



## Installer Manual

TZT-100 Multi-function Thermostat



Ver 1

This document is not typically left with the user as it contains information on setting values which, if not correctly set may damage the heating, cooling or air conditioning system or seriously affect its performance or energy consumption.

Great effort has been taken to making the TZT-100 thermostat system intuitive, reliable and easy to install. Using a common sense approach to the installation will ensure this product is installed easily and to the customer's satisfaction. Please read and understand this instruction manual so that installation, testing and commissioning process is undertaken in an efficient and effective manner.

This manual is to be used in conjunction with the TZT-100 "User Manual".

*Throughout this manual and any associated documentation, references to "temperzone" relate to "Temperzone Ltd." in New Zealand, and "Temperzone Australia Pty. Ltd." in Australia.*

*Care has been taken in the preparation of this manual. However temperzone takes no responsibility for errors or omissions in this document. It is the user's responsibility to ensure this thermostat and the equipment connected to it, is operating to their specifications, and in a safe manner.*

*Due to ongoing product improvement Smart Temp Australia Pty. Ltd., Temperzone Ltd. and Temperzone Australia Pty. Ltd. reserve the right to change the specifications of the TZT-100 thermostat (or its components) without notice.*

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## Table of Contents

<b>Installation .....</b>	<b>4</b>
Mounting the wall controller .....	5
Setting the hardware switches .....	6
<b>TT Terminal Functions .....</b>	<b>9</b>
Outside Air Sensor wiring .....	10
Remote Air Temperature sensor wiring.....	10
Averaging Temperature sensors .....	11
Remote ON / OFF function .....	11
Using the “Occupancy Mode .....	11
Supply Air Temperature Monitoring .....	12
<b>Typical Drawings.....</b>	<b>12</b>
<b>Attaching the thermostat.....</b>	<b>17</b>
<b>Advanced Installer Settings .....</b>	<b>18</b>
<b>Commissioning .....</b>	<b>31</b>
<b>Using Remote Temperature Sensors.....</b>	<b>34</b>
<b>Advanced Functions .....</b>	<b>35</b>
<b>Specifications.....</b>	<b>40</b>
<b>Sensor Resistance v Temperature Table.....</b>	<b>40</b>
<b>Troubleshooting.....</b>	<b>41</b>

## Installation

As with any air conditioning project undertaken, careful installation is the key to a successful outcome. Time taken during this installation process will be rewarded with a happy customer and fewer call-backs.

The steps required to install the TZT-100 thermostat are -

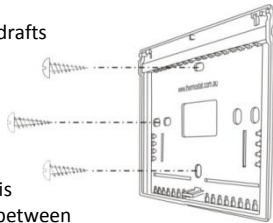
1. Read and understand this manual and the User manual.
2. Mount the TZT-100 back plate in a suitable location.
3. Set the 8 DIP switches to match the need of the project / user.
4. Wire the optional remote temperature sensor(s) or switches if required.
5. Power up the air conditioning system.
6. Set the installer software options (if required).
7. Program and set up the TZT-100 thermostat.  
(The User Manual will assist with this).
8. Test the heating, cooling and other functions – Commissioning.

For convenience the layout of this manual is in the same order as the steps listed above.

### **Mounting the TZT-100 thermostat.**

The TZT-100 can only be as accurate as the onboard temperature sensor, or its optional remote temperature sensor(s) permit. It is therefore essential that the TZT-100 be installed in a location that is typical of the ambient room temperature. Do not install the thermostat in a draft, near a floor, behind doors or on a non-insulated external wall. Also avoid placing the thermostat in areas where the air movement is limited, affected by direct sunlight or other areas not “typical” of the temperature of the room.

Further, when mounting the TZT-100 be aware that drafts may travel down the inside of cavity walls, (especially if mounted on external walls) and enter the back of the thermostat or sensor enclosure through the cable entry holes in the wall. It is important to fully seal these holes to prevent any drafts affecting the internally mounted temperature sensor. It is recommended to mount the TZT-100 or remote sensors between 1.5 & 1.7 metres from the floor where possible.



Move the control wires through the large opening in the thermostat base plate then place the thermostat base on the wall and using appropriate screws, firmly attach the thermostat base to the wall. Block any holes where cables enter the back of the thermostat to prevent drafts entering through these holes affecting the sensor.

