

TE86S,TE86SB

Digital Thermostat

INSTALLATION MANUAL

APPLICATION

The TE86S Thermostat provides universal replacement of single-stage, 24Vac (20 mA to 1.5A) thermostats used in electric, gas, and oil heating and cooling systems. This thermostat is mercury free and requires no batteries. The thermostat also can be used to control single stage heat pumps.

The TE86S uses advanced proportional plus integral (P+I) control for optimum temperature control and comfort.

Table 1. Description of Thermostat.

Model	Mounting	System Selection	Fan Selection	Powering Method	Backlight
TE86S	VERTICAL	COOL-OFF-HEAT	ON-AUTO	Power Stealing	No Backlight
TE86SB	VERTICAL	COOL-OFF-HEAT	ON-AUTO	Power Stealing	Backlight



Fig. 1. Thermostat

FEATURES

- Stylish design, replaces Honeywell T834C, White Rodgers 1E56 or Lux PSD150.
- LCD display with back lighting lit all the time (TE86SB).
- Power stealing for universal replacement. No common wire required. No batteries.
- Heat cycle rate can be selected (1,3,4,5,6,9,12) by software to suit many heating applications.
- Heating / cooling damper output to control either dampers or heat pump reversing valve.
- User options and set point are retained in the event of lost power.

SPECIFICATIONS

Table 2. Thermostat specifications.

Power Power Supply	24 Vac nominal, 18-30 Vac, 50/60 HZ.
Electrical Rating Heating rating Cooling rating Fan rating Note: The fan load plus the higher of the heating or cooling load must not exceed 1.5 Amp continuous	0.02 to 1.5 A continuous 0.02 to 1.5 A continuous 0.02 to 0.5 A continuous
TEMPERATURE RATINGS Temperature setting range Ambient temperature range Shipping temperature range	40 to 99 °F (4 to 37 °C) 40 to 110 °F (4 to 43 °C) 14 to 140 °F (-10 to 60 °C)
OPERATING RELATIVE HUMIDITY	5 to 90% RH, non-condensing
CYCLE RATES Cooling mode Heating mode	3 Cycles Per Hour 1,3,4,5,6,9,12 Selectable Cycles Per Hour

DIMENSION

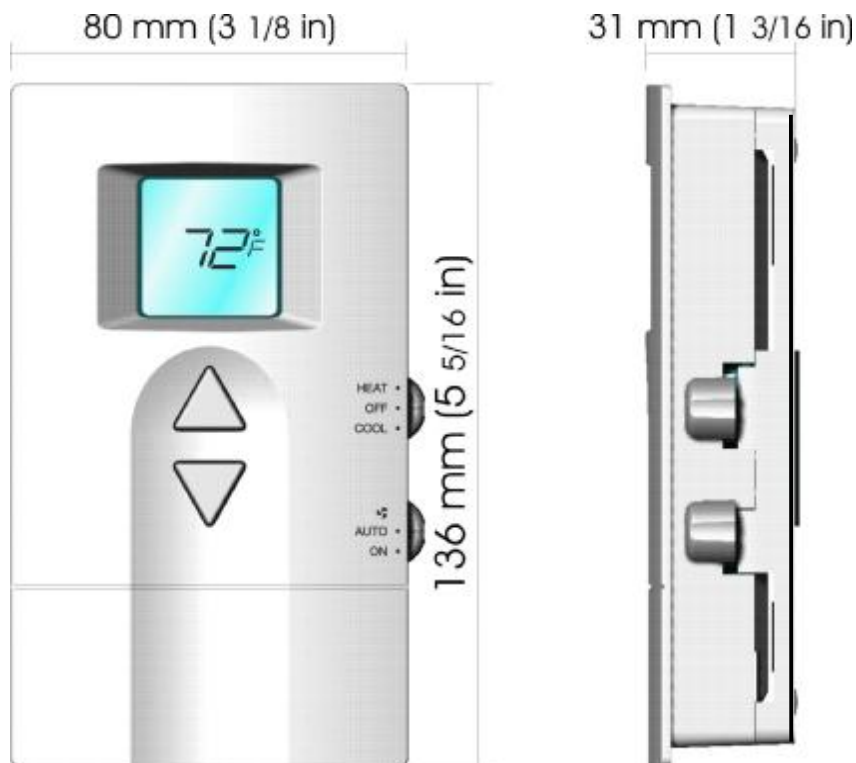


Fig. 2. Thermostat dimension

INSTALLATION

Read these instructions thoroughly before installing product. Failure to follow these instructions could damage the product or cause a hazardous condition. Check the voltage and current ratings on the product to ensure that it is suitable for your application. Installer must be a trained, experienced service technician. Check product for proper operation after installation.



