

## tcu.z Commercial Programmable Thermostat Installation Instructions

### Application

The tcu.z Commercial Programmable Thermostat controls 24-VAC commercial single-zone heating, ventilating, and air conditioning (HVAC) equipment. It consists of a thermostat and subbase. The thermostat includes the display and keypad for 7-day programming. The subbase includes equipment control connections. The subbase mounts on the wall and the thermostat mounts to the subbase.

---

### 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 it properly. Contact your local waste management authority for instructions regarding recycling and the proper disposal of an old control.

---

### Installation

When installing this product:

- Read these instructions carefully. Failure to follow them could damage the product or cause a hazardous condition.
  - Check ratings given in these instructions and on the product to ensure the product is suitable for your application.
  - Installer must be a trained, experienced service technician.
  - After installation is complete, check out product operation as detailed in these instructions.
- 

**CAUTION!** Electrical Shock or Equipment Damage Hazard! Individuals can be shocked or equipment circuitry shorted. Disconnect power supply before installing.

---

### Location

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.
- 

**CAUTION!** To avoid electrical interference, which can cause erratic performances, keep wiring runs as short as possible and do not run thermostat wires adjacent to the line voltage electrical distribution systems. Use shielded cable. The cable shield must be grounded only at the controlled equipment case.

---

### Subbase

- When used to sense room temperature, install the thermostat about 5 feet (1.5 m) above the floor in an area with good air circulation at average temperature (see Figure 1).
  - When the remote-mounted temperature (and humidity) sensor(s) are used to sense ambient conditions (rather than room temperature), install the thermostat in an area that is accessible for setting and adjusting the temperature and settings.
- 

**CAUTION!** To avoid damaging the equipment or the TIM connection beyond repair, disconnect the TIM cable prior to opening or closing the thermostat cover.

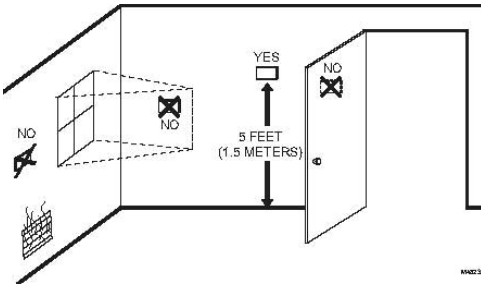
---



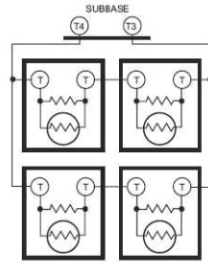
**NOTE!** Allow sufficient clearance below the thermostat to plug in the TIM cable.

Install the remote-mounted sensor(s) about 5 feet (1.5 m) above the floor in an area with good air circulation at average temperature (see Figure 1).

If multiple remote sensors are required, they must be arranged in a temperature-averaging network consisting of four sensors (see Figure 2).



**Figure 1.** Typical location of thermostat or remote-mounted sensor



**Figure 2.** Four sensors providing temperature averaging network for tcu.z Thermostat

### Mounting Subbase

The subbase mounts horizontally.

**NOTE!** When using the internal temperature or humidity sensor, the device must be mounted horizontally (with the LCD facing upwards). Precise leveling is not needed.

When using remote room temperature and humidity sensors, thermostat mounting orientation does not matter.

The subbase is normally mounted to a wall (using standard drywall screws), but it can also be mounted to a 2- 4-inch (50.8- 101.6-mm) wiring box.

- For a horizontal box, no extra hardware is required.
- Mount to European standard wall box having 2.4 inches (60.3 mm) between mounting screws in a horizontal line) with or without adaptive hardware.