## Setting the hardware switches

Switch	Off	On
<b>Sw1</b> – Fan Speeds	1 Speed Fan	3 Speed Fan
<b>Sw2</b> – Equipment Type	Heat Cool	Heat Pump (O/B terminals)
<b>Sw3</b> – Stages	1 Stage	2 Stages
<b>Sw4</b> – Reversing Valve If Sw 2= ON – Heat Pump	Energise in cool (O)	Energise in heat (B)
<b>Sw4</b> – Fan Mode If Sw 2= OFF – Heat/cool	Fan Control by Heater (HG)	Fan Control by T'stat (HE)
<b>Sw5</b> – Anti-Rapid Cycle Timer	Off	4 Minutes
<b>Sw6</b> – Operation	Manual Thermostat	Programmable Thermostat
<b>Sw7</b> – Minimum Run	2 minutes	6 Minutes
<b>Sw8</b> – Program Type If Sw 6= ON – Programmable	Commercial Program	Residential Program
<b>Sw8</b> – Set points If Sw 6= OFF – Manual	Single Set point	Two Set points



Typical drawings have been provided on page 12 of this manual that will assist with the selection of the correct positions for these function switches.

### **Switch 1 – Relay Assignment**

The TZT-100 is fitted with 5 relays capable of switching up to 24VAC @ 1Amp each. Switch 1 sets the function of these relays as either 3 fan speeds with 1 heat and 1 cool operation or single fan speed with 2 heat and 2 cool, in either HP (heat pump / reverse cycle) or HC (heat with add on cool) mode.

### **Switch 2 – Equipment Type.**

Both heat with add on cool, or heat pump types of systems can be controlled by the TZT-100 thermostat.

**Heat Cool** System uses the “W” terminal(s) only for heating and the “Y” terminal(s) only for cooling.

**Heat Pump** systems use the “Y” terminal(s) for **BOTH** heating and cooling (the compressor). The “W1” terminal controls the reversing valve which determines the heating or cooling mode.

### **Switch 3 – Equipment Stages.**

When it is necessary to control a single stage A/C system fitted with auxiliary heating elements, turn Sw3 OFF thereby selecting single stage mode. Heating elements controlled by the W2 output are now assigned as stage 2 heat.

### **Switch 4 – Reversing Valve or Fan mode**

Regardless of the other switch positions, this switch should normally be left in the factory default ON position for all temperzone units.

### **Switch 5 – Anti-Rapid Cycle Timer**

temperzone recommends that this switch be left in the ON position. This means that the thermostat's Anti-Rapid Cycle Timer is in use. The TZT-100 timer will work in parallel with the Anti-Rapid Cycle Timer in the Air Conditioner's internal controls. Leaving "Switch 5" ON will provide the user with feedback as to the equipment status.

**Note:** When power is first applied to the TZT-100, it "assumes" that the compressor has just stopped and applies this Anti-Rapid Cycle delay time before starting. This may hold off the indoor fan also.

### **Switch 6 – Thermostat Operation**

To suit the varying requirements of the user, the TZT-100 can be set as a "Programmable" thermostat using the time clock to automatically control the building temperature to a programmed temperature profile or to the very simple to operate, "Manual" mode where the user turns the thermostat on or off and adjusts the temperature set point manually.

### **Switch 7 – Minimum Run Time**

To conserve energy and protect the A/C system, it is recommended that each time the compressor starts it runs for a minimum period of time. This ensures oil return for lubrication purposes. "Switch 7" enables you to select a minimum run time of 2 or 6 minutes. Once heat or cool cycle has started it must continue for this minimum period. The LCD will flash the word "Heating" or "Cooling" whenever this timer is holding Heating or Cooling on past set point, or when the user has changed mode etc.

### **Switch 8 – Thermostat Control Logic.**

This switch has two functions based on the position of “Switch 6”.

When the TZT-100 is set as a programmable thermostat, “Switch 8” determines whether a commercial or residential program is selected. When “Switch 6” has the TZT-100 set as a non-programmable thermostat, “Switch 8” then selects between single set point mode (imitating a simple mechanical thermostats operation), or separate heating and cooling set points. “Two set point” mode also permits the user to select a separate day and night set point if desired.

## **TT Terminal Functions**

The TZT-100 is fitted with a set of terminals marked “TT”. Details of the “TT” terminals functionality is provided below. See the advanced installer setting menu on page 25 of this manual for setting the function of this set of terminals. The wiring used in the following examples are not polarity dependent and do not normally require screened cable for short runs (less than 10 metres). With longer cable runs, or where there is electrical noise present, can benefit from the use of screened cable, earthed at one.

