TC40 Touch Series

Digital Room Thermostats with Touch Screen LCD

Features

- Wall-mount Display Control Unit to match any decor
- Extra large easy-to-read Liquid Crystal Display (LCD), with display icons and LED backlight
- Compact touch screen with operating icons
- Selectable constant display of ambient temperature or temperature set point value
- Output relays employed for direct connection of valve actuators and 3-speed fan
- Slim separate Power Supply Unit to fit on all sizes of fan coil units and to provide highly reliable power source
- Configurable operating parameters
- Selectable ºC or ºF temperature display via parameters setup menu
- Adjustable proportional band and integral time for modulating output models
- Selection of valve stroke time for 3 -wire on-off/floating models
- Field adjustable high and low occupied set point limit values
- Field adjustable cooling and heating unoccupied set point values (applicable to some models only)
- Field selectable configuration to retain last entered settings on power resumption
- 2-wire on-off, 3-wire floating and 0 -10 VDC output models available
- Dual-output models with auto cooling/heating changeover (deadband operation) and manual override
- Field selectable 1 to 5 K deadband for dual-output models
- Selectable operating mode sequence for dual-output models
- Selectable unoccupied mode activation in operating mode only or in both standby and operating modes
- Selectable fan action in unoccupied mode
- Window contact closure to lock out all thermostat functions
- Field recalibration capability of measured temperature
- Continuous or auto fan operation
- External and seasonal changeover temperature sensor capability
- Optional infer-red remote control unit
- Suitable for both American and European electrical box mounting standards
- Both vertical and horizontal mounting versions available

General

The TC40 Touch Series digital room thermostats are available in either vertical or horizontal mounting versions for 2-wire on-off, 3-wire floating or 0-10 VDC proportional control of valves and High-Medium-Low-Auto speed control of fan motors in fan coil units, heat pumps and packaged air-conditioning units for commercial, industrial and residential installations.

All floating and 0-10 VDC proportional thermostats adopt true proportional-integral (PI) control algorithm.

A fan-speed touch screen allows control of a 3-speed fan. The speed control touch screen has 4 positions: “Hi-Med-Low-Auto”. In the “Hi”, “Med” or “low” position, the fan runs continuously at the selected speed. In the “Auto” mode, the fan speed is temperature dependent and controlled automatically in 2 K differential increments from low to medium and from medium to high speed.

Mounting

The TC40 Touch Series digital room thermostats can be surface mounted or secured to a standard American 2”x 4” single gang box or a standard European 75 x 75 x 35 mm electrical box. The same mounting method is applicable to both vertical and horizontal mounting versions. Two M3.5 mounting screws are included.

Ordering

To order, specify model numbers of complete set, display control unit or power supply unit.

Figure 1: TC40 Touch Series Digital Room Thermostat Model Number Selection Guide

TC40 Touch Series Digital Room Thermostats Model Number Selection Guide (Complete Sets)

TC4	0	–	1AM	R	–	V
Product Type	Power Supply	Separator	Control Type	Options	Separator	Mounting
TC4 = TC40 Touch Series room thermostats	**0** = 100-230 VAC **2** = 230 VAC + 24 VAC* **3** = 120 VAC + 24 VAC* * Suitable for line-voltage fan control and 24 VAC valve control		**1** = Single 2-wire on-off output, cool only or heat only **1M** = Single 2-wire on-off output, manual cool/heat changeover **1F** = Single 3-wire floating output, cool only or heat only **1FM** = Single 3-wire floating output, manual cool/heat changeover **1A** = Single 0-10 VDC output, cool only or heat only **1AM** = Single 0-10 VDC output, manual cool/heat changeover **2** = Dual 2-wire on-off outputs, manual or auto cool/heat changeover changeover **2A** = Dual 0-10 VDC outputs, manual or auto cool/heat changeover **2AH** = 0-10 VDC cooling output, 2-wire on-off heating output, manual or auto cool/heat changeover	**R** = with infra-red receiver for RCU-1		**V** = For vertical mounting **H** = For horizontal mounting

Power Supply Unit Model Number Selection Guide

PSU4	0	–	1	A
Product Type	Power Supply	Separator	Number of Outputs	Control Type
PSU4 = Power Supply Units for TC40 Touch Series	**0** = 100-230 VAC **2** = 230 VAC + 24 VAC* **3** = 120 VAC + 24 VAC* * Suitable for line-voltage fan control and 24 VAC valve control		**1** = Single output **2** = Dual outputs	**Nil** = 2-wire on/off **F** = 3-wire floating **A** = 0-10 VDC **AH** = 0-10 VDC cooling output + 2-wire line voltage heating output

Display Control Unit Model Number Selection Guide

DCU4	1	A	M	R	–	V
Product Type	Number of Outputs	Control Type	Seasonal Changeover	Options	Separator	Mounting
DCU4 = TC40 Touch Series Display Control Units	**1** = Single output **2** = Dual outputs	**Nil** = 2-wire on/off **F** = 3-wire floating **A** = 0-10 VDC output **AH** = 0-10 VDC cooling output + Line-voltage 2-wire on-off heating output	**Nil** = Auto **M** = Manual	**R** = with infra-red receiver for RCU-1		**V** = For vertical mounting **H** = For horizontal mounting

