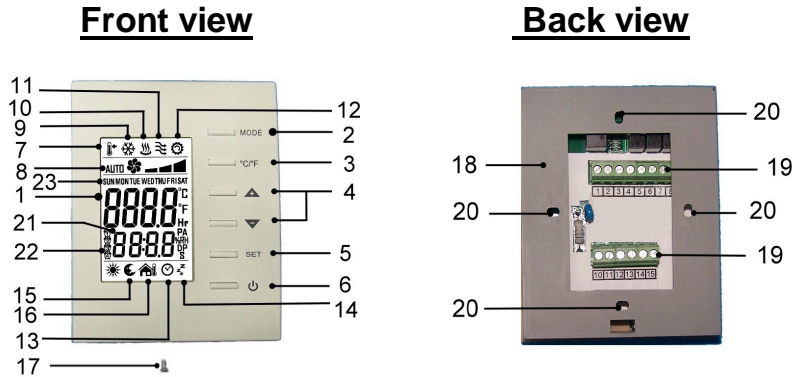


TE221 Series Programmable Digital Room Thermostats Modulating or On/ Off Heating Control

OPERATION MANUAL



#	Item	Description
1	LCD	Display temperature and working status.
2	MODE button	Access to user and engineer menu and for setting confirmation
3	°C/ °F button	Toggle to change °C/ °F scale unit
4	UP & DOWN buttons	Increase & decrease setting or previous/next item
5	SET button	Setting for schedules and Time/ Date
6	On/Off button	Start/ Stop Using Heating Device
7	Set-point icons	Displaying set-point temperature while it is flashing
8	AUTO icons	Device is in Using
9	Flake icon	NA
10	Hot spring icon	Indicate working on Heating mode
11	Flow icon	NA
12	Gear icon	Indicate Heating Device currently is Open or ON
13	Clock	NA
14	Sleep	NA
15	Moon Sign	Indicating room is unoccupied via occupancy contact
16	Outdoor icon	NA
17	Cover screw	Screw to tighten back cover with front cover
18	Back plate	Plate for mounting on electric box
19	Wiring terminal blocks	Terminals for wiring
20	Mounting holes	Holes for mounting on electric box
21	Time	Display time
22	Schedule number	Current Schedule running or setting
23	Day	Current day of Sunday ~ Saturday or Selected setting day

Installation

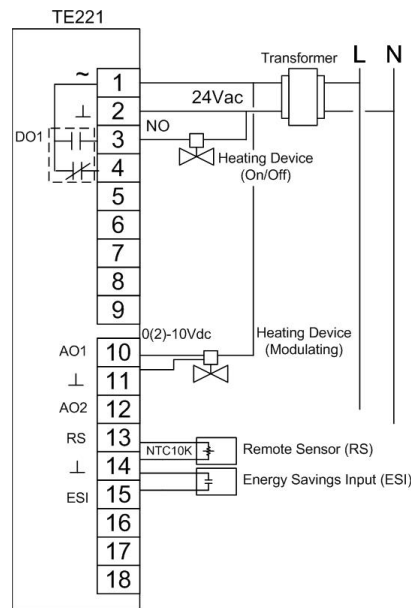
Mounting on electric box

1. Separate back plate from the controller by loosening the cover screw;
2. Align the mounting holes on the screw holes of the electric box (applicable to 65x65 or US standard box);
3. Fix the back plate on the electric box by tightening the back plate screws. Suggest to use Philips wider "truss head" or "washer head" #6-32x 3/4" (20mm).
4. DO NOT let the bolt head rise above the wall of mounting holes of back plate. It might cause the short circuit of the controller.

Mounting front cover

1. Lock front cover on the back plate by tightening the cover screw underneath with screw driver of Philip electronic instrument type or similar.

Wiring Example



Wiring diagram for
TE221
thermostat


1. All wires come from electric box must be inserted above the retainers of respective terminal block before tightening the captive screws;




I/O			
AO1(0~10VDC)	DO1(SPDT Relay)	RS	ESI
Modulating Type Heating Output	On/ Off Type Heating Output	Remote Temperature Sensor(NTC 10K)	Occupancy Contact

Operation

User Mode Operation

The first tier of operation includes the following settings as Figure 2. To operate:

1. Power switch  "ON" or "OFF" to start/ stop the System;
2. After switching "ON", press any button to start the User Mode operation.
 - i. Press "MODE" button to switch over different program modes.
 - ii. Press UP/ DOWN button to increase/ decrease or rotate the values of setting.
 - iii. Press "°C/ °F" button to toggle between °F and °C scale.
 - iv. Press "SET" button to set current time-date. When SET is pressed for more than 3 seconds, users can set the temperature setpoint schedules.
3. It will return to normal display with the latest setting if there's no button pressed for 10 seconds.