Step	Procedure
1	Position and level the subbase. <ul style="list-style-type: none"> <li>■ The level wall plate is only for appearance. The thermostat functions properly when not level.</li> </ul>
2	Use a pencil to mark the mounting holes (see Figure 3).
3	Remove the subbase from the wall and drill two 3/16-inch (4.8-mm) holes in the wall (if drywall) as marked. <ul style="list-style-type: none"> <li>■ For firmer material (e.g., plaster or wood), drill two 7/32-inch (5.6-mm) holes.</li> </ul>
4	Gently tap anchors (provided) into the drilled holes until flush with the wall.
5	Position the subbase over the holes, pulling wires through the wiring opening.
6	Loosely insert the mounting screws into the holes.
7	Tighten mounting screws.

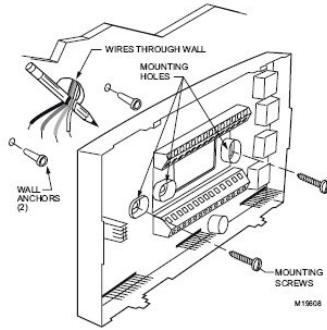


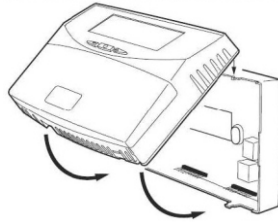
Figure 3. Mounting the subbase

**Mounting Thermostat on Subbase**

With the subbase installed, mount the thermostat.

Step	Procedure
1	Engage top subbase tabs into the thermostat top (Figure 4).
2	Swing the thermostat down.
3	Press the lower edge of the case to latch.

A. ENGAGE TABS AT TOP OF THERMOSTAT AND SUBBASE OR WALLPLATE.



B. PRESS LOWER EDGE OF CASE TO LATCH.

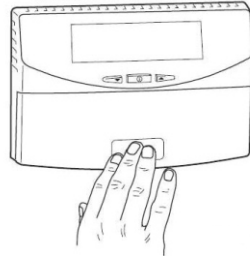


Figure 4. Mounting the thermostat on the subbase

**NOTE!** To remove the thermostat from the wall, first pull out at the bottom of the thermostat; then remove the top.

**Wiring**

Follow equipment manufacturer wiring instructions when available. Refer to the “Wiring Diagram” section of this document for typical hookups. A letter code is located near each terminal for identification.

**CAUTION!** All wiring must comply with local electrical codes and ordinances.

**NOTE!** Maximum and recommended wire size is 18-gauge. do not use wire smaller than 22-gauge.

Step	Procedure
1	Loosen subbase terminal screws and connect system wires.
2	Securely tighten each terminal screw.
3	Push excess wire back into the hole in the wall.
4	Plug the hole with nonflammable insulation to prevent drafts from affecting the thermostat.

Settings

Using Thermostat Keys

The thermostat keys (Figure 5) are used to:

- Set current time and day.
- Program times and setpoints for heating and cooling.
- Override the program temperatures.
- Display present setting.
- Set system and fan operation.
- Perform simple configuration.

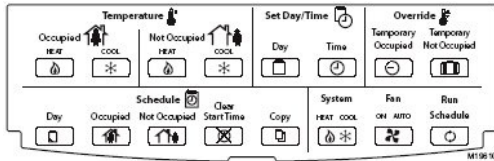


Figure 5. Thermostat keys

Setting Temperature

Refer to the default temperature setpoints information provided in the “Installer Setup” section.

Setting System and Fan

The System and Fan keys are used to change settings. System default setting is Auto. Fan default setting is On.

System Settings

SETTING	EXPLANATION
Auto	Thermostat automatically changes between heating and cooling based on indoor temperature.
Cool	Thermostat controls cooling.
Off	Heating, cooling, and fan are all off.
Heat	Thermostat controls heating.
Em Heat	Auxiliary heat serves as first stage. Compressor stages are locked off.