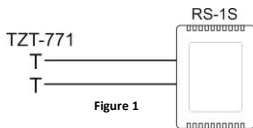


**Please Note** - *The TZT-100 can use multiple sensors if required. Drawings showing these various configurations are shown on page 34 of this manual.*

### Outside Air Sensor Wiring

#### **Set “TT= OA” in the advanced installer menu.**

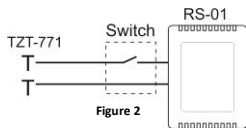
The TZT-100 can display the outside air temperature if desired. Some advanced control functions such as high and low balance points rely on this sensor to be fitted for correct operation. Using a single pair of wires connect the “TT” terminals in the TZT-100 to the two terminals in the outside air temperature sensor. (See Figure 1). If the outside air sensor fails two dashes will be shown on the LCD where the outside air temperature would normally be displayed to alert you of the problem.



### Remote Room Temperature Sensor Wiring

#### **Set “TT= RS” in the advanced installer menu. (Default)**

When you wish to measure the temperature from a location distant from the TZT-100, simply connect a remote temperature sensor to the “TT” terminals in the TZT-100 controller. This will automatically disable the sensor fitted inside the TZT-100 and use the remote temperature sensor(s) to control the room temperature (Shown in Figure 1 above). Should you wish, you can easily switch the remote temperature sensor on and off, thereby switching temperature sensing locations between the remote sensor and the TZT-100 internal temperature sensor. Simply fit an inline switch in the sensor wiring. (See Figure 2.)



### Averaging Temperature Sensors

#### **Set “TT= AV” in the advanced installer menu.**

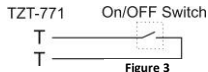
If required, the TZT-100 can average the sensed temperature, between the remote temperature sensor(s) and the one fitted to the TZT-100. (See *Figure 1 on the previous page for details on wiring the sensor.*) The TZT-100 will auto-detect this sensor and automatically average the two sensor values to control the room temperature.

### Remote ON / OFF Function

#### **Set “TT= OF” in the advanced installer menu.**

The TZT-100 can be connected to an external dry contact.

When this contact is closed the TZT-100 will turn OFF. (See *Figure 3.*) When the TZT-100 has been switched OFF via the “TT” terminals the word “OFF” will flash in the LCD to indicate that this has been the shutdown method. The TZT-100 will return to the user settings when this switch is open.



### Using the “Occupancy Mode”

#### **Set “TT= OC” in the advanced installer menu.**

The TZT-100 can alternate between the user preferred set points and an installer pre programmed set point when required. Simply wire a remote switch to the TZT-100 “TT” terminals (See *Figure 3*). When the switch is open the user settings will control the room temperature. When the switch is closed the Installer “Oc” (Occupied Cooling value) & “Oh” (Occupied Heating value) settings will be used to control the room temperature.

### Supply Air Temperature Monitoring

**Set “TT= DA” in the advanced installer menu.**

In this mode, the TZT-100 will ONLY broadcast this sensor temperature value via its ModBus communication. This value is not used by the TZT-100 nor is it displayed on the LCD. It is expected that this information is used for supervisory functions or equipment control feedback.

The TT input pair, is an analogue input designed to read a temperature dependant resistor, otherwise known as a thermistor. If a switched resistor network is connected to the TT inputs, a supervisory system can read the varying analog signal present at the TT terminals as a result of the switching of resistors. This would enable the supervisory system (BMS), to decode a number of digital states.

## Typical Drawings

Simplified Wiring schematics showing different Air Conditioning system configurations appear on the following pages. The DIP switch combinations corresponding to each of these systems are shown beside each schematic.

## Heat only system (with fan control)

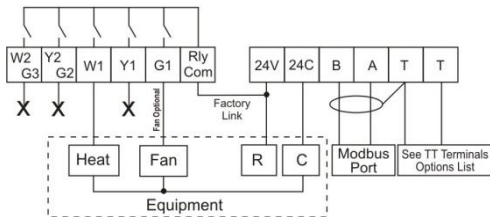


Figure 4

### Switch Settings

- Sw1 = Off (1 speed fan)
- Sw2 = Off (HC System)
- Sw3 = Off (Single Stage)
- Sw4 = Off (HG)
- Sw5 = Installer preference
- Sw6 = User requirements
- Sw7 = Installer preference
- Sw8 = User requirements

### Tip

**Set Installer menu Fn=H**

## Cool only system with 1 speed fan

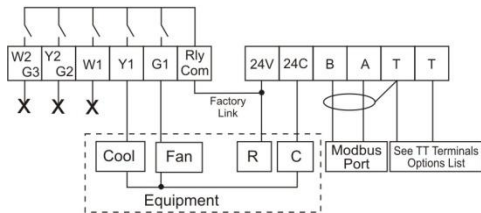


Figure 5

### Switch Settings

- Sw1 = Off (1 speed fan)
- Sw2 = Off (HC System)
- Sw3 = Off (Single Stage)
- Sw4 = N/A
- Sw5 = Installer preference
- Sw6 = User requirements
- Sw7 = Installer preference
- Sw8 = User requirements

