

T7984 A,B,C Electronic Modulating Control Thermostats

PRODUCT DATA



APPLICATION

These microprocessor-based thermostats provide proportional - integral (PI) individual room temperature control in zoned commercial Heating, Ventilating, and Air Conditioning systems such as hydronic heating and/ or cooling, pressure dependent VAV or by-pass box with or without terminal reheat.

The T7984 family provides modulating analog 2 to 10 Vdc control. Optional features include automatic heat/ cool changeover, reheat control, remote night setback with local timed override, and remote sensor on VAV models.

FEATURES

- PI (proportional and integral) control action provides accurate, stable room temperature control.
- T7984 models are used with Series 70 direct-coupled damper actuators such as ML7161 or ML7984, or with valve actuators such as ML7285, ML7421, VC7930 or M7410.
- All models feature user-friendly set point knob.
- All models feature output status LEDs for installer check-out.
- Locking cover and range stops are standard.
- Night setback models feature selection of two different offset temperatures and use central time switch control.
- Night setback models feature 2 1/2 hour local timed override.
- Heat/cool models feature automatic changeover with 3° or 5°F (1.5°C or 3°C) selectable Zero Energy Band (Z.E.B.) to meet requirements of ASHRAE 90.1
- Heat/cool models have installer-definable setpoint at midpoint of Z.E.B, at heating setpoint, or at cooling setpoint.
- Reheat models feature fast/slow response selection to match heating system dynamics.
- DIP switch selectable 75°F (24°C) high limit heating setpoint and low limit cooling setpoint.
- Horizontal and vertical covers included.

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SPECIFICATIONS

IMPORTANT

The specifications given in this publication do not include normal manufacturing tolerances. Therefore, this unit may not exactly match the listed specifications. Also, this product is tested and calibrated under closely controlled conditions, and some minor differences in performance can be expected if those conditions are changed.

MODELS: T7984A,B,C, 2 to 10 Vdc analog output

Table 1. Model Specifications

Model	Output 1	Cool/Heat Changeover For Output 1	Output 2	Night Setback	Main Temperature Sensor *	Mode Selection Input
T7984A	Modulating 2 to 10 Vdc	Dry Contact or Sensor	On/off	-	Internal or remote	-
T7984B	Modulating 2 to 10 Vdc	-	-	Dry Contact	Internal or remote	Jumper
T7984C	Modulating 2 to 10 Vdc	Dry Contact or Sensor	Modulating 2 to 10 Vdc	Dry Contact	Internal or remote	-

* Remote sensor models are:

272845 Remote wall mount sensor

272847 Remote duct mount sensor

DIMENSIONS

See Figure 1.

MOUNTING: Mounts to single-gang NEMA-standard 2"x 4" electrical box, or directly to wall requires 1 1/8" [35mm] access hole for wiring.

WIRING: Four to eight 1/8" screw terminals suitable for 2 no. 18 AWG [1 mm 2] wires each depending on model.

POWER SUPPLY: 19-30 Vac, 50-60 Hz, 2 VA, Class 2. (Does not include actuator or reheat stage power requirements.)

OPERATING AMBIENT:

32-104°F [0-40°C] at 5-95% Relative Humidity (non-condensing).

ACCURACY: 1°F (0.6°C) **PRECISION:** ±1°F (0.5°C) temperature after stabilization.

PRECISION: ±1°F (0.5°C) temperature after stabilization.

SETPOINT RANGE: 55-90°F [13-32°C], T7984A.

Heating: 55-75°F [13-24°C], T7984B, C*.

Cooling: 75-90°F [24-32°C], T7984B, C*.

* The maximum heating setpoint and minimum cooling setpoint is electronically limited to 75°F [24°C].

REMOTE SENSOR: 47 kΩ NTC thermistor [part nos. 272845 and 272847].

ANALOG OUTPUT: 2 to 10 Vdc, 2 mA max.

SWITCHED OUTPUT RATING: 0.5A running, 1.1A inrush, 24Vac, protected with selfresetting fuse.

OPERATING PARAMETERS: See Table 2 for installer selections.

APPROVALS:

Designed for Class II low voltage installation only.