Fan Settings

SETTING	EXPLANATION
On	See Table 1.
Auto	Fan always cycles with call for heat or cool. <ul style="list-style-type: none"> <li>■ Conventional: The equipment (plenum switch) controls fan operation in heat mode. Thermostat controls fan operation in cool mode.</li> <li>■ Electric Heat: Thermostat controls fan operation in heat and cool modes.</li> </ul>

Fan operation can extend (delay Off) after the heating/cooling turns off:

- Heating choices are 0 or 90 seconds.
- Cooling choices are 0 or 40 seconds.

Table 1. Fan On Control Logic			
SCHEDULED	SENSOR SIGNAL	CALL FOR HEAT/COOL	
		YES	NO
Occupied	Occupied	On	On
Occupied	Standby	On	Off <sup>A</sup>
Standby	—	On	On
Not Occupied	—	On	Off <sup>A</sup>

<sup>A</sup> In heat mode, when set for conventional heat, the equipment (i.e., plenum switch) could power the fan despite the tcu.z.

### Installer Setup

For most applications, the thermostat factory settings do not need to be changed. Review the factory settings in Table 2.

Table 2. Default Setpoints			
CONTROL	OCCUPIED	NOT OCCUPIED	STANDBY
Heating	70 F (21 C)	55 F (13 C)	67 F (19 C)
Cooling	75 F (24 C)	85 F (29 C)	78 F (26 C)

When power is first applied to the thermostat, the display shows all segments (Figure 6).

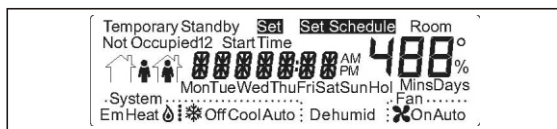


Figure 6. LCD display of all segments

**CAUTION!** Fan must be running when the system is operating to prevent possible equipment damage.

Heat pump and electric heat systems must be configured correctly to prevent equipment damage caused by the system running without the fan.

### Setup Using Keypad

The installer uses the Installer Setup to customize the thermostat to specific systems. For basic setup functions, the thermostat can be configured using the keypad.

A combination of key presses are required to use the Installer Setup feature:

- To enter the Installer Setup, press and hold both the **Run Schedule** and the **Copy** keys until “DEG F” (or “DEG C”) displays.
- To advance to the next Installer Setup number, press the “1” key (center button on the front of the tcu.z).

**NOTE!** Pressing **Run/Copy** again while in this mode displays the tcu.z firmware version number.

- To return to a Setup item, cycle through the options.
- To change a setting, use the up ▲ or down ▼ key.
- To exit the Installer Setup, press **Run Schedule**.
- Display prompts “SAV CFG” (save configuration).

- To save the new configuration, use the up ▲ or down ▼ key to change No to Yes before pressing **Run Schedule**.
- To maintain configuration as it was before starting this change, make sure that the display indicates “SAV DFG NO” before pressing **Run Schedule**.

---

**NOTE!** Installer Setup automatically exits after five minutes with no key pressed. At automatic exit, all changes are lost.

---

**Setting Keypad Lockout**

Proper keypad sequences activate the lockout features. The following procedure explains how to change the keypad lockout state.

<b>Step</b>	<b>Procedure</b>
1	Enter the Installer Setup: press and hold both the <b>Run Schedule</b> and <b>Copy</b> keys until “DEG F” (“DEG C”) displays.
2	Press the “I” key (center button, front of tcu.z) until KYLCK displays.
3	Use the up or down arrow key to change the setting to the following options: <ul style="list-style-type: none"> <li>■ 0: No lockout.</li> <li>■ 1: Lockout all keys except the Temporary Occupied, Temporary Not Occupied, up, down, and “I” key.</li> <li>■ 2: Lockout all keys except the “I” key.</li> </ul> Options 1 and 2 do not allow adjustments on dehumidification high limit. No options lockout special keypress functions. See the “Special Functions” section for details.
4	<i>Once the proper option is chosen:</i> Exit Installer Setup by pressing <b>Run Schedule</b> .
5	<i>To save the configuration, when the display prompts “SAV CFG”:</i> Use the up or down key to change No to Yes before pressing <b>Run Schedule</b> again.