Specifications

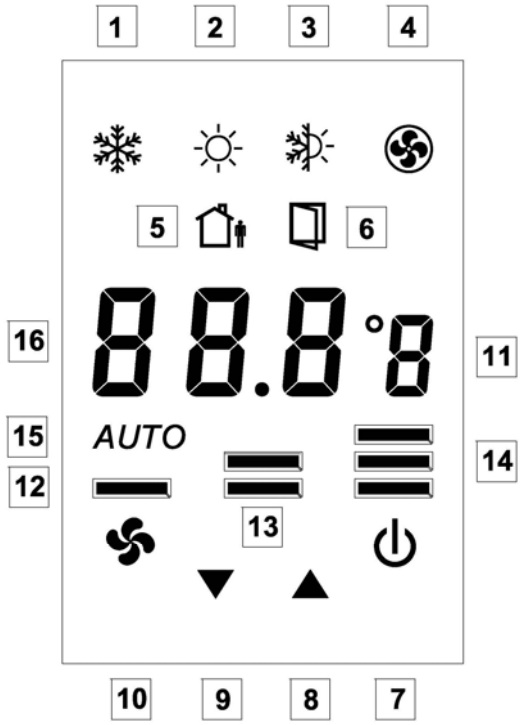
Product Model Numbers	Display Control Units See Fig.1: TC40 Touch Series Model Number Selection Guide	
Power Requirements	100-230 V, ±10%, 50/60 Hz or 120 or 230 V, +10% and -15%, 50/60 Hz depending on models	
0-10 VDC Output Impedance	Minimum 10,000 Ω	
Operating Temperature Differential	Fixed at 1 K (1 R) for both cooling and heating modes (for on-off output models only)	
Temperature Display Range	5-35°C in 0.5 K increments: accuracy ±1 K (41-95ºF in 0.5 R increments, accuracy ±1 R)	
Temperature Set Point Range	5-35°C in 0.5 K increments, initial factory set at 22°C (41-95ºF in 0.5 R increments)	
Constant Display on LCD	Selection of ambient temperature or temperature set point value	
Offset Adjustment of Temperature Indication (Field Recalibration)	+2, +1, 0, -1 and -2 K (+2, +1, 0, -1 and -2 R) throughout the range, factory setting 0	
Deadband of Dual-Output Models	Adjustable 1 to 5 K(1 to 5 R) between cooling Mode and heating Mode, factory set at 3 K(3 R)	
3-wire Floating Travel Time	Accumulatively 10, 60, 90,120, 150,180, 210 or 240 s maximum in one direction, depending on setting. Setting = 0 means the output being activated as on-off mode.	
Proportional Band for PI Control Models	Adjustable 1 to 10 K (1-10 R) in 1 K (1 R) increments, factory setting 5 K (5 R)	
Integral Time for PI Control Models	Adjustable 0 to 30 minutes in 1 minute increments, factory setting 15 minutes. Setting = 0 means integral time being turned off.	
Valve Stroke Time for 3-Wire Floating Models	Selectable 10, 60, 90, 120, 150, 180 (factory setting), 210 and 240 s	
Auto Fan Temperature Differential	At 2 K (2 R) increments. In cooling mode, fan stays at low speed when there is no cooling valve output. Fan status in heating mode depends on auto fan action selection setting.	
Sensing Element	NTC thermistor, 10 kΩ@25ºC; accuracy ±0.5 K@25ºC	
Unoccupied Mode	Input signal from external voltage-free contact Selectable activation of unoccupied mode: in operating mode only or in both standby and operating modes. Selectable fan action: always runs at “Low” fan when in operation or runs at “low” fan only when thermostat calls for cooling or heating.	
Unoccupied Temperature Set Point Range	Field adjustable 5-35ºC (41-95ºF) in 1 K (1 R) increments separately for cooling and heating; Factory settings: 16ºC (61ºF) for heating and 26ºC (79ºF) for cooling	
Enclosure	Material: Self-extinguishing, molded ABS Finish: Off white and dark grey color	
Protective Class	IP30	
Electrical Ratings	Valve output (24 VAC valve output only)	24 V, 0.3 A resistive, 0.3 A inductive, 50/60 Hz
	Valve output (all other models)	100-230 V, 5 A resistive, 2 A inductive, 50/60 Hz
	Fan output relays	100-230 V, 5 A resistive, 2 A inductive, 50/60 Hz
	Total rating	100-230 V, 5 A maximum, 50/60 Hz
Ambient/Storage Temperature Limits	0 to 50 °C / -30 to 50 °C, 10% to 90% RH non-condensing	
Connections	Non-removable Terminal Blocks	
Power Wires	Wire size 1 mm^2 or 18 AWG solid copper recommended	
Sensor Wires	22 AWG twisted shielded pair double-insulated cable	
PSU/DCU Inter-connecting Wires	Cat 5e twisted 6-conductor cable (shielded or unshielded)	
Accessories and Options	See Figure 2: Accessories and Options	
Agency Approval	CE Mark compliant to EMC and low voltage directives pending	
Dimensions	See Figure 3: Dimensions in mm	
Shipping Weight	0.6 kg (1.3 lb)	

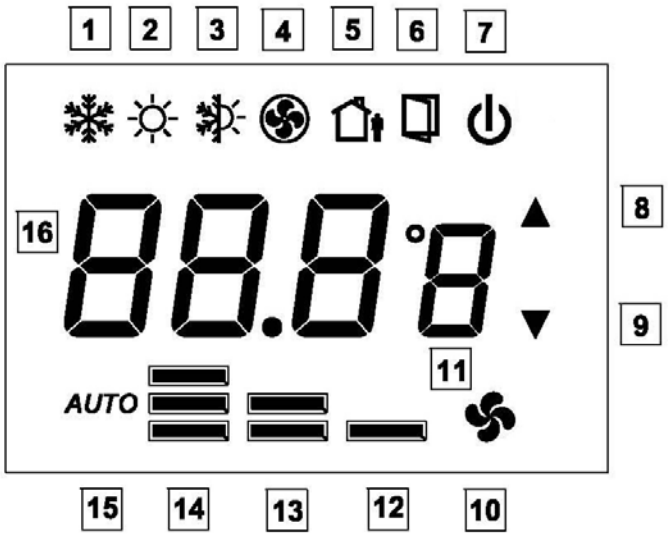
The performance specifications above are nominal and subject to tolerances and application variables of generally acceptable industry standards. The Manufacturer shall not be liable for damages resulting from misapplication or misuse of its products.