#	Item	Description	Remarks
1	Normal Display	Display Current Room or Set-Point Temperature and Current Time-Day.	Setting "-SP- "Parameter in Engineer Table to Choose Current Room or Set-Point Temperature.
2	Temperature Setting 	View Current Set Point or Set the Required Temperature	
3	Mode Select 	1. Select the Working Mode: (1) Run/ Halt/ Stop for Schedule	RUN: Run Schedules. HALT: Pause "Current" Schedule and Use Manual SP. STOP: Stop Using All Schedules and Use Manual SP.
4	°C/ °F	1. It will toggle the Unit of Temperature to change between °F and °C.	
5	Time/ Date/ Schedule Setting 	1. Set Current Time in 12- Or 24- Hour Format; 2. Set Calendar and Day of Week; 3. When SET Is Pressed for More Than 3 Seconds, Users Can Set Temperature Set Point Schedules	Press SET to Continue Settings. Press MODE, Or POWER Button to Escape Any Time During Setting.

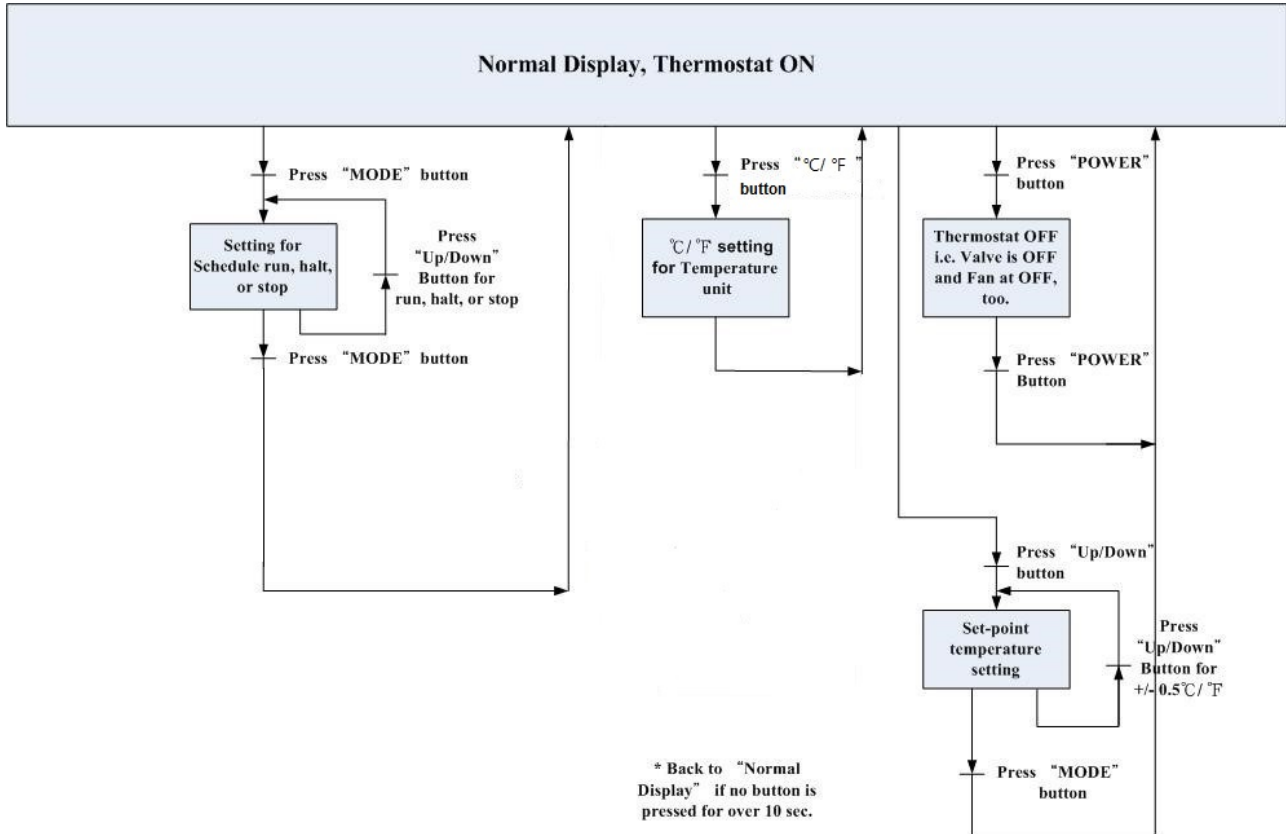
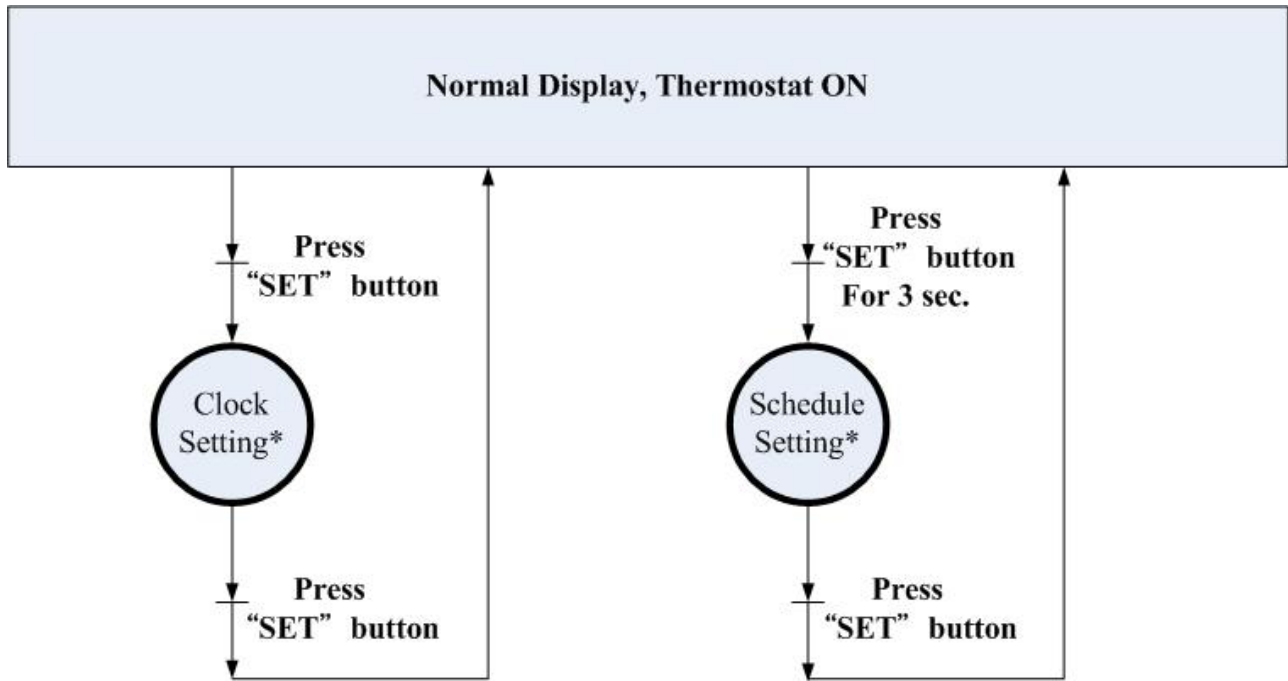


