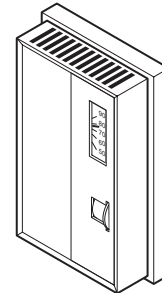


**TP-8101, TP-8102, TP-8103**

These self-contained room temperature controllers conserve energy in heating and/or cooling applications requiring a single setpoint adjustment. See Table-1 for particular characteristics.

The heating and cooling equipment is precisely controlled from a single 1000 ohm Balco sensor operating through a single controller for heating and/or cooling. The controller provides a proportional output to control TAC System 8000 controlled devices for control of valves, dampers, electric heat, DX coils, etc.

TP-8101,  
TP-8102,  
TP-8103  
Single Setpoint  
Adjustment



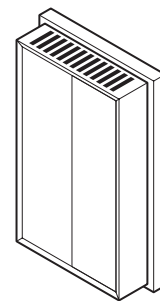
**TP-8124, TP-8125**

These self-contained room controllers conserve energy in heating and/or cooling equipment in applications requiring heating and cooling setpoint adjustment.

See Table-1 for particular characteristics.

The heating and cooling equipment is precisely controlled from a single 1000 ohm Balco sensor operating through independent heating and cooling controllers. These controllers provide proportional outputs to control TAC System 8000 controlled devices for control of valves, dampers, electric heat, DX coils, etc. The heating output (OP1 to COM) can be programmed for direct-acting or reverse-acting operation. The cooling output (OP2 to COM) provides a direct-acting output only.

TP-8124  
& TP-8125  
Dual  
Setpoint  
Adjustment



**Table-1**

Part Number	Dial Marking	Control Dial Range	Throttling Range for 3 Vdc Output Change	Input Voltage	Output Voltage	Control Action	Wiring Connections	Number of Controlled Devices
TP-8101	°F & °C	55-85°F	2, 3, 6 and 20°F Factory Set 3°F By Jumper/Pins	20 Vdc 13 mA	2-15 Vdc or 15-2 Vdc	Factory Set Direct-acting Jumper Terminal 4 to 5 For Reverse-acting Jumper Terminal 4 to 3	3 Color-coded Pigtail Leads Terminals for Options See Figure 2	6 TAC System 8000 Devices or 2 MP-5200 Series Actuators
TP-8101-116	°C	13-29°C						
TP-8102	°F & °C	7-24°C (45-75°F)						
TP-8103	°F & °C	24-41°C (75-105°F)	Heating and Cooling 2-10°F Independently Adj. Factory Set 3°F	20 Vdc 23 mA	Heat 2-15 Vdc or 15-2 Vdc Cool 2-15 Vdc	Heating Factory Set Reverse-acting Jumper J7 to pin B for Direct-acting Cooling Direct-acting only	Coded Terminals see Figure 3	6 TAC System 8000 Devices or 2 MP-5200 Series Actuators in both Heating and Cooling
TP-8124 Dual Setpoints	°F & °C	Heating 7-24°C (45-75°F) cooling 21-38°C (70-100°F)						
TP-8125 Dual Setpoints	°F & °C	Heating 7-24°C (45-75°F) Cooling 24-41°C (75-105°F)						

## Features

1. TP-8124 meets ASHRAE 90-75 and DOE requirements. TP-8125 meets DOD requirements.
2. Heating and cooling cannot operate simultaneously.
3. Heating/cooling deadband obtained by adjustable dual setpoints and throttling range.
4. Proportional outputs operate remote TAC System 8000 controlled devices such as valves, dampers, electric heat coils, etc.
5. Concealed adjustments eliminate occupant tampering.

## INSTALLATION

Open the carton and visually inspect the device for part number and obvious defects before proceeding with the installation.

Mounting screws are provided.

Locate the controller where it will be exposed to unrestricted natural air circulation and to the average conditions of the controlled space. Do not locate it near sources of heat or cold (such as lamps, motors, sunlight radiators and concealed pipes or ducts within the wall) which might affect the control point. Avoid locations where excessive vibration moisture. Corrosive fumes or vapors are present, or where high radio frequency or electromagnetic generating devices are near.

## Dimensions

111 mm (4-3/8") high x 77 mm (2-7/8") wide x 41 mm (1-5/8") deep.

## Ambient Limits

Operation: 40 to 140°F (4.4 to 60°C). Storage: 40 to 160°F (-40 to 71°C).

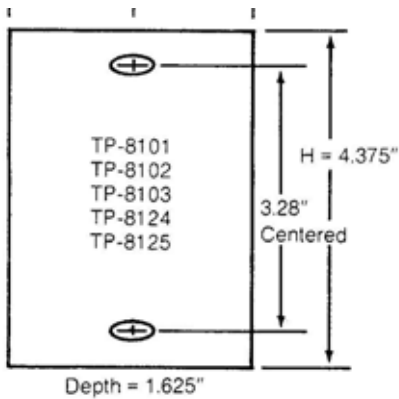


Figure-1

## MODES OF OPERATION

1. Direct-acting control (DA): Increase in temperature at the sensor causes the controller output signal to increase.
2. Reverse-acting control (RA): Increase in temperature at the sensor causes the controller output signal to decrease.

## THROTTLING RANGE

Throttling range (T.R.) is defined as the degrees (°F or °C) change at the temperature sensor in order to cause a 6 to 9 Vdc controller output signal change.

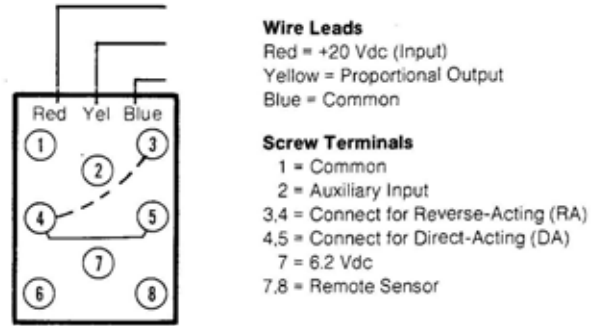


Figure-2 Terminal Nomenclature TP-8101, TP-8102, and TP-8103.

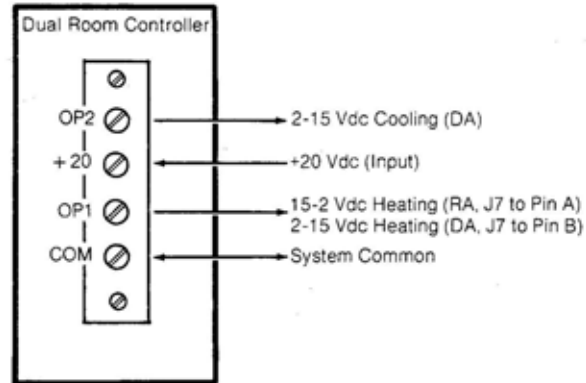


Figure-3 Terminal Nomenclature TP-8124 and TP-8125.

## WIRING

Make all electrical connections according to installation wiring diagrams. Comply with national and local electrical codes.

No. 18 multi-conductor thermostat cable may be used. Low voltage Class 2 wire is acceptable, but No. 18 or larger 600V wire should be used if splices are to be made in the same junction box with the voltage wiring.

The controller may be installed on either a 52 mm x 102 mm (2" x 4") flush switch box or a surface switch box. To install, proceed as follows:

1. Wiring for the TP-8101, TP-8102 and TP-8103 is shown in Figures 4 and 5. See Figures 6 and 7 for TP-8124 and TP-8125 typical wiring.
2. "Pull" all wires required.
3. Connect all control wiring to the thermostat.
4. Remove the thermostat cover by loosening the screw at the bottom of the cover. Pull the cover out from the bottom and up to disengage it from the base.
5. Fasten the base to the box with the screws provided.
6. Replace the cover and tighten the cover screw.