### Tip

**Set Installer menu Fn=C**

## 1 heat with add on cool

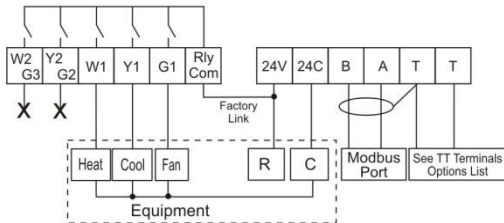


Figure 6

### Switch Settings

Sw1 = Off (1 speed fan)

Sw2 = Off (HC System)

Sw3 = Off (Single Stage)

Sw4 = Off (HG)

Sw5 = Installer preference

Sw6 = User requirements

Sw7 = Installer preference

Sw8 = User requirements

## 2 stage gas heat 1 stage add on cool

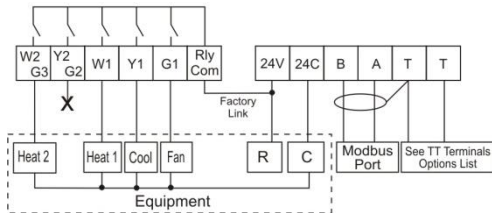


Figure 7

### Switch Settings

Sw1 = Off (1 speed fan)

Sw2 = Off (HC System)

Sw3 = On (Two Stage)

Sw4 = Off (HG)

Sw5 = Installer preference

Sw6 = User requirements

Sw7 = Installer preference

Sw8 = User requirements

## 1 stage reverse cycle 1 speed fan

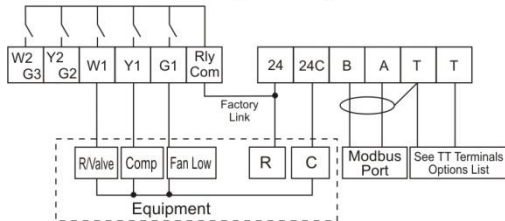


Figure 8

### Switch Settings

- Sw1 = Off (1 speed fan)
- Sw2 = On (HP System)
- Sw3 = Off (One Stage)
- Sw4 = On Heat (B)/ Off Cool (O)
- Sw5 = Installer preference
- Sw6 = User requirements
- Sw7 = Installer preference
- Sw8 = User requirements

Note – Set SW4 to suit suit the system

## 1 stage reverse cycle 3 speed fan

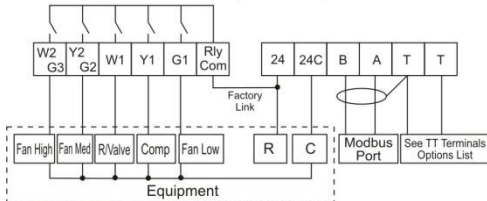


Figure 9

### Switch Settings

- Sw1 = Off (1 speed fan)
- Sw2 = On (HP System)
- Sw3 = Off (One Stage)
- Sw4 = On Heat (B)/ Off Cool (O)
- Sw5 = Installer preference
- Sw6 = User requirements
- Sw7 = Installer preference
- Sw8 = User requirements

Note – Set SW4 to suit suit the system

## 1 stage reverse cycle with auxiliary heat 1 speed indoor fan

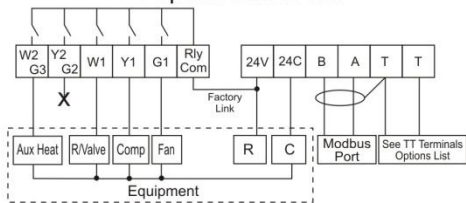


Figure 10

### Switch Settings

- Sw1 = Off (1 speed fan)
- Sw2 = On (HP System)
- Sw3 = Off (One Stage)
- Sw4 = On Heat (B)/ Off Cool (O)
- Sw5 = Installer preference
- Sw6 = User requirements
- Sw7 = Installer preference
- Sw8 = User requirements

Note – Set SW4 to suit suit the system

## 2 stage heat pump with emergency heat

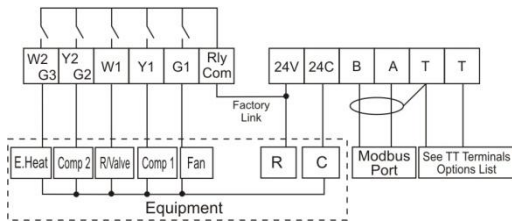


Figure 11

### Switch Settings

- Sw1 = Off (1 speed fan)
- Sw2 = On (HP System)
- Sw3 = On (Two Stage)
- Sw4 = On Heat (B)/ Off Cool (O)
- Sw5 = Installer preference
- Sw6 = User requirements
- Sw7 = Installer preference
- Sw8 = User requirements

**Note: Set W3=EH in the installer menu.**

## Attaching the thermostat

Check that the position of the 8 DIP switches matches the requirements of the equipment being controlled and the specific requirements of the user. Detailed information on the 8 DIP switches can be found on page 6 of this manual.