**tcu.z Key Functions**

Table 3 presents a summary of tcu.z key functions. Figure 7 shows the location of the Temperature, Set, Override, and Schedule buttons. The up and down arrow keys and “I” key are located on the front of the tcu.z.

<b>GROUPING</b>	<b>BUTTON</b>	<b>DEFINITION</b>
Information	Down arrow	Lowers setpoint, day, or time. When setting times or temperatures, hold key down to continuously decrease value. Also can make temporary change in temperature setpoint.
	Information	Obtains information (where humidity “high-limit” can be set), cycles through setup options.
	Up arrow	Raises setpoint, day, or time. When setting times or temperatures, hold key down to continuously increase value. Also can make temporary change in temperature setpoint.

*continued*

Temperature	Occupied Heat	Sets Occupied Heat setpoint.
	Occupied Cool	Sets Occupied Cool setpoint.
	Not Occupied Heat	Sets Not Occupied Heat setpoint.
	Not Occupied Cool	Sets Not Occupied Cool Setpoint.
Setup	Day	Sets day of week. Tapping key with "Set Value" segment on increases current day (same effect as up arrow key).
	Time	Sets time. Tapping key with "Set Value" segment on increases time in one-hour increments.
Override	Temporary Occupied	Temporary occupied setting for length of time defined by installer. User can modify settings.
	Temporary Not Occupied	Sets holiday length. User selects number of days (0-99) or "---" for continuous override.
Schedule	Day	Selects day schedule to modify. (Used also with copy key.)
	Occupied	Selects occupied event start times for specified day. Repeatedly press this key to toggle between two occupied events.
	Not Occupied	Selects not occupied event start times for specified day. Repeatedly press this key to toggle between two not occupied events.
	Clear Start Time	Clears start time for specified period and day.
	Copy	Copies schedule from one day to another.
	System	Selects system mode. Toggles through EmHeat, Heat, Off, Cool, and Auto.
	Fan	Selects fan operation mode. Toggles between on and Auto. <ul style="list-style-type: none"> <li>■ On: Continuous fan operation (occupied and standby). During not occupied periods, fan cycles with call for heat or cool.</li> <li>■ Auto: Fan cycles with call for heat or cool during all periods.</li> </ul>
	Run Schedule	Resumes running schedule (cancels temporarily occupied action, holiday, and/or temporary setpoint changes).

The display returns to default screen after pressing **Run Schedule** (or after a period of time without keypress):

- 10 seconds: when returning from temporary setpoint changes, info screen, temp occ, and temp not occ.
- 1 minute: when returning from setting clock/day.
- 10 minutes: when returning from System Checkout.
- 5 minutes: when returning from all other modes.

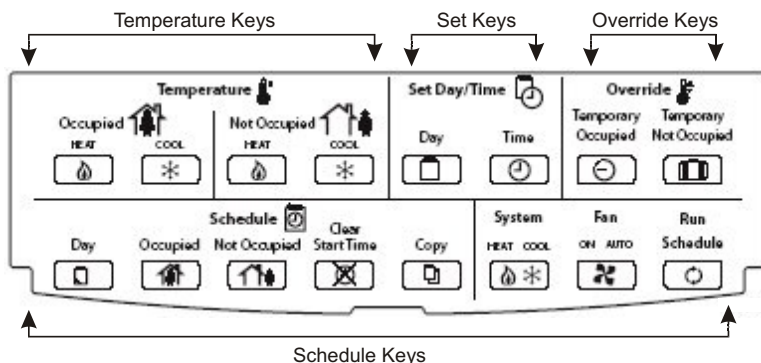


Figure 7. Locations of Temperature, Set, Override, and Schedule buttons on the tcu.z

**Special Functions**

**Restore Factory Configuration (Run/Clear)**

The following procedure erases current configuration and restores factory defaults for all configuration, parameters, setpoints and schedules. To regain the old requires device reconfiguration.

