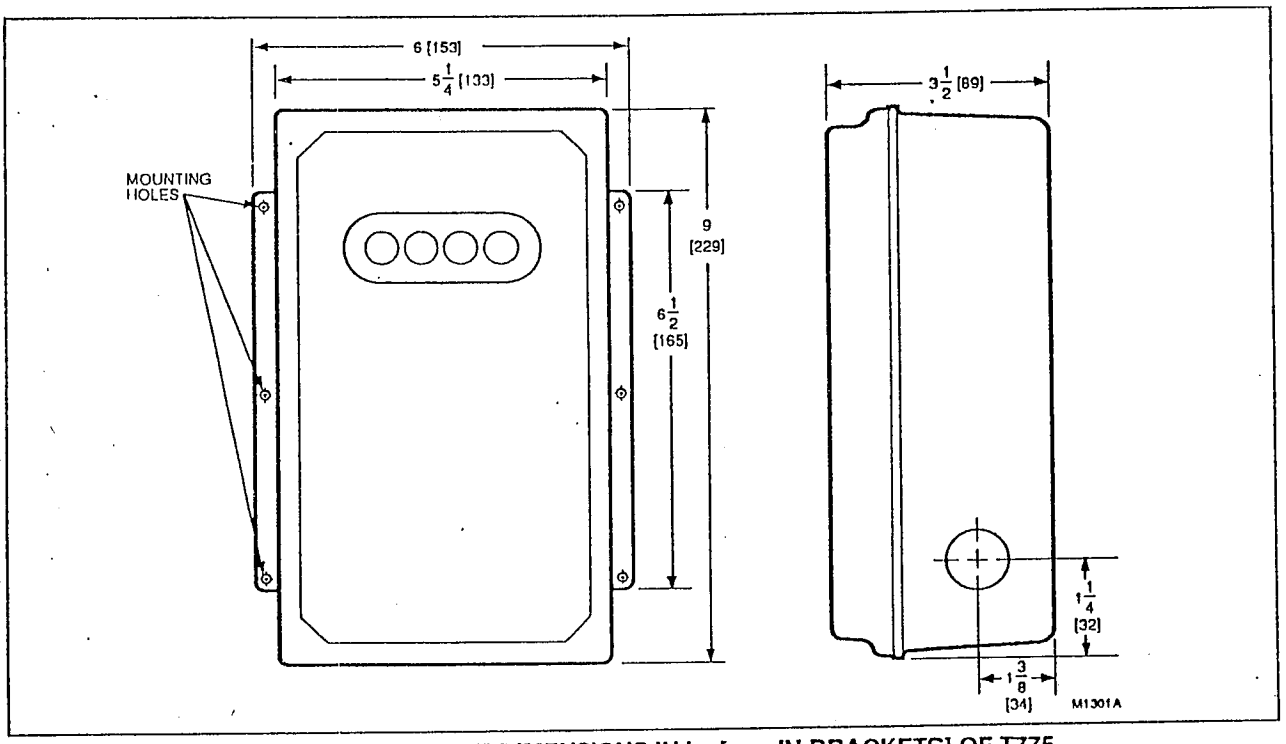


FIG. 1—APPROXIMATE DIMENSIONS IN In. [mm IN BRACKETS] OF T775.