CAUTION

Damage to heating and cooling system may occur. Disconnect power from the equipment at the main breaker/fuse block while installing the thermostat.

Mounting Location.

Mount the thermostat approximately 5 ft. (1.5m) above the floor in a location that is free from direct sunlight, heat from appliances, hot or cold air from ducts, concealed pipes and chimneys, and drafts or dead spots behind doors or in corners. Do not mount on exterior wall, if possible. Failure to locate thermostat mounting as indicated will result in poor temperature control.

NOTE: Level thermostat mounting is for appearance only and is not required for proper thermostat operation.

Mounting Thermostat

Take out the back plate by removing the locking screw (if any) at the bottom of the thermostat. Use flat head screw driver to unlock the snaps. Lift and pull it up to remove back plate.

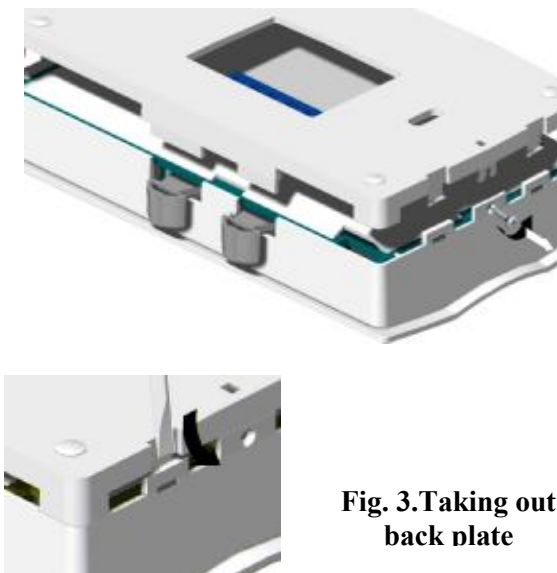


Fig. 3. Taking out back plate

Using back plate as a guide, mark two mounting holes on the wall. Drill two mounting holes. Place anchors (provided) into the holes until flush with the hole. Position back plate on the wall and thread the wires from the heating and cooling equipment through the wiring hole. Holding the back plate in place on the wall, secure it to the wall using mounting screws (provided).



Fig. 4. Installing back plate

Wiring

Pull the connector from the back of thermostat by inserting screw driver at the base of connector and gently lift up.

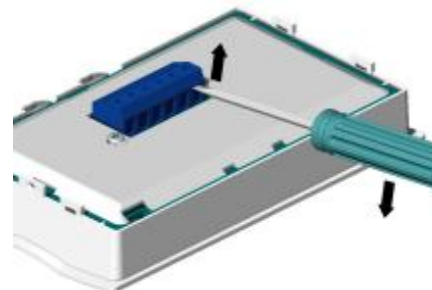


Fig. 5 Lifting the connector

Color-coded 18-22 gauge wire is recommended for wiring. All wiring must follow local electrical code located near each terminal.