<b>Step</b>	<b>Procedure</b>
1	Press both <b>Run Schedule</b> and <b>Clear Start Time</b> . <ul style="list-style-type: none"> <li>■ The display gives the option to revert to “FAC CFG” (factory configuration).</li> </ul>
2	Press the up or down arrow key until the display indicates “YES” to restore the factory defaults or make sure that the display indicates “NO” to cancel.
3	Press <b>Run Schedule</b> .

**Get Factory Schedule (Info/Clear)**

The following procedure reverts the schedules to the factory defaults.

<b>Step</b>	<b>Procedure</b>
1	Press both <b>Info</b> and <b>Clear Start Time</b> . <ul style="list-style-type: none"> <li>■ The display offers the option of reverting to the “FAC SCH” (factory schedule).</li> </ul>
2	Press the up or down arrow key until the display indicates “YES” to restore the factory schedule or make sure that the display indicates “NO” to cancel.
3	Press <b>Run Schedule</b> .

**Test Mode (Occupied/Not Occupied/Schedule Day)**

---

**CAUTION!** Equipment damage can result if the compressor is cycled too quickly. The minimum off time for compressors is bypassed during Test Mode.

---

The Test Mode is used to check the thermostat configurations and operation. The following procedure explains how to start the system test.

<b>Step</b>	<b>Procedure</b>
1	Press <b>Schedule Day</b> , <b>Occupied</b> , and <b>Not Occupied</b> simultaneously. <ul style="list-style-type: none"> <li>■ The display offers the <b>Test</b> option.</li> </ul>
2	Press the up or down arrow keys until the display says “In Test” or make sure the display says “No Test” to cancel.
3	Press <b>Run Schedule</b> .

Notes:

- To determine if the system test is still active, repeat the process above.
  - The system test times out after 10 minutes with no key pressed.
-



### Save User Schedule (Info/Copy)

The following procedure saves the current schedule (including holidays) to memory, overwriting the old saved schedule.

Step	Procedure
1	Press both <b>Info</b> and <b>Copy</b> . <ul style="list-style-type: none"> <li>■ The display offers the revert to <b>SAV SHD</b> option.</li> </ul>
2	Press the up or down arrow keys until the display says “Yes” to save the current schedule or make sure the display says “No” to cancel.
3	Press <b>Run Schedule</b> .

### Get User Schedule (Info/Run)

The following procedure restores the schedule (including holidays) from saved memory, overwriting the schedule currently in use.

Step	Procedure
1	Press both <b>Run Schedule</b> and <b>Info</b> . <ul style="list-style-type: none"> <li>■ The display offers the <b>GET SHD</b> option.</li> </ul>
2	Press the up or down arrow keys until the display indicates “Yes” to retrieve the saved schedule or make sure the display indicates “No” to cancel.
3	Press <b>Run Schedule</b> .

### Troubleshooting Information

Table 4 explains how to troubleshoot the tcu.z.

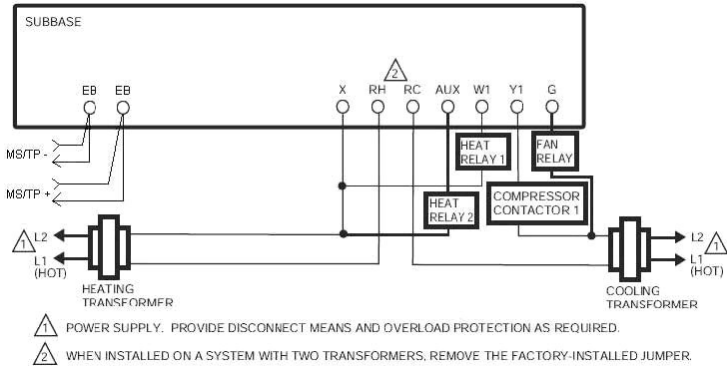
**Table 4. Troubleshooting Information**