Fig. 2 User Mode operation sequence

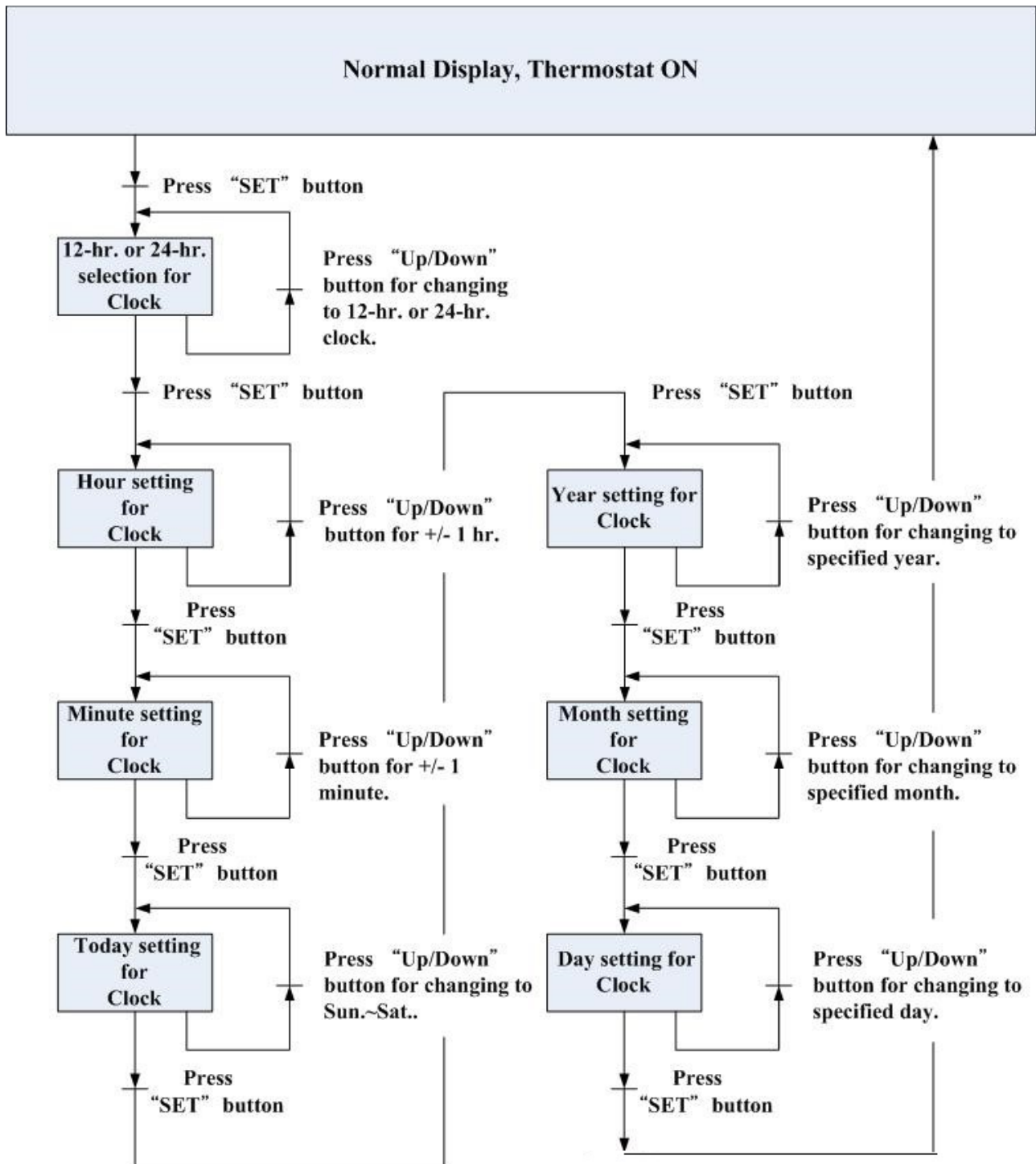
Overview for the settings of Clock and Schedules