Check the wiring matches that of the equipment the TZT-100 is to control and that all wiring is tight and not likely to short between adjacent wires. Equipment wiring information can be found commencing on page 12 of this manual.

If using the ModBus communication capability of the TZT-100, ensure the “A”, “B” & “T” data wires are in the correct position as an error here may affect the communication of the entire network. See page 35 for detailed wiring of the communications port of the TZT-100.

Using masking tape or similar, block the hole in the wall where the wiring enters the back of the thermostat to prevent drafts that may travel down the inside of the wall cavity affecting the accuracy of the internally fitted temperature sensor.

**Remove and discard the plastic tab on the internally fitted backup battery so that the battery is now in circuit and operating. Be careful not to pull the battery out or damage the battery holder when doing this.**

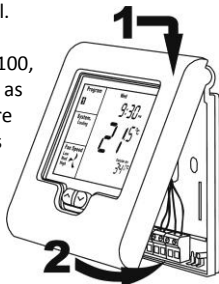


Figure 12

When attaching the thermostat to the base, avoid twisting the case as this may stress the LCD and cause it to crack. Avoid running wiring near the internally fitted sensor.

**Take care not to damage or crush the temperature sensor between the two half's of the case when you close the TZT-100 case. Check this sensor location.**

## Advanced Installer Settings

The TZT-100 is fitted with many advanced functions that can be finetuned by the installer to specifically match the needs of the project of the user.

Normally these functions will not need to be altered from the factory default position however, there may be times when you wish to alter a setting or control capability so that the TZT-100 performance will perfectly match a particular application. On the next few pages there is detailed explanation of these functions and their range of control.

While in the advanced installer menu, all TZT-100 equipment control functions will be suspended. Normal equipment operation will continue when you have exited this menu (after any Anti-Rapid Cycle delays or safety delays have terminated).

### Using the Installer Menu

To move forward through the Installer menu items tap the “O/RIDE” button.

To move backwards through the Installer menu items tap the “PROG” button.

To adjust a value, tap the ▲ (Up) or ▼ (Down) buttons.

To exit the installer menu, tap the “Mode” button, the “Fan” button or wait 60 seconds.

### Entering the Installer Menu

To enter the Installer menu, press and hold the O/RIDE button for 15 seconds. After 15 seconds the LCD will show “88 : 15” (eight eight one five).

Adjust this value to “88 : 21” – (eight eight two one) the factory default PIN (or your previously selected value) by using the ▲ (Up) or ▼ (Down) button. Tap the O/RIDE button again to enter the menu.

If you have entered the correct PIN you will be given the first menu option, if you have entered an incorrect PIN you will be exited from this menu. You may retry.

The Default Values are shown in **bold** text in heading line of the explanation for each parameter shown on the following pages:

**PN = 21 Keyboard Lock PIN**

This is the required PIN for future entry into the Installer menu.

Range 00 to 99 in 01 steps. To prevent accidental PIN changes, you must press and hold the ▲ or ▼ buttons for longer than 1 second to change the PIN value.

*(Caution, if you change this value and forget your new PIN, you may need to return the TZT-100 to temperzone for unlocking, there may be a fee for this service)*

**LC = 0 Keyboard Lock level**

**Programmable Mode** (SW6=ON)

**LC = 00** - Key board Lock OFF.

**LC = 01** - All buttons are locked except the Temperature +/- buttons\*.

**LC = 02** - All buttons are locked except the O/Ride button & Temp +/- buttons\*.

**LC = 03** - Fan and Program buttons are locked\*.

**LC = 04** - Fan, Program and Override buttons are locked\*.

**LC = 05** - All buttons locked except O/Ride.

**LC = 06** - All Buttons locked.

**Manual Mode** (SW6=Off)

**LC = 00** - Key board Lock OFF.

**LC = 01** - All buttons are locked except the Mode button.

**LC = 02** - All buttons are locked except the Mode and temperature +/- button\*.

**LC = 03** - Fan & O/ride buttons are locked\*.

Mode button can only select Auto (Heat & Cool) and off.

**LC = 04** - O/Ride Button is locked\*.

Mode button can only select Auto (Heat & Cool) and off.