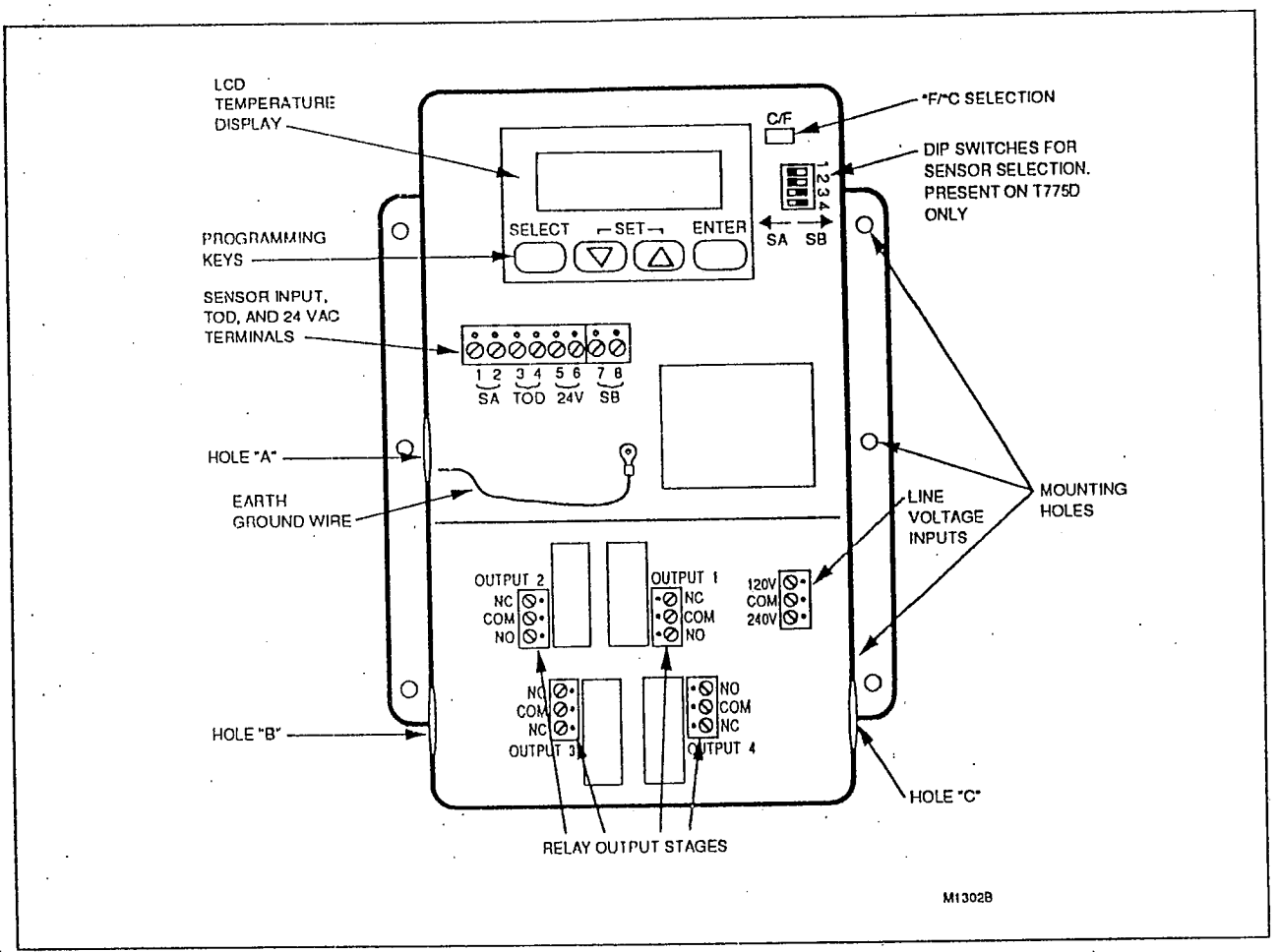


FIG. 2—FEATURE LOCATIONS.

CONTROLLER DESCRIPTION/OPERATION

CONTROL ALGORITHM

On/Off Control

The T775C operates with one (1) temperature input supplied by the remote sensor, while the T775D has two (2) temperature inputs. The T775C and D are capable of providing four (4) stages of relay outputs for on/off control. Each stage of the T775C and D has its own independent set point which can be configured to operate in either the Cooling or Heating mode. The mode of operation for each stage is user determined by the programming keys.

Heating Mode Operation

- Relay outputs are energized at set point minus differential
- Relay outputs are de-energized at set point

Cooling Mode Operation

- Relay outputs are energized at set point plus differential
- Relay outputs are de-energized at set point

The T775D has dual sensor inputs and allows two separate controllers to exist within one enclosure. Selection of the stage parameters (operation mode, set points, and differentials) is the same as that for a single sensor device once each stage has been assigned to its operating sensor. This assignment is hardware driven via a four position DIP switch. See Fig. 2 for the DIP switch location. See Fig. 3 for DIP switch explanation.

Contact Closure Override Input

A two-terminal input is provided to allow the user to override a relay energized condition of any output by using a contact closure between terminal pins 3 and 4 of the terminal block for sensor input shown in Fig. 2. This override function can be achieved manually or by using an EMS controller or time clock with normally open contacts, i.e., W7505, S7005, etc.

When this override is active, the display will show the numbers of the 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. 2. The unit is shipped with the jumper installed in the °F mode. To operate the device in °C mode, remove the jumper.

DIP Switch Selections

On the T775D, DIP switches are provided for assignment of each relay output stage to its operating sensor. If an individual switch is depressed toward its corresponding load number (1-4 on DIP switch) or to the right, Sensor B will be the controlling sensor for that output stage. If an individual switch is depressed to the left, Sensor A will be the controlling sensor for the output stage. An example of the switches and their corresponding positioning is shown in Fig. 3.

KEYPAD PROGRAMMING AND DISPLAY

The T775 utilizes a Liquid Crystal Display for interactive prompting during programming and display of sensed temperature 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. Control values and operation selection will remain in the device memory even after power is removed.

IMPORTANT

A control value or operation will not be entered in the memory of the microprocessor until the Enter key is pressed.

- 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 of the arrow keys is 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 sensed temperature and load energized status.

