Honeywell

T8501
Microelectronic Thermostats

APPLICATION

The T8501 Microelectronic Thermostats provides electronic control of 24 Vac single-stage heating and cooling systems. Refer to Table 1 for a general description of the thermostat. All T8501 thermostats require a common wire to supply power.

Table 1. Description of T8501 Thermostats.

System	Changeover	System Selection	Fan Selection	Comments
Heat-Cool	Automatic	Heat-Off-Cool-Auto	On-Auto	System and fan selections are done by keyboard.

MERCURY NOTICE

If this control is replacing a control that contains mercury in a sealed tube, do not place your old control in the trash. Dispose of properly.

Contact your local waste management authority for instructions regarding recycling and the proper disposal of the old control.
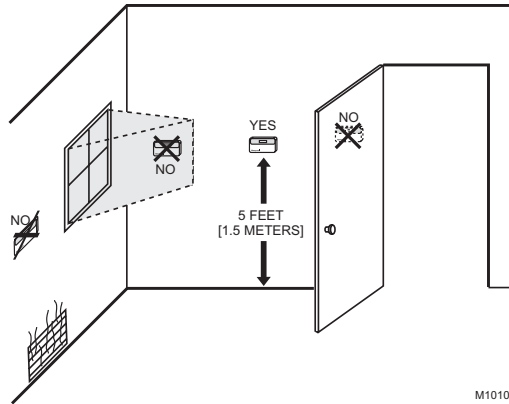
INSTALLATION

When Installing this Product...

1. Read these instructions carefully. Failure to follow the instructions can 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 completing installation, use these instructions to check out the product operation.

Location

Install the thermostat about 1.5m (5 ft) above the floor in an area with good air circulation at average temperature. See Fig. 1.

Do not install the thermostat where it can be affected by:
— drafts, or dead spots behind doors and in corners.
— hot or cold air from ducts.
— radiant heat from sun or appliances.
— concealed pipes and chimneys.
— unheated (uncooled) areas such as an outside wall behind the thermostat.

Wallplate Installation

The thermostat can be mounted horizontally on the wall or on a 2 in. x 4 in. (50.8 mm x 101.6 mm) wiring box. Position wallplate horizontally on the wall or on a 2 in. x 4 in. (50.8 mm x 101.6 mm) wiring box.

1. Position and level the wallplate (for appearance only). The thermostat will function properly even when not level.
2. Use a pencil to mark the mounting holes. See Fig. 2.
3. Remove the wallplate from the wall and drill two 3/16 inch (76 mm) holes in the wall (if drywall) as marked. For firmer material such as plaster, drill two 7/32 inch (5.56 mm) holes. Gently tap anchors (provided) into the drilled holes until flush with the wall.
4. Position the wallplate over the holes, pulling wires through the wiring opening.
5. Loosely insert the mounting screws into the holes.
6. Tighten mounting screws.

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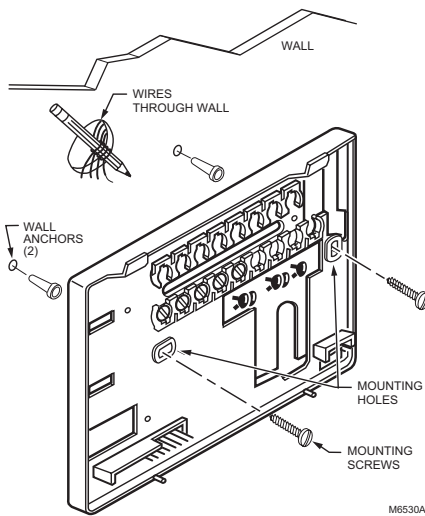**Fig. 1. Typical location of thermostat.**

Fig. 2. Mounting the wallplate.