SYMPTOM	POSSIBLE CAUSE	ACTION
Display will not come on.	Thermostat is not being powered.	Check that X terminal is connected to the system transformer. Check for 24 VAC between X and RH terminals. If 24 VAC is missing: <ul style="list-style-type: none"> <li>■ Check for tripped circuit breaker; if tripped, reset.</li> <li>■ Check for blown system fuse; if blown, replace.</li> <li>■ Check the HVAC equipment power switch; if in the off position, set to the on position.</li> <li>■ Check wiring between thermostat and HVAC equipment. Replace broken wires and tighten loose connections.</li> </ul> If 24-VAC is present, proceed with troubleshooting.
Temperature display is incorrect.	Thermostat is configured for F or C display.	Press both <b>Run Schedule</b> and <b>Copy</b> , then reconfigure the display.
	Bad thermostat location.	Relocate the thermostat.
	Display shows three dashes and a degree sign (all systems shut down).	tcu.z is set for remote sensing and the sensor is missing or the circuit is open or shorted.

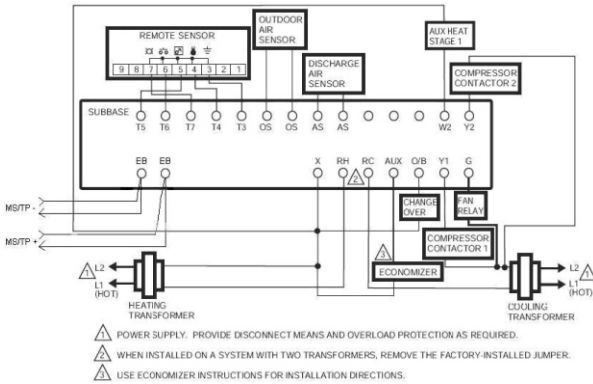
*continued*

Temperature settings will not change. (Example: Cannot set heating higher or cooling lower).	Upper or lower temperature limits were reached.	Check the temperature setpoints: <ul style="list-style-type: none"> <li>■ Heating limits are 40 to 90 F (7 to 31 C).</li> <li>■ Cooling limits are 45 to 99 F (9 to 37 C).</li> </ul>
	Occupied setpoint temperature range stops were configured.	Use Opus Supervisor to check setpoint stops. If necessary, reconfigure the stop(s).
	Keypad is locked. When a locked key is pressed, "Locked" appears momentarily on the LCD.	<ul style="list-style-type: none"> <li>■ Use Opus Supervisor (Set, Display) to unlock keypad.</li> <li>■ Press both <b>Run Schedule</b> and <b>Copy</b>, then change keypad lock level.</li> </ul>
Room temperature is out of control.	Remote temperature sensing is not working.	Check all remote sensors.
Heat will not come on.	No power to the thermostat.	<p>Make sure that the X terminal is connected to the system transformer. Check for 24 VAC between X and RH terminals. If 24 VAC missing:</p> <ul style="list-style-type: none"> <li>■ Check for tripped circuit breaker; if tripped, reset.</li> <li>■ Check for blown system fuse; if blown, replace.</li> <li>■ Check the HVAC equipment power switch; if in the off position, switch to the on position.</li> <li>■ Check wiring between thermostat and HVAC equipment. Replace broken wires and tighten loose connections.</li> </ul> <p>If 24 VAC is present, proceed with troubleshooting.</p>
	Thermostat minimum off time is activated.	<ul style="list-style-type: none"> <li>■ Wait up to five minutes for the system to respond.</li> <li>■ Use Opus Supervisor to configure heating response.</li> </ul>
	System selection is set to off or Cool.	Set system selection to Heat or Auto.
Cooling will not come on.	No power to the thermostat.	<p>Make sure that the X terminal is connected to the system transformer. Check for 24 VAC between X and RH terminals. If 24 VAC missing:</p> <ul style="list-style-type: none"> <li>■ Check for tripped circuit breaker; if tripped, reset.</li> <li>■ Check for blown system fuse; if blown, replace.</li> <li>■ Check the HVAC equipment power switch; if in the off position, switch to the on position.</li> <li>■ Check wiring between thermostat and HVAC equipment. Replace broken wires and tighten loose connections.</li> </ul> <p>If 24 VAC is present, proceed with troubleshooting.</p>
	Thermostat minimum off time is activated.	<ul style="list-style-type: none"> <li>■ Wait up to 5 minutes for the system to respond.</li> <li>■ Use PDA to configure cooling response.</li> </ul>
	System selection is set to off or Heat.	Set system selection to Cool or Auto.
System indicator (flame: heat, snowflake: cool) is displayed, but no warm or cool air is coming from the registers.	The call for heat or cool is not yet given.	Check to see if any stage indicators (dots next to the system indicator) are displayed. With no display of stage indicators, no call for cool/heat is yet given.
	Conventional heating equipment turns the fan on only after the furnace has warmed to a setpoint.	Wait 1 minute after seeing the on indicator; then check the registers.
	Heating or cooling equipment is not operating.	Verify operation of heating or cooling equipment in self-test.

