Thermostat (Make-Up Air)
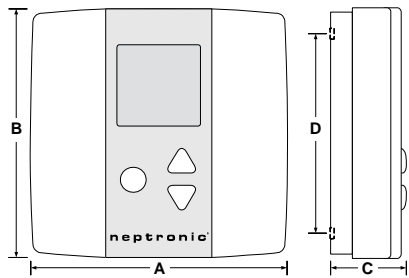## Specification & Installation Instructions

Thermostat for controlling an electric heater in a Make-Up Air unit.

Features:

- Selectable analog output
- Selectable Fahrenheit or Celsius scale
- Manual Night Set Back override
- Multi level lockable access menu
- Lockable Set point
- Selectable internal or external temperature sensor (10k Ω type 3)
- Selectable proportional control band
- Proportional-integral-derivative (PID) controller

TMA54-EXT1

Technical Data	TMA54-EXT1
Outputs	2 Analog Cooling outputs (0-10Vdc)
	2 Analog Heating outputs (0-10Vdc)
	0 or 22 Vdc, TPM, (Time proportional modulation) 250 mA max.
Power supply	22 to 26 Vac 50/60Hz
Power consumption	2 VA
Set point range	0ºC to +60ºC [32ºF to +140ºF]
Internal Temperature Sensor	Range: 0ºC to +50ºC [32ºF to +122ºF]
External Temperature Sensor	10k Ω type 3 | Range: -40ºC to +100ºC [-40ºF to +212ºF]
Control accuracy	Temperature: +/-0.2ºC [0.4ºF]
Proportional band	0.5 ºC to 20ºC [1 ºC to 40ºF] adjustable
Electrical connection	0.8 mm^2 [18 AWG] minimum
Operating temperature	0ºC to +50ºC [32ºF to +122ºF]
Storage temperature	-30ºC to +50ºC [-22ºF to +122ºF]
Relative Humidity	5 to 95 % non condensing
Degree of protection of housing	IP 30 to EN 60529
Weight	85 g. [0.2 lb]
Dimensions A = 3.00" | 78mm B = 3.00" | 78mm C = 1.00" | 24mm D = 2.36" | 60mm	

Presentation

Legend

	Cooling ON A: Automatic		Menu set-up Lock ON
	Heating ON A: Automatic		Programming mode
	Energy saving mode ON	**MIN MAX**	Minimum/Maximum set points
°C or °F	ºC: Celsius scale ºF: Fahrenheit scale		

Mounting Instructions

CAUTION: Risk of malfunction. Remove power prior to separate thermostat cover from its base.
A.   Remove the screw (captive) holding the base and the front cover of the thermostat.
B.   Lift the front cover of the thermostat to separate it from the base.
C.   Pull wire through the base hole.
D.   Secure the base to the wall using wall anchors and screws (supplied). Make the appropriate connections.
E.   Mount the control module on the base and secure using the screw.

Terminal Descriptions

Terminals	TMA54-EXT1
1	Common
2	24 Vac
3	Exterior temperature sensor
4	Night set back input*
5	Heating 1st ramp
6	Heating 2nd ramp†
7	Cooling 1st ramp
8	Cooling 2nd ramp
9	TPM (time proportional modulation)

* For a replacement in an existing night set back (NSB) loop with thermostat PTA, the NSB input, terminal #4, of the TMA should be isolated for a good performance.

† For controlling an electric heater with a modulating signal (0-10Vdc), use terminal 6 (Heating 2nd ramp)

Settings on PC Board

Mode Selection

Jumper (JP1) on RUN:
Thermostat is in **Operation mode**.
Thermostat must be set in this mode to operate properly.
If not locked, set point and control mode (Heating & Cooling ON, Cooling only ON or Heating only ON) may be modified by the end user.

Jumper (JP1) on PGM:
Thermostat is set in **Programming mode**.
Refer to the following section more details

Programming Mode

When in this mode this symbol 🔧 is displayed. Please press on ◯ button to advance to the next program function and press on Δ or

∇ to change value. You can exit programming mode at any time, changed values will be recorded.

