Date: 3 July, 2020

Subject: Product Info: Touch thermostat (TM-020057)

Overview:

➢ T&J touch thermostat is designed for HVAC system with a Fan Coil Unit (FCU) which is a device consisting of a heating and / or cooling heat exchanger or 'coil' and fan.

➢ Touch thermostat is optimised for hotel, residential, and commercial applications.

➢ LCD display modes include air-conditional operating mode, fan speed, power on / off, and display room / pre-set temperature.
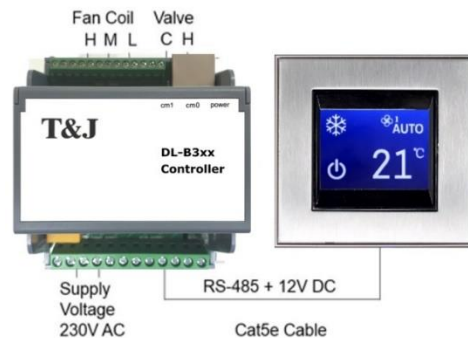

Front view of touch thermostat

Features:

➢ LCD display with touch-screen control

➢ Cooling and heating control

➢ 3-step fan speed control

➢ To pre-set temperature with temperature compensation

➢ RS-485 Modbus communication for remote configuration, control and monitoring.

➢ Non-volatile memory retains the last user settings when power loss.

➢ Two different version of thermostat:

i. Integral-type thermostat (TD):
  - High-voltage thermostat with LCD display and driver board.
  - LCD display and driver board are bundled as a complete product.

ii. Split-type thermostat (TD7):
  - Low-voltage thermostat with only LCD display.
  - LCD display and driver board are split into two separate products.

* Note: TD0 – 240V AC
         TD7 – 12V~24V DC

TM-020057.5

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Date: 3 July, 2020

Subject: Product Info: Touch thermostat (TM-020057)

Technical Data:

- **LCD display**

  - Screen size: 2.3 inch
  - Resolution: 320 * 240 pixel
  - Color depth: 16-bit (65,536 color)
  - Capacitive type touch screen
  - Built-in back-light
  - Standard background color: Navy blue

- **Temperature control**

  - Temperature units: Celsius or Fahrenheit
  - Room temperature display range: 0°C to 37°C (32°F to 99°F)
  - Pre-set temperature range: 16°C to 35°C in 1°C step (61°F to 95°F in 1°F step)
  - Temperature compensation: -8°C to +8°C (-14°F to +14°F)
  - Type of built-in thermistor: NTC
  - Control precision: +/- 1°C
  - Temperature control hysteresis: 1°C

Air-Con Mode	Cooling / Heating Valve	Fan speed run in "AUTO" mode
Cooling Mode		
Heating Mode		

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Date: 3 July, 2020

Subject: **Product Info: Touch thermostat (TM-020057)**

Electrical:

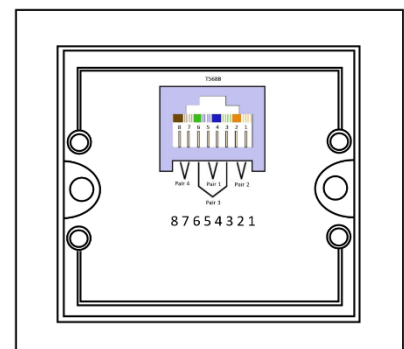- **Integral-type thermostat (TD)**

  - Power supply: 230V AC
  - Power dissipation: < 1.2W
  - Terminal:
    - i.   Screw type: M2.5 Steel zinc plated
    - ii. Terminal size: 2.5mm^2
  - Cable size and type: 0.5mm^2 – 2mm^2
  - Cooling valve relay and heating valve relay (SPST-NO).
  - Fan speed relay: Low, Mid, High
  - Relay rating:

Rated current	Voltage
3A	250V AC
3A	24V AC
3A	24V DC
3A	12V DC

- **Split-type thermostat (TD7)**

  - Power supply: 12V DC ~ 24V DC
  - Power dissipation: < 500mW
  - Two types of terminals:
    - i.   RJ45 jack (T568B-type termination)
    - ii. Screw-type removable connector
  - Cable type: Straight Cat5/6 cable
  - Cable length: < 10 m
  - RJ45 Jack pin assignments:

Pin #	Description
1	0V (GND for RS485)
2	RS485 D-
3	RS485 D+
4	Cooling valve signal
5	Low fan speed signal
6	Mid fan speed signal
7	High fan speed signal
8	+12V DC / +24V DC (Power supply)

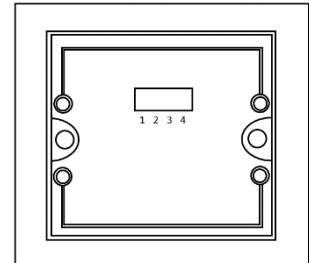TM-020057.5

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Date: 3 July, 2020

Subject: **Product Info: Touch thermostat (TM-020057)**

> Screw-type terminal pin assignments:

Pin #	Description
1	RS485 D+
2	RS485 D-
3	+12V DC / +24V DC (Power supply)
4	0V (GND for RS485)

Mechanical:
➢ Operating Temperature: -5°C to 40°C
➢ Dimensions: 86 x 86 mm
➢ Depth: ~34mm (high-voltage thermostat), ~24mm (low-voltage thermostat)
➢ Fix Center: 60.3 mm
➢ Materials for the front plastic: high grade polycarbonate
➢ Materials for housing: high grade polycarbonate

RS-485 channel:
➢ 2-wire RS-485 communication port.
➢ Supported function code 0x03, 0x06 and 0x10 of Modbus RTU protocol.
➢ Port settings can be configured by means of RS-485 communication.
  • Baud rate: 2400, 4800, 9600, 19200, 38400, and 115200 bps.
  • Parity bit: none, odd, and even parity.
  • Stop bit: 1 stop bit and 2 stop bits.
➢ Default settings: 9600bps, none parity and 2 stop bits.
➢ Default Modbus station no. is # 3.
  • **Integral-type thermostat (TD)**
    ➢ Two available options:
      1. With RS-485 port – Enable communication port.
      2. With keycard input – Disable communication port and replace it with a digital 'keycard' input.
  • **Split-type thermostat (TD7)**
    ➢ Allow RS-485 port to communicate with designed DL-B3xx controllers (driver board) which are generally classified into three types of controllers:
      1. DL-B31x – A customised controller for particular project and to control or to interface with FCU or room control unit (RCU) via RS-485 communication channel.
      2. DL-B32C – A general controller to control digital-type FCU.
      3. DL-B33C – A general controller to control modulating-type FCU.

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Configurable Controls:

To configure various settings and to control thermostat by means of RS-485 communication.

- ➢ To enable / disable touch-screen keys which include:
    - i.   Power key – To ON / OFF thermostat
    - ii. Fan-speed key – To adjust fan speed
    - iii. Air-Con mode key – To adjust air-con operating mode
    - iv. Temperature key – To enter pre-set temperature adjustment page

  note: Once a key is disabled, user cannot change the related function.

- ➢ To change the pre-set temperature.
- ➢ To change the temperature compensation.
- ➢ To show / hide the following controls:
    - i.   Power control
    - ii. Air-con mode control (Cooling, Fan, Heating, Dry)
    - iii. Fan-speed control (Low, Mid, High, Auto, Off)
    - iv. Fan-speed numeric indicator

  For example, the default of Fan-speed OFF is hide and invisible, user can only select Low, Mid, High, and Auto fan-speed.

Remark on operations:

- ➢ Back-light of LCD screen:
  Back-light shall be turned OFF after 1 minute of inactivity. When user touches on the screen, back-light shall be switched to ON.
- ➢ Power-Off thermostat:
  When thermostat is power-off, all heating valve, cooling valve, fan-speed relays are all in OPEN condition. But RS-485 communication port is still in operation, thermostat can be remote-controlled and monitored.

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Subject: **Product Info: Touch thermostat (TM-020057)**

Available Product Code:

- **Integral-type thermostat (TD)**

Series	with RS-485 option	with keycard input option
Ultimate II	G2-TD00A	G2-TD00/S488
Titanium	GC2-TD00A	GC2-TD00/S488
Minimalist	EB2-TD00A	EB2-TD00/S488
Radiance	K2-TD00A	K2-TD00/S488
Lavina 95	JC2-TD00A	JC2-TD00/S488
Glare	V2-TD00A	V2-TD00/S488

- **Split-type thermostat (TD7)**

Series	Cooling & Fan Mode	Cooling & Fan & Heating Mode
Ultimate II	G2-TD70A	G2-TD72A
Titanium	GC2-TD70A	GC2-TD72A
Minimalist	EB2-TD70A	EB2-TD72A
Radiance	K2-TD70A	K2-TD72A
Glare	V2-TD70A	V2-TD72A
Lavina 95	JC2-TD70A	JC2-TD72A

Note: If isolated RS-485 is needed, please replace A with MT.
- G2-TD70A (non-isolated RS-485, RJ45 jack terminal).
- G2-TD70MT (isolated RS-485, screw-type terminal).