WIRING

All wiring must comply with local electrical codes and ordinances. Refer to Fig. 3 and 5 for typical hookup. A letter code is located near each terminal for identification.
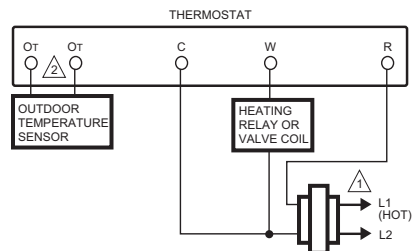
⚠ **CAUTION**

Electrical Shock Hazard.
Can cause electrical shock and equipment damage.
Disconnect power before wiring.

1. Loosen the terminal screws on the wallplate and connect the system wires. See Fig. 6.

IMPORTANT

Use 18 gauge, color-coded thermostat cable for proper wiring.

2. Securely tighten each terminal screw.
3. Push excess wire back into the hole.
4. Plug the hole with nonflammable insulation to prevent drafts from affecting the thermostat.

1. POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2. AVAILABLE ON SELECT MODELS.
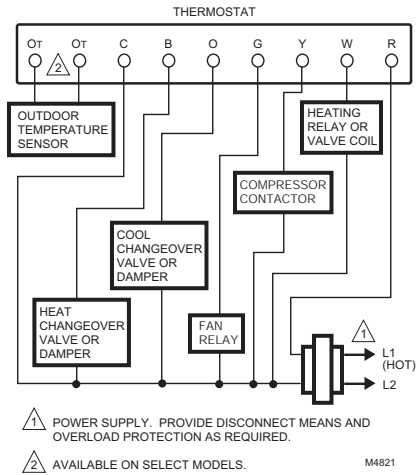
Fig. 3. Typical hookup in heat only application.

1. POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2. AVAILABLE ON SELECT MODELS.

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Fig. 4. Typical hookup in heat and cool system with one transformer.

1. POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2. AVAILABLE ON SELECT MODELS.

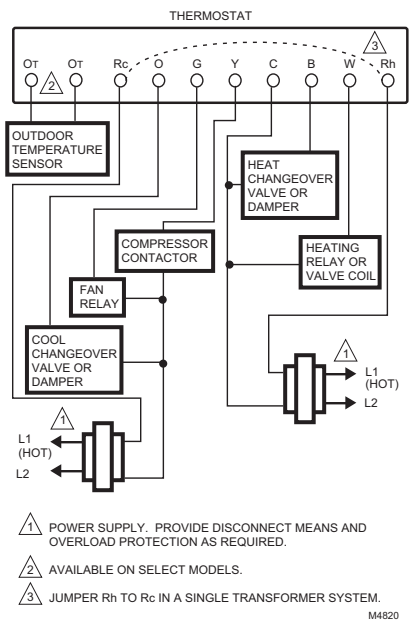3. JUMPER Rh TO Rc IN A SINGLE TRANSFORMER SYSTEM.

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Fig. 5. Typical hookup in heat and cool system with two transformers.
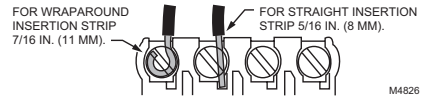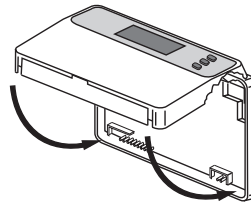

Fig. 6. Correct wiring technique.

Mounting Thermostat

1. Engage tabs at the top of the thermostat and wallplate. See Fig. 7.
2. Press lower edge of case to close and latch.

NOTE: To remove the thermostat from the wall, first pull out at the bottom of the thermostat; remove top last.

A. ENGAGE TABS AT TOP OF THERMOSTAT AND WALLPLATE.
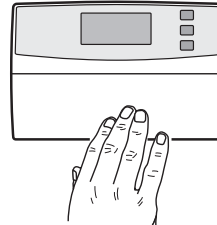

B. PRESS LOWER EDGE OF CASE TO LATCH.

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Fig. 7. Mounting thermostat on wallplate.

Using Thermostat Keys

The thermostat keys are used to:
- set the temperature,
- display present setting,
- configure Installer Setup,
- check System-Test,
- display outdoor temperature (select models),

Select models have keys to:
- set the system operation,
- set the fan operation.