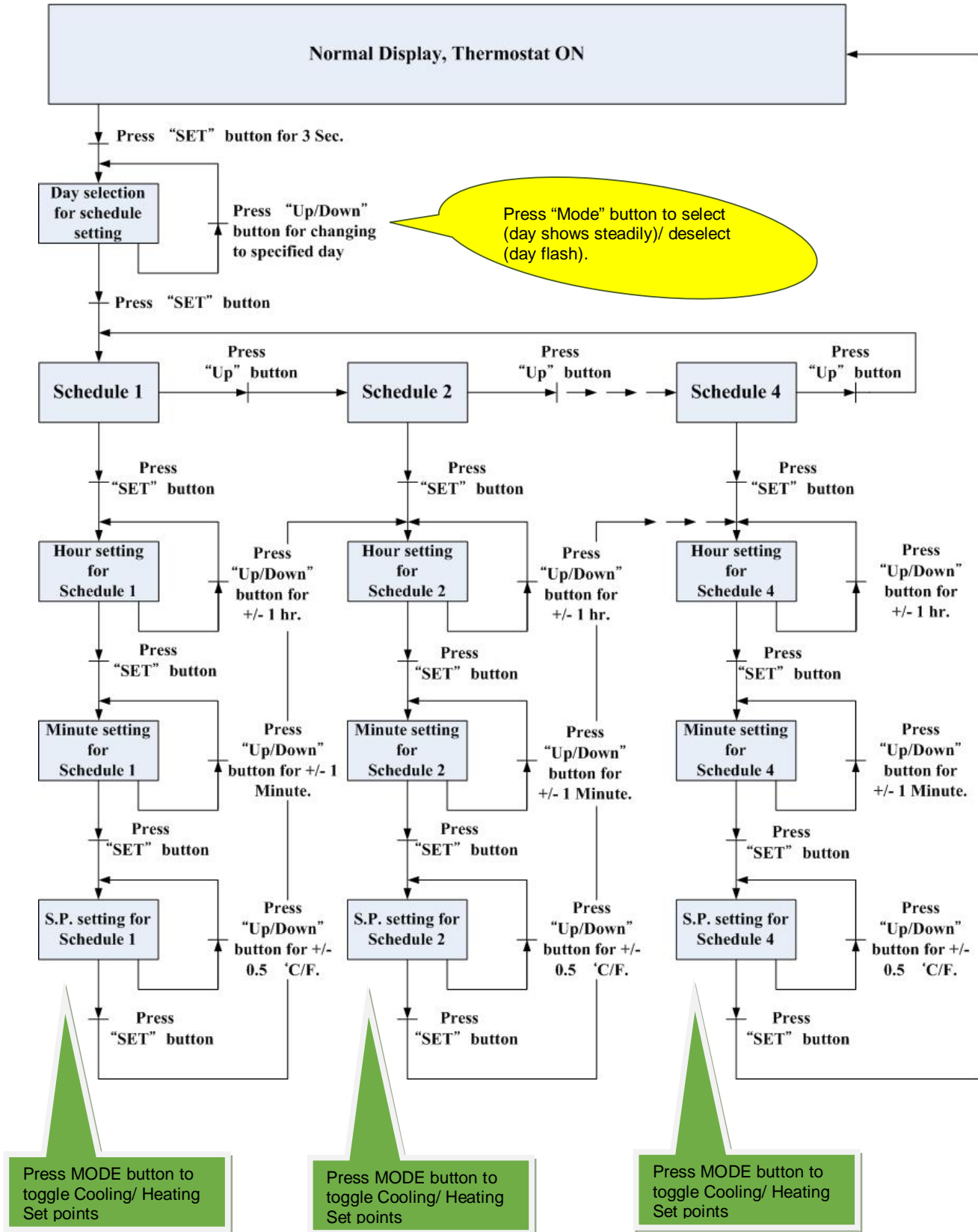
* Please refer to its related detailed state diagram respectively for details.