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Subject: **Product Info: Touch thermostat (TM-020057)**

Wiring Diagrams:

(A)   Integral-type thermostat with RS-485 option

(B)   Integral-type thermostat with keycard input option

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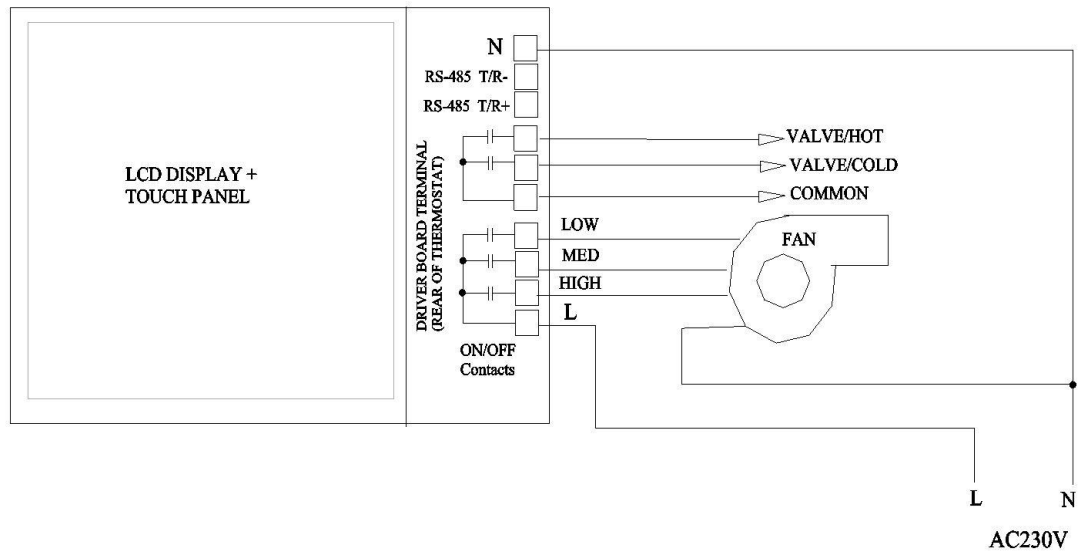
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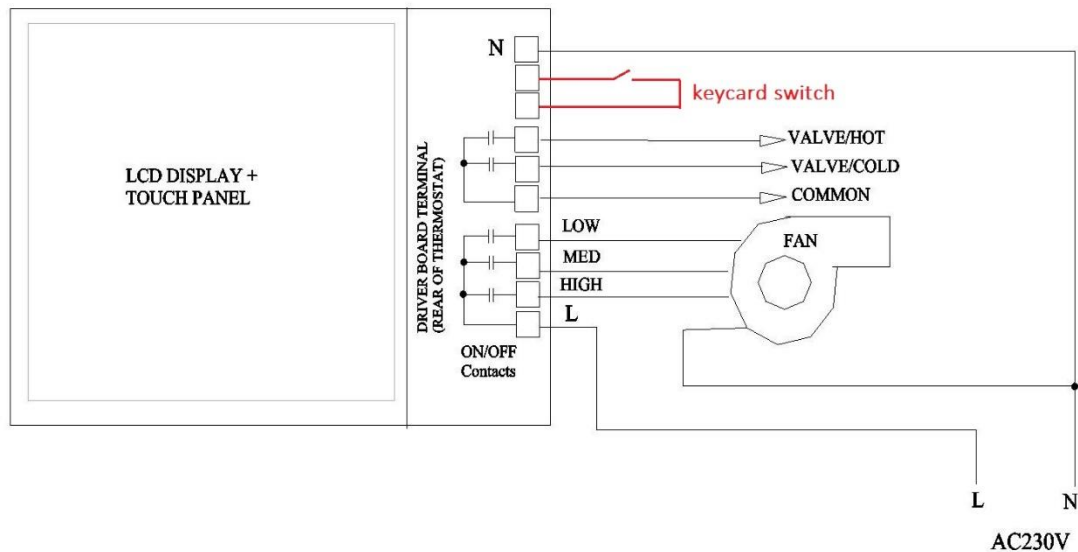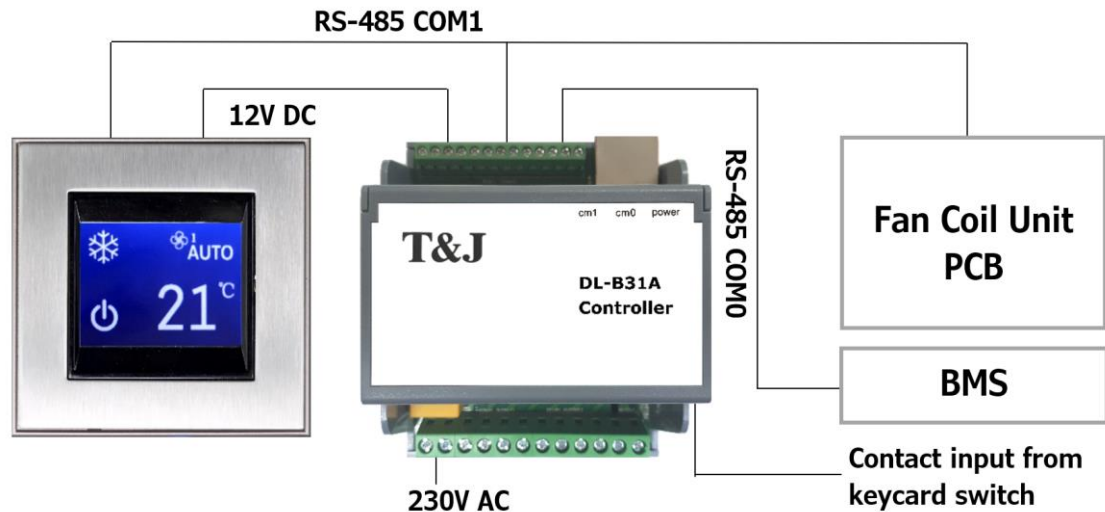Telephone: +65 6547-4333   Fax: +65 6547-4666