Case and cover meets UL94-5V flammability requirements, and North American codes for line voltage thermostat enclosures.

Meets requirements of F.C.C. Part 15 Class B, IEC 801-3 for radio frequency interference.

ACCESSORIES:

272845 - Remote sensor (wall mounted).

272846 - Adaptor plate for 2-gang NEMA, or British 75 mm electrical box.

272847 - Remote sensor (duct mounted).

ORDERING INFORMATION

When purchasing replacement and modernization products from your TRADELINE® wholesaler or 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 Automation and Control Products Sales Office (check white pages of your phone directory).
2. Honeywell Customer Care
1885 Douglas Drive North
Minneapolis, Minnesota 55422-4386

In Canada—Honeywell Limited/Honeywell Limitée, 35 Dynamic Drive, Scarborough, Ontario M1V 4Z9.

International Sales and Service Offices in all principal cities of the world. Manufacturing in Australia, Canada, Finland, France, Germany, Japan, Mexico, Netherlands, Spain, Taiwan, United Kingdom, U.S.A.

Table 2. Option Settings

Parameter	Selection	T7984 Model		
		A	B	C
Reheat Time Constant	Fast (7.5 min.); or Normal (15 min.)		•	
Zero Energy Band	3°F (1.5°C); or 5°F (3°C)		•	•
Setpoint Definition	Heating; Cooling or H/C midpoint		•	•
Night Setback	5°F (3°C) heat/cool offset, or 10°F (5°C) setback / cooling shutdown		•	•
Main Sensor	Remote or internal	•	•	•

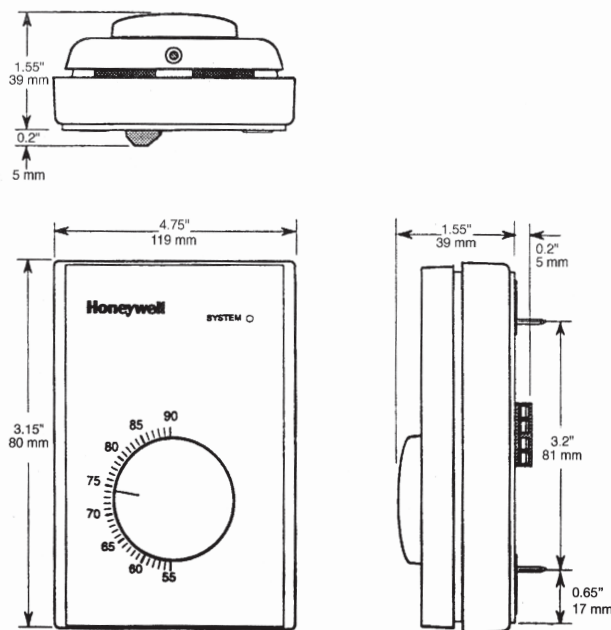


Fig. 1. Dimensions in inches (mm)

INSTALLATION

Location

Install the thermostat about 5 ft. (1.5 m) above the floor in an area with good air circulation at average temperature conditions.

Do not install thermostat where it may be affected by:

- drafts, or dead air spots behind doors and in corners.
- hot or cold air from ducts.
- radiant heat from sun or appliances.
- concealed pipes and chimneys.
- unheated (cooled) areas such as an outside wall behind the thermostat.

Mounting

The thermostat can be mounted directly on the wall with or without a wallplate or a standard single gang electrical box, or double gang with adaptor plate (accessory part 272846).



CAUTION

Disconnect power supply to prevent electrical shock or equipment damage.

Wiring

Typical wiring connections are shown in Fig.2 to Fig.7. Wiring connections may be made to the screw terminal block with 2-18AWG or 1-14AWG, solid or stranded copper wires. Connect the system wires to the thermostat terminals. Push excess wire back into hole. Plug hole to prevent drafts.

Auxiliary screw terminal strip may be used in a junction box when the application requires multiple wires to be brought down at the thermostat. This can make troubleshooting, startup and servicing easier.

DIP Switch Settings

T7984 thermostats must be configured for proper operation by setting DIP switches.

T7984B

Reheat output control action: 7.5 or 15 minutes.