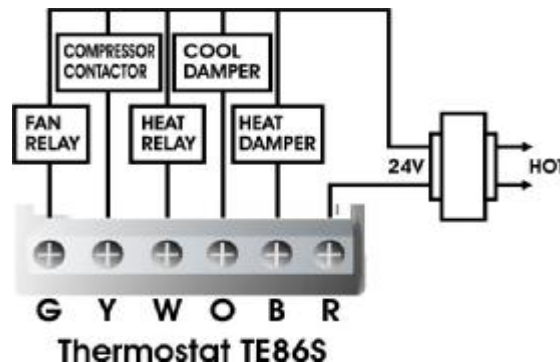
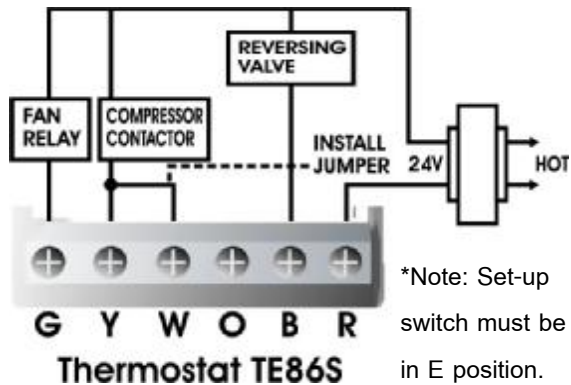


Fig. 6a. Wiring diagram.

**HEAT PUMP WITH
HEAT ACTIVE
REVERSING VALVE**



**HEAT PUMP WITH
COOL ACTIVE
REVERSING VALVE**

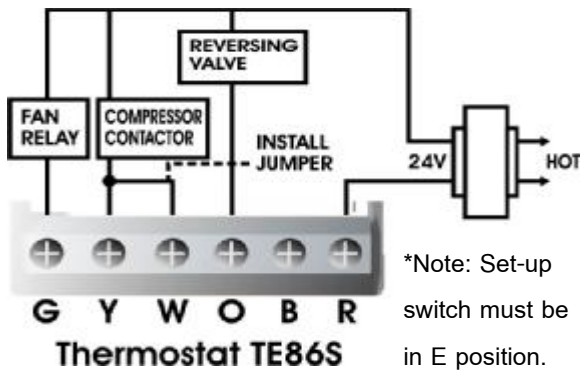


Fig. 6b. Wiring Diagram for single stage heat pump.

Loosen the terminal screw, strip the wire and connect the wire as shown in fig 7. Firmly tighten terminal screw when finished.

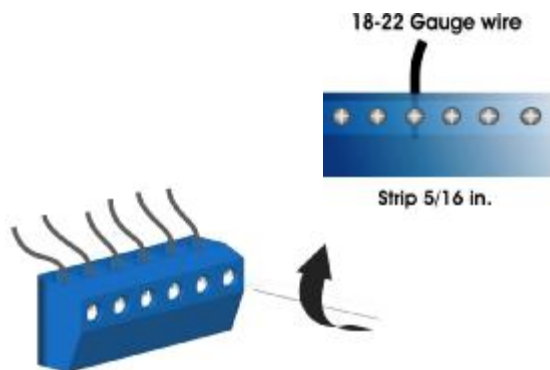


Fig. 7. Connecting wire.

Set-up switch (E/F)



Failure to set the set-up switch to the E position when electric resistance heat is used may result in the overheating of the electric heater elements due to improper fan operation.

The set-up switch is an internal switch (E,F) located near the wiring terminals. It is used to select proper fan operation for the heating system being used.

- ❑ The E position is for electric heat and single stage heat pump applications.
- ❑ The F position is for fuel applications.

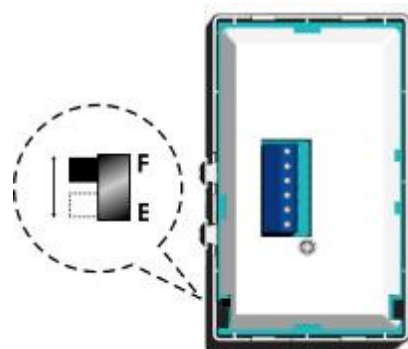


Fig. 8. Setup switch.

Place the terminal back to the thermostat, make sure it has the same orientation like in the picture described at the back. Snap the thermostat to its back plate.