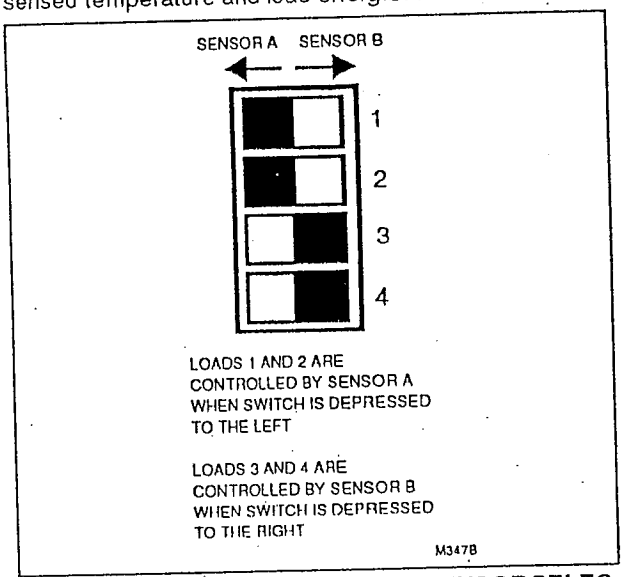


FIG. 3—DIP SWITCH SETTINGS FOR SENSOR SELECTION.

Display

Once power is applied or restored to the device, the display will countdown from 210 until the display reads zero. This is intended to protect compressors in the event of a power outage. The countdown takes approximately 3-1/2 minutes, during which time any previously energized outputs will be de-energized.

To avoid viewing this entire countdown, press the Select key. The LCD display will now show what it normally reads: sensed temperature, stages energized, and which sensor (sensor A or sensor B) is being read for two sensor devices. 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.

For two sensor applications, the user has three options as to what is displayed. The display can be con-figured to alternatively indicate "sensor A" and "sensor B" sensed temperature at a 5 second rate or lock on to sensor A or sensor B sensed temperature continuously.

This selection is accomplished by stopping at "sensor A" or "sensor B" sensed temperature points in the Select key scrolling loop. To lock on to either sensor, the user must scroll the Select key through the loop to the sensed temperature prompt of interest. The display will stick to that parameter until the Select key is activated to advance the loop. When the loop is stopped at any other prompt, the display will alternatively indicate "sensor A" and "sensor B" sensed temperature after 60 seconds from the last key closure or immediately after the Select key has been depressed at the end of the programming sequence.

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 the display shows a flashing SF, this indicates an out of range sensor. Determine if the sensor(s) are connected properly. For T775C, all loads will be de-energized when this error message is flashing.

For the T775D, the loads controlled by the out of range sensor will be de-energized. The display will flash "SF" to indicate which sensor is defective or in error. In the event that only one sensor is defective, the remaining sensor and it's load(s) will operate normally. Only the loads controlled by the defective or unconnected sensor will be de-energized.

EF—EEPROM Failure

The values read back from the EEPROM are not the same as what was written into the EEPROM. This error can not be field repaired. The EEPROM is not intended to be field repaired. Replace device.

CF—Calibration Failure

A calibration resistor reading was not within the range of the Analog to Digital converter. This error can not be field repaired. Replace device.

OF—Stray interrupt failure

An unused interrupt occured. This error cannot be field repaired. Replace device.

CE—Configuration error

The device hardware has been configured to a nonexistant device. This error can not be field repaired. Replace device.

OE—ROM error

The internal ROM of the microprocessor is defective. This error can not be field repaired. Replace device.

AE—RAM error

The internal RAM of the microprocessor is defective. This error can not be field repaired. Replace device.

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. Refer to programming instructions for entering temperature set points in programming section.

SENSOR WIRE LENGTH	CALIBRATION OFFSET
0-399 ft.	none required
400-599 ft.	1.0 degrees
600-799 ft.	2.0 degrees
800-1000 ft.	3.0 degrees

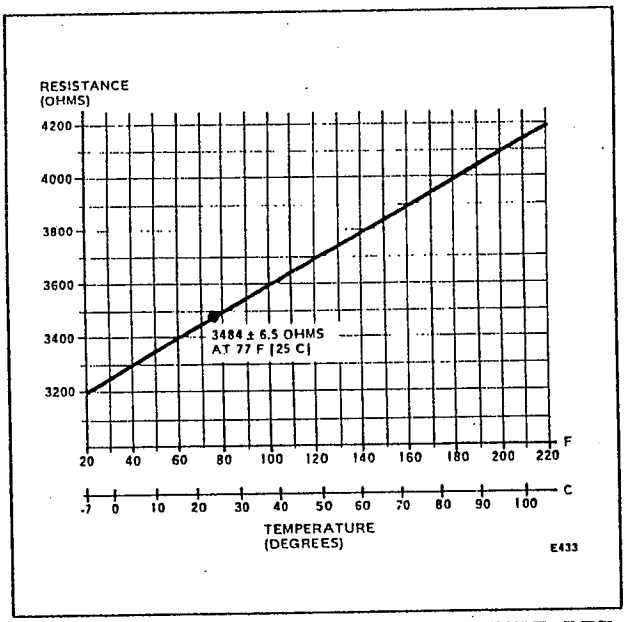


FIG. 4—RESISTANCE VS. TEMPERATURE PERFORMANCE CHARACTERISTICS.

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 location using the six mounting holes provided along the sides of the NEMA 4X enclosure (mounting screws are not included). Controller dimensions in Fig. 1 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. 2 for locating the appropriate power inputs, remote sensor input, load output terminals, Contact closure override input, and sensor selection switch. Access to the terminals can be gained through holes A-C located around the perimeter of the enclosure. NOTE: Hole "A" should only be used for the green earth ground wire, sensor, low voltage, and Contact closure wiring. 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). Holes "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 Figs. 5-8 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).