# WIRING OF CONTROLLED DEVICES TO CONTROLLER

## Types of controlled devices and their power supplies:

1. Filtered and regulated power supplies: All TAC System 8000 controlled devices except MP-52XX and MP-54XX series actuators.
2. Filtered and unregulated power supplies: MP-54XX series actuators.
3. Unfiltered and unregulated power supplies: MP-52XX series actuators.

## General rules for wiring controllers to controlled devices:

1. Never connect red lead (or +20 terminal) of any controlled device which has a regulated power supply to the red lead (or +20 terminal) of any other controlled device.
2. Controlled devices with unfiltered and unregulated power supplies must be filtered. TAC System 8000 controllers will provide filtering for a maximum of two controlled devices by connecting the two red leads (+20 terminals) together at the controllers red lead (+20 terminal).

3. Controlled devices with filtered and unregulated supplies. Up to six controlled devices with the red leads (+20 terminals) can be connected together. Number of units paralleled depends on the current (mA DC) requirements of the controller of adaptor.

**Table-2 Devices and Their Internal Supplies.**

Filtered & Regulated	Filtered & Unregulated	Unfiltered & Unregulated
CC-8101	MP-54XX Actuators	MP-52XX Actuators
CC-8102		
CC-8103		
CC-8118 Series		
CC-8218 Series		
CC-8111 Series		
CP-8301 Series		
CP-8161 Series		
CP-8425 Series		
CP-5501 Series		
CP-8502 Series		

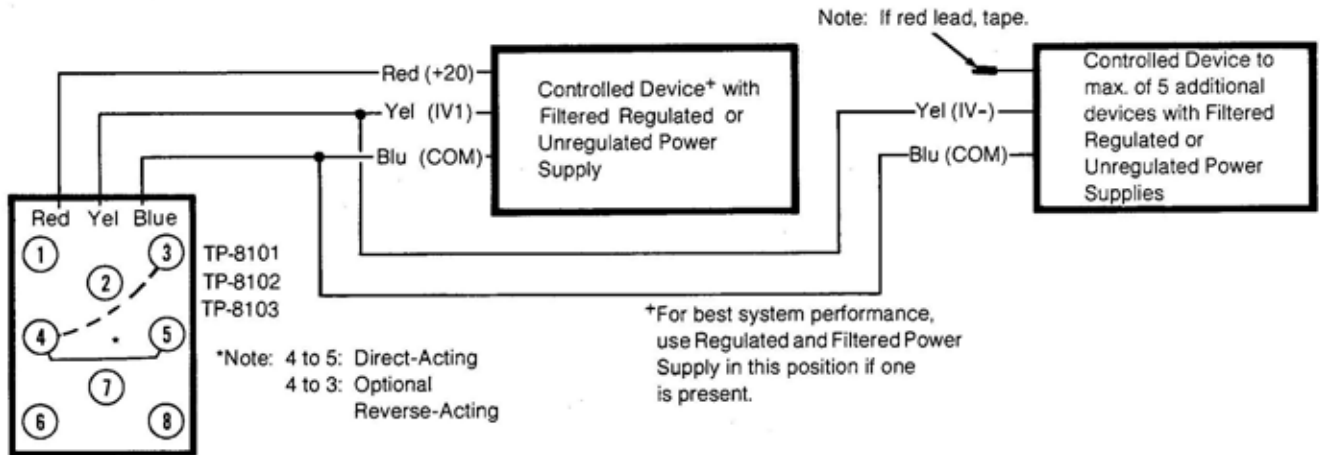


Figure-4 TP-8101, TP-8102, and TP-8103 Typical Wiring *without* MP-52xx Actuators.

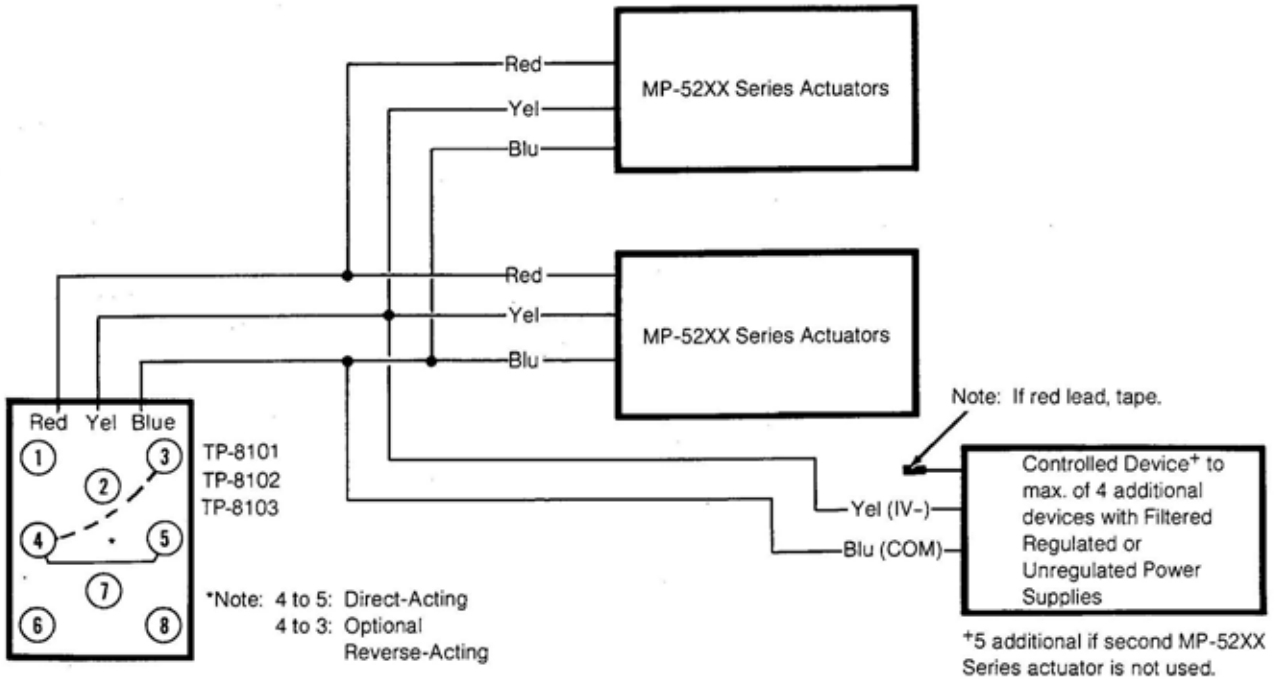


Figure-5 TP-8101, TP-8102, and TP-8103 Typical Wiring with MP-52xx Actuators.