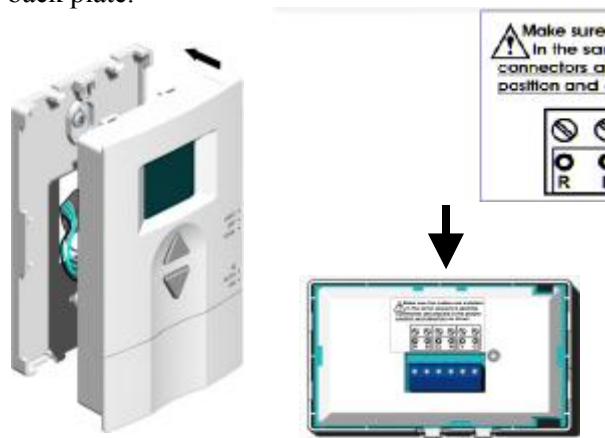


Fig. 9. Installing thermostat.

Secure the thermostat by tightening the screw provided to protect the thermostat from unwanted access.



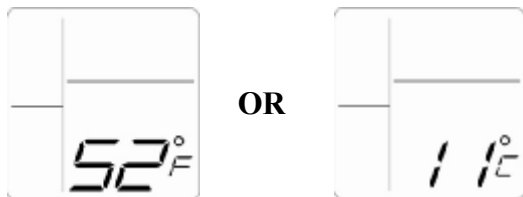
Fig. 10. Secure the front cover.

INSTALLER SETUP

The following instructions provide information to test the heating / cooling equipment and to change operating parameters from the factory settings.

Enter Installer Setup

a. Use Δ or ∇ key to set the temperature set point to 52°F (or 11 °C).



b. Press Δ and ∇ key simultaneously to enter installer setup.

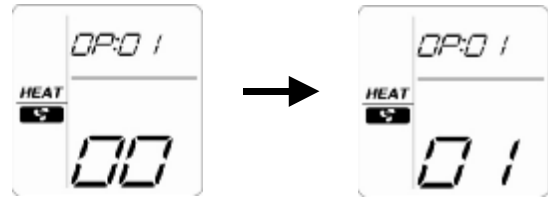


Now follow the following steps to change each of the settings. Each time you press Δ key, you will advance to the next operating parameter. To go back you must re-enter the installer set up as described above.

Testing Heating / Cooling Equipment. (OP:01)

While in the installer setup, slide the mode switch to heat to operate the heating equipment or cool to operate the cooling equipment. The display will show either 00 or 01 on the lower right area and either heat or cool as selected by the mode switch.

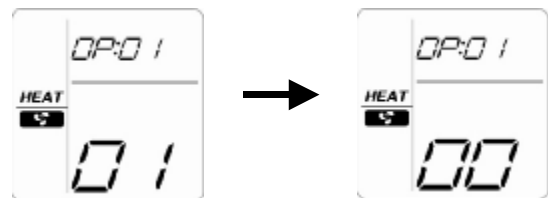
a. If the equipment is off, press ∇ key to turn it on (if not, check the wiring or the equipment).



Example display showing Heat equipment is off.

Example display showing Heat equipment is on.

b. Press ∇ key again to turn off.



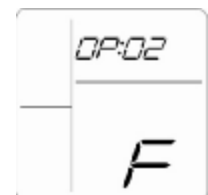
Example display showing Heat equipment is on.

Example display showing Heat equipment is off.

Setting °C / °F Indication. (OP:02)

While in the installer setup,

a. Press Δ key, the display will show °F/°C indication.



b. Press ∇ key to change °F or °C indication.



NOTE: Factory setting is °F indication.

Setting Heating Cycle Rate. (OP:03)

In cooling, the cycle rate is fixed at 3 Cycles per hour. To set the cycle rate in heating; while in installer setup,

- a. Press Δ key, the display will show the heat cycle rate.



- b. Press ∇ key to change the heat cycle rate to 1,3,4,5,6,9 or 12 cycles per hour.



Note: The default is set at 6 cycle per hour. Table 4 is the recommended cycle rate. The installer should consult with the heating equipment manufacturer for proper use.

Table 4. Recommended cycle rate (CPH).

SYSTEM	CPH SETTING
Steam Gravity	1
Hydronic heat	3
Gas or Oil forced air	6
Electric heat	9

Note: If the equipment manufacture recommends a different rate use the rate specified by the equipment manufacture.