Multiple Sensors can be Parallel-series wired to sense average temperatures in large spaces. In order to maintain control accuracy, the number of sensors used must be of n^2 power (i.e. 4, 9, 16, etc.).

CAUTION

The green wire by the sensor terminal block must be connected to earth ground through hole A (see Fig. 2) 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 1: Fan 1 (cool)
SetPt 1 _____ On at _____
Diff 1 _____ Off at _____

2. For 2 sensor models (T775Ds) determine which loads will be controlled from sensor "A" or sensor "B" and enter this into the worksheet at the end of this section:

For Example:
Load 1: Fan 1 (cool)—Sensor A
SetPt 1 _____ On at _____
Diff 1 _____ Off at _____

3. Determine the set point (SetPt) and the switching differential (Diff) for each load and enter this into the worksheet at the end of this section:

For Example:
Load 1: Fan 1 (cool)—Sensor A
SetPt 1 78 On at _____
Diff 1 4 Off at _____

4. Refer to the Control Algorithm section (page 4) to calculate the load on and off temperatures and enter this into the worksheet at the end of this section. Remember that the load is 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 1: Fan 1 (cool)—Sensor A
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 enrgized 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.

5. 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	_____
Diff 1	_____	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

NOTE: 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	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. For the T775D assign the loads to the appropriate sensor by setting the DIP switch in the upper right corner of the T775 (see DIP Switch Selection Fig. 3).
2. Before programming the T775 verify that the °F/°C selection jumper is properly installed. The T775 is shipped from the factory with the jumper installed in the °F position. If °C is desired the jumper should be removed.
3. Apply power to the device. The device will begin counting down from 210. This countdown sequence will last for approximately 3-1/2 minutes.
4. To override this time delay, press **Select**.
5. 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.

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

IMPORTANT

FOR THE T775C ONLY

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 degrees and in the same direction. If increasing or decreasing the set point for stage 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.

PROGRAMMING STAGE CONTROL VALUES

1. Press **Select** to display the current stage setpoint.
2. Press **Set (Up Arrow)** to increase or **Set (Down Arrow)** to decrease to the desired set point.
3. Press **Enter** to enter the displayed value into memory.
4. Press **Select** to display the current stage switching differential.
5. Press **Set (Up Arrow)** to increase or **Set (Down Arrow)** to decrease the display to the desired switching differential.
6. Press **Enter** to enter the displayed value into memory.
7. Repeat steps 1 thru 6 to program each additional stage.
8. For the T775C press **Select** to return to stage 1 parameters. For the T775D press **Select Select Select** to return to stage 1 parameters. Scroll through the programming loop a second time to confirm that the appropriate values have been entered into memory by pressing **Select**.

NOTE: The T775D has three options for displaying the sensed temperature.
1. Sensor "A" only
2. Sensor "B" only
3. Alternating between Sensor "A" and Sensor "B"

For the T775D only:
9. Press **Select** after viewing the switching differential for the final stage to display sensor "A" temperature only.
10. Press **Select** again to display sensor "B" temperature only.
11. Press **Select** again to alternate the display between sensor "A" temperature and sensor "B" temperature at approximately 5 second intervals.
12. 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.

CHECKOUT

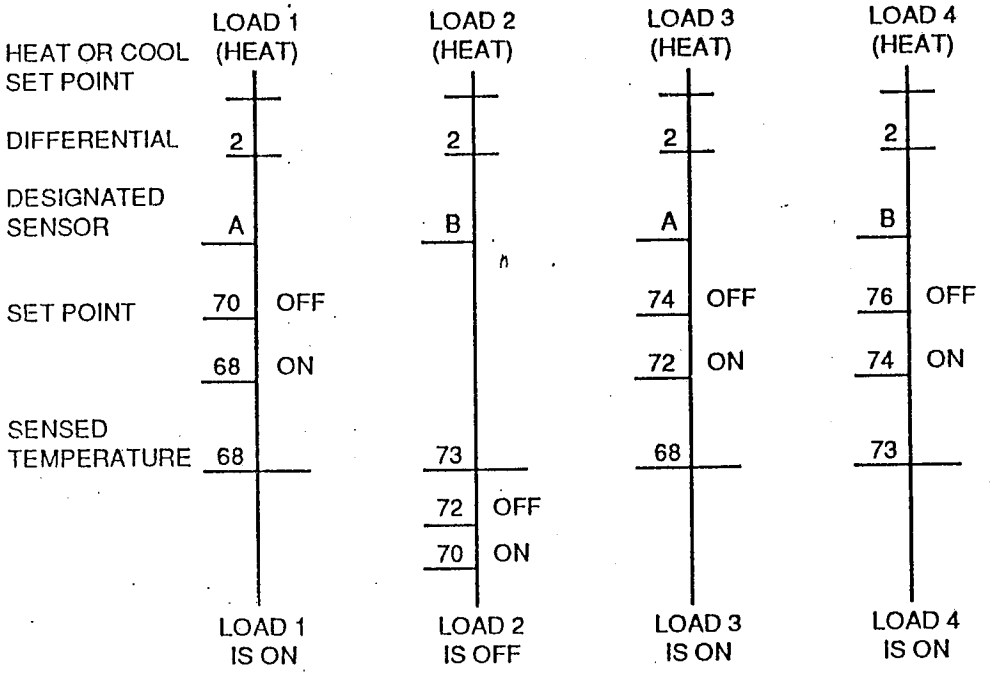
After the controller is installed and wired, apply power. Make initial adjustments and settings desired.