T7984B,C

Zero energy band (ZEB): 3°F (2°C) or 5°F (3°C)

Setpoint adjustment: cooling, centred, heating centred with limit override for commissioning.

Night setback amount: see Table 2 for complete listing of option settings.

T7984A,B,C

Main sensor, internal or remote.

Table 3. T7984 DIP Switch Definition

OUTPUT 2 ON/OFF CPH

T7984B only

For more information, see on/off output cycle per hour application note.

CYCLES/HOUR	S1
FAST 8 CPH	1
SLOW 4 CPH	0

It is possible to fix the number of times per hour the on/off output will be energized.

ZERO ENERGY BAND

T7984B & C only

ZEB	S2
5°F (3°C)	1
3°F (1.5°C)	0

On models which have 2 outputs, 1 for cooling and 1 for heating, it is possible to adjust the zero energy band value (dead band between heating and cooling endpoints).

SETPOINT DIAL DEFINITION

T7984B & C only

For more information, see setpoint dial definition & setpoint limitation application note.

DEFINITION	S3	S4
75°F OVERRIDE	1	1
HEATING DIAL	0	1
COOLING DIAL	1	0
CENTERED HC	0	0

Models with cooling and heating outputs

- » Setpoint dial centered, 75°F limitation not active.
- » Setpoint dial defined as heating, 75°F limitation active.
- » Setpoint dial defined as cooling, 75°F limitation active.
- » Setpoint dial centered, 75°F limitation active.

DAY/NIGHT SETBACK

T7984B & C only

HEAT SETBACK	COOL SETUP	S5
10°F (5°C)	20°F (10°C)	1
5°F (3°C)	5°F (3°C)	0

Night mode setpoints can be adjusted to different values depending on the application.

REMOTE SENSOR

T7984A, B & C

On model T7984A, switch S7 & S8 are not used.

MAIN SENSOR	S6
LOCAL INTERNAL	1
REMOTE SENSOR	0

For duct return air or remote room sensor control only.
Do not use remote sensor in supply or discharge air control applications.

ON = 1

OFF = 0



T7984A

Output 1 analog 2–10V	Output 2 on/off	Mode input jumper	Changeover input for Out 1	Day/Night mode (NSB)	Remote sensor option	75°F setpoint limit
Cooling and/or heating			X		X	

WIRING

To install a remote duct or room temperature sensor, adjust DIP switch S6 to 0 = off and wire as shown.

To reverse operation of output 1 to heating, install the changeover contact or the changeover sensor across

the screw terminals and wire as shown.

(If sensor is used, wire 1 changeover sensor per thermostat.)