*(\*Note the temp +/- buttons range can be limited in the HL & CL menu)*

<b>HL = 35 (95F)</b>	<b>Heating Limit (or High Limit)</b>
The highest Heating value permitted to be set by the user. Adjustable between 5~49°C (41~120°F).	
<b>CL = 16 (41F)</b>	<b>Cooling Limit (or Low Limit)</b>
The lowest Cooling value permitted to be set by the user. Adjustable between 6 ~50°C. (43~122°F).	
<b>CF = C</b>	<b>Temperature display Format</b>
Deg C or deg F display type. (effects all user and installer menu items)	
<b>C1 = 0.0</b>	<b>Fitted Sensor Calibration</b>
Calibration Offset for the internal sensor. Adjustable range +/- 4.5°C (+/-9°F). in 0.1 steps	
<b>tC = 12</b>	<b>Time Clock</b>
tC = 12 - 12 Hour Time Clock. tC = 24 - 24 Hour Time Clock. tC = 0 - No time clock shown (Manual mode only –SW6=off)	
<b>td = 0</b>	<b>Temperature Display</b>
td = 00 - The TZT-100 will display both the Room & Set Temperature. td = 01 - The TZT-100 will display set temperature only.	
<b>AH = 2</b>	<b>After Hours Override Timer</b>
<b>Start / Stop Mode</b> - Commercial Thermostat Mode (Sw6=on, Sw8=off) After hour run time period - Adjustable range 0 (off) to 12 hours in 0.5 hour steps. <b>Setback (1, 2, 3, 4) mode</b> – Residential programmable Mode (Sw6=on, Sw8=on) Temporarily program override period. Off= Override till next program change or 0.5 to 12 hours (fixed time override)	

**St = off Start Program temperature (Commercial Mode)**

Start/stop mode Only. (Sw6=on, Sw8=off).

This sets the default temperature that will be used each time the “Start” program begins regardless of any adjustments the user may have made previously.

Adjustable between OFF, 15~35°C. (59~95°F). If set to off, the user set point will not be automatically reset to a default value each day.

**SC = off Stop Cooling temperature (Commercial Mode)**

Start/stop mode Only. (Sw6=on, Sw8=off).

Cooling temperature that will be maintained when running the “STOP” program. (Night Setback)

Adjustable between 6 ~50°C. (43~122°F) + OFF.

**SH = off Stop Heating temperature (Commercial Mode)**

Start/stop mode Only. (Sw6=on, Sw8=off).

Heating temperature that will be maintained when running the “STOP” program. (Night Setback)

Adjustable between 5 ~49°C. (41~120°F) + OFF.

**db = 0.5 °C/1 °F Single Set Point Dead band** *(See page 30 for more information)*

Dead band between Heat and Cool cycle when in single set point mode (sw8 off).

Adjustable between 0 and 5 °C (or 0 and 10 °F) in 0.5 °C (1 °F) steps.

**Fo = 0      Fan Options - Advanced Fan Functions**

This function is only enabled when the selected fan mode is **Fan On**.  
“FAN ON” will be displayed in the LCD to confirm this mode.

**Fo = 0** - (Default for Residential mode – Sw6 On Sw 8 ON). The fan will run continuously, 24 hours a day 7 days a week when ever “Fan On” mode is selected.

**Fo = 1** - The fan will continue to run after the cooling stops to ensure the maximum fresh air ventilation and to aid in cooling. The fan will stop when the heating stops. (This is done to prevent cold drafts that may occur on cold days when the A/C system is heating).

**Fo = 2** - (Default in Start Stop Mode). Available only if in Programmable Mode (Sw6=on). The Fan will Run continuously from program # 1 (or Start) Program to program #4 (or Stop) program. It will then run in AUTO mode overnight to maintain the night time set points.

**Fo = 3** - Available only if in Programmable Mode (Sw6=on). This mode is the combination of option 1 and option 2 given above.

**FP = 1      Fan Purge Time Period (Fan run on)**

If fan mode is “Auto Fan”, the indoor fan will run for FP=X minutes after heating or cooling has stopped to extract any residual energy in the indoor coil(s).  
(Necessary when controlling electric element heating).  
Adjustable between 0 to 5 minutes in 1 minute intervals.

**Fn = A      Function - Available Equipment Modes**

**FN = A** - Select if controlling a Heating & Cooling system.

**FN = C** - Select if controlling a Cooling only system. (disables heating menus)

**FN = H** - Select if controlling a Heating only system. (disables cooling menus)

**FN= --** (Double Dash) This mode will set TZT-100 to Heat only, Cool only or OFF.  
(Emergency heat will also be selectable if enabled)

**H3 = oF      W2 relay Function**

Only operates in single fan speed HP mode. (Sw1=off & Sw2=on).