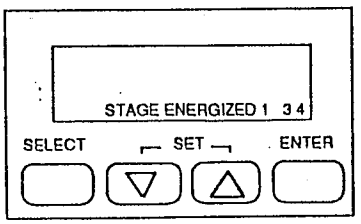
1. As illustrated in the Example on page 8, record the sensed temperatures for both Sensor A and Sensor B as displayed on the device. Using the **Select** key, advance through the programming loop to determine and then write on the Checkout table which loads are controlled by each sensor.
2. Write the operating mode for each stage in the Checkout table. (Heat or Cool).
3. Write the sensed temperature for each load on the "sensed temp." line.
4. 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).
5. 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.

6. If an error message flashes, refer to the description of these messages on page 5. If "SF" (5F) flashes, check the sensor connections. If they are properly connected and if "SF" continues to flash, check the sensor location to ensure it is located in an ambient condition that is within the sensor capability (-20° F to +240° F).
7. If an error message other than "SF" flashes, the device can not be field repaired. Replace the device.

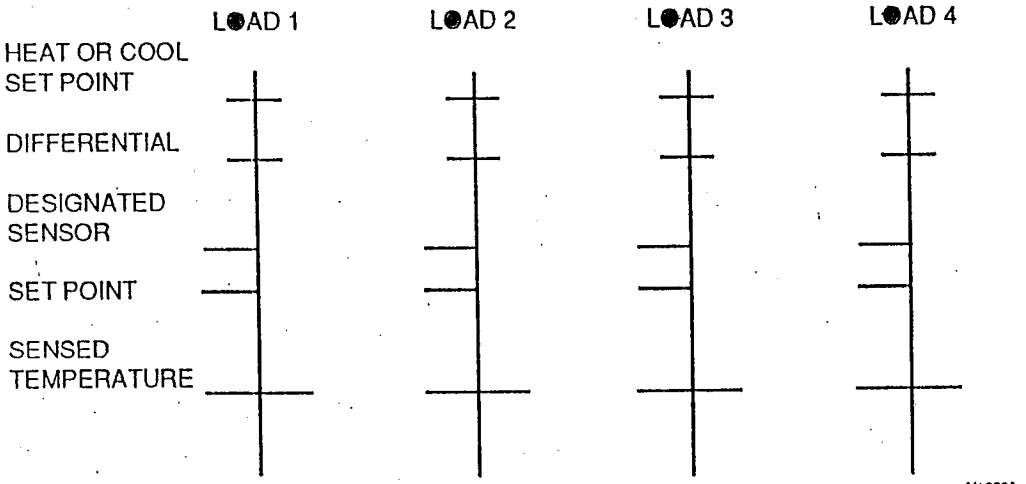
CHECKOUT EXAMPLE WITH SENSOR A = 68° AND SENSOR B = 73°