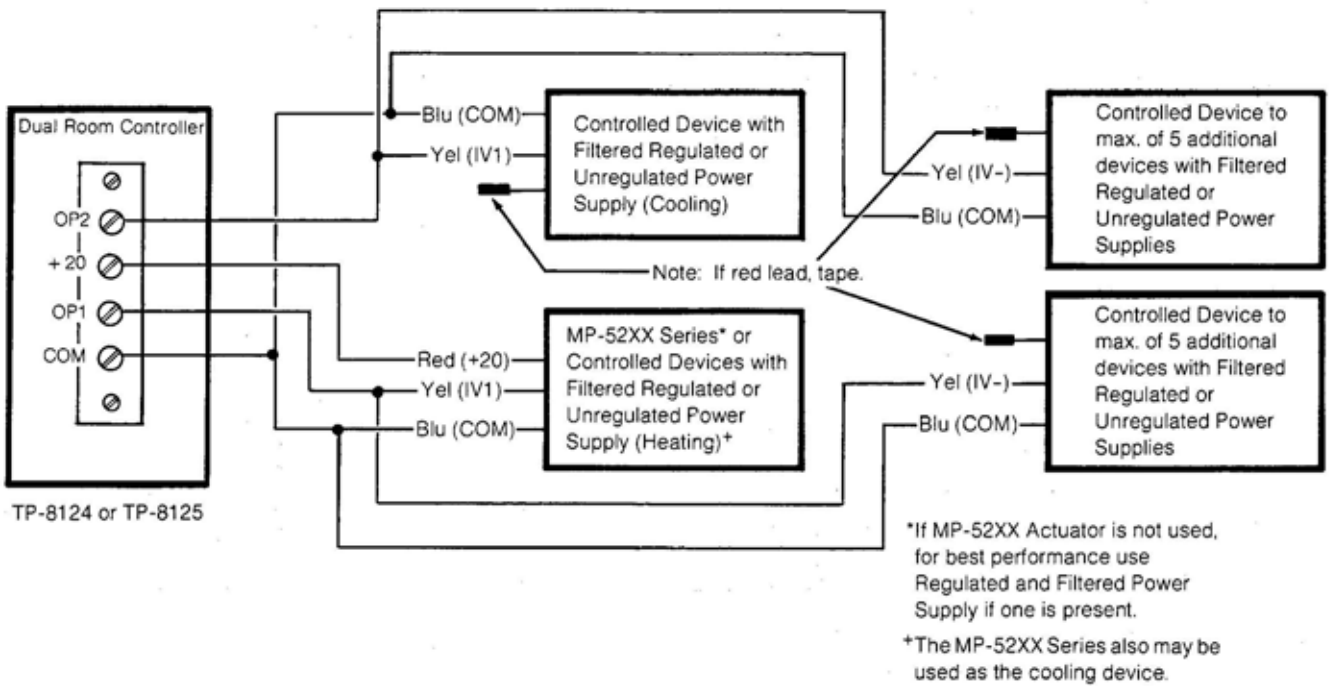


Figure-6 TP-8124 and TP-8125 Typical Wiring with One or No Mp-52xx Actuators.

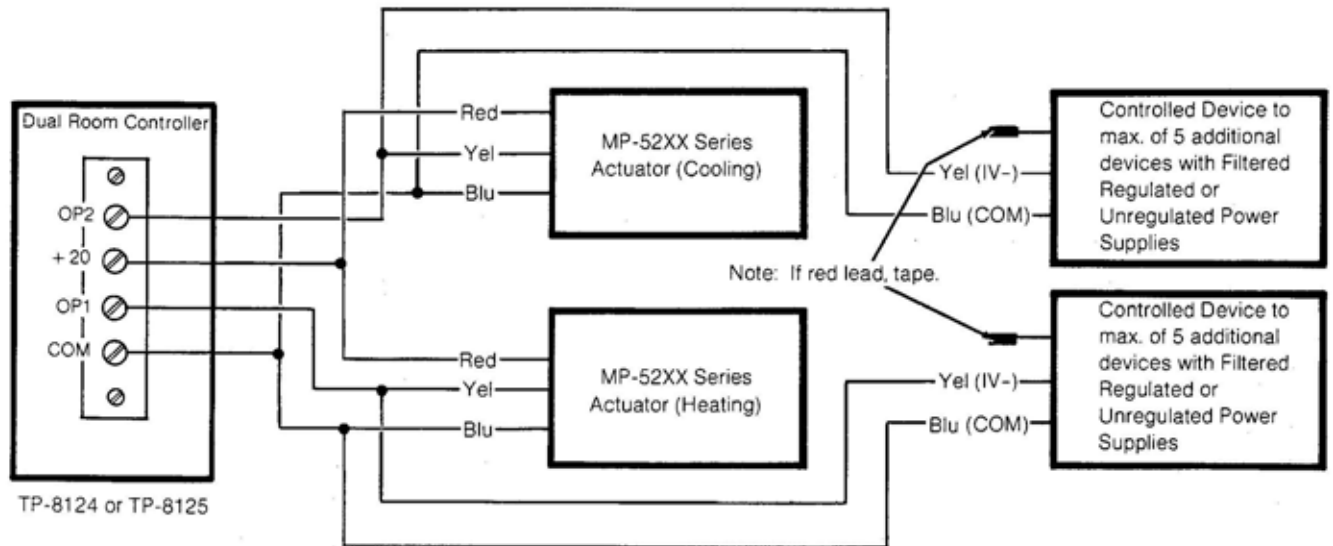


Figure-7 TP-8124 and TP-8125 Typical Wiring with Two MP-52xx Actuators.

## ADJUSTMENTS

### TP-8101, TP-8102, TP-8103

1. Turn the setpoint adjuster to the required temperature setting. Normally, no further adjustments are required.
2. Throttling range settings of 2, 3, 6 and 20° are available by placing the T. R. jumper on the proper selector pin. See Figure 8. For other throttling ranges (1 through 60°) add a resistor to the auxiliary pins. Select the resistor from the chart below. Place the T. R. jumper on the auxiliary pin nearest the center of the controller.

### TP-8124 and TP-8125

1. Remove the cover and turn the setpoint adjuster (SPA) to the required temperature for heating mode (typically 65°F). Turn the setpoint adjuster (SPB) to the required temperature for the cooling mode (typically 78°F). The cooling signal is direct-acting, and stages cooling or proportionally opens a normally closed chilled water valve with a temperature increase. The heating signal is factory set for reverse-acting. With a temperature decrease, the signal stages electric heat or proportionally increases the electric heat output controlled by a TAC CP-8400 or CP-80000 Series SCR controller.
2. For applications that require a direct-acting signal in the heating mode, such as normally open heating valve, move jumper J7 to pin "B".

Table-3 Throttling Range Resistor Values.

°F T. R.	Auxiliary Resistor	TAC Part Number
1	4.3 Meg. ± 5%	E19-23-562
1.5	3.0 Meg. ± 5%	
2.0	2.2 Meg. ± 5%	CYZR-481-860
2.5	1.8 Meg. ± 5%	CYZR-481-580
3.0	1.5 Meg. ± 5%	CYZR-481-680
3.5	1.2 Meg. ± 5%	CYZR-481-450
4.0	1 Meg. ± 5%	CYZR-481-610
4.5	975K, ± 1%	CYZR-862-496
5.0	866K, ± 1%	
6.0	732K, ± 1%	
7.0	619K, ± 1%	CYZR-862-477
8.0	549K, ± 1%	
9.0	487K, ± 1%	
10.0	432K, ± 1%	CYZR-862-462
15.0	287K, ± 1%	CYZR-862-445
20.0	215K, ± 1%	
25.0	174K, ± 1%	CYZR-837-913
30.0	143K, ± 1%	CYZR-837-130
40.0	107K, ± 1%	
50.0	84.5K, ± 1%	E19-64-390
60.0	69.8K, ± 1%	CYZR-837-890

3. The Temperature Deadband between heating and cooling is the difference in SPB and SPA settings. For example, the deadband is 13°F with SPA at 65°F and SPB at 78°F.
4. The throttling ranges are factory set at 3°F for heating and cooling. These settings should not be changed for normal applications. Increase the throttling range only to achieve control stability (adjustable 2 to 10°F).  
To adjust, turn the T. R. dial to position the required T. R. value closest to the thermostat cover.
5. Replace the cover.