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(C)   Split-type thermostat with DL-B31A controller

(D)   Split-type thermostat with DL-B32C controller

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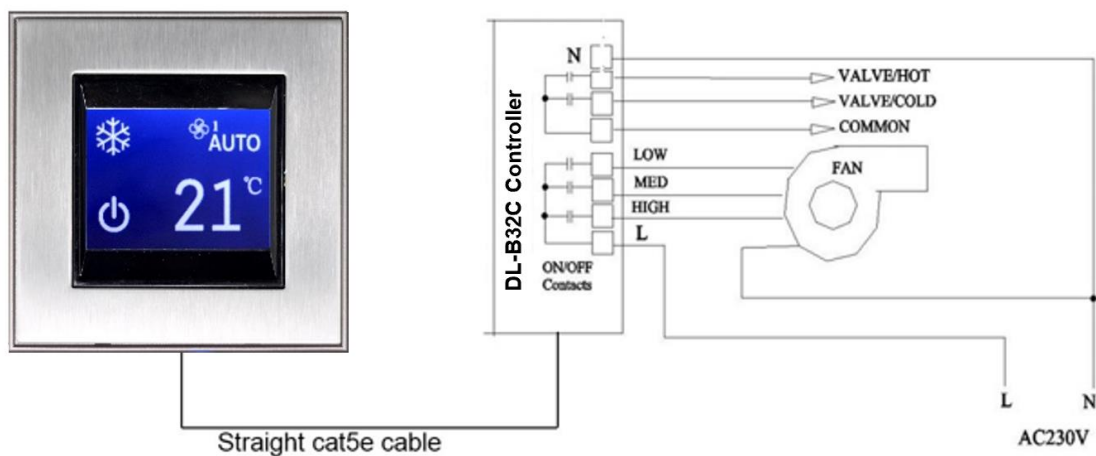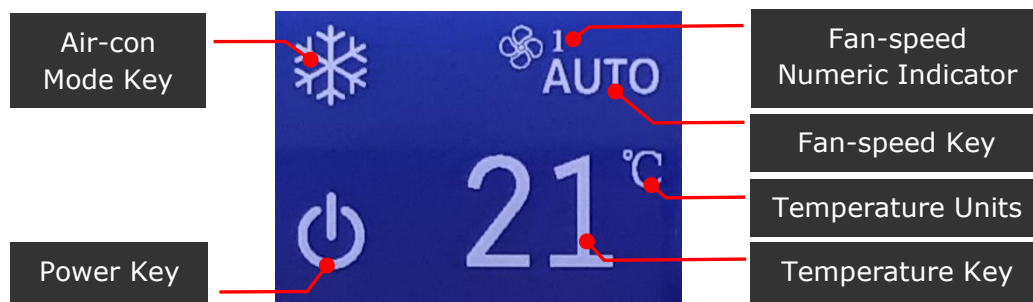Telephone: +65 6547-4333   Fax: +65 6547-4666

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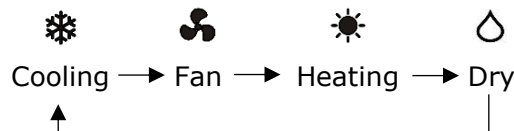
Subject: Product Info: Touch thermostat (TM-020057)

Operation Manual:

(A)   Homepage

Default settings：cooling mode、auto-speed, pre-set temperature at 27°C, display room temperature, and visible fan-speed numeric indicator when in Auto-speed.

1. Air-Con Mode Key: Press and release to switch modes in the following sequence.

$$❄ \to ♣ \to ☀ \to ◊$$
$$Cooling \to Fan \to Heating \to Dry$$

2. Fan-speed Key: Press and release to select fan speed in the following sequence.

$$Low \to Mid \to High \to Auto \to Off$$

   Note: (i) Auto-speed is only available in Cooling mode and Heating mode.
   (ii) Off-speed is hide and invisible by default.

3. Power Key: Press and release ⏻ to power off thermostat.
   ➢ If thermostat is ON, it will prompt a pop-up window to confirm to power OFF.
   ➢ If thermostat is OFF, it will prompt a pop-up window to confirm to power ON.
   ➢ If no selection is made after 2 second timeout, it will discard the current action.
4. Temperature Key: Display room temperature or display pre-set temperature.
   ➢ Short press and release to enter the pre-set temperature adjustment page.
   ➢ Long press about 2 seconds for switching temperature display between room temperature and pre-set temperature. It will return to the original temperature display in 2 seconds timeout.
5. Fan-speed Numeric Indicator: To show actual fan running status when in Auto-speed.
6. Temperature Units: To display temperature in Celsius (^{o}C) or Fahrenheit (^{o}F).