NOTE: RELAYS ARE DEENERGIZED AT SET POINT

CHECKOUT TABLE



M1353A

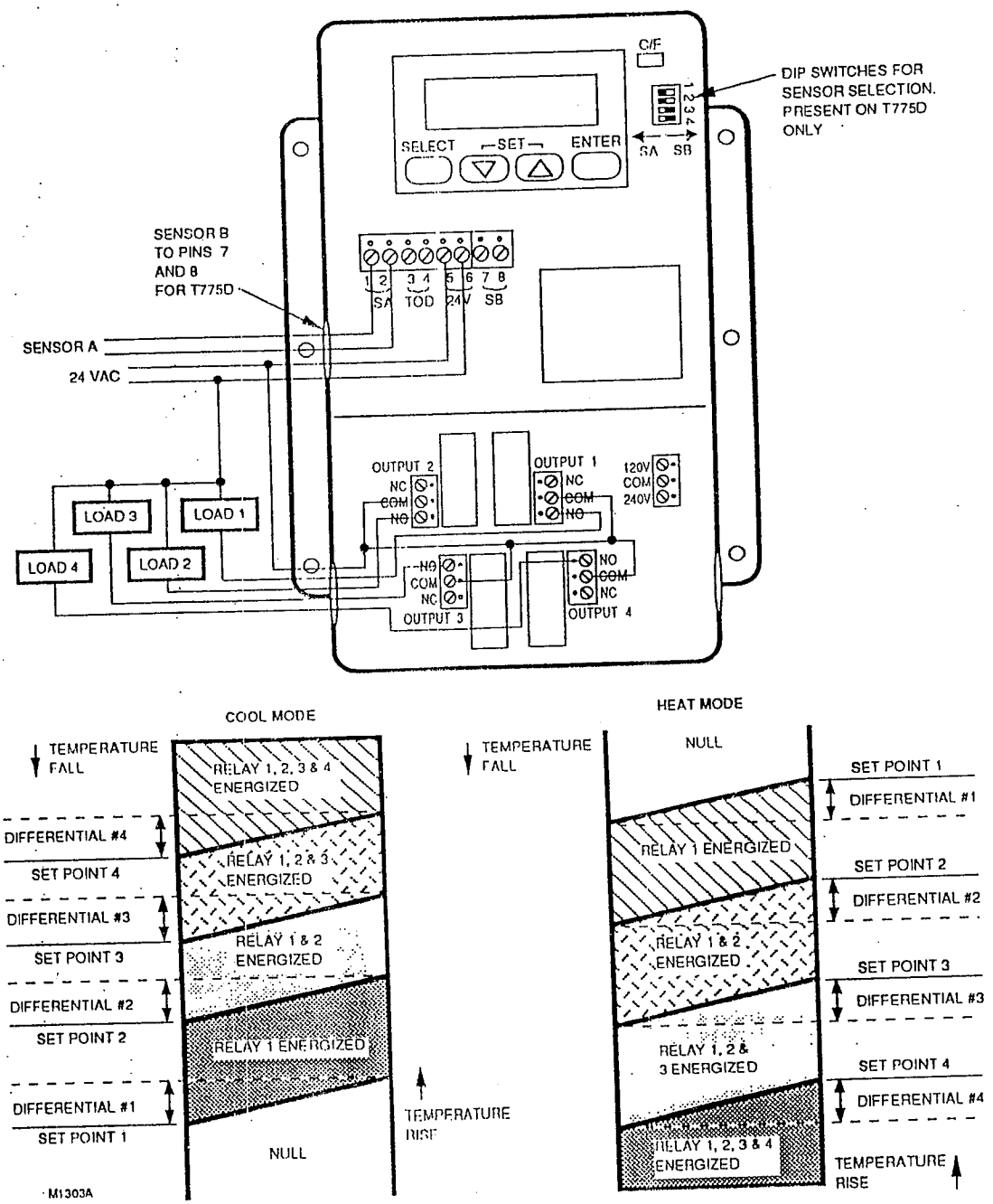
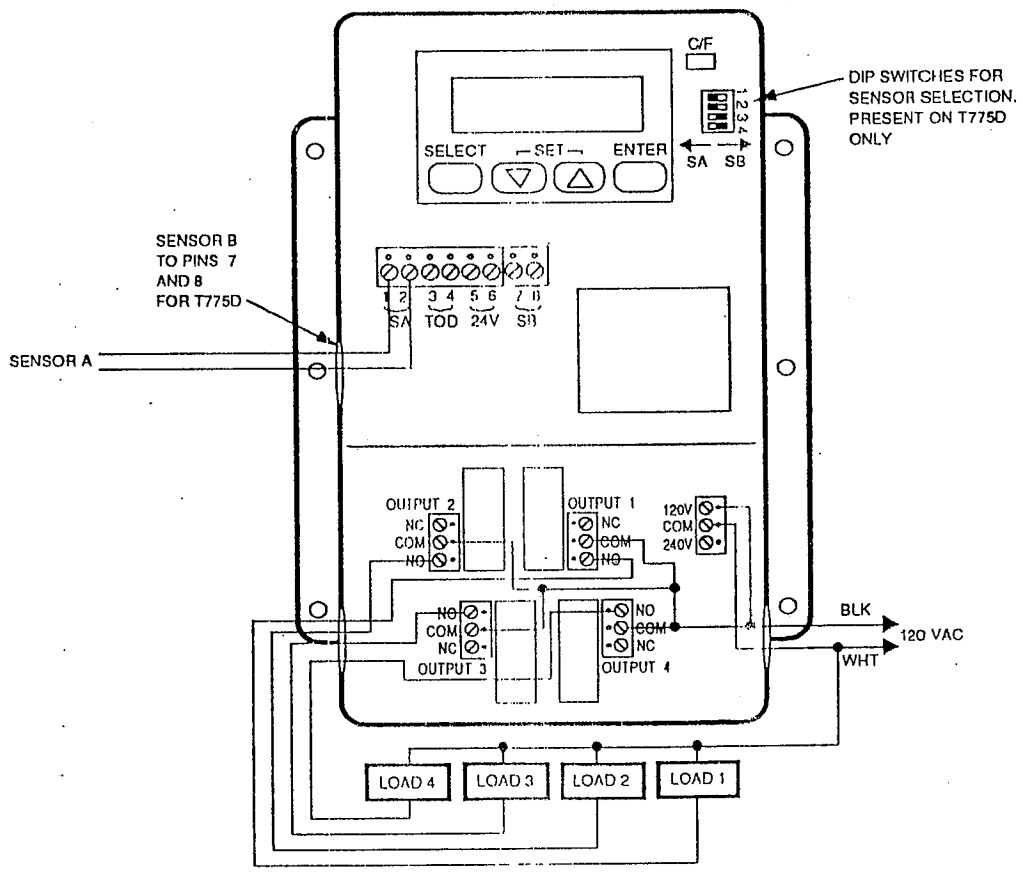


FIG. 5—FOUR-STAGE CONTROL, 24 VAC INPUT; 24 VAC LOAD.