Figure 2: Optional Accessories and Functions

Description	Part No.
Remote Control Unit	RCU-1
Probe Temperature Sensor	TE10-1
Duct Temperature Sensor	TE10-2
With Remote Control Receiver Capability	TC4x-xxxR-x

Touch screen and LCD Layout





Display icons: 1, 2, 3, 4, 5, 6, 11, 12, 13, 14, 15 and 16
Operating icons: 7, 8, 9 and 10

1 Cooling mode
2 Heating mode
3 Auto cooling/heating mode
4 Fan only mode
5 Unoccupied mode
6 Window function enabled mode
7 System operation mode touch icon
8 Temperature set point value increase touch icon (+)
9 Temperature set point value decrease touch icon (-)
10 Fan speed control touch icon
11 ºC or ºF indication
12 Low fan speed indication
13 Medium fan speed indication
14 High fan speed indication
15 Auto fan speed mode
16 Temperature indication

Thermostat Errors Reporting

When the following errors are reported on the LED display unit, these errors will prevent the thermostat from normal operation and all thermostat functions will be locked out:

E-1 EEPROM read/write error
E-2* Temperature sensor open-circuited
E-3 Temperature sensor short-circuited

* If jumper JP1 is cut open and external sensor is used, E-2 means the external sensor may have been disconnected from Terminals SR1 and GND. Check the external sensor's connectivity and resistive value. If E-2 error is still reported, return the thermostat to the manufacturer for repair.

When the error E-1 or E-3 is reported or when the error E-2 is reported without jumper JP1 being cut and external sensor being installed, return the thermostat to the manufacturer for repair.

Trouble-Shooting

Before trouble-shooting starts, ensure that the voltage output from Terminals 1 (GND) and 2 (+5 Vdc) on the power supply unit is between 5 Vdc and 5.25 Vdc and not higher. Higher voltage may damage the internal circuitry and components of the display control unit.

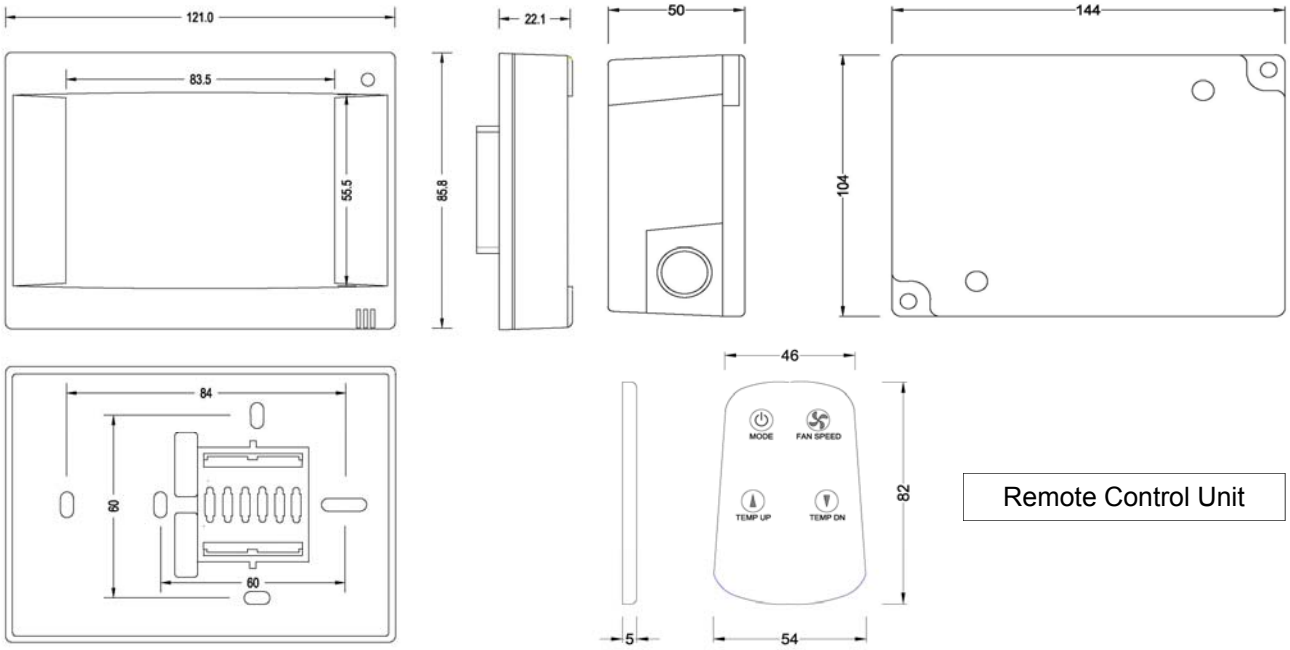
When abnormal power voltages are found, return the thermostat to the manufacturer for repair.

When there is no 5 Vdc power output, check the line voltage power and its 5 A fuse.