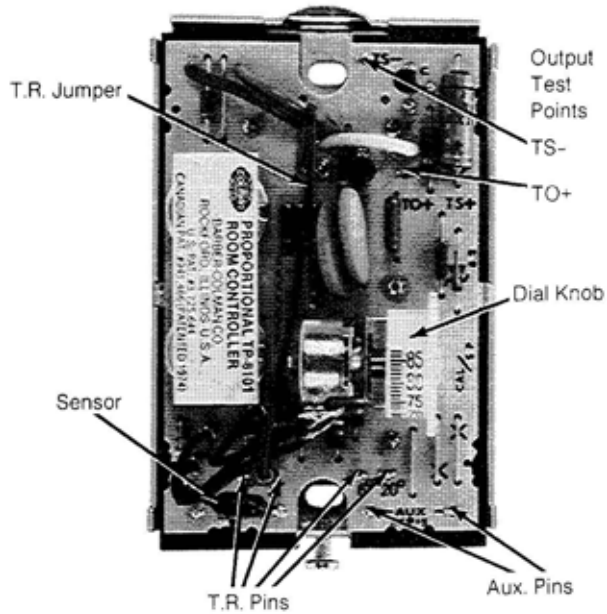


Figure-8 TP-8101, TP-8102, and TP-8103.

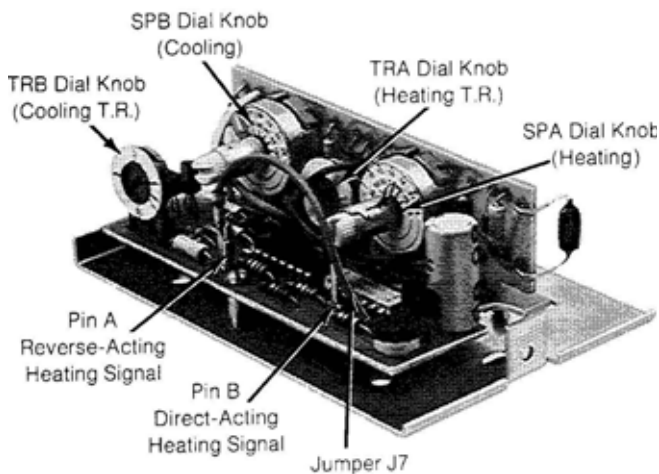


Figure-9 TP-8124 or TP-8125.

## SERVICE

### TP-8101, TP-8102, TP-8103

*Note:* The TP-8101, TP-8102 and TP-8103 have been factory calibrated to produce a 7.5 Vdc output signal at the yellow and blue leads (TO+ and TS-) when the setpoint and the temperature at the sensing element agree.

1. Verify wiring per job wiring diagram.
2. Measure with a 20,000 ohm per Vdc VOM.
  - a. Power supply 20 Vdc Red (+) to blue (-) wires or test point pins TS- and TS+ (+ end of the 47  $\mu$ f capacitor).
  - b. Output 2 to 15 Vdc: Yellow (+) to blue (-) wires or TO+ and TS- test pins. The voltage varies between 2-15 as the dial knob is rotated.
3. Consult EN 111 for additional service information.
4. Replace the controller if it is defective.

If calibration is necessary, proceed as follows:

1. Connect a 20,000 ohm per Vdc VOM between the yellow (+) and blue (-) leads or TO+ and TS- pins on the thermostat.
2. With the thermostat cover on, insert a 5/64" Allen wrench through the hole on the right-hand side of the thermostat into the setpoint potentiometer shaft.
3. Measure the temperature at the thermostat.
4. Adjust the thermostat setpoint by rotating the Allen wrench until the setpoint dial reading equals the temperature measured in step 3 above.
5. Using the thumb of your left hand, hold the knob in place. Avoid touching the lower left-hand corner of the thermostat where the sensor is located.
6. Rotate the Allen wrench until VOM reads 7.5  $\pm$  3 Vdc.
7. The thermostat is calibrated.

### TP-8124 and TP-8125

*Note:* The TP-8124 and TP-8125 have been factory calibrated to produce 6.0 Vdc output signals at OP1 and OP2 to COM terminals when the setpoints and the temperatures at the sensing element agree.

Test the power supply and output as follows:

1. Verify the wiring per the job wiring diagram.
2. Measure with a 20,000 ohm per Vdc VOM:
  - a. Power supply 20 Vdc:  $\pm$ 20 (+) to COM (-).
  - b. Heating output: OP1 (+) to COM (-), Vdc varies between 2-15 as SPA is rotated.
  - c. Cooling output: OP2 (+) to COM (-). Vdc varies between 2-15 as SPB is rotated.
3. Replace the controller if it is defective.

If calibration is necessary, proceed as follows:

1. Remove the thermostat cover. Note room temperature.

2. If room temperature is 75°F or greater:
  - a. Connect VOM internally to OP2 (+) and COM (-). See Figure 10 for details.
  - b. Rotate SPB until VOM reads  $6.0 \pm 3$  Vdc. SPB pointer must indicate the temperature measured. If not, hold SPB shaft and rotate pointer (CCW) until it indicates the temperature measured.  
SPB is calibrated.
  - c. Disconnect VOM lead from OP2 and reconnect to OP1. Connect Jumper J7 to Pin A.
  - d. Connect 1 MEG  $\pm$  1% resistor (SYZE-13512 test kit) between AB1 and 6.2 connections.
  - e. Rotate SPA until VOM reads  $6.0 \pm$  Vdc. SPA should read temperature measured minus 10°F. If not, hold SPA shaft and rotate pointer (CCW) until it indicates temperature measured minus 10°F.  
SPA is calibrated.
3. If room temperature is 74°F or less:
  - a. Connect VOM internally to OP1 (+) and COM (-). See Figure 11 for details.
  - b. Rotate SPA until VOM reads  $6.0 \pm 3$  Vdc. SPA must indicate the temperature measured. If not, hold SPA shaft and rotate the pointer (CCW) until it indicates the measured temperature.  
SPA is calibrated.
  - c. Disconnect VOM lead from OP1 and re-connect to OP2. Connect Jumper J7 to Pin A.
  - d. Connect 1 MEG,  $\pm$  1% resistor (SYZE-13512 test kit)

- e. Rotate SPB until VOM reads  $6.0 \pm 3$  Vdc. SPB should read the measured temperature plus 10°F. If not, hold SPB shaft and rotate pointer (CCW) until it indicates the measured temperature plus 10°F.  
SPB is calibrated.