Setting cooling algorithm. (OP:04)

The cooling algorithm can be selected as normal or aggressive. For aggressive, the system will cool down the room to setting point faster than normal algorithm. However, an overshoot might occurred in some situations.

- a. Press Δ key to show the cooling algorithm.



- b. Press ∇ key to change algorithm.
0 = Normal algorithm (default).
1 = Aggressive algorithm.



Setting Cooling Delay Time. (OP:05)

In some case there is a necessity to delay the operation of the cooling equipment for protection purpose. While in the installer setup,

- a. Press Δ key. The display will show cooling delay time.



- b. Press ∇ key to select the cooling delay time (0,3,5 minutes).



NOTE : The default setting is 3 minute.

Configuration Checkout. (OP:06)

Press Δ key, the current configuration is displayed. This information is for factory use only.



Exit Installer Setup.

- a. Press Δ key again to save all settings and exit to the normal operating mode.



NOTE: After return to normal operation, change the set point to the desired room temperature, otherwise the default set point (70 °F or 21°C) will be used.

OPERATION

System Setting

Use mode switch for selecting system operation.

- ❑ Cool : The thermostat controls the cooling system.
- ❑ Heat : The thermostat controls the heating system.
- ❑ Off : Both heating and cooling are off.

Fan Setting

Fan switch settings are

On : Fan symbol is indicated on the display. The fan runs continuously. Used to improve air circulation and air quality.



Auto : Fan and Auto symbols are indicated on the display.



For cooling mode:
The fan starts and stops with cooling equipment.

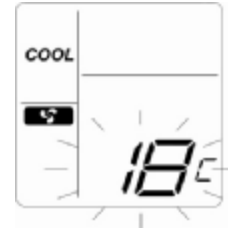
For heating mode:

- ❑ If setup switch is at 'F' position, the fan is controlled directly by the heating equipment.
- ❑ If setup switch is at 'E' position, the fan starts and stop with heating equipment.

Temperature Setting

Use Δ or ∇ key to change temperature setting in a range of 40 to 99 °F (or 4 to 37 °C).

The display shows set point value flashing for 5 seconds before returning to the room temperature.



Minimum Off Timer

For cooling, when the thermostat calls for operation while the minimum off timer is not expired, the star symbol keeps flashing.



Back Lighting (TE86SB)

The thermostat features a back light that will illuminate all the time. The user can easily see the LCD screen under dim light situation.



SYSTEM CHECKOUT

Cooling Checkout

WARNING ! Do not operate in cooling mode when the outdoor temperature is below 50 °F (10 °C) otherwise the compressor might be damaged.

1. Slide mode switch to COOL, O terminal will get energized.
2. Pressing ∇ key to lower the set point below room temperature. The star symbol is shown on the display. If flashing, the compressor delay time is not yet expired. If lit steady, the compressor is on and terminal Y is energized.
3. Press Δ key until set point is higher than room temperature. The star symbol is removed. The compressor is off and Y terminal is de-energized.

Heating Checkout

1. Slide mode switch to HEAT, B terminal will get energized.
2. Press Δ key until the set point is higher than room temperature. The star symbol is shown on the display. The heating equipment is on and terminal W is energized.
3. Press the ∇ key until set point is lower than room temperature. The star symbol is removed. The heating equipment is off and W terminal is de-energized.

Fan Checkout

1. Slide FAN switch to ON position. The G terminal is energized and the fan should always be running.
2. Slide FAN switch to AUTO position,
 - ❑ In cooling mode, the fan starts and stops with the cooling equipment.
 - ❑ In heating mode when setup switch is in the F position, the fan is controlled directly by the heating equipment and may start a few minutes after the heating equipment turns on. When setup switch is in the E position, the fan starts and stops with the heating equipment.

Application Note

Attached 1000 ohm, 3 watt resistor is used in certain applications to assure compatibility with power stealing thermostats where Fan does not come ON during call for Heat or Cool. Note that resistor has to be installed at the fan terminals and not at thermostat terminals.

To install the Resistor

1. Disconnect power supply.
2. Connect the resistor leads to the terminals as shown in the drawing.
3. Turn on the system power.