Figure 3: Dimensions in mm

Display Control Unit

Power Supply Unit



Remote Control Unit

Operation Notes

- LCD shows ambient temperature constantly except when set point adjustment is being made.
- Tap the system icon Φ to enter into the desired operating mode: Cool-Heat-Fan Only-Auto-Off, etc.
- Tap the fan icon ✱ to change the fan speed: High-Med-Low-Auto.
- Increase and decrease temperature set point by tapping adjustment operating icons ▲ and ▼ respectively. When the adjustment icon is tapped, the LCD shows the existing set point value.
- In unoccupied mode, the factory temperature set points are 26°C for cooling and 16°C for heating and the factory fan speed is always set at “low”.
- Unoccupied mode can be activated in the following manner when the unoccupied contact closes:
  For 2-pipe models with auto seasonal changeover, the unoccupied cooling or heating mode is determined by the status of the SR2 seasonal changeover sensor and the valve output is activated according to the measured temperature.
  For 2-pipe models with manual seasonal changeover, the unoccupied cooling or heating status is determined by the last status of the occupied mode and the valve output is controlled according to the measured temperature.
  For 4-pipe models, the unoccupied cooling or heating mode is always determined by the measured temperature and valve output is also activated according to the measured temperature.
  When unoccupied mode is activated, all keys are locked out and no setting values can be entered.
- When the window contact is closed, the window function enabled mode is activated and locks out all thermostat functions and displays the window icon on the LCD. This function has a higher priority than the unoccupied mode.
- The thermostat allows authorized service agent to change the following operating parameters in the field:

Function	Symbol	Description
MCU firmware (software) revision level	0	Appears after entering the setup menu
Choice of temperature engineering unit	1	1- 1 = ºC (factory setting) 1-2 = ºF
Choice to retain last entered settings on power resumption	2	20n = program on (factory setting) 20F = program off
Offset adjustment of temperature indication (field recalibration of measured temperature)	3	3 2 = temperature indication plus 2 degrees 3 1 = temperature indication plus 1 degree 3 0 = no offset (factory setting) 3- 1 = temperature indication minus 1 degree 3-2 = temperature indication minus 2 degrees
Adjustable proportional band for PI control	A	Selections of 1 to 10 A 1 = 1 K (1 R)…….A 5 = 5 K (5 R) = factory setting…….A 10 =10 K (10 R)
Choice of integral time for 3-wire floating models	b	To set integral time from 0 (0 min) to 30 (30 min) in numeric 1 (1 min) increment factory setting = 15 minutes. Setting = 0 means integral time being turned off.
Choice of valve stroke time for 3-wire floating models	C	Selection of 1 to 24 C 1 = 10 seconds……..C 18 = 180 seconds = factory setting……..C24 = 240 seconds
Deadband value adjustment for dual-output models only	d	To set auto cool/heat changeover deadband value from 1 to 5 K (1 to 5 R), factory setting 3 K (3 R)
Upper occupied set point limit setting	E	To set upper occupied set point limit, adjustable between current lower set point limit value and 35°C (factory setting 35°C). The program is set such that there is always a minimum separation of 4 degrees maintained between the upper occupied set point limit value and the lower set point limit value.
Lower occupied set point limit setting	F	To set lower occupied set point limit, adjustable between current upper set point limit value and 5°C (factory setting 5°C). The program is set such that there is always a minimum separation of 4 degrees maintained between the upper occupied set point limit value and the lower set point limit value.
Unoccupied cooling set point setting	G	To set unoccupied cooling set point, adjustable between current unoccupied heating set point value and 35°C (factory setting 26°C). The program is set such that there is always a minimum separation of 4 degrees maintained between the unoccupied cooling set point value and the unoccupied heating set point value.
Unoccupied heating set point setting	h	To set unoccupied heating set point, adjustable between current unoccupied cooling set point value and 5°C (factory setting 16°C). The program is set such that there is always a minimum separation of 4 degrees maintained between the unoccupied cooling set point value and the unoccupied heating set point value.
Choice of fan action in unoccupied mode	J	J- 1 = Low fan will run only when unoccupied set point calls for cooling or heating in unoccupied mode (factory setting). J-2 = Low fan always runs whenever thermostat is in unoccupied mode.
Choice of activation for unoccupied mode	L	L- 1 = Unoccupied mode can only be activated when thermostat is in operating mode (factory setting). When unoccupied contact closes with this setting, all thermostat functions will be locked out. L-2 = Unoccupied mode can be activated when thermostat is in either standby mode or operating mode
Choice of auto fan action in heating mode (operation of both control valve and fan is temperature-dependent)	P	P- 1 = No fan output when room temperature (Tr) is ≥ set point value (Ts). Low speed when - 2.0K ≤ Tr - Ts ≤ -0.5K Med speed when - 4.0K ≤ Tr - Ts ≤ -2.5K≥ High speed when Tr - Ts ≤ -4.5K P-2 (factory setting) = Low fan output when -2.0K ≤ Tr - Ts Med speed when - 4.0K ≤ Tr - Ts ≤ -2.5K High speed when Tr - Ts ≤ -4.5K
Choice of operating mode sequence for dual-output models only	r	r- 1 = to set operating mode in sequence of Cool-Heat-Auto-Fan Only-Off (factory setting) r-2 = to set operating mode in sequence of Auto-Off
Choice of “1” or “1M” model	t	t- 1 = to set operating mode in sequence of Off-Cool or Heat-Fan Only (factory setting for “1” model) t-2 = to set operating mode in sequence of Off-Cool-Heat-Fan Only (factory setting for “1M” model)
Choice of constant display of ambient temperature or temperature set point value	u	u- 1 = constant display of ambient temperature (factory setting) u-2 = constant display of set point value
Restoration of default factory settings	rS	rS 1 = Retain current settings (factory setting) rS2 = Restore default factory settings

Figure 5: Wiring Diagrams

The thermostats consist of two basic units: the Display Control Unit (DCU) and the Power Supply Unit (PSU). While all line-voltage wiring is terminated at the PSU, all connections between the DCU and PSU are of low-voltage signaling wires.