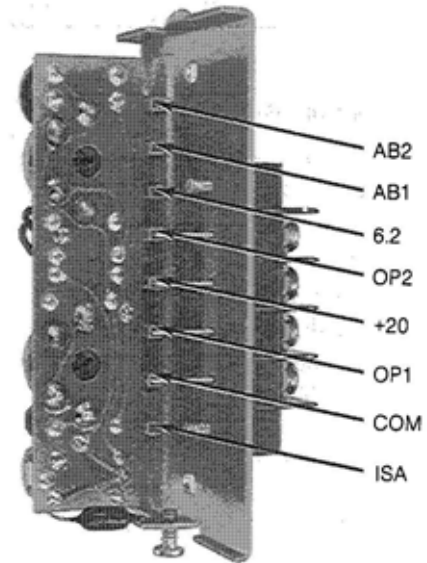


Figure-10

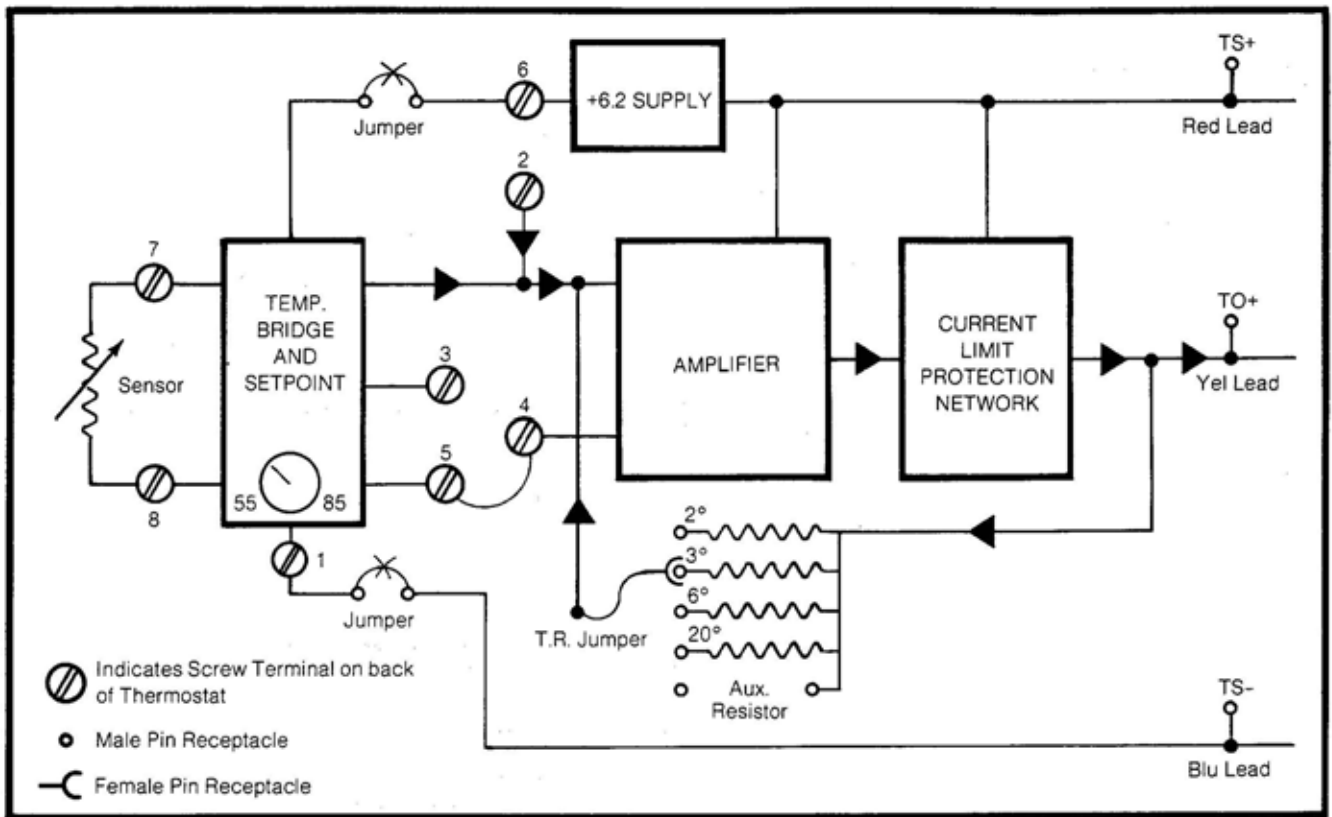


Figure-11 TP-8101, TP-8102., and TP-8103 Block Diagram.

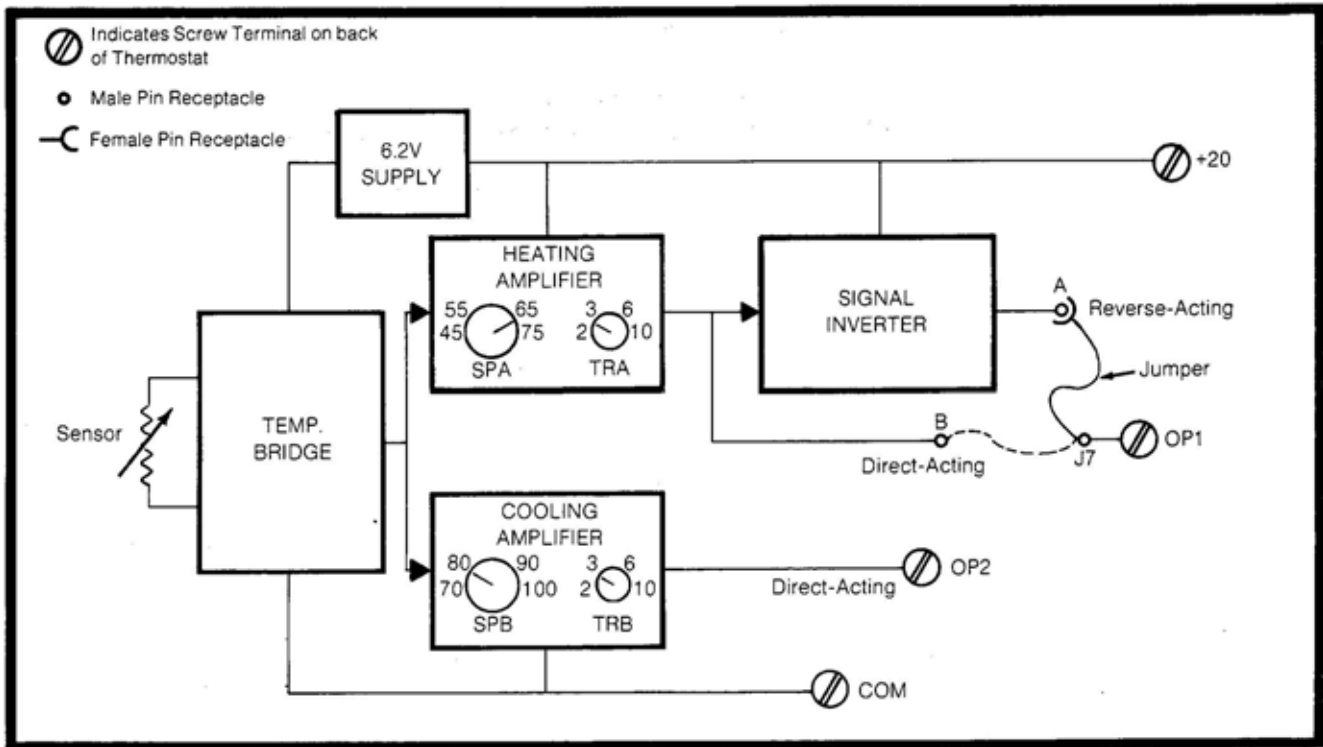


Figure-12 TP-8124 and TP-8125 Block Diagram.

## OPTIONS

### TP-8101, TP-8102, TP-8103

(TP-8124 and TP-8125 have no options.)

#### Remote Setpoint

Install the AT-8100 Series remote setpoint adjuster between terminals 1, 2 and 7. These are used for applications where the setpoint adjustment is mounted remote from the controller. See Figure 15, 16, or 17.

Remove the dial rim from the setpoint knob using wire cutters. Turn the dial to 70°F. The AT-11-404 blank cover is recommended to prevent dust infiltration.

#### Remote Sensing

Remove the internal 1000 ohm sensor and install the remote sensor (TS-8000 Series) between terminals 7 and 8. This is used for applications where the sensor is mounted remote from the controller. See Figure 14.

#### Summer-Winter Changeover

This is accomplished without remote setpoints or selective ratio discharge. The controller operates in either the DA or RA mode. See Figure 13.

Jumper 4 to 5 - DA (directing-acting): A temperature increase causes an output voltage increase.

Jumper 3 to 4 - RA (reverse-acting): A temperature increase causes an output voltage decrease.

#### Selective Ratio Discharge Control

Connect the ratio discharge sensor (Figure 20) to the room controller as shown in Figure 15, 16 or 17. This is used for room and discharge control applications.

#### Winter-Summer Operation

This is accomplished using selective ratio discharge and/or remote setpoints. For direct-acting see Figure 15. For reverse-acting, see Figure 16. For winter-summer switching, see Figure 17.