📖 Press °C/ °F or POWER button to escape any time during setting.





1. Detailed State Diagram for Clock Setting







2. Detailed State Diagram for Schedule Setting



Default Set Point Schedules

COOL	Sun	Mon	Tue	Wed	Thu	Fri	Sat
Sch. 1 	6:00 26.0°C	6:00 26.0°C	6:00 26.0°C	6:00 26.0°C	6:00 26.0°C	6:00 26.0°C	6:00 26.0°C
Sch. 2 	8:00 29.5°C	8:00 29.5°C	8:00 29.5°C	8:00 29.5°C	8:00 29.5°C	8:00 29.5°C	8:00 29.5°C
Sch. 3 	18:00 26.0°C	18:00 26.0°C	18:00 26.0°C	18:00 26.0°C	18:00 26.0°C	18:00 26.0°C	18:00 26.0°C
Sch. 4 	22:00 26.0°C	22:00 26.0°C	22:00 26.0°C	22:00 26.0°C	22:00 26.0°C	22:00 26.0°C	22:00 26.0°C

HEAT	Sun	Mon	Tue	Wed	Thu	Fri	Sat
Sch. 1 	6:00 21.0°C	6:00 21.0°C	6:00 21.0°C	6:00 21.0°C	6:00 21.0°C	6:00 21.0°C	6:00 21.0°C
Sch. 2 	8:00 16.0°C	8:00 16.0°C	8:00 16.0°C	8:00 16.0°C	8:00 16.0°C	8:00 16.0°C	8:00 16.0°C
Sch. 3 	18:00 21.0°C	18:00 21.0°C	18:00 21.0°C	18:00 21.0°C	18:00 21.0°C	18:00 21.0°C	18:00 21.0°C
Sch. 4 	22:00 16.0°C	22:00 16.0°C	22:00 16.0°C	22:00 16.0°C	22:00 16.0°C	22:00 16.0°C	22:00 16.0°C

- **Unoccupied Set Points:** activated by occupancy contact; Cooling: 28.0°C/ Heating: 15.0°C
- When **schedules are activated**, refer to cooling/ heating set points according to current schedule.
- When **pause or stop schedules**, refer to manual set point or latest set point as Cooling Set Point and dead band for Heating Set Point deviation.
- Scheduled Cooling Set Point range: 10.0°C ~ 37.0°C; Heating Set Point range: 4.5°C ~ 32.0°C; make sure to set heating lower than cooling set point to have proper controls.