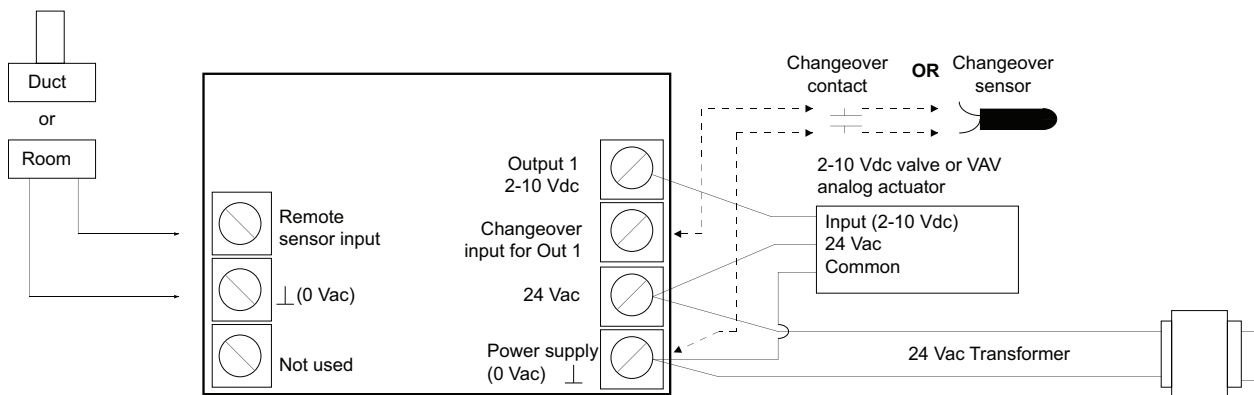


Fig. 2. T7984A Wiring

SEQUENCE

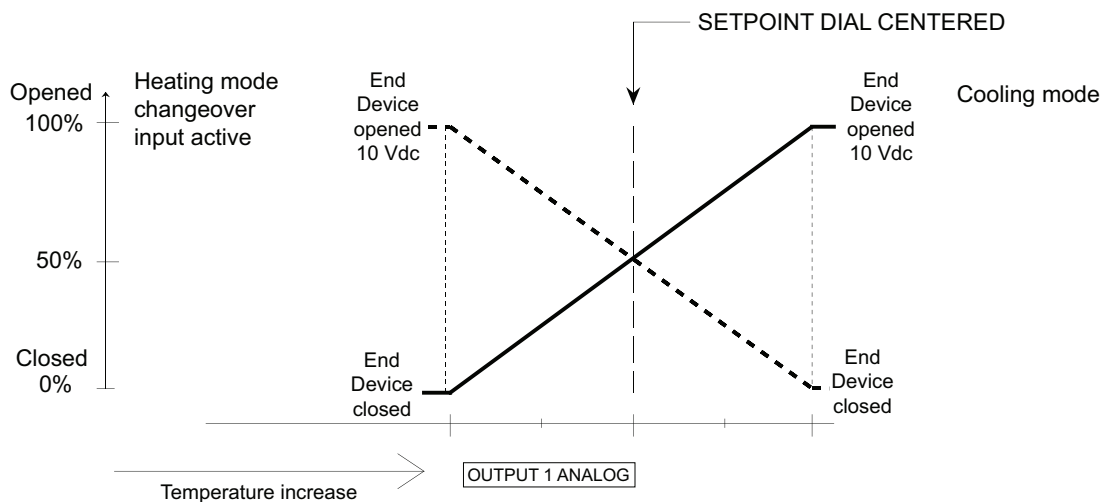


Fig. 3. T7984A Sequence

DIP SWITCH SETTINGS

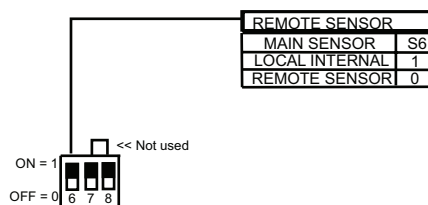


Fig. 4. T7984A Dip Switch Settings

T7984B

Output 1 analog 2–10V	Output 2 on/off	Mode input jumper	Changeover input for Out 1	Day/Night mode (NSB)	Remote sensor option	75°F setpoint limit
Cooling	Heating	Mode A (Jumper out)		X	X	X
Heating	Cooling	Mode B (Jumper in)				

WIRING

To install a remote duct or room temperature sensor, adjust DIP switch S6 to 0 = off and wire as shown.

* To enable mode B of operation, install a jumper across the screw terminals and wire as shown