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Subject: **Product Info: Touch thermostat (TM-020057)**

(B)   Pre-set Temperature Adjustment Page

Press & hold at the upper left corner to enter settings page.

- ➢ Press ▲ / ▼ arrow to increase / decrease the pre-set temperature.
- ➢ Press 🏠 to exit and return to homepage.
- ➢ Press and hold for 1 second at the upper left corner, it will enter the settings page.
- ➢ Return to homepage after 1 minute of inactivity.

(C)   Settings Page

Five parameters are available to be selected in this settings page:

1. "Display Temp"   : To set the display format for temperature.
2. "Compensation"   : To set the temperature compensation.
3. "Addr Setting"   : To set the station ID of device.
4. "About"   : To display the information of device.
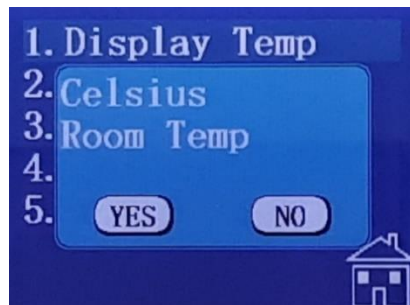5. "Resetting"   : To reset the device to factory default.

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Subject: Product Info: Touch thermostat (TM-020057)

1. "Display Temp" Pop-up Menu

Pop-up menu appears by pressing **"Display Temp"**.
Press **"YES"** to confirm the settings.
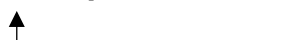Press **"NO"** to cancel and exit.

1. Current temperature scale to be displayed in the screen. Press "Celsius" to select temperature scale in following sequence:

$$\textbf{"Celsius"} \longrightarrow \textbf{"Fahrenheit"}$$

   1.1. "Celsius" – To show temperature in Celsius(^{o}C).
   1.2. "Fahrenheit" – To show temperature in Fahrenheit (^{o}F).
2. Current display for temperature in homepage is room temperature. Press " Room Temp" to select temperature display in following sequence:

$$\textbf{"Room Temp"} \longrightarrow \textbf{"Set Temp"}$$

   2.1. "Room Temp" – To display room temperature.
   2.2. "Set Temp" – To display pre-set temperature.
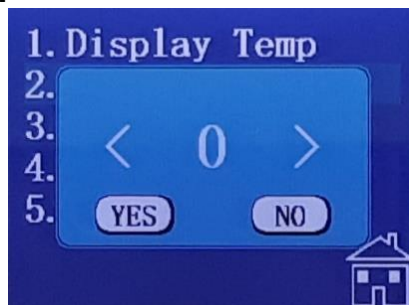
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2. "Compensation" Pop-up Menu

Pop-up menu appears by pressing **"Compensation"**.
Press **"YES"** to confirm the settings.
Press **"NO"** to cancel and exit.

Press **"<"** and **">"** to adjust the value of compensation.
- **">"** – Increase the value by 1.
- **"<"** – Decrease the value by 1.

The touch thermostat has built-in NTC thermister to measure the current room temperature. If the touch thermostat has been installed on some distant location, the temperature shown might not be the same as the one in the other location within the guest room, e.g. the temperature at the sofa area in the guest room, might be different from the thermostat.

The hotel's technician can select a value between -8°C to +8°C in compensation menu to reflect the difference between temperature in sofa area and touch thermostat.

For example: If we set the compensation value to -3°C and the measured temperature is 17°C, the touch thermostat shall display 14°C in the homepage of screen if "Room Temp" has been selected. The touch thermostat shall turn "Cold-valve/Hot-valve" on or off by comparing the difference between pre-set temperature and 14°C which value is after compensation.

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3. "Addr Setting" Pop-up Menu

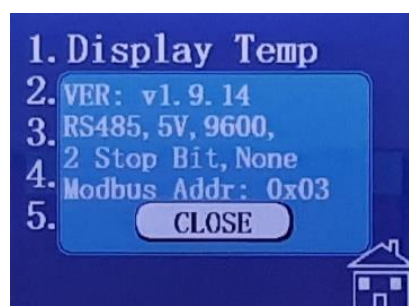Pop-up menu appears by pressing **"Addr Setting"**.
Press **"YES"** to confirm the settings.
Press **"NO"** to cancel and exit.
Press **"<"** and **">"** to adjust the station ID of device.
- **">"** – Increase the value by 1.
- **"<"** – Decrease the value by 1.