For panel mounting, see Figure 19.



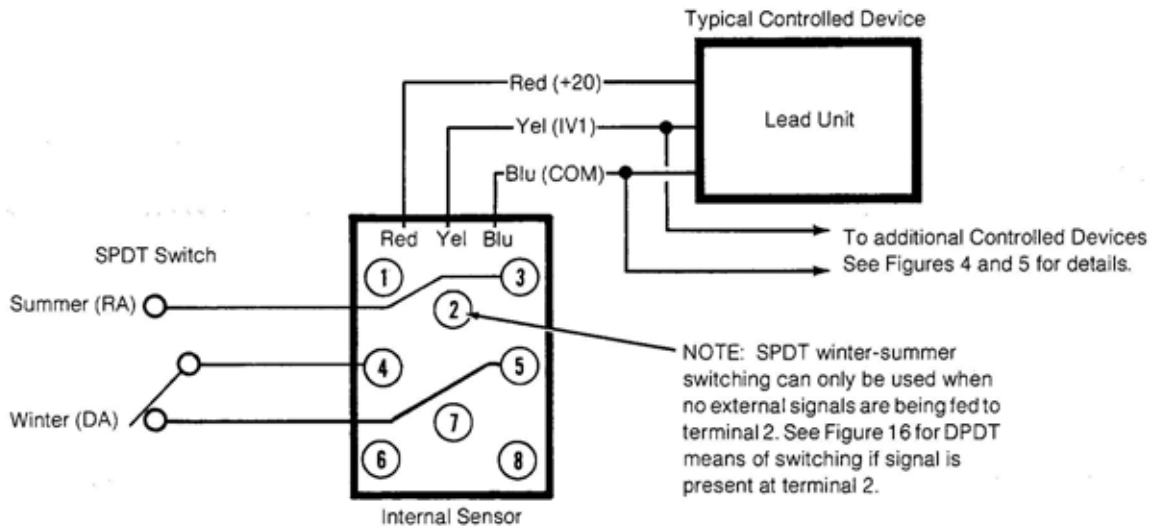


Figure-13 TP-8101, TP-8102, and TP-8103 with Single Pole Double Throw (SPDT) Winter-Summer Switching.

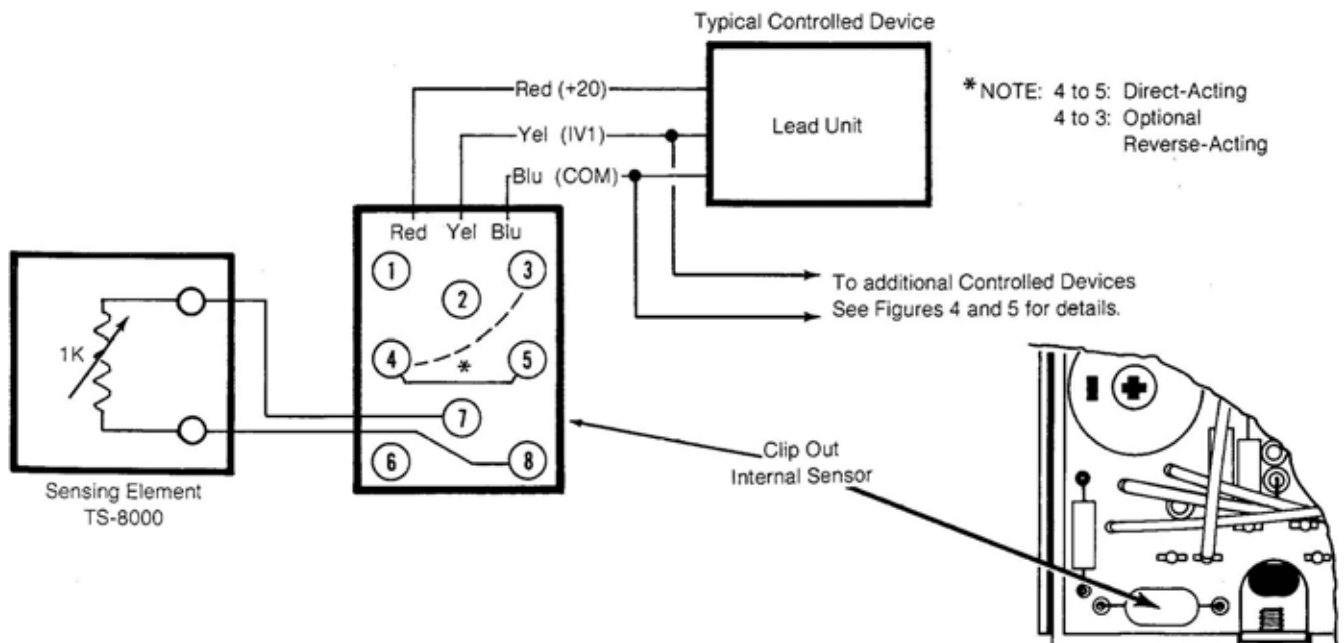


Figure-14 TP-8101, TP-8102, and TP-8103 with Remote Sensor.

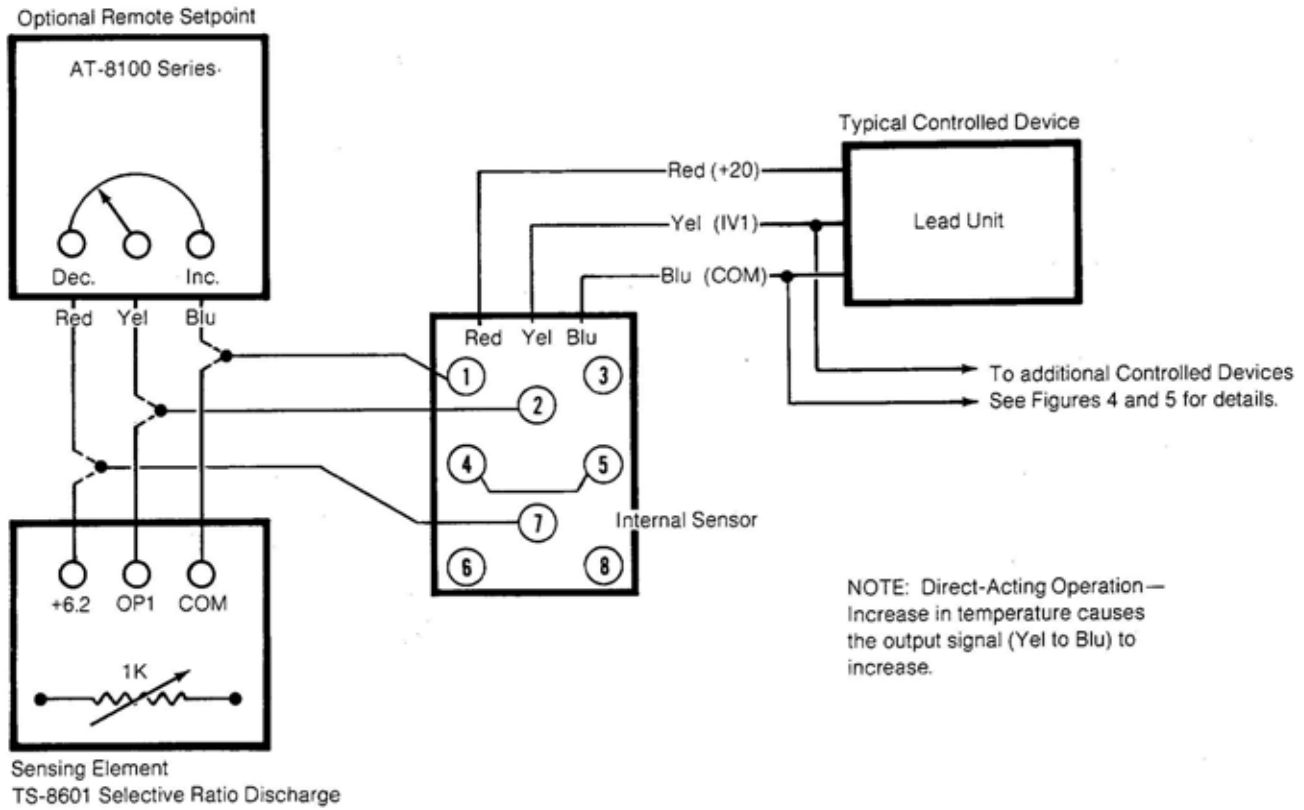


Figure-15 TP-8101, TP-8102, and TP-8103 with Remote Setpoint and/or Selective Ratio Discharge Sensor. *Direct-Acting Output Only.*