NOTE: Always press the keys with your fingertip or similar blunt tool. Sharp instruments like a pen or pencil point can damage the keyboard.
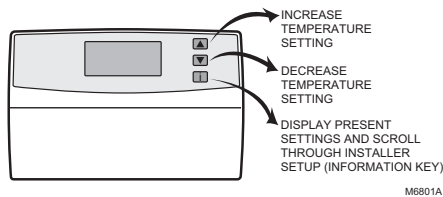
See Fig. 8 for key locations.

Fig. 8. Thermostat key locations and descriptions.

SETTINGS

System and Fan Settings

System settings control the thermostat operation:
    Heat: The thermostat controls the heating.
    Off: Both the heating and cooling are off.
    Cool: The thermostat controls the cooling.
    Auto: The thermostat automatically changes between heating and cooling operation, depending on the indoor temperature.

Fan settings control the system fan:
    On: Fan operates continuously.
    Auto: Fan operates with equipment.

The system default setting is Heat and the fan default setting is Auto. Use the keyboard or System and Fan switches, depending on model, to change to the desired settings. See Fig. 9.
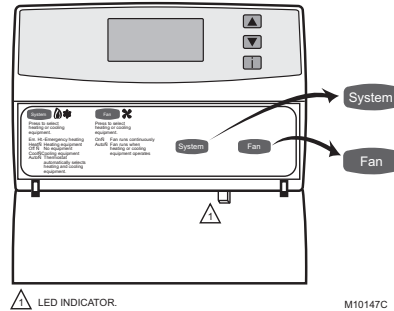

Fig. 9. T8501 System and Fan key locations.

Temperature Settings

The default setpoint for heat is 70°F (21°C) and for cool is 78°F (25.5°C). Press the increase ▲ or decrease ▼ key to change the present setting. To change between heat and cool, press the Information **i** key until the setting to be changed appears.

INSTALLER SETUP

NOTE: For most applications, the thermostat factory-settings do not need to be changed. Review the factory settings in Table 2 and if no changes are necessary, go to the Installer Self-Test section.

The Installer Setup is used to customize the thermostat to specific systems. Some of the options include:
— temperature display,
— changeover and
— outdoor temperature display.

Installer Setup numbers are listed in Table 3. The table includes all the configuration options and the factory-settings for the T8501.

A combination of key presses are required to use the Installer Setup feature:
— To enter the Installer Setup, press and hold the information **i** key with the increase ▲ and decrease ▼ keys until the first number is displayed. All display segments appear for approximately three seconds before the number is displayed. See Fig. 11 and 12.
— To advance to the next Installer Setup, press the **i** key.
— To change a setting, use the increase ▲ or decrease ▼ key.
— To exit the Installer Setup, press and hold the Information **i** key until the display returns to normal (approximately three seconds). The display scrolls the numbers backward to get to the normal display. The Installer Setup is automatically exited if no key presses are made for five minutes.
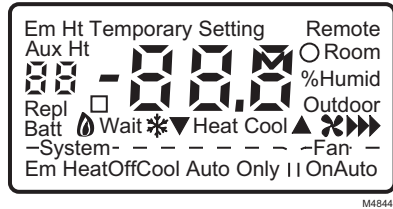
NOTE: Only configurable number are shown.
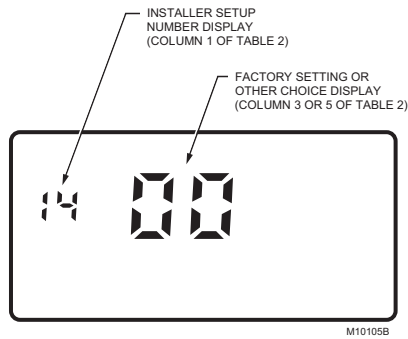
Fig. 10. Display of all LCD segments.

INSTALLER SETUP NUMBER DISPLAY (COLUMN 1 OF TABLE 2)

FACTORY SETTING OR OTHER CHOICE DISPLAY (COLUMN 3 OR 5 OF TABLE 2)

Fig. 11. Display of Installer Setup number and setting.