Wiring and Application Notes

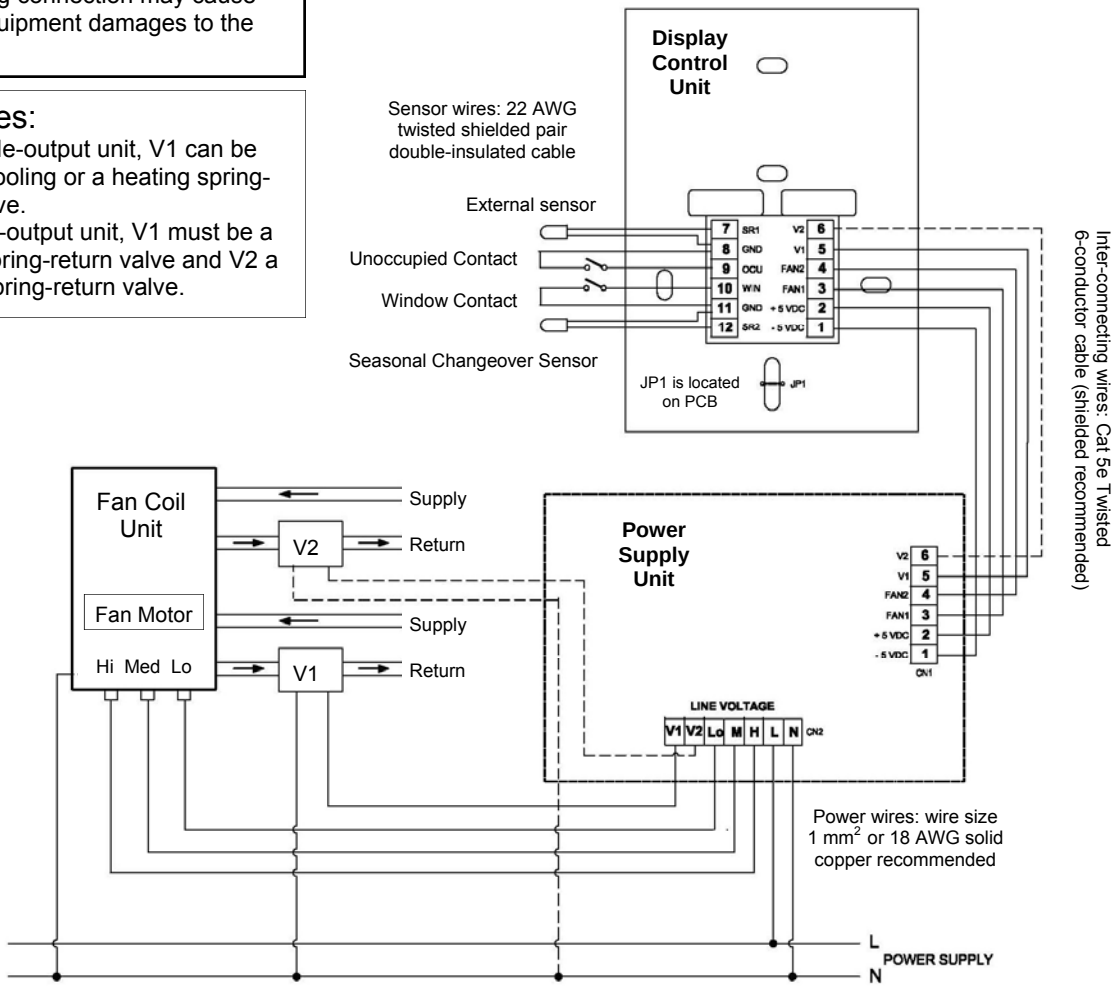
- Cut jumper JP1 open if external sensor is wired to SR1 and GND. Run the wiring away from any electrical motors or power wiring. Failure to do so may result in poor thermostat performance due to electrical noise.
- 22 or 24 AWG twisted shielded pair double-insulated cable is recommended as remote sensor wiring and its length must not exceed 25 m.
- Connecting wires between Display Control Unit and Power Supply Unit must not exceed 15 m.
- Do not bundle and run power wiring and remote sensor wiring in the same conduit.
- When an individual TE10-1 sensor is employed in each thermostat, the seasonal changeover sensor should be wrapped around the supply water pipe when associated with a water system. When the changeover sensor temperature exceeds 30ºC, the thermostat enters into heating mode.
- Seasonal changeover sensor or switch is applicable to cool only or heat only 2-pipe models only.
- Unoccupied contact closure activates unoccupied mode.
- Window contact closure activates thermostat lockout mode.
- Hidden-line wiring for Terminals V2 and 6 are applicable to dual-output models only.
- The thermostat outputs are designed for controlling zone valves. If used for controlling electric heaters, external contactors must be used.
- For a 3-wire on-off/floating thermostat set in cooling mode, Terminal V1 is wired to open valve on temperature rise and V2 to close valve on temperature drop. The action in heating mode is reversed. Use terminal N as the common for line voltage valve output and terminal COM as the common for 24 VAC valve output.