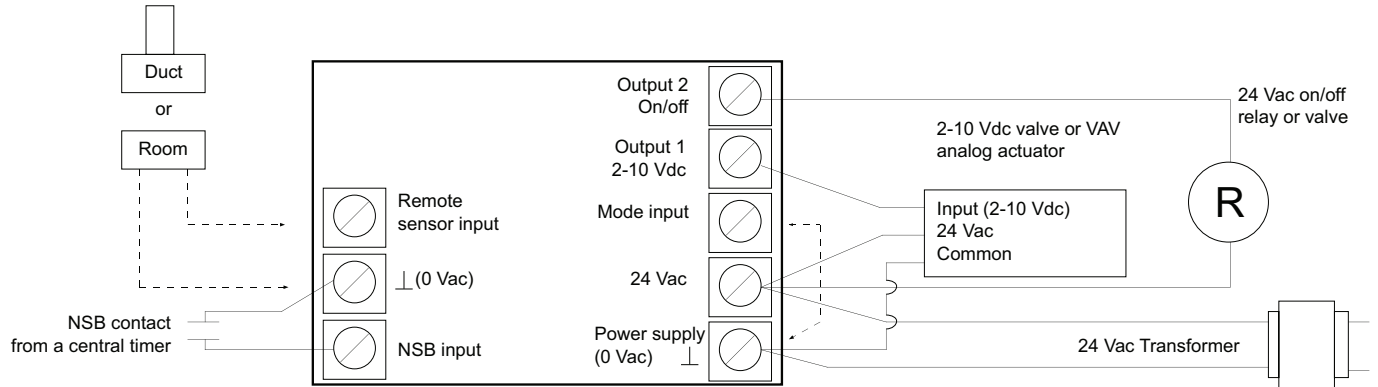


Fig. 5. T7984B Wiring

SEQUENCE

Mode A (jumper not installed)

Output 1 analog in cooling mode

Output 2 on/off in heating mode

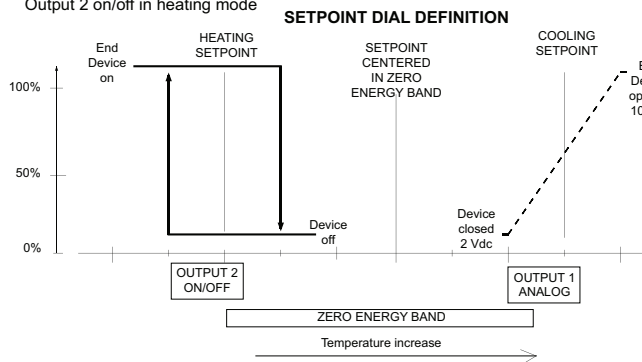


Fig. 6. T7984B Sequence (Mode A)

Mode B (jumper installed)

Output 1 analog in heating mode

Output 2 on/off in cooling mode

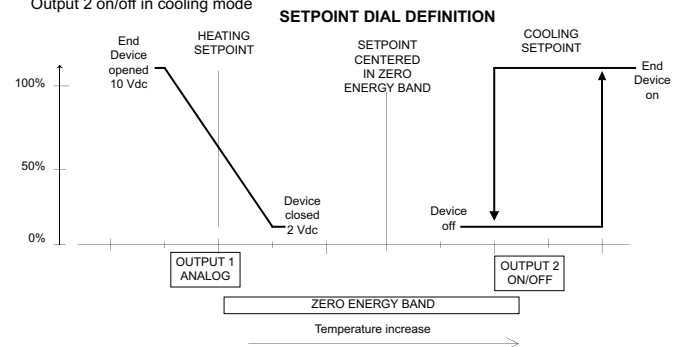


Fig. 7. T7984B Sequence (Mode B)

DIP SWITCH SETTINGS

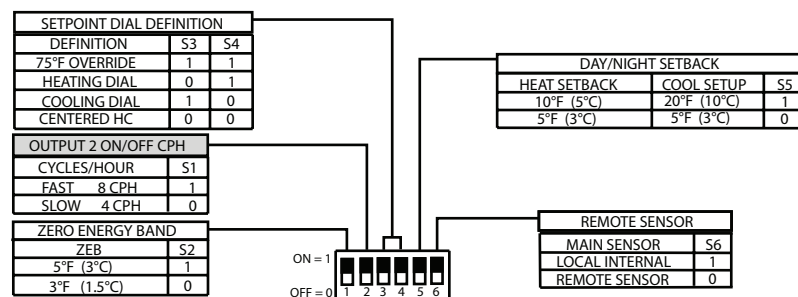


Fig. 8. T7984B Dip Switch Settings

T7984C

Output 1 analog 2-10V	Output 2 analog 2-10V	Mode input jumper	Changeover input for Out 1	Day/Night mode (NSB)	Remote sensor option	75°F setpoint limit
Cooling and Heating	Heating only		X	X	X	X

WIRING

To install a remote duct or room temperature sensor, adjust DIP switch S6 to 0 = off and wire as shown.

To reverse operation of output 1 to heating, install the changeover contact or the changeover sensor across

the screw terminals and wire as shown.

(If sensor is used, wire 1 changeover sensor per thermostat.)