4. "About" Pop-up Menu

Pop-up menu appears by pressing **"About"**.
Press **"CLOSE"** to exit.
The page will display about the product informations likes firmware version, RS-485 channel settings and device station ID.
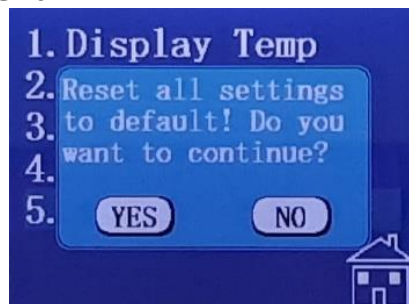
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5. "Resetting" Pop-up Menu

Pop-up menu appears by pressing **"Resetting"**.
Press **"YES"** to reset all the settings to factory default.
Press **"NO"** to cancel and exit.

(D)   Error Code Pop-up Window

Press **"ALERT"** to exit the window or it will disappear automatically in 2 seconds timeout.
Thermostat will display the error messages when receiving Modbus command (Write holding register @ address 0x130) from controller. Sending "0xFFFF" for no error message to display.

There is a built-in watch dog timer for split-type thermostat and its B3xx controller. When communication failure happens between thermostat and controller, thermostat will display "E1" if no receiving any commands within 15 seconds. Watch dog timer is disabled for integral-type thermostat.
These error codes are shown in a string format (Two ASCII codes):
1. "E1" – Communication failure between touch thermostat and controller.
2. "E2" – Communication failure between 1st FCU and controller.
3. "E3" – Communication failure between 2nd FCU and controller.
4. "DO" – Air-con off when window or sliding door opens.
The rest of error codes are shown in two characters format.

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DL-B32C Digital Controller

Overview:

➢ T&J DL-B32C controller is designed to control standard digital-type FCU with digital on / off valve and 3-step fan motor.

Top view of B32C controller

Features:

➢ DIN-rail mounting module
➢ Power supply 230V AC
➢ Built-in 12V DC (max. 2A) to supply power for low-voltage thermostat
➢ Built-in real time clock
➢ Cooling valve: 1 relay (SPST-NO)
➢ Heating valve: 1 relay (SPST-NO)
➢ Fan speed: 3 relays (SPST-NO)
➢ Relay rating:

Rated current	Voltage
3A	250V AC
3A	24V AC
3A	24V DC
3A	12V DC

➢ Two RS-485 ports:

Port	Functions
COM0	Download configuration, real time control and monitoring. Connect to Building Management System (BMS).
COM1	Provide a RJ45 jack to connect with low-voltage thermostat using straight Cat5/6 cable.

➢ Four digital inputs: Keycard input, check-in input, window input, and spare input.

Features	Data	Additional info
Input voltage	3.3 ~ 24V DC	
Input current (min)	1.5mA	
Load type	input current sinking	
Logic level	activate (logic 1)	> 3.0V
	de-activate (logic 0)	< 0.5V
Isolation	yes	Digital input's power (+V DC and GND) are isolated from controller's power. These inputs can have independent power supply.

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Wiring diagram:

DL-B32C Wiring Diagram

Note: (1) NC – No Connection
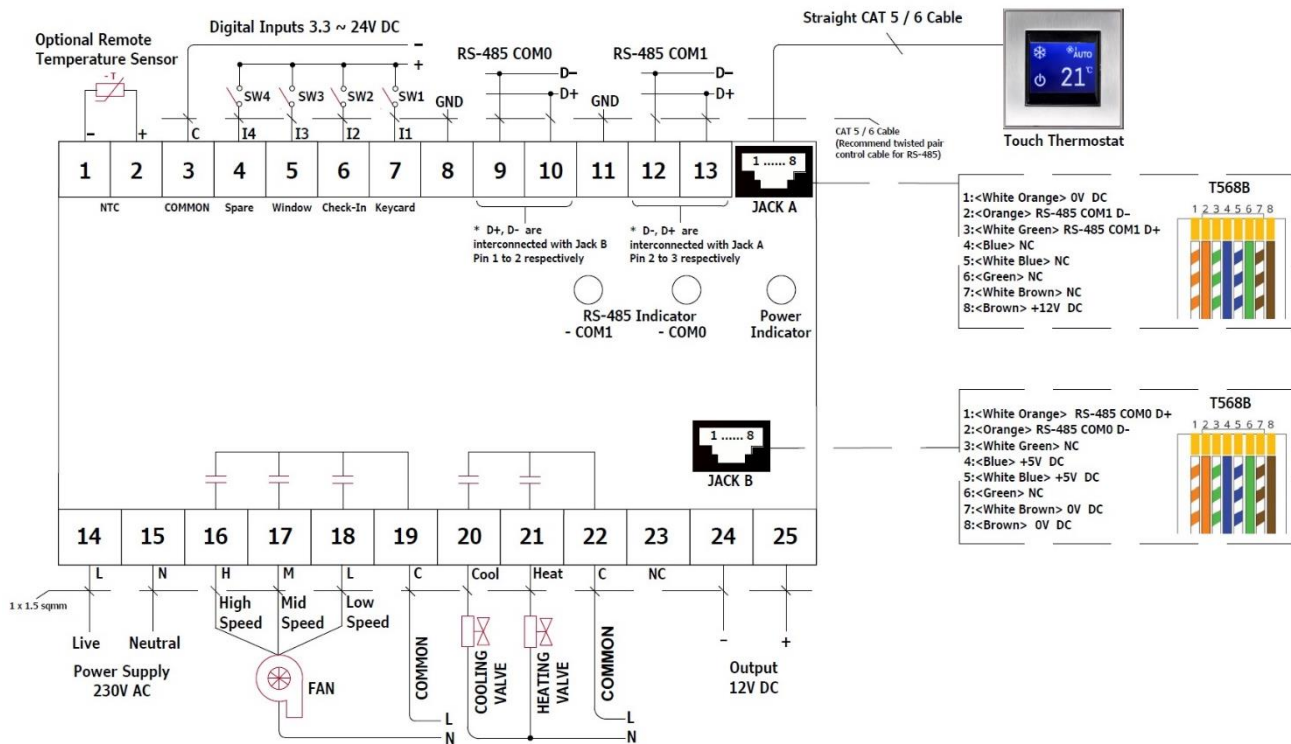(2) –||– Single-Pole Single-Throw Relay, Normally-Open (SPST-NO)