Wiring Diagram for Line-Voltage Fan and Line-Voltage On-Off Valve outputs

WARNING
Incorrect wiring connection may cause permanent equipment damages to the thermostat.

Piping Notes:

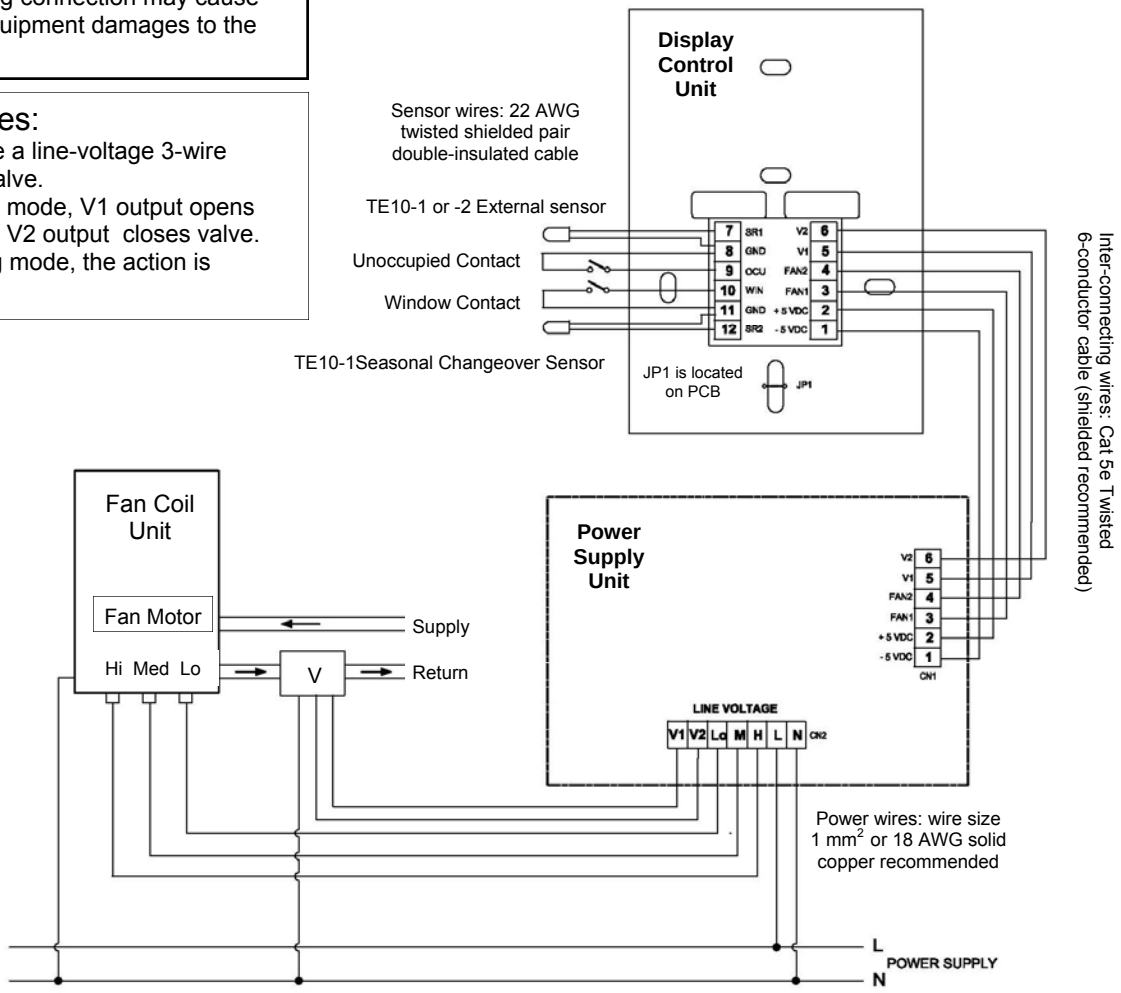
1. On a single-output unit, V1 can be either a cooling or a heating spring-return valve.
2. On a dual-output unit, V1 must be a cooling spring-return valve and V2 a heating spring-return valve.



Wiring Diagram for Line-Voltage Fan and Single Line-Voltage 3-Wire Floating Valve Output

WARNING
Incorrect wiring connection may cause permanent equipment damages to the thermostat.

Piping Notes:
1. V must be a line-voltage 3-wire floating valve.
2. In cooling mode, V1 output opens valve and V2 output closes valve.
3. In heating mode, the action is reversed.