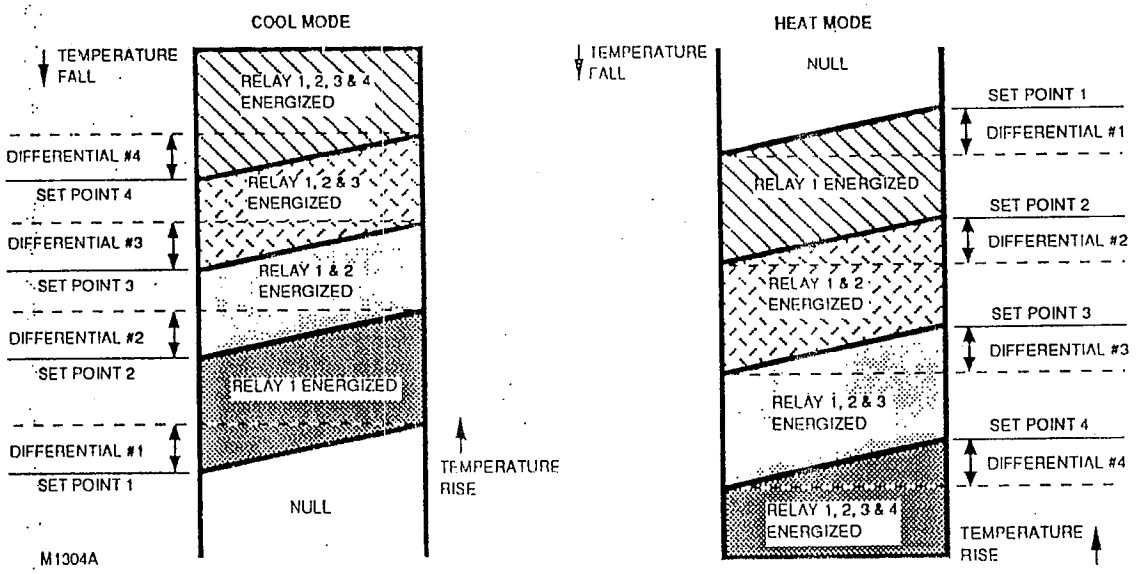


FIG. 6—FOUR-STAGE CONTROL, 120 VAC INPUT; 120 VAC LOAD.