Control Actions

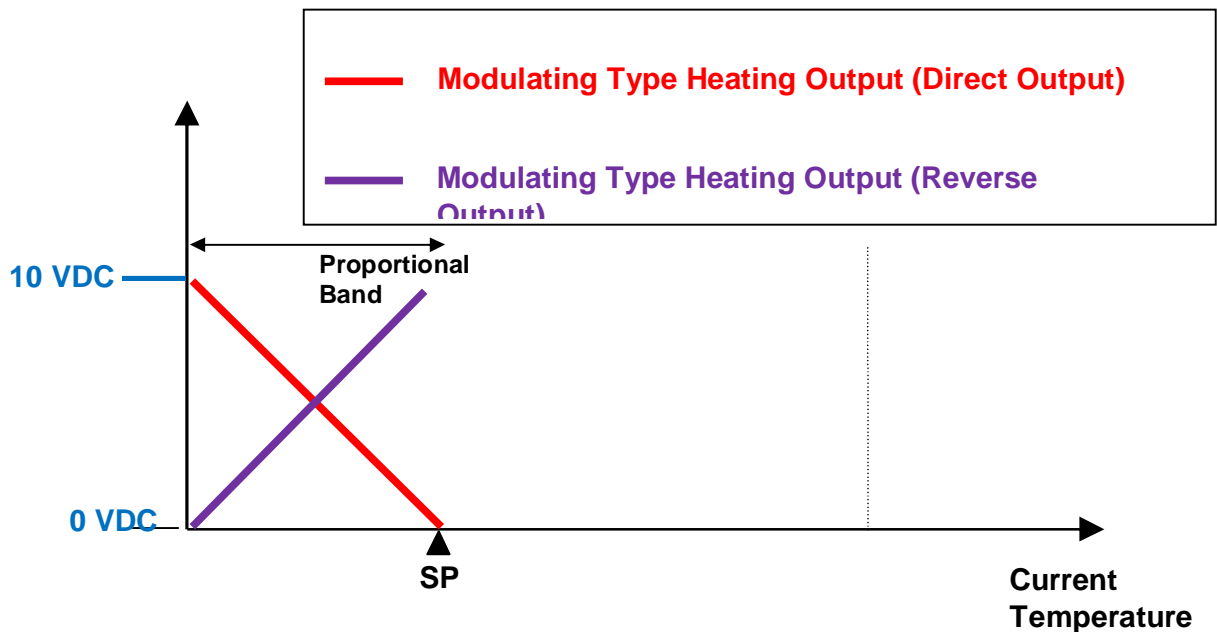
There are two types of heating control output: Modulating (0~10 VDC) and On/ Off (SPDT relay). Both will output simultaneously.

1. Modulating Type Heating Control:

(1) **Output Voltage:** Valve output allow minimum adjustment ([AO1 Low\(E5\)](#)) from 0-2 Vdc and maximum adjustment ([AO1 High\(E6\)](#)) from 8 to 10 Vdc. These two output voltages can be gauged by multimeter during setting to reflect the setting change effects.

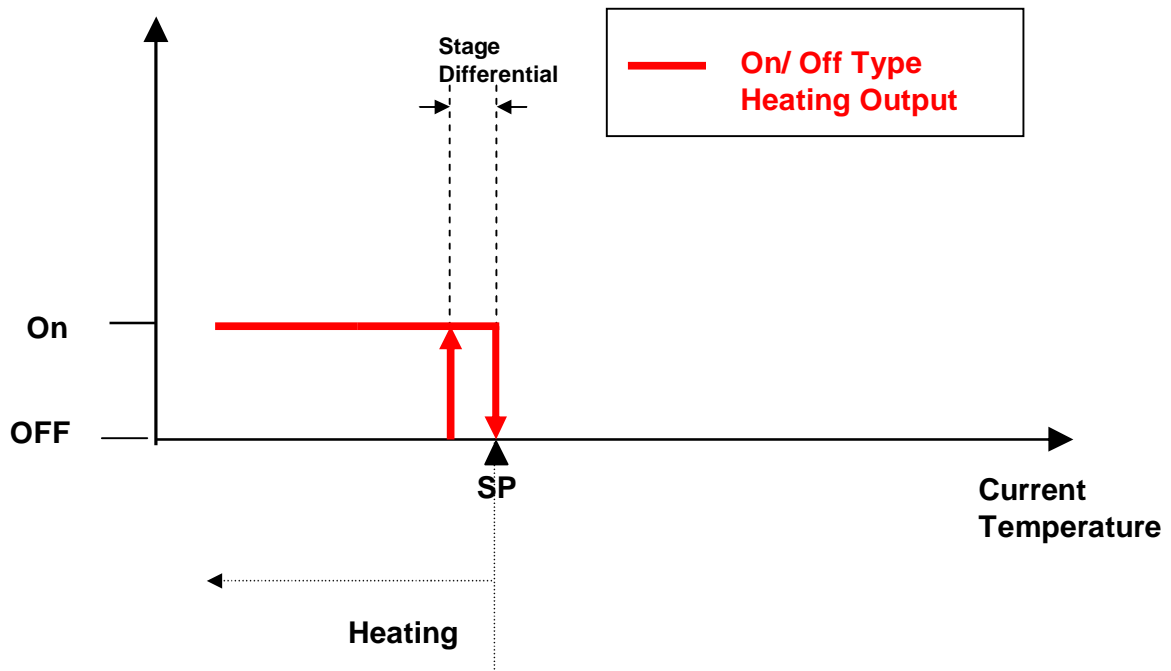
(2) **Reverse Output:** The output voltage can be reversed by setting [rE-H\(E18\)](#) to 0(Direct) or 1(Reverse).