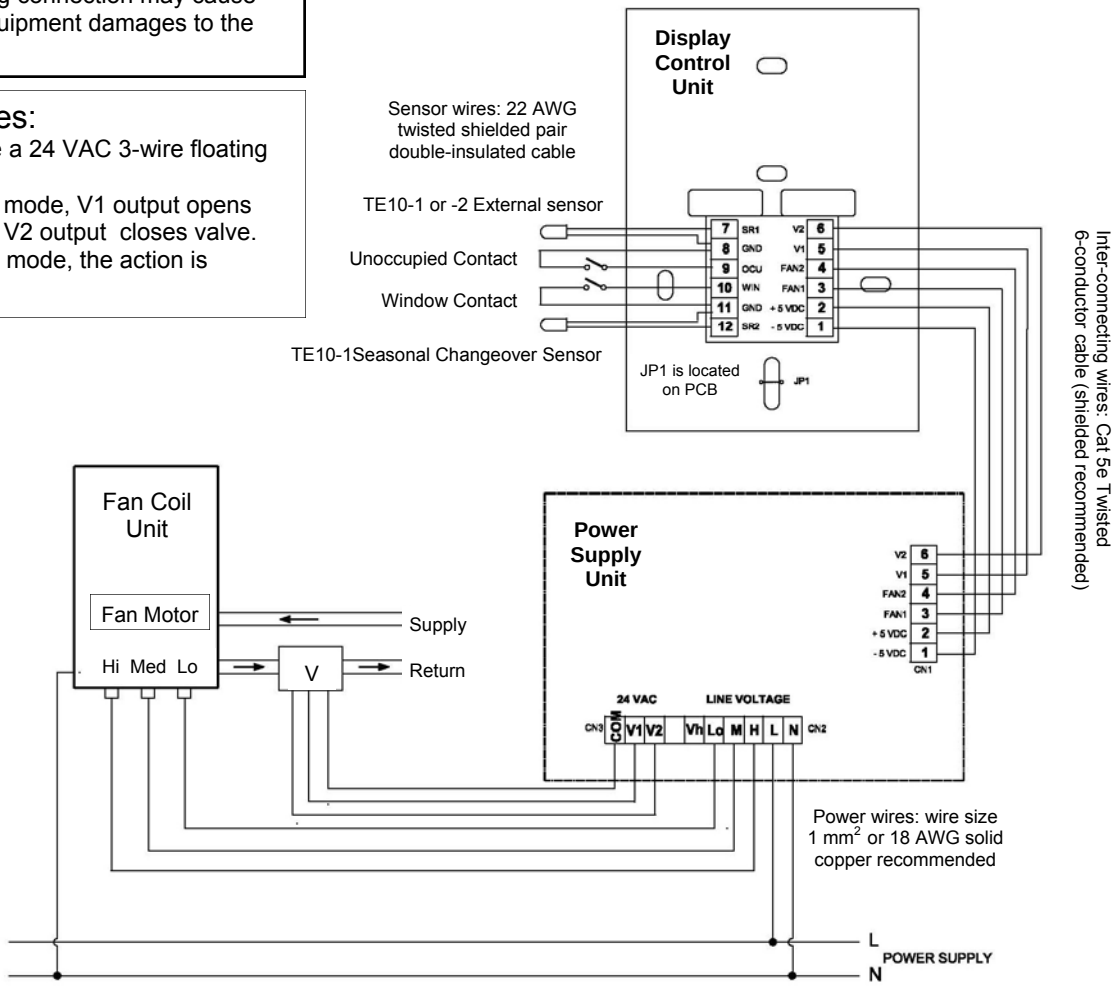


Wiring Diagram for Line-Voltage Fan and Single 24 VAC 3-Wire Floating Valve Output

WARNING
Incorrect wiring connection may cause permanent equipment damages to the thermostat.

Piping Notes:

1. V must be a 24 VAC 3-wire floating valve.
2. In cooling mode, V1 output opens valve and V2 output closes valve.
3. In heating mode, the action is reversed.