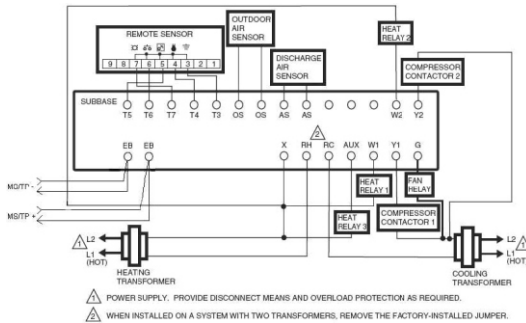
**Wiring Diagrams**  
(Figures 8–12)



**Figure 8.** Typical hookup of tcu.z in two-stage heat and one-stage cool conventional system with two transformers.



**Figure 9.** Typical hookup of tcu.z in two-stage heat and two-stage cool heat pump system with two transformers



**Figure 10.** Typical hookup of tcu.z in three-stage heat and two-stage cool conventional system with two transformers

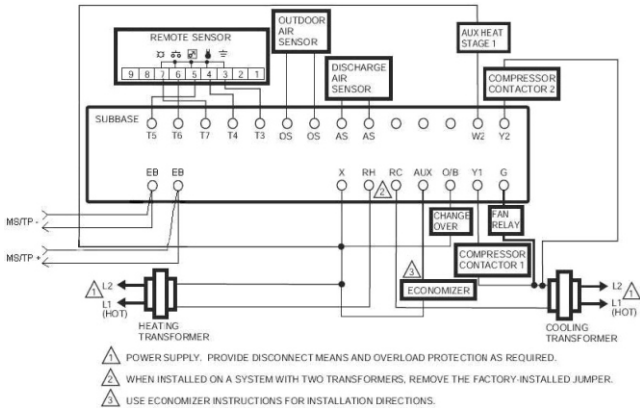


Figure 11. Typical hookup of tcu.z in three-stage heat and two-stage cool heat pump system with two transformers

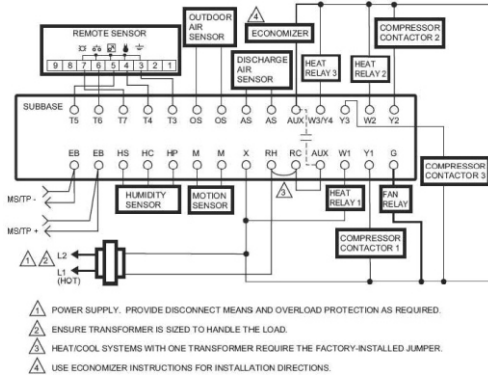


Figure 12. Typical hookup of tcu.z in three-stage heat and three-stage cool conventional system with one transformer

## Dehumidification (tcu.zD,H,M)

There are five methods through which the tcu.z can control for dehumidification. Three of them modify the control algorithm, thus providing limited dehumidification through cooling. The other two use the auxiliary output to control another device.