(2) When Demand for Heating, a "Running ()" icon will be shown on the LCD.



2. On/ Off Type Heating Control:

(1) **Control Output:** SPDT relay 24Vac output allows connecting to N.O. or N.C. terminal depending on requirement. On Demand for Heat Terminal 3 will = 24Vac On/ Off differential can be set at (diff(E19)).



By pressing POWER button OFF you can switch the heating device OFF Terminal 3 = 0Vac Terminal 4 = 24Vac

Special:

1. ESI (Energy Saving Input) Contact status -- When the contact is activated (Room unoccupied), a "Moon (☾)" icon will be shown on the LCD and the thermostat will change the set-point temperatures of Cooling & Heating to be ESIC & ESIH (refer to Engineer table for details.). When the contact is deactivated (Room back to be occupied), it will set the set-point values back as normal.
2. If disable local ESI contact detection, the room will become always occupied status as default.
3. The icon ①, ②, ③, or ④ will be shown on LCD while the Schedule 1,2,3, or 4 is running or being set.
4. If press "MODE" button, there are three schedule modes "RUN, HALT, and STOP" for selection.
 - a.) RUN mode means activating Schedules. And at the same time an icon (① ~ ④) will be steadily shown on the LCD.
 - b.) HALT mode means temporarily pause current schedule and using manual S.P instead. And the icon (① ~ ④) will be flashing on the LCD.

c.) STOP mode means stop to use manual S.P until manually activate schedule again. And the icon

( ~ ) will be NOT shown on the LCD.

Engineer Mode Operation

This mode is highly suggested to be operated by trained engineers because it is related to system parameters that will affect the control results. To operate:

1. Press “Up” and “Down” buttons for over 5 seconds to enter into engineer mode;
 2. Press UP or DOWN button to rotate the menu item and press MODE button to enter into the item;
 3. Press UP or DOWN button to change the setting and press MODE button to confirm the setting and return to menu item selection. For no button pressed for 10 seconds, it will go back to menu item selection. The setting won't be changed then.
 4. To leave Engineer Mode, rotate till “End” and press MODE button or leave the button intact for 10 seconds.
- Engineer mode operation flow chart:

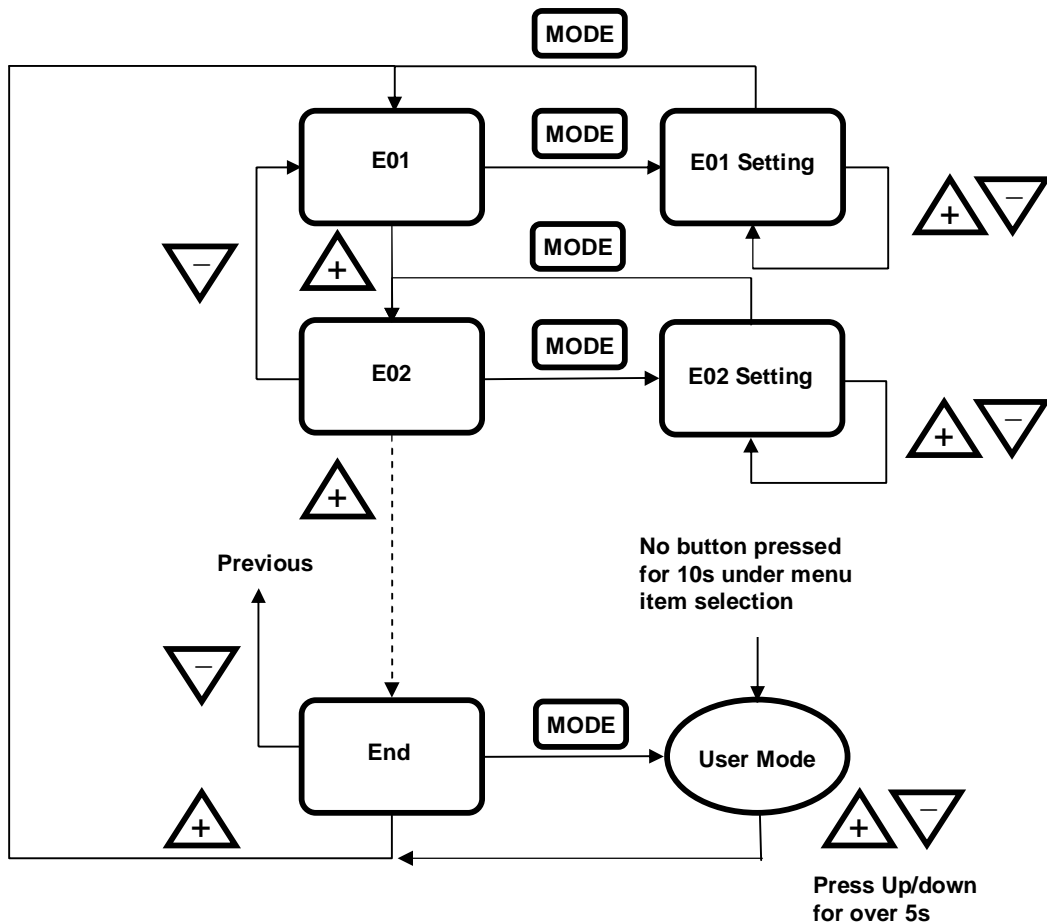


Fig. 3 Engineer Mode operation sequence

Engineer mode menu item descriptions:

Item	Mnemonic	Description	°C Type		°F Type		Step
			Default	Range	Default	Range	
E1	db	Deadband	4.0	0~10.0	7.0	0~18.0	0.5 (°C/°F)
E2	ESIC	Unoccupied(ESI) Cooling Set Point	28.0	25.0~35.0	82.0	77.0~95.0	1.0 (°C/°F)
E3	ESIH	Unoccupied(ESI) Heating Set Point	15.0	10.0~22.0	59.0	50.0~72.0	1.0 (°C/°F)
E4	I-t	Integral Time and Output Cycle Time	90	10~500	90	10-500	10 (Sec.)
E5	AO1L	Analog Output 1(Valve) Low Adjustment	0	0~50	0	0~50	1(~0.04V)
E6	AO1H	Analog Output 1(Valve) High Adjustment	-19	-50~0	-19	-50~0	1(~0.04V)
E7	AO2L	Not Used					
E8	AO2H	Not Used					
E9	SP-L	Low Limit for Temperature Set Point	10.0	0~50.0	50.0	32.0~122.0	1.0 (°C/°F)
E10	SP-H	High Limit for Temperature Set Point	35.0	0~50.0	95.0	32.0~122.0	1.0 (°C/°F)
E11	OFSt	Current Temperature Offset	0.0	-10.0~10.0	0.0	-18.0~18.0	0.1 (°C/°F)
E12	Pb	Proportional Band or Stage Width	2.0	0~10.0	3.6	0~18.0	0.1 (°C/°F)
E13	LOC	Bit Definition --- Bit 0: Mode Button 1: Down Buttons 2: Up Button 3: °C/°F Button 4: Power Button 5: Set Button 6: ESI Contact Detection 7: Door/Window Contact ct detection *Bit Value 0: Unlock / enable 1: Lock / disable Examples: 0- Unlock/enable all 1- Lock MODE Button 2- Lock Down Button ... 8-Lock °C/°F Button ... 15-Lock MODE & Down & Up & °C/°F Buttons 16-Lock Power Button ... 64-Disable ESI contact detection ... 128-Disable Door/Window contact detection ... 255- Lock/disable all	0	0-255	0	0-255	1

E14	ESI	ESI Contact Definition	0	0~1	0	0~1	0: N.O. 1: N.C.
E15	rS	Present Temperature Is Getting from Built-In Temperature Sensor, or Remote Temperature Sensor.	0	0~1	0	0~1	0: built-in 1: remote
E16	-SP-	Display Present Value of Temperature or Set-Point for Normal Displaying	0	0-1	0	0-1	0: display PV 1: display SP
E17	rE-C	Not Used					
E18	rE-H	Modulating Heating direct/ reverse signal output	0	0-1	0	0-1	0 (direct) 1 (reverse)
E19	diFF	Stage differential	0.5	0.1~1.0	0.9	0.1~1.8	0.1 (°C/°F)
E20	tEst	Self-Diagnostic					
E21	rSt	Reset All Parameters to Factory Defaults					
E22	End	Exit Engineer Mode					