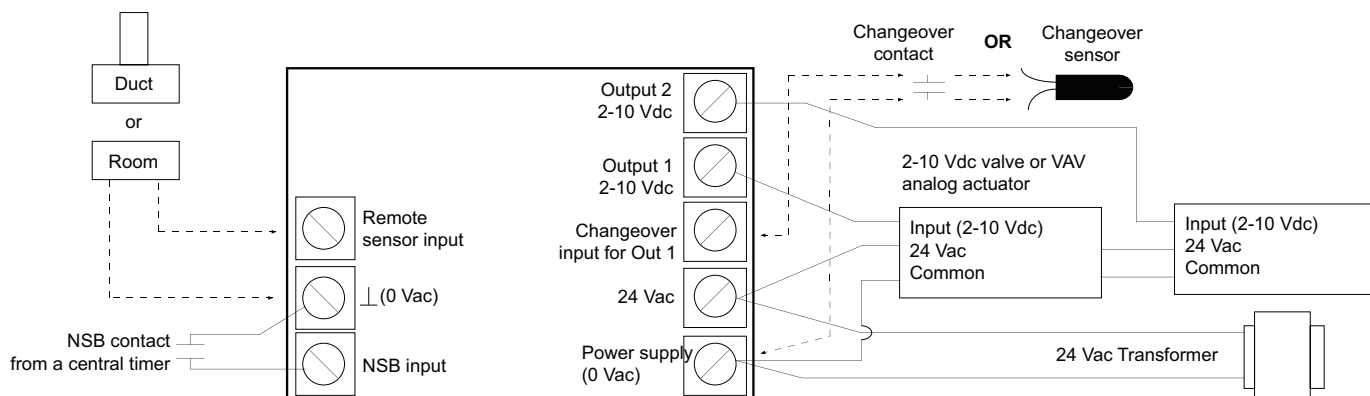


Fig. 9. T7984C Wiring

SEQUENCE

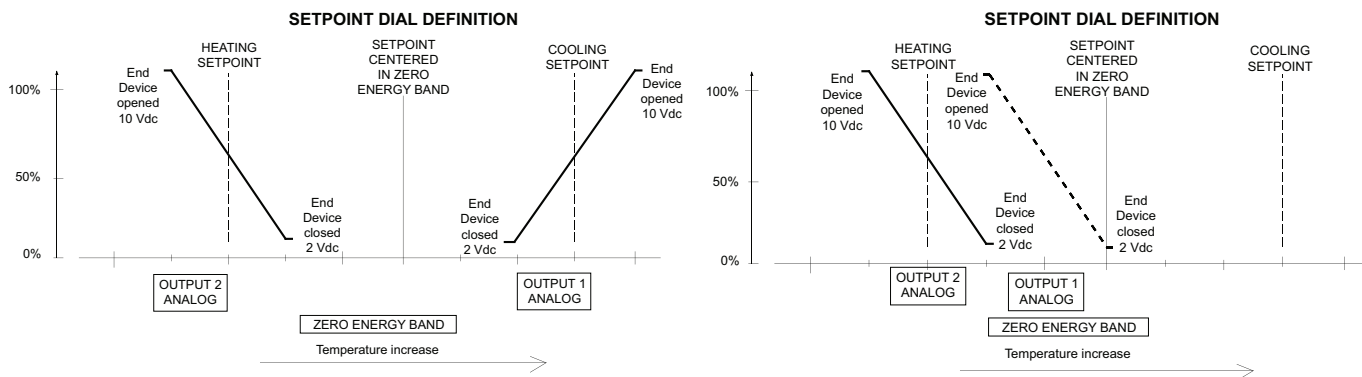


Fig. 10. T7984C Sequence

DIP SWITCH SETTING

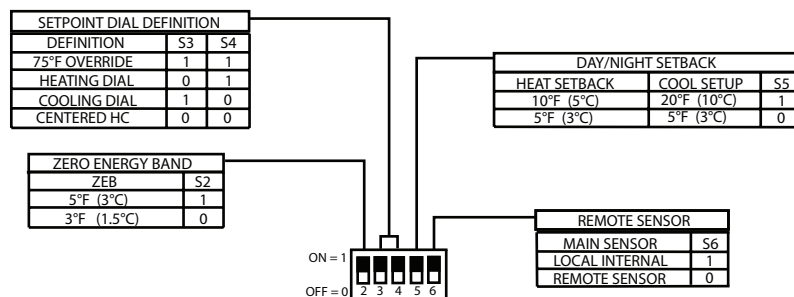


Fig. 11. T7984C Dip Switch Setting

Output 1, Modulating Analog Output 2 to 10Vdc (T7984 All)