---

**NOTE!** Configure dehumidification using Opus Supervisor. The dehumidification high limit can be set within the range of 10 to 90 percent relative humidity.

---

## Control through Cooling

Configure using some combination of the following:

- Minimum On
- Reheat
- Reset

Notes:

- These methods operate only during cooling.
  - Selecting both **Reheat** and **Reset** options can cause frequent setpoint adjustments. This selection is not recommended.
- 

### Minimum ON Time

Dehumidifies by increasing the compressor minimum on time (normally 3 minutes) by a programmable amount. This is useful with oversized systems because it forces the coils to cool to a point where dehumidification can occur.

Notes:

- It can force wider temperature swings by cooling when setpoint control does not require it.
  - The minimum on time can be set within the range of 5 to 15 minutes.
  - Hysteresis and a minimum timer are used to ensure this behavior does not change with every equipment cycle.
- 

### Reheat

Dehumidifies by operating cooling during typical off time. The tcu.z maintains the proper setpoint by running the heat at the same time.

---

**NOTE!** At times during Reheat dehumidification, the tcu.z operates heating and the cooling simultaneously. This is normal.

---

Notes:

- The heat stage never energizes during Reheat if more than one cool stage is on.
  - Reheat mode cannot occur during heating.
  - The tcu.z-M does not support the Reheat method.
- 

### Reset Temp SetPt

The room temperature setpoint resets to a specified number of degrees below the actual setpoint when room relative humidity (RH) rises above humidity high limit setpoint.

Though this may not technically reduce relative humidity in the room, it reduces the dew point to provide the customer with a sense of comfort due to a lower temperature setting in the room.

As long as RH stays above humidity high limit setpoint, this setpoint is maintained.

---

**NOTE!** Hysteresis and a minimum timer prevent the setpoint from short interval alternation (between standard and reset setpoints).

---

**Options Using  
Auxiliary Output**

Two dehumidification options use the auxiliary output:

- Simple Dehumidification
- Hot Gas Bypass Dehumidification

**Simple Dehumidification**

The auxiliary output:

- Energizes when RH rises above humidity high limit
- De-energizes when RH drops below humidity high limit

Notes:

- Hysteresis and a minimum timer prevent short cycling of this output.
- Unlike Hot Gas Bypass Dehumidification Hot Gas BP, the relay remains energized during calls for multiple cooling stages.

**Hot Gas Bypass Dehumidification**

The auxiliary output operates as shown in Table 5.

<b>Table 5. Hot Gas Bypass Dehumidification Logic</b>		
<b>HUMIDITY</b>	<b>COOLING STAGES ACTIVE</b>	<b>AUXILIARY OUTPUT</b>
High	More than one	De-energized
High	One or less	Energized
Low	More than one	De-energized
Low	One or less	De-energized

Auxiliary output during call for multiple cooling stages for two reasons:

- This method assumes that the cooling provides dehumidification.
- Multiple cooling stages probably provide necessary dehumidification.

---

**NOTE!** Hysteresis and a minimum timer prevent short cycling of this output.

---

**Notes**

The material in this document is for information purposes only. The contents and the product it describes are subject to change without notice. Novar makes no representations or warranties with respect to this document. In no event shall Novar be liable for technical or editorial omissions or mistakes in this document, nor shall it be liable for any damages, direct or incidental, arising out of or related to the use of this document. No part of this document may be reproduced in any form or by any means without prior written permission from Novar.

Printed in Mexico.

Copyright © 2007 by Honeywell International, Inc.. All Rights Reserved.

Novar; 6060 Rockside Woods Blvd., Cleveland, OH 44131  
Tel.: 800.348.1235 [www.novar.com](http://www.novar.com)