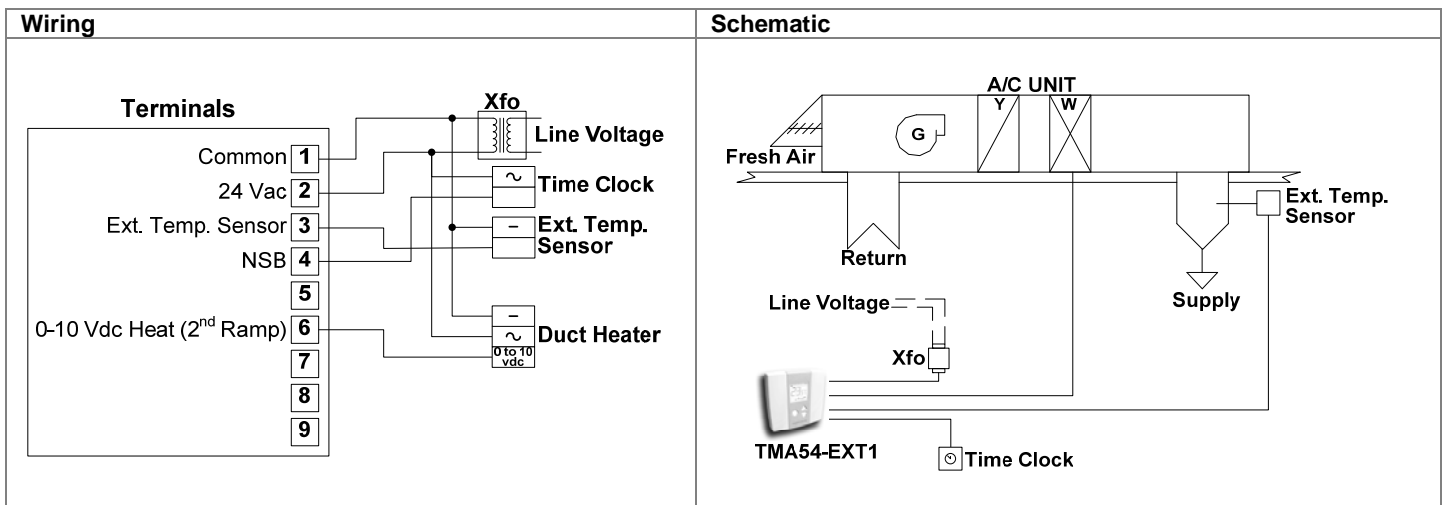| Step	Display	Description	Values
1	tS1	**Internal temperature sensor Calibration:** Display switches between "**tS1**" and temperature read by internal temperature sensor. You can adjust the calibration of the sensor by comparison with a known thermometer. For example if thermostat has been installed in an area where temperature is slightly different than the room typical temperature (thermostat place right under the air diffuser).	22.0°C — Range : 10 to 35ºC [50 to 95ºF] Increment:1ºC [1ºF] **NOTE: This thermostat has been calibrated at factory**
2A	LOc	**Locking the set point :** Display switches between "**LOc**" and "**Stp**". You can lock or unlock the set point adjustment by end user. If locked the lock symbol will appear. If you do not want to lock set point adjustment by end user, go directly to step #3.	Stp LOc Stp *Default value: Unlocked*

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Step	Display	Description	Values
2B		**Locking the set point (cont'd):** Select the desired locked set point temperature. **Note:** This value must respect the temperature range of the selected temperature sensor – either internal or external at step #11A (see Technical Data table on page 1). Once locked set point temperature is selected, please go directly to step #5	Set point range : 0 to 60ºC [32 to 140ºF] Increment: 1ºC [1ºF] *Default value: 22ºC [72ºF]*
3		**Minimum set point:** Display switches between "Stp" and the minimum set point temperature. **MIN** symbol is also displayed. Select the desired minimum set point temperature. *Note 1: The minimum value cannot be set higher than the maximum value set in step #4. **Note 2:** When adjusting this value, please consider the selected temperature sensor's range – either internal or external at step #11A (for range, see Technical Data table on page 1).*	Range for Minimum 0 to 60ºC [32 to 140ºF] Incrément1ºC [1ºF] *Default value: 0ºC [32ºF]*
4		**Maximum set point** Display switches between "Stp" and the maximum set point temperature. **MAX** symbol is also displayed. Select the desired maximum set point temperature. *Note 1: The maximum value cannot be set higher than the minimum value set in step #3. **Note 2:** When adjusting this value, please consider the selected temperature sensor's range. Set to either internal or external at step #11A (for range, see Technical Data table on page 1).*	Range for Maximum 0 to 60ºC [32 to 140ºF] Increment1ºC [1ºF] *Default value: 60ºC [140ºF]*
5A		**Locking the control mode:** Display switches between "LOc" and "CtL". You can lock or unlock selection of control mode by end user. If locked the lock symbol will appear. If you do not want to lock selection of control mode by end user, go directly to step #6.	*Default value: Unlocked*
5B		**Locking the control mode (cont'd):** Display switches between "CtL" and "Aut". Select which control mode you want to authorize: Automatic cooling and heating, OFF cooling and heating, heating only or cooling only.	*Default value: Automatic cooling and heating*
6		**Proportional band:** Display switches between "Pbd" and the value of the proportional band. Please select the desired value of proportional band.	Proportional band range : 0.5 to 20ºC [1.0 to 40ºF] Increment: 0.5ºC [1.0ºF] *Default value: 2.0ºC [4.0ºF]*
7		**Integral time:** Display switches between "Int" and the value of the integral time in seconds. Set the desired value for the integration factor compensation.	Range: 0 to 250 seconds Increment: 5 seconds *Default value: 0*
8		**Differential time:** Display switches between "dif" and the value of the differential time in seconds. Set the desired value for the differential time.	Range: 0 to 250 seconds Increment: 5 seconds *Default value: 0*
9		**Minimum position of 1st cooling ramp:** Display switches between "CL." and the value of the minimum position of the 1st cooling ramp. **MIN** and cooling symbols are also displayed. Please select the desired value of the minimum position of the 1st cooling ramp.	Range: 0.0 to 5.0 Volt. Increment: 0.2 Volt. *Default value: 0.0 Volt*
10		**Minimum position of 1st heating ramp:** Display switches between "ht." and the value of the minimum position of the 1st heating ramp. **MIN** and heating symbols are also displayed. Select the desired value of the minimum position of the 1st heating ramp.	Range: 0.0 to 5.0 Volt. Increment: 0.2 Volt. *Default value: 0.0 Volt*
11A		**Internal/external temperature sensor selection:** Display switches between "tS" and "in" or "out". Please select internal or external sensor. If you select internal temperature sensor, go directly to step #12.	*Default value: Out (External temperature sensor)*
11B		**External temperature sensor Calibration:** Display switches between "tS2" and the temperature read by the external temperature sensor (if connected). You can adjust the calibration of the external sensor by comparison with a known thermometer.	Range: -40 to 100ºC [-40 to 212ºF] Increment:1ºC [1ºF] -40ºC [-40ºF]: resistance = infinite. 100ºC [212ºF]: resistance = short circuited (alarm [!] is displayed).
12		**Night set back derogation time :** Display switches between "nSb" and the derogation time in minute. **MIN** and NSB ☽ symbol is also displayed. Please select the desired derogation time, if no derogation time is desired select "OFF".	Range: OFF or 30 to 180min. Increment: 15min. *Default value: 120 min.*
13		**Cooling Set point during Night set back:** Display switches between "Stp" and the value of the cooling set point temperature during night set back. NSB ☽ and cooling symbols are also displayed. Select the cooling set point temperature during night set back.	Range: 22 to 35ºC [72 to 95ºF] Increment: 1ºC [1ºF] *Default value: 28ºC [83ºF]*
14		**Heating Set point during Night set back:** Display switches between "Stp" and the value of the heating set point temperature during night set back. NSB ☽ and heating symbols are also displayed. Please select the heating set point temperature during night set back.	Range: 10 to 22ºC [50 to 72ºF] Increment: 1ºC [1ºF] *Default value: 16ºC [61ºF]*