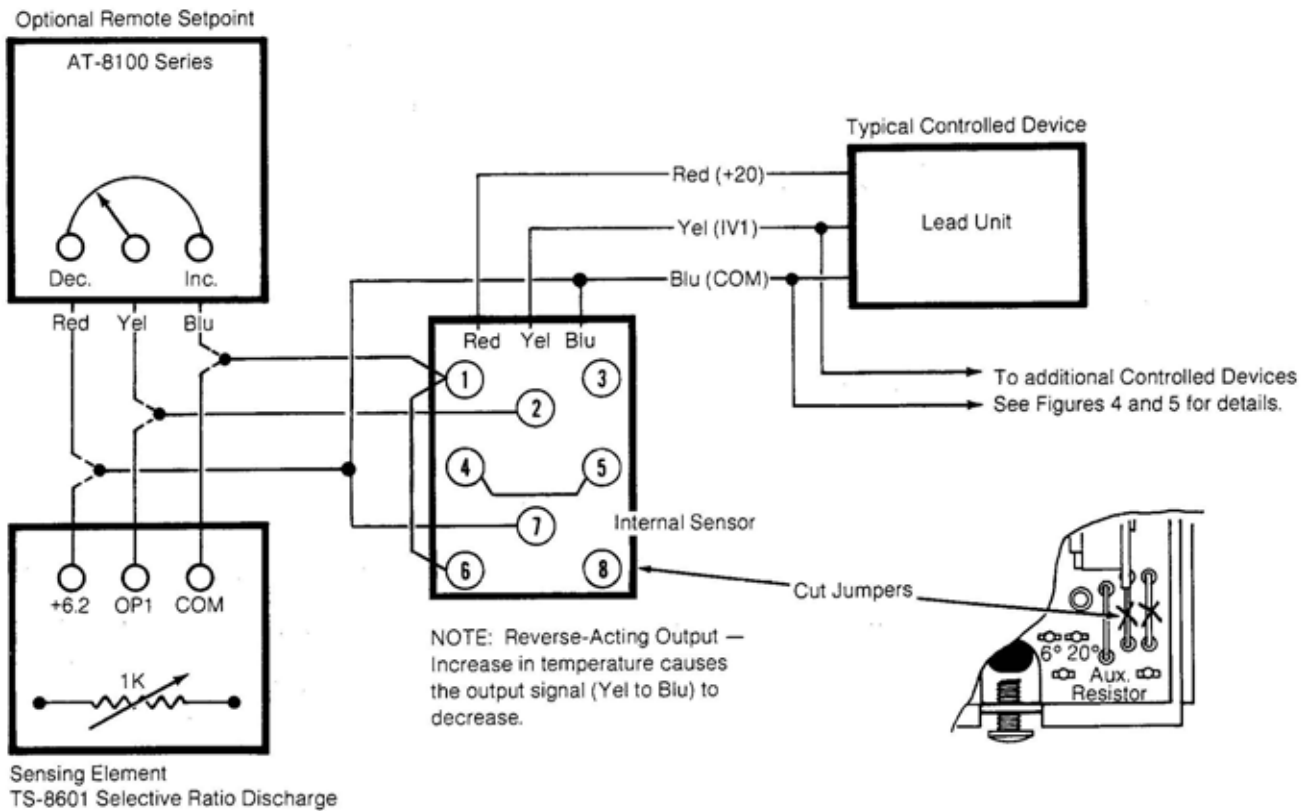


Figure-16 Tp-8101, TP-8102, and TP-8103 with Remote Setpoint and/or Selective Ratio Discharge Sensor *Reverse-Acting Output Only.*

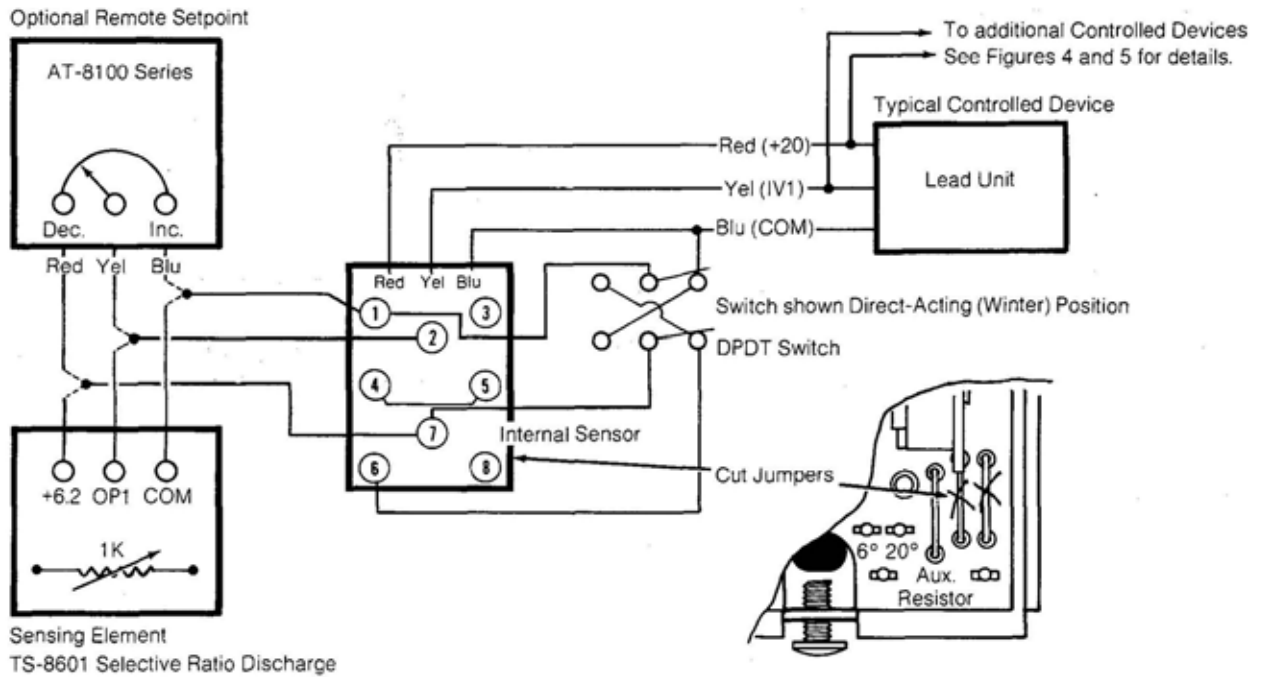


Figure-17 TP-8101, TP-8102, and TP-8103 with Remote Setpoint and/or Selective Ratio Discharge Sensor with Double Pole Double Throw (DPDT) Winter-Summer Switching.