⚠ **CAUTION**

Equipment Damage Hazard.
Heat pump and electric heat systems can be damaged when run without fan.
Configure to 01 in Installer Setup number 02 to prevent equipment damage.

IMPORTANT

Only configurable numbers are shown on the device. Example: If thermostat does not have a system key, Installer Setup Number 12 does not display. Review Table 3 factory-settings and mark any desired changes in the Actual Setting column. When Installer Setup is complete, review the settings to confirm that they match the system.

Table 2. Thermostat Installer Setup Options.

Select	Installer Setup Number (Press i key to change)	Factory Setting		Other Choices (Press ▲ or ▼ key to change)	
		Display	Description	Display	Description
Not Used.	01	—	—	—	—
Fan operation[a]	02	0	Conventional applications where equipment controls fan operation in heat mode.	01	Heat pump or electric heat applications where thermostat controls fan operation in heat mode.
Not Used.	03	—	—	—	—
Heating cycle rate.	04	6	6 cph used for conventional systems	01, 03 or 09	01—1 cph used for radiant floor heat, gravity system 03—3 cph used for hot water systems or high efficiency furnaces 09—9 cph used for electric heat systems
Not Used.	05 thru 11	—	—	—	—
Changeover (T8501D only)	12	01	Manual changeover	00	00—Auto changeover
Not used	13	—	—	—	—

Table 2. Thermostat Installer Setup Options. (Continued)

Select	Installer Setup Number (Press i key to change)	Factory Setting		Other Choices (Press ▲ or ▼ key to change)	
		Display	Description	Display	Description
Degree temperature display	14	00	Temperature is displayed in °F	01	Temperature is displayed in °C
Not Used.	15 thru 18	—	—	—	—
Extended fan operation in heating.[a,b]	19	00	No extended fan operation after the call for heat ends.	01	Fan operation is extended 90 seconds after the call for heat ends.
Extended fan operation in cooling.[a]	20	00	No extended fan operation after the call for cool ends.	01	Fan operation is extended 90 seconds after the call for cool ends.
Not Used.	21 thru 23	—	—	—	—
Outdoor temperature display[a]	24	00	No outdoor temperature is displayed.	01	Outdoor temperature is displayed. Needs a C7089B1000 Outdoor Temperature Sensor to operate.
Not Used.	25 thru 32	—	—	—	—
Minimum off time for the compressor.	33	05	5 minutes minimum off time for the compressor.	00, 01, 02, 03 or 04	Minimum number of minutes (0 thru 5) the compressor will be off between calls for the compressor.
Temperature range stops in heating.	34	90	Heating setpoint can be set no higher than 90°F.	40 to 90	Number can be set anywhere between 40 and 90 in 1°F increments.
Temperature range stops in cooling.	35	45[c]	Lowest setpoint cooling can be set to.	45 to 99	Number can be set anywhere between 45 and 99 in 1°F increments.
System On display.[a]	36	00	LCD On symbol is displayed when system is energized.	01	Display is disabled, usually set for 01 for a zoned system.
Temperature display adjustment.	37	00	No difference in displayed temperature and actual room temperature.	+3 thru 03	01—Display adjusts to 1°F higher than actual room temperature. 02—Display adjusts to 2°F higher than actual room temperature. 03—Display adjusts to 3°F higher than actual room temperature. -1—Display adjusts to 1°F lower than actual room temperature. -2—Display adjusts to 2°F lower than actual room temperature. -3—Display adjusts to 3°F lower than actual room temperature.

[a]Available on select models.

[b]Mode 02 must be set to 01 to extend fan operation.

IMPORTANT

Review the settings to confirm that they match the system. Press Run Program to exit the Installer Setup. The thermostat has saved the Installer Setup changes and initiated a reset in order to operate using the new settings. Be sure to set the current day and time immediately.

INSTALLER SYSTEM TEST

Use the Installer System Test to check the thermostat operation. Refer to Table 3 for a list of the available system tests.

⚠ CAUTION

Equipment Damage Hazard.
Minimum off time for compressor is bypassed during Installer System Test.
Prevent compressor from cycling too quickly.