Main output of the thermostat. On the T7984 series that output is modulating PI analog (2 to 10 Vdc). That signal uses a variable Vdc signal for the control of analog damper actuator and analog valve actuator. This type of output on the T7984 series uses a half wave rectifier bridge.

There is a status LED mounted internally that indicates the action of the output. The green LED intensity is proportional to the action of the output.

Mode Input (T7984B only)

Model T7984B has a mode input. This thermostat is designed to operate and function in 2 distinct mode of operation depending on the application requirements.

This input is not a changeover input for output 1.

Installing a jumper on the mode input will reverse modulating output 1 to operate as a heating only output & the on/off output 2 as a cooling only output. (See the control sequence section for each thermostat.)

Heat/Cool Changover of Output 1 (T7984A & C)

Models T7984A & C all have the possibility of changeover for output 1. Automatic changeover is used on systems where a valve or a VAV unit may have cold and hot water or air in the same system depending on the season. Basically output 1 is primarily cooling (Direct Acting) when the changeover input is not activated. Activating the changeover input reverses the function of output 1 to heating mode (Reverse Acting) so that the thermostat can use the end device as a heating device instead of a cooling device.

A common contact may be used for multiple thermostats.

For the T7984 series a single, common dry contact or **1 supply sensor per thermostat** can be used for changeover. A common contact may be used for multiple thermostats.

If a supply sensor is used, changeover temperature trip point from cooling to heating is as follows:

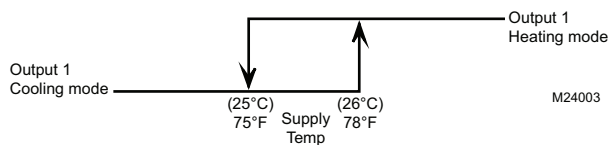


Fig. 12. Changeover temperature trip point.

Main Temperature Remote Sensor (T7984A, B, C)

All thermostats have their internal sensing device (Thermistor) mounted internally in the thermostat. On the T7984A, B & C models, it is possible to install a remote room or remote duct return sensor at a different location than the thermostat.

See wiring diagram for each model on how to wire the sensor.

The remote sensor are not to be used for supply control applications.

Zero Energy Band (T7984B & C)

Thermostats which have cooling and heating outputs (T7984B & C) have 2 distinct setpoints, one for heating the other for cooling (see the control curves section for each model). When the room temperature is between these 2 setpoints both heating and cooling outputs are off and the room temperature is in the Zero Energy Band. When the room temperature drops below the heating setpoint, output 2 output will energize. When the room temperature rises above the cooling setpoint, output 1 will energize.

Two settings values are available for Zero Energy Band: 3°F (1.5°C) or 5°F (3°C), can be adjusted with dip switch (S2).

Setpoint Dial Definition (T7984 B & C)

Because these thermostats have 2 distinct setpoints; one for heating the other for cooling, the thermostat setpoint dial knob need to be defined as being either:

- The true heating setpoint
- The true cooling setpoint
- Or centered in the middle of the Zero Energy Band.

This can be adjusted with dip switch (S3 & S4). (See the control curves section for each model.)

75°F (25°C) Setpoint Limitation (T7984B & C)

Models with a reheat output have setpoint limitation capability compatible with ASHRAE 90.1. Both heating and cooling setpoints are internally limited to 75°F (24°C). The cooling setpoint cannot go below 75°F while the heating setpoint cannot go above 75°F. This setpoint limit can be overridden for system checkout by setting the DIP switches S3=1 and S4=1.

NSB Day/Night Mode (T7984B & C)

An energy saving mode by which the actual setpoints are modified to different value than the ones adjusted on the dial.