Operation Mode

Step	Description	Display
1	At powering up, thermostat will light display and activate all LCD segments during 2 seconds. **Illuminating the LCD.** To illuminate the LCD, you just have to push onto any of the 3 buttons. LCD will light for 8 seconds. **Temperature display** In operation mode, thermostat will automatically display temperature read. To change the scale between ºC and ºF, press on both Δ and ∇ for 3 seconds.	*23.7°C*
2	<u>Set point display and adjustment</u> To display the set point, press twice on the Δ or ∇ button. Set point is displayed for 5 seconds. To adjust set point, press on Δ or ∇ while the temperature set point is displayed. **Note:** This value must respect the temperature range of the selected temperature sensor. Set to internal or external at step #11A (for range, see Technical Data table on page 1). *Note: If set point adjustment has been locked, 🔒 symbol will be displayed.*	*22.°C 22.°C*
3	<u>Night set back (NSB) :</u> When thermostat is in night set back mode, NSB symbol ☽ is displayed, so set point for cooling and/or heating are increased as per the setting made in programming mode. If not locked, night set back can be derogated for a predetermined period by pressing onto any of the 3 buttons. During period of NSB derogation the ☽ symbol will flash. If NSB does not flash, the derogation period is finished or the Night set back derogation has been locked in programming mode.	*23.7°C*
4	<u>Control mode selection :</u> To verify which control mode is set, press once onto the ○ button. Control mode will be displayed during 5 seconds. To change of control mode, press on Δ or ∇ while control mode is displayed. You can choose one of the following: ✓ Automatic Cooling or Heating ✓ Cooling and Heating OFF ✓ Cooling only ✓ Heating only *Note: If control mode selection has been locked, 🔒 symbol will be displayed.*	*Aut OFF* *on on*

Typical Application

Thermostat for controlling an electric heater in a Make-Up Air unit.

Wiring	Schematic
Terminals Xfo Common **1** — Line Voltage 24 Vac **2** — Time Clock Ext. Temp. Sensor **3** — Ext. Temp. Sensor NSB **4** **5** 0–10 Vdc Heat (2nd Ramp) **6** — Duct Heater (0 to 10 vdc) **7** **8** **9**	A/C UNIT Y W Fresh Air G Return Line Voltage Xfo TMA54-EXT1 Time Clock Ext. Temp. Sensor Supply

Recycling at end of life

At end of life, please return the thermostat to your Neptronic local distributor for recycling. If you need to find the nearest Neptronic authorized distributor, please consult **www.neptronic.com**.

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