**H3 = oF** - W2 relay is used as 2nd (or 3rd) stage Auxiliary heat.

**H3 = EH** - W2 relay is used to control an Emergency Heating system.

**H3 = AH** - W2 relay is used to control a Add On Heat system.

**H3 = AL** - Permits both Aux heat & E. Heating mode (both use W2 relay)

**H3 = FF** - TZT-100 set up in "Fossil Fuel" Mode (Comp stops with Aux heat)

**tt=RS**      **TT terminal Function** *(See page 9 for more detail on this function)*

**tt = oA** - Connect the outside air temperature sensor to the TT terminals to display the outside Air Temperature.

*(Required for all outside air control functions to operate.)*

**tt = RS** - Connect the remote room temperature sensor to the TT terminals to measure the temperature at a remote location away from the TZT-100.

*(Note: This completely disables the temperature sensor fitted to the TZT-100)*

**tt = AV** - The TT terminals will average the temperature measured by the TZT-100 internal sensor and remote room temperature sensor(s).

**tt = oF** - A closed contact on the TT terminals will switch the TZT-100 On or OFF. (More detail on this function provided on page 11 of this manual.)

**tt = oC** - A closed contact on the TT terminals will switch the TZT-100 to Occupied Mode, where the oC & oH temperatures will replace the user set temperatures. (See page 11 of this manual for more detail on this function.)

**tt = dA** - The TZT-100 will broadcast the measured temperature from the remote temperature sensor via ModBus. It will not display this value on the LCD, nor is it used for any control option.

*This mode is intended to provide system feedback to the ModBus master only.*

**tt = 2P** – Do not select this option – this is not required for temperzone units.

**AF = 0**      **Anti-Freeze Function**

**AF = 0** - Antifreeze function off.

**AF = 1** - Room temperature will not be permitted to fall below 5°C (41°F) even if the TZT-100 mode is OFF.

**oH = oF Occupied Mode Heat Set** *(See page 11 for more information)*

**Only operates if TT=OC.**

This is the heating temperature that will be used in “Occupied mode” and will temporarily replace the user heat set point while the TT terminals are shorted together.

Adjustable range 0-35c (32 – 95f)

**oC = oF Occupied Mode Cool Set** *(See page 11 for more information)*

**Only operates if TT=OC.**

This is the cooling temperature that will be used in “Occupied mode” and will temporarily replace the user cool set point while the TT terminals are shorted together.

Adjustable range 5-37c (41 – 98f)

**SP = 2 Stage 1 Span** *(See page 30 for an overview of this control function)*

Hysteresis for Stage 1.

(difference between the heating and cooling turning on and off)

**Sp = 1** 0.5c

**SP = 2** 1.0c

**Sp = 3** 1.5c

**Sd = 2     Stage 2 Span** *(See page 30 for an overview of this control function)*

Hysteresis for Stage 2.

(difference between the 2<sup>nd</sup> stage heating and cooling turning on and off)

**Sd = 1**     0.5c

**Sd = 2**     1.0c

**Sd = 3**     1.5c

**dt = 30     Upstage delay time**

Time in minutes before next stage of heating or cooling is to be called.

Delay only operates if stage trip temperature has not yet been reached.

Adjustable between 10 ~ 90 Minutes in 5 minute steps.

**oS = 0     Optimised Start/stop. (Adaptive Recovery)**

**oS = 0** - Optimised start/stop function Off.

**oS = 1** - Optimised start/stop function activated.

*(See page 39 for more information on this function)*

**C2 = 0.0     Calibration Remote Sensor**

Calibration Offset for the TT terminal temperature sensor.

Adjustable range +/- 4.5 deg C (+/-9 F).

**Co = 5 (41F)     Cooling OFF temperature** *(See page 38 for more detail.)*

Only operates if tt=OA and outside temperature sensor is fitted.

Outside air temperature below this value will force the cooling function OFF.

Adjustable between 0 ~37c. (32~98F).

**Ho = 35 (95F) Heating OFF temperature** (See page 38 for more detail.)

Only operates if tt=OA and outside temperature sensor is fitted.

Outside air temperature above this value will force the heating function OFF.

Adjustable between 0 ~37c. (32~98F).

**HB = 37 (98F) High Balance Point** (See page 38 for more detail.)

tt=OA, the outside temperature sensor must be fitted and Sw 1=off.

2nd (or 3rd) stage heating is locked out when the outside air is above this temperature.

Adjustable between 0 ~37c. (32~98F).

**LB = 9.5 (15F) Low Balance point** (See page 38 for more detail.)

tt = OA, (the outside temperature sensor fitted), H3=EH, Sw 1=off and Sw2=on.

Outside temperatures below this value will automatically select the Emergency Heat mode .

Adjustable between -9.5 ~25c. (15~77F).