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Subject: Product Info: Touch thermostat (TM-020057)

DL-B33C Modulating Controller

Overview:
➢ T&J DL-B33C controller is designed to control standard modulating type FCU with 0~10V modulating valve and 3-step fan motor.

Features:
➢ DIN-rail mounting module
➢ Power supply 230V AC
➢ Built-in 12V DC (max. 2A) to supply power for low-voltage thermostat
➢ Built-in real time clock
➢ Cooling value output: 0 ~ 10V
➢ Proportional–integral–derivative (PID) control
➢ Fan speed: 3 relays (SPST-NO)
➢ Relay rating:

Rated current	Voltage
3A	250V AC
3A	24V AC
3A	24V DC
3A	12V DC

Top view of B33C controller

➢ Two RS-485 ports:

Port	Functions
COM0	Download configuration, real time control and monitoring. Connect to Building Management System (BMS).
COM1	Provide a RJ45 jack to connect with low-voltage thermostat using straight Cat5/6 cable.

➢ Four digital inputs: Keycard input, check-in input, window input, and spare input.

Features	Data	Additional info
Input voltage	3.3 ~ 24V DC	
Input current (min)	1.5mA	
Load type	input current sinking	
Logic level	activate (logic 1)	> 3.0V
	de-activate (logic 0)	< 0.5V
Isolation	yes	Digital input's power (+V DC and GND) are isolated from controller's power. These inputs can have independent power supply.

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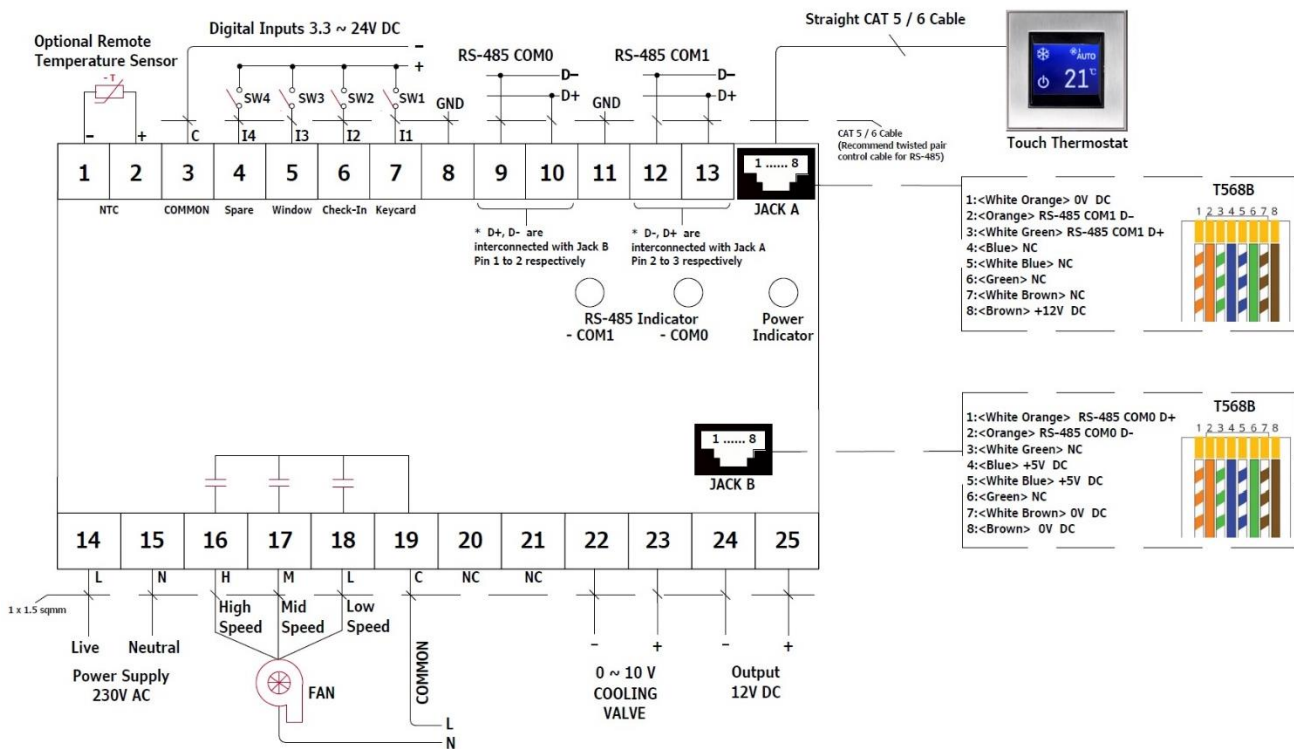
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Wiring diagram:

DL-B33C Wiring Diagram

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Subject: Product Info: Touch thermostat (TM-020057)

B3x Functions and Operation Modes:

All B3x controllers, who support B3x operation mode, will have these features.

Hardware features	Functions
Real-time clock	➢ To trigger the night mode when pre-configured timing is time out.
Keycard input	➢ To receive an input signal when guest has inserted the hotel card into keycard switch. ➢ Besides physical input point, a MODBUS command can activate this point. ➢ When MODBUS command is activated, the status of physical input point will be ignored.
Check-in input	➢ To receive an input signal from Room Control Unit when guests have been checked-in in lobby. ➢ Besides physical input point, a MODBUS command can activate this point. ➢ When MODBUS command is activated, the status of physical input point will be ignored.
Window input	➢ To trigger the interlock mode when window is open.

B3x Operation Mode	Details
Pre-cooling	➢ When 'Check-in' input signal is switched from OFF -> ON, FCU will go into the mode. ➢ Set a low temperature to chill the room faster during guest check-in. ➢ Default: Disabled.
Welcome	➢ When 'Keycard' input signal is switched from OFF -> ON and it is in pre-cooling mode, FCU will go into the mode. ➢ Set a comfortable temperature when guest enters the room for the first time. ➢ Default: Disabled.
Un-occupied	➢ When 'Keycard' input signal is switched from ON -> OFF, FCU will go into the mode. ➢ System moderate the temperature when guest leaves the room. ➢ Default: Enabled, Cooling mode, 26°C, Low fan speed.

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Subject: Product Info: Touch thermostat (TM-020057)

B3x Operation Mode	Details
Occupied	➢ When 'Keycard' input signal is switched from OFF -> ON and it is in un-occupied mode, FCU will go into the mode. ➢ Guest can set a desired temperature by adjusting the touch screen interface in the room. ➢ Default: Enabled, last state. (e.g. The last setting before the guest leave the room).
Interlock	➢ When 'Window' input signal is switched from ON -> OFF, FCU will go into the mode. ➢ System switch FCU to fan mode when window is open. ➢ Default: Enabled, Fan mode, Set temperature remain unchanged, Turn-off fan speed.
Night 1 & 2	➢ Two separate night modes driven by Real-time-Clock. ➢ Set a specific time to reduce or to increase the temperature especially in midnight period. e.g. From 1am to 5am, setting: No changed for Air-Con mode (Fan / cooling / heating mode), 23°C, Low fan speed. When reached 5am, restore back to the last setting. ➢ Default: Disabled.

Note: The settings of each mode can be set via MODBUS command on the RS-485 port COM0.

TM-020057.5

Date: 3 July, 2020

Subject: Product Info: Touch thermostat (TM-020057)

Summary Table of T&J Thermostat and B3x Controllers:

Modules	Driver Board	B32 Controller	B33 Controller	B31 Controller
Functions	Integral thermostat	Split-type digital thermostat	Split-type modulating thermostat	Split-type customized thermostat
Cooling valve	Relay *1	Relay *1	0 ~ 10V	*3
Heating valve	Relay *1	Relay *1	No	*3
Fan speed	3 relays *1 (L, M, H)	3 relays *1 (L, M, H)	3 relays *1 (L, M, H)	*3
Real-time clock	No	Yes	Yes	Yes
Keycard input	Yes / No *2	Yes	Yes	Yes
Check-in input	No	Yes	Yes	Yes
Window input	No	Yes	Yes	Yes
B3x operation mode	No	Yes	Yes	Yes
Data communication with FCU *3	No	No	No	Yes

Remarks	Descriptions
*1	All relays used in modules are Single-Pole Single-Throw, Normally-Open (SPST-NO).
*2	"Yes / No" is depended on model type of integral thermostat.
*3	B31 is a customized controller. These features depended on the particular model. Please contact T&J sales staff for detail information.

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