The cooling setpoint will go up and the heating setpoint will go down. This mode is energized with a dry contact from a remote time clock.

Table 4. DIP switch setup and setback values

Two different setup & setback value can be adjusted with a DIP switch.

S5 = 1	10°F (6°C) heating setpoint setback	20°F (12°C) cooling setpoint setup (equivalent to cooling shut down)
S5 = 0	5°F (3°C) heating setpoint setback	5°F (3°C) cooling setpoint setup

The system LED on the thermostat cover on these models will flash to indicate that the thermostat is in night mode. The night mode can be overridden for 2.5 hours for each thermostat individually by pressing the button switch on the thermostat cover. This will bring back the thermostat to the day mode setpoints.

A common NSB timer contact may be used for multiple thermostats.

Output 2 On/Off (T7984B only)

A 24 Vac on/off output which is normally used to control terminal reheat in a zoned system. Example: electric base board relay, electric duct heater relay, perimeter on/off 24 Vac valve, etc.

This output can also be used for cooling applications with the mode jumper installed (See the control curves for T7984B) There is a status LED mounted internally that indicates the action of the output. The red LED indicates that the output electronic contact (triac) is energized.

This electronic contact (triac) is rated at 1.1A max. in rush and 0.5A running. This electronic contact (triac) is protected with a PTC self-resetting fuse. In the event of an overload or a short circuit, the PTC self-resetting fuse will reduce the load to a very low level. If the power is removed or the overload or the short disappears, the PTC fuse will return to its normal state and allow normal operation.

CPH (Cycles per Hour)

It is possible to fix the number of time per hour the reheat end device will be energized. Those settings are adjusted with DIP switch (S1).

Two different settings are possible:

4 cycles per hour or 8 cycles per hour

Use the following setting for the following reheat device applications:

Table 5. Cycle settings for reheat device applications

4 cycles per hour	8 cycles per hour
Anything using a gas fired or oil fired terminal reheat device	N.C. 24 Vac thermal valve (Hot wax thermal body valve)
Any gear driven end device valve or damper actuator	
Properly sized electric base board strip	Oversized capacity electric base board strip
Properly sized electric duct heater	Oversized capacity electric duct heater

Output 2, Modulating Analog Output 2 to 10Vdc (T7984C only)

A modulating signal that uses a variable Vdc signal for the control of analog valve actuator or SCR power controller which is normally used to control terminal reheat in a zone system.

This type of output on the T7984C uses a half wave rectifier bridge. If the same transformer is to be used for the thermostat and the end device, be sure to select end devices which also use a half wave rectifier bridge.

There is a status LED mounted internally that indicates the action of the output. The red LED intensity is proportional to the action of the output.

CHECKOUT

Service LED

All thermostats have internal service LED & a system status Led on the cover. The internal service LED are colored lights that can be viewed from the side of the thermostat they are energized and the system status LED is the one mounted on the cover. (See the checkout & start up procedures section.)

Table 6. System Status LEDs

Thermostat operation can be confirmed with the System status LED on the thermostat cover.

Model	Color	Explanation
T7984A	green	High intensity = Demand for cooling or heat. Low = no demand.
T7984B,C	red	Flashing = Night setback/set-up activated.

Table 7. Internal Service LEDs

A	B	C	Color	Indication when
•	•	•	green	Intensity is proportional to output 1
	•		red	On/off output 2 is closed (load energized)
		•	red	Intensity is proportional to reheat output

Test Condition:

1. No contact changeover input and changeover sensor disconnected. No wire on mode input.
2. T7984B & C: set DIP switch S3 and S4 to "ON" position to remove 75°F (24°C) limitation.
3. Room temperatures must be between 60-80°F.

Table 8. Knob position

Rotate Knob to:	Green	Red (reheat models only) T7984B & C
Minimum Position	ON	OFF
Maximum Position	OFF	ON

The night setback feature can be temporarily overridden for 2-1/2 hours by depressing the override button on the thermostat cover.

Automation and Control Solutions

Honeywell International Inc.
1985 Douglas Drive North
Golden Valley, MN 55422
customer.honeywell.com

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