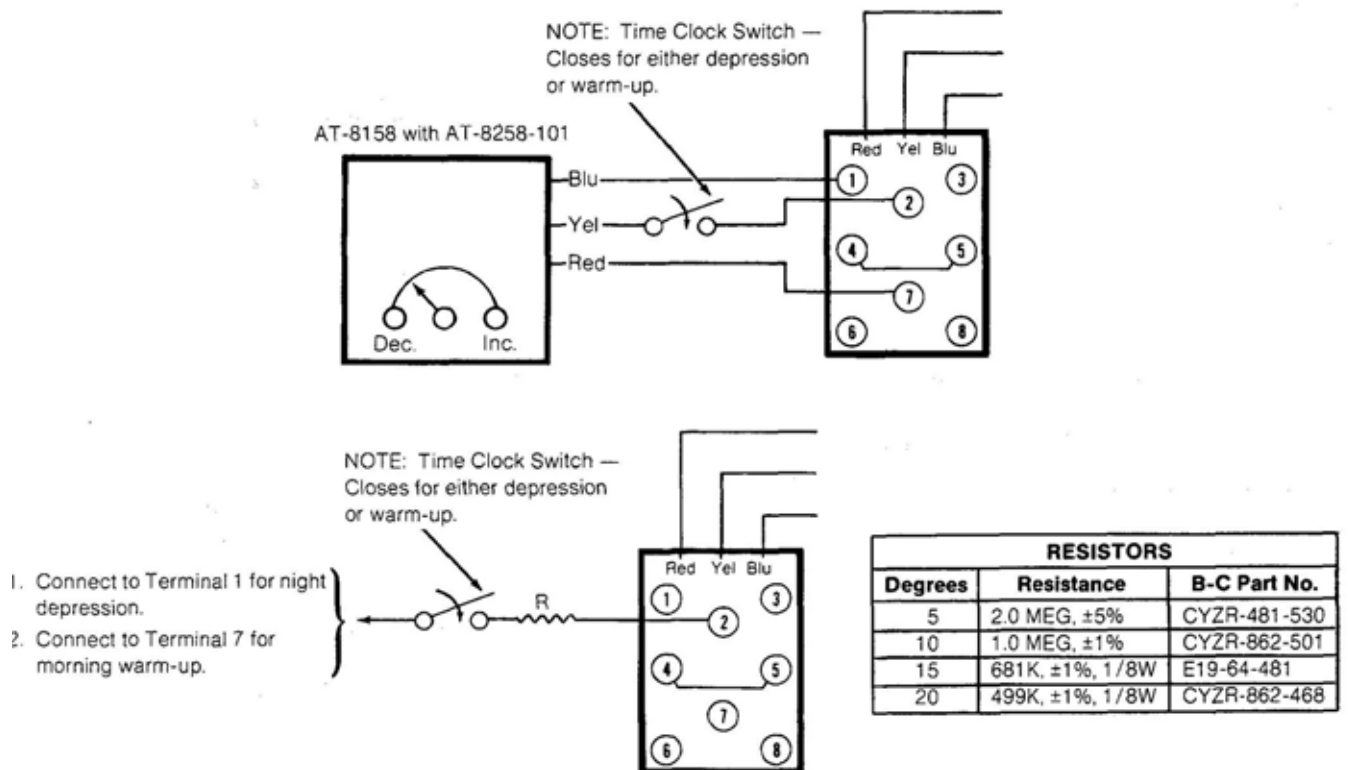


Figure-18 TP-8101, TP-8102, and TP-8103 with Night Depression and/or Morning Warm-Up.

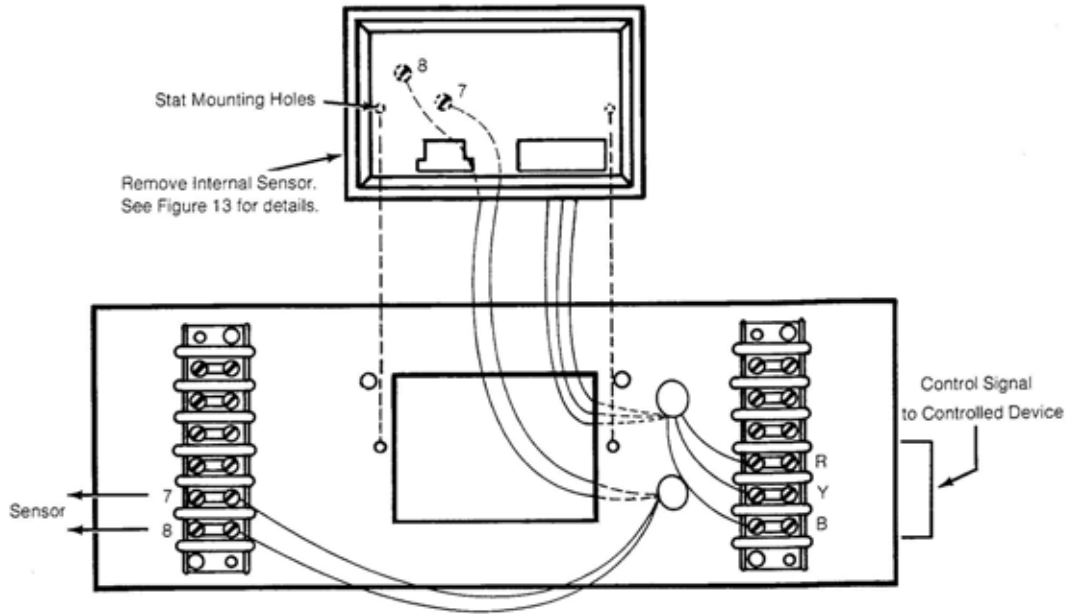
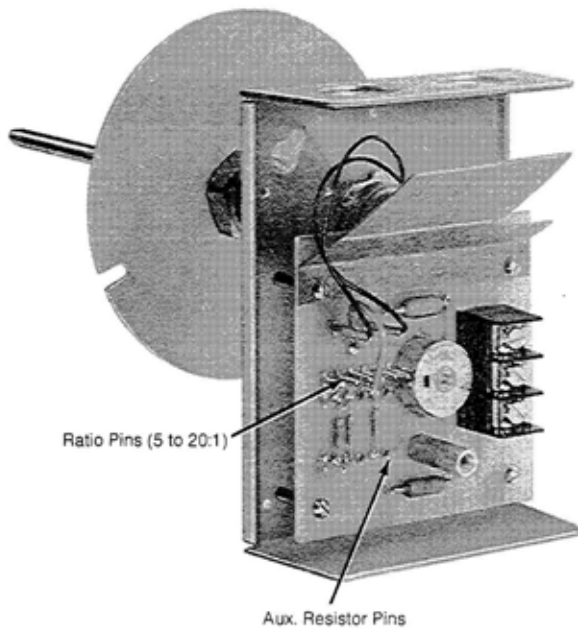


Figure-19 TP-8101, TP-8102, and TP-8103 Mounted on AD-8951.



AUXILIARY RESISTORS		
Ratio	Resistance	B-C Part No.
25:1	59K, ±1%, 1/8W	CYZR-932-66
30:1	71.5K, ±1%, 1/8W	CYZR-868-19
40:1	95.3K, ±1%, 1/8W	E19-29-395
50:1	121K, ±1%, 1/8W	CYZR-788-12

Figure-20 TS-8601 Ratio Discharge Sensor for use with TP-8101, TP-8102, and TP-8103.

## MAINTENANCE

This is a quality product. Regular maintenance of the total system is recommended to assure optimum performance.

Copyright 2007, TAC  
 All brand names, trademarks and registered trademarks are the property of their respective owners. Information contained within this document is subject to change without notice.

**TAC**  
 1354 Clifford Avenue  
 P.O. Box 2940  
 Loves Park, IL 61132-2940  
[www.tac.com](http://www.tac.com)