To start the system test:
Press and hold the increase ▲ and decrease ▼ keys at the same time until two zeros (00) appear. All segments of the LCD are displayed before 00 appears.
See Fig. 11 and 12.

Table 3. Tests Available In Installer System Test.

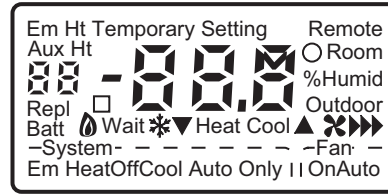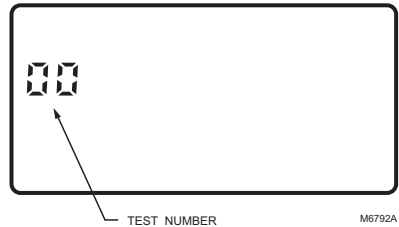| Test Number	System Test Description
10-19	Heating equipment can be turned on and off.
30-39	Cooling equipment can be turned on and off.
40-49	Fan equipment can be turned on and off.
60 0 to 60 19	Keyboard keys test.
70-79	Thermostat information including date code and software versions are displayed.

Fig. 12. Display of all LCD segments.

Fig. 13. Display of test number.

Refer to Table 4 for the directions and results of the specific tests.

IMPORTANT
Models with System and Fan switches must set the switches to the equipment that is being checked for the equipment to operate.

NOTE: Press and hold the increase ▲ and decrease ▼ keys for three seconds to exit the system test mode. The system test times out after five minutes without any key presses.

Table 4. Installer System-Test Options.

Keys to Press	Test Number	Description
Heating Equipment System-Test		
i	10	Enter heating equipment system-test. (Set System switch to Heat on switch models.)
▲	11	Heat comes on. When Installer Setup number 02 is 01, the system fan is also energized.
▼	10	Heat and system fan turn off.
Cooling Equipment System Test		
i	30	Change from heating to cooling equipment system test. (Set system switch to Cool on switch models.)
▲	31	Cool and system fan come on.
▼	30	Cool and system fan turn off.
Fan Equipment System Test (T8501D only)		
i	40	Change from cooling to fan equipment system-test.
▲	41	Fan comes on.
▼	40	Fan turns off.

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Table 4. Installer System-Test Options. (Continued)

Keys to Press	Test Number	Description

Key or Switch Operation System-Test[a]
IMPORTANT
    Test numbers are displayed only when the system is configured for the selected function.
    Example: Numbers 60, 61 and 62 are the only numbers that are displayed when a system is configured for heat only.		

System Key or Switch System Test (When System switch is used, move switch to see Test Numbers.)		
i	60	Change from cooling or fan to key operation system test.
System	61	Heat test number is displayed. (Set System switch to Heat.)
System	62	Off test number is displayed. (Set System switch to Off)
System	63	Cool test number is displayed. (Set System switch to Cool.)
System	64	Auto Test number is displayed.
Fan Key System Test (Fan switch cannot be tested)		
Fan	68	
Fan	69	

[a] Available on select models.

THERMOSTAT INFORMATION

1. Press the **i** key to access the thermostat information.

2. Press the increase ▲ key to display the production date code. The first two large digits are the month and the third digit is the last digit of the year (Example: 026 = February 1996).

3. Press the increase ▲ key again to display the software identification code. (Example: 02 = software ID code 2).

4. Press the increase ▲ key again to display the software revision number (Example: 001 = revision number 1).

5. Press the increase ▲ key again to display the EEPROM identification code. (Example: 222 = EEPROM ID 222.)

6. Press and hold the increase ▲ and decrease ▼ keys together, until the room temperature is displayed, to exit the system test mode. The system test times out after five minutes without any key presses.

CHECKOUT

Outdoor Temperature Sensor (Select Models)

Allow the outdoor temperature sensor to take in the outdoor air for a minimum of five minutes before taking a reading. With an accurate thermometer ±1°F (±0.5°C), measure the temperature at the sensor location, allowing time for the thermometer to stabilize before reading. Match the thermometer reading to the outdoor temperature display at the thermostat.