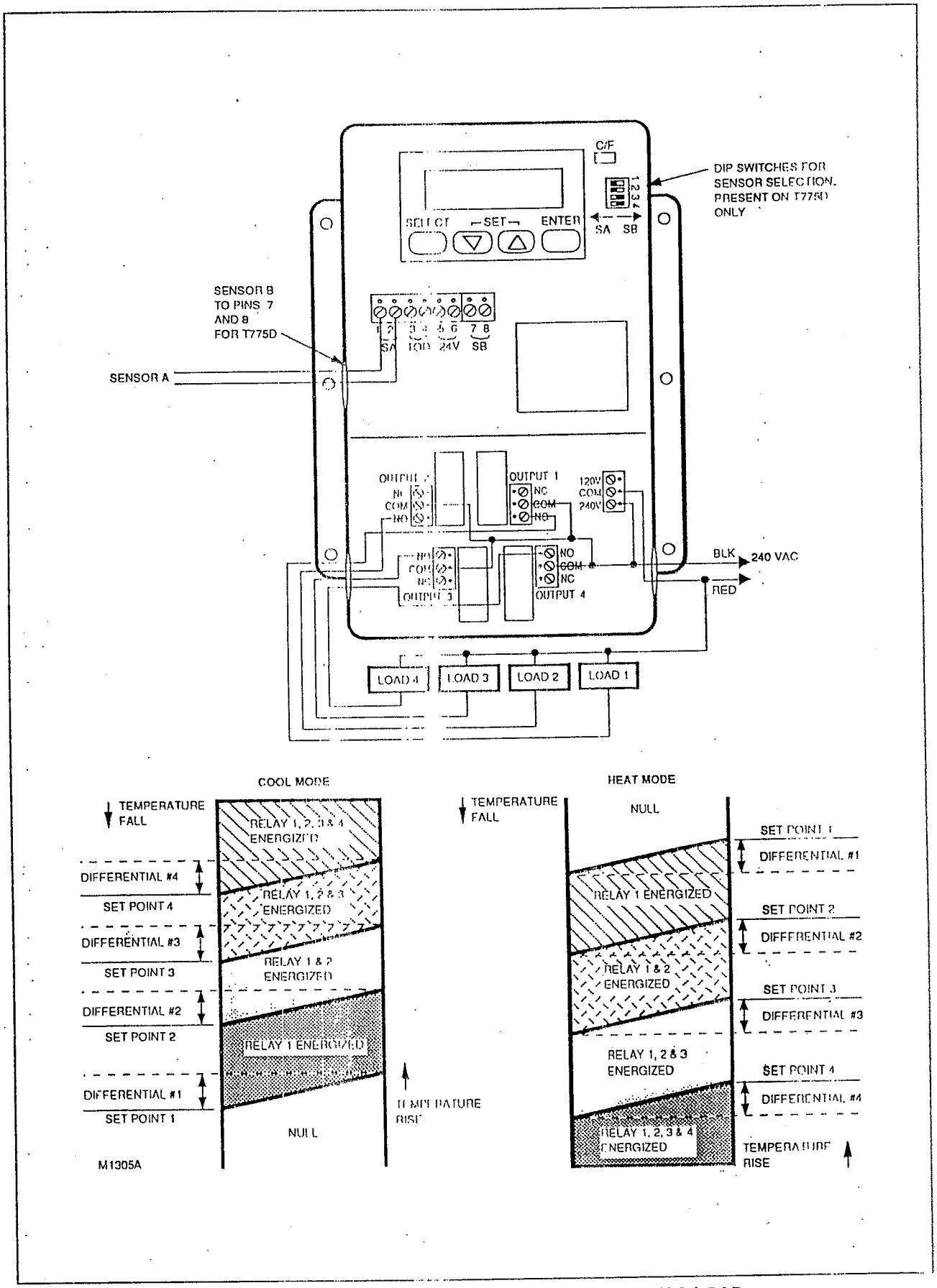


FIG. 7—FOUR-STAGE CONTROL, 240 VAC INPUT; 240 VAC LOAD.

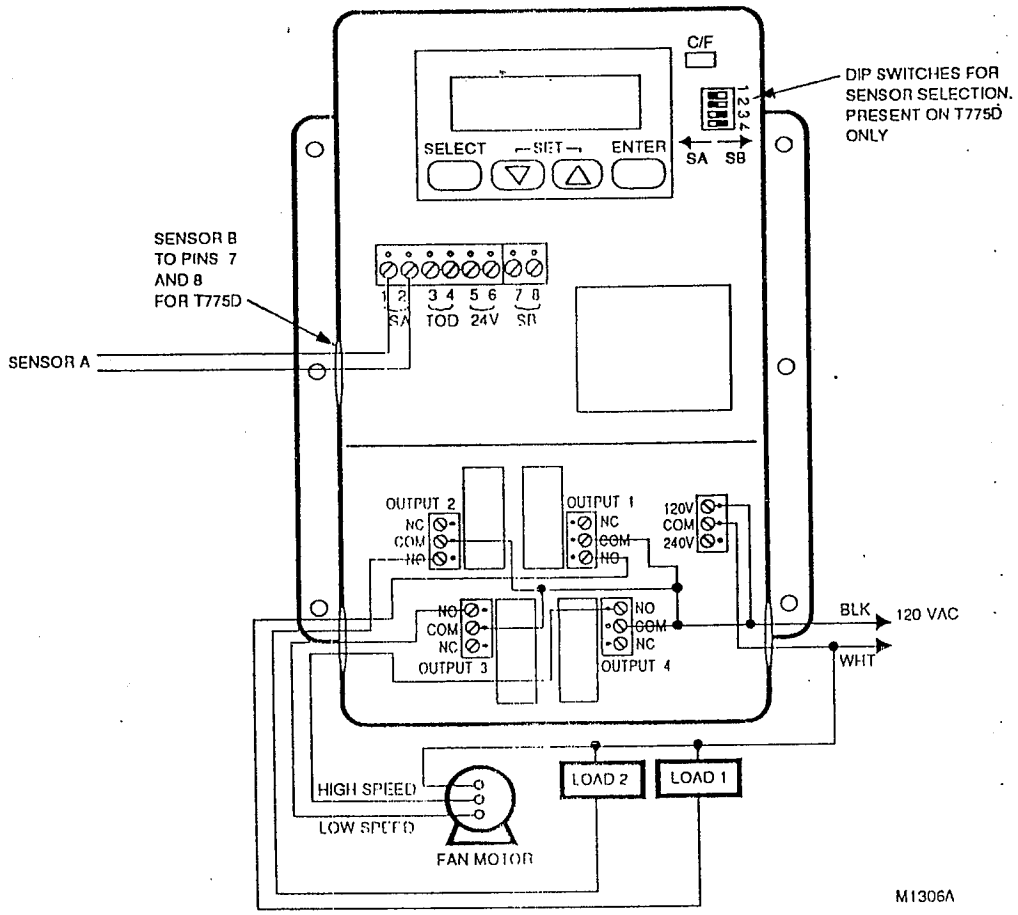


FIG. 8—T775 HOOKUP FOR CONTROLLING 2-SPEED FAN AND TWO ADDITIONAL LOADS.

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