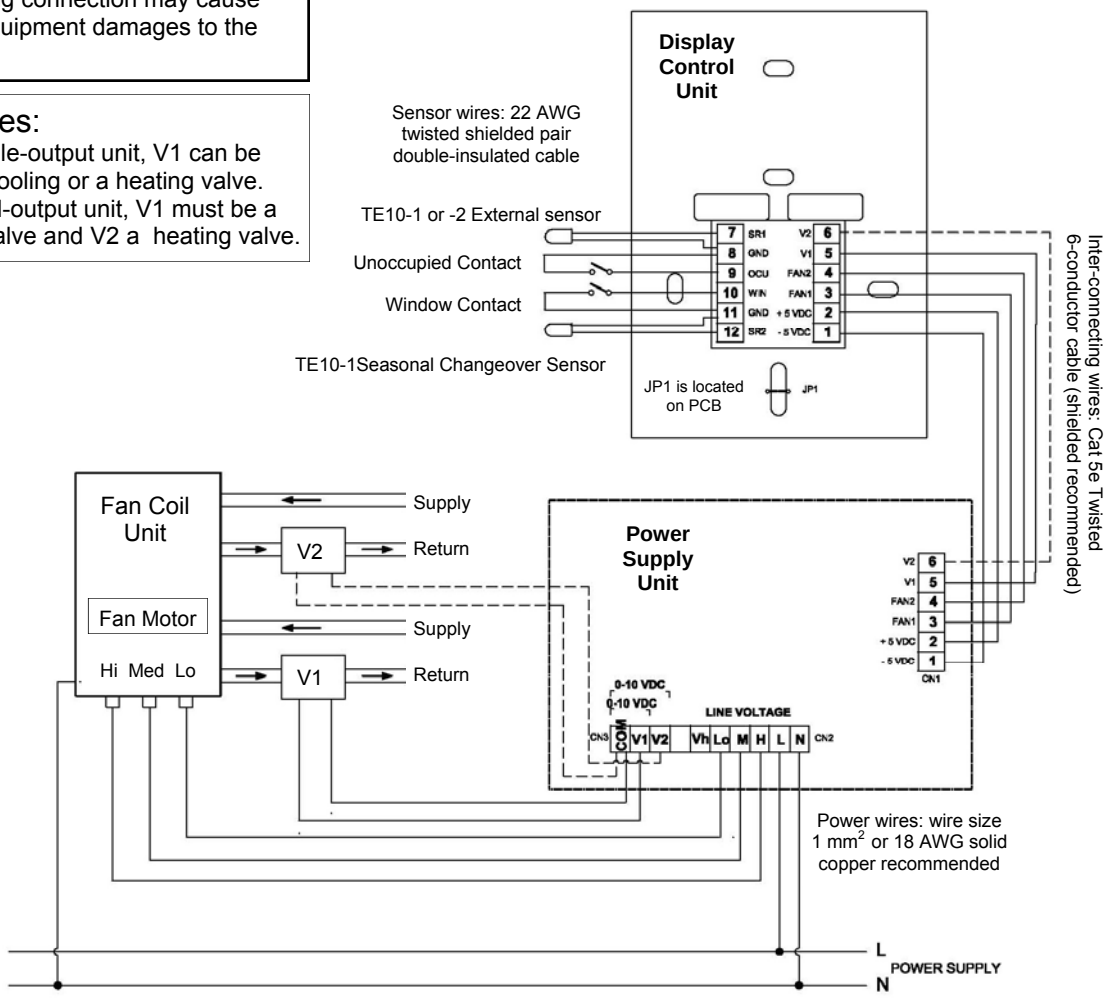


Wiring Diagram for Line-Voltage Fan and 0-10 VDC Valve Outputs

WARNING
Incorrect wiring connection may cause permanent equipment damages to the thermostat.

Piping Notes:

1. On a single-output unit, V1 can be either a cooling or a heating valve.
2. On a dual-output unit, V1 must be a cooling valve and V2 a heating valve.



Wiring Diagram for Line-Voltage Fan, 0-10 VDC Cooling Valve Output and Line-Voltage On-Off Heating Output

WARNING
Incorrect wiring connection may cause permanent equipment damages to the thermostat.

Piping Notes:
1. Vc must be a 0-10 VDC cooling valve.
2. H must be an electric contactor and connected to line-voltage terminals Vh and N.

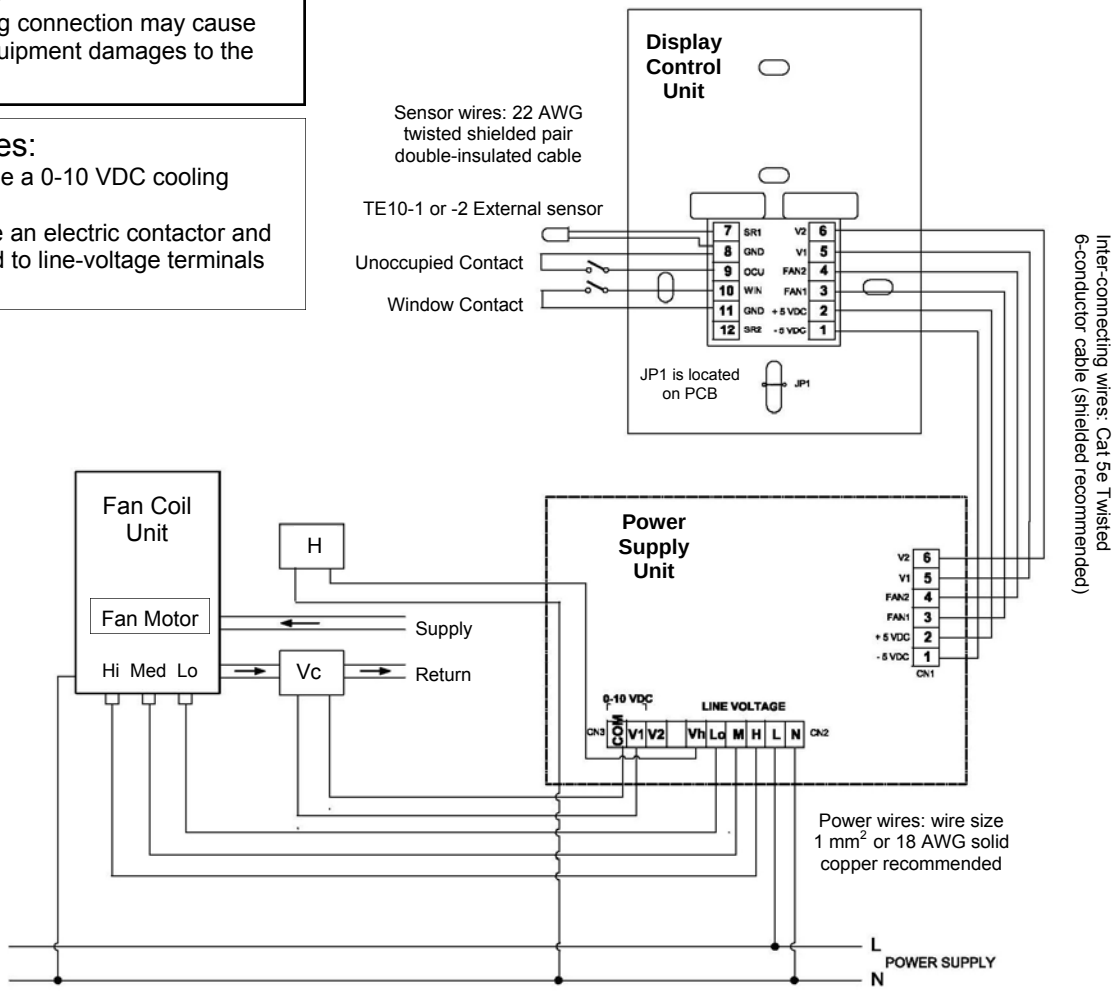


Figure 6: Cover Removal Procedure

1. Poke a thin-blade screw driver into the rift of the latch position between the cover and the base.
2. Slightly lever the screw driver upwards to crack open the cover from the base.
3. Hold the base firmly with one hand and remove the cover with another hand by pulling away from the base forcibly.

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