TROUBLESHOOTING GUIDE

Table 5. Troubleshooting Guide.

Symptom	Possible Cause	Action

Display will not come on.	Thermostat is not being powered.l	• Check that C terminal is connected to the system transformer.
		• Check for 24 Vac between C and R or RH terminals.
		  — If missing 24 Vac:
		    — check if the circuit breaker is tripped—reset the circuit breaker.
		    — check if the system fuse is blown—replace the fuse.
		    — check if the power switch on the HVAC equipment is in the Off position—set to the On position.
		    — check wiring between thermostat and HVAC equipment—replace any broken wires and tighten any loose connections.
		  — If 24 Vac is present, proceed with troubleshooting.

	Thermostat microprocessor is locked up.	Remove the thermostat from the wallplate for two minutes. After two minutes, replace the thermostat on the wallplate.
Temperature display is incorrect.	Room temperature display has been reconfigured.	Enter Installer Setup number 37 and reconfigure the display.
	Thermostat is configured for °F or °C display.	Enter Installer Setup number 14 and reconfigure the display.
	Bad thermostat location.	Relocate the thermostat.
Temperature settings will not change. (Example: Cannot set the heating higher or the cooling lower.)	The upper or lower temperature limits were reached.	Check the temperature setpoints: • Heating limits are 40 to 90°F (4.5 to 32°C) • Cooling limits are 45 to 99°F (7 to 37°C).
	The setpoint temperature range stops were configured.	Check Installer Setup numbers 34 and 35 and reconfigure the setpoint stops.

Heating will not come on.	No power to the thermostat.	• Check that C terminal is connected to the system transformer.
		• Check for 24 Vac between C and R or RH terminals.
		  — If missing 24 Vac:
		    — check if the circuit breaker is tripped—reset the circuit breaker.
		    — check if the system fuse is blown—replace the fuse.
		    — check if the System switch on the HVAC equipment is in the Off position—set to the On position.
		    — check wiring between thermostat and HVAC equipment—replace any broken wires and tighten any loose connections.
		  — If 24 Vac is present, proceed with troubleshooting.

	Thermostat minimum off time is activated.	Wait up to five minutes for the system to respond.
	System selection is not set to Heat.	Set system selection to Heat.

Table 5. Troubleshooting Guide. (Continued)

Symptom	Possible Cause	Action
Cooling will not come on.	No power to the thermostat.	• Check that C terminal is connected to the system transformer. • Check for 24 Vac between C and R or RC and Y terminals. — If missing 24 Vac: — check if the circuit breaker is tripped—reset the circuit breaker. — check if the system fuse is blown—replace the fuse. — check if the power switch on the HVAC equipment is in the Off position—set to the On position. — check wiring between thermostat and HVAC equipment—replace any broken wires and tighten any loose connections. — If 24 Vac is present, proceed with troubleshooting.
	Thermostat minimum off time is activated.	• Wait up to five minutes for the system to respond. • Enter Installer Setup number 33. Reconfigure minimum off time (if required).
	System selection is not set to Cool.	Set system selection to Cool.
System on indicator is displayed, but no heat is being delivered.	Fan operation set for 00 (conventional heat) when it should be set for 01 (electric heat).	Enter Installer Setup mode number 02 and reconfigure the fan operation.
	Conventional heating equipment turns on the fan when the furnace has warmed up to setpoint.	Wait a minute after seeing the On indicator and then check the registers.
	Heating equipment is not operating.	Verify operation of heating equipment in self-test.
Outdoor temperature not displayed[a]	Option not activated.	Enter Installer Setup number 24 and set to 01. Thermostat must have OT terminals and a C7089B1000 installed.
Outdoor temperature display is incorrect[a]	Outdoor sensor is connected incorrectly.	Refer to C7089B1000 installation instructions and check wiring between the thermostat and sensor.
	Wrong sensor.	Replace sensor with C7089B1000 sensor.

[a]Select Models

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