**Ft = off Filter warning time**

Return air filter cleaning warning time.

Adjustable between off and 900 hours.

**Ad = 07 ModBus Address** (See page 35 for more information.)

ModBus communications address

**bd = 9.6 ModBus Baud Rate**

Bd = 4.8 - ModBus baud rate is 4,800 Baud.

Bd = 9.6 - ModBus baud rate is 9,600 Baud.

Bd = 19.2 - ModBus baud rate is 19,200 Baud.

<p><b><u>Cd = 0</u>      <u>Commissioning Mode</u></b> <i>(See page 38 for more detail.)</i></p> <p><b>Cd = 0</b> - Commissioning mode is OFF.</p> <p><b>Cd = 1</b> - All time delays are off or reduced to a very small value.</p>
<p><b><u>SS = 0</u>      <u>Start Stop Mode Override</u></b> <i>(Typically used by ModBus Master)</i></p> <p>SS = 0 - User Start Stop program in use</p> <p>SS = 1 - Thermostat held in “Start” program typically via call from ModBus master.</p> <p>SS = 2 - Thermostat held in “Stop” program typically via call from ModBus master.</p>
<p><b><u>OF</u>              <u>Override Function</u></b> <i>(Typically used by ModBus Master)</i></p> <p>OF=0 – The TZT-100 will control its own relays (Default)</p> <p>OF=1 – The 5 TZT-100 relays are being controlled via a ModBus master only.</p> <p>No buttons will function and all programming and control information is suppressed. The word “Override” will flash on the LCD during this mode. The TZT-100 will automatically exit this mode if no valid ModBus signals have been received for 5 mins.</p>
<p><b><u>rS = 40</u>      <u>Thermostat sensor response time to room temperature changes.</u></b></p> <p>Adjustable from RS=10 (very fast) to RS=90 (very slow) Default is RS=40</p>
<p><b><u>tS = 0</u>      <u>Factory test mode</u></b> <i>(See page 38 for more detail.)</i></p> <p><b>TS = 0</b> - Factory test Mode OFF.</p> <p><b>TS = 1</b> - Display configuration code.*</p> <p><b>TS = 2</b> - Step cycle all relays in sequence, 1 2 3 4 5 etc.</p> <p><b>TS = 3</b> - Reset software to factory default. <b>Press Fan button to initiate.</b></p> <p><i>(* this table is available from the download section at <a href="http://www.thermostat.com.au">www.thermostat.com.au</a>)</i></p>

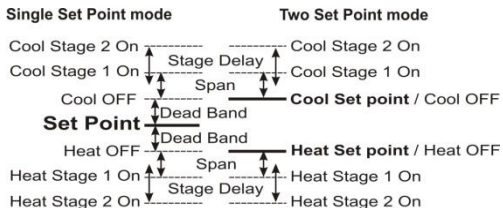
## Control logic

This simple diagram (right) provides a general insight into the control logic of the TZT-100 thermostat. It attempts to describe the action of the DB=XX, the SP=XX and SD=XX advanced installer control capabilities

in both two set point and single set point mode. By adjusting these three values to suit the needs of the user or equipment extremely tight temperature control can be achieved, or a more energy efficient temperature control profile can be set.

In single set point mode (sw8=off) the individual heating and cooling set points are replaced by a “Dead Band” where the heating and cooling differential is controlled by a installer set value. This is the simplest method of temperature control.

Further, you are able to adjust how quickly the TZT-100 thermostat responds to room temperature changes by adjusting the RS=XX value in the installer menu. The lower this setting the faster the thermostat will respond to room temperature fluctuations, the larger this number the slower the thermostat will respond to changes in room temperature.



## Commissioning

As with any thermostat, commissioning ensures that the thermostat and the equipment connected to it are operating correctly and as expected. Although the TZT-100 is a multifunctional thermostat, commissioning is quite a simple process. Follow the steps detailed below and use the troubleshooting guide on page 41 if you encounter a problem.

When the thermostat is fitted to the base plate and when 24VAC power is first applied, the LCD should briefly show all available segments (a LCD function test) then display the thermostat firmware version before showing the time and operating mode etc.

The TZT-100 is fitted with a number of safety and energy saving time delays. If desired, these can be disabled for commissioning purposes by entering the installer mode and setting the CD=00 value to read CD=01. After exiting the installer menu you will note a “Spanner” icon flashing on the LCD to remind you that commissioning mode is Active. After commissioning has been completed it is important to disable commissioning mode by entering the installer menu once again and setting the CD=01 value back to CD=00.



**Note-** When in “Commissioning Mode” **ALL** time delays are either OFF or reduced to a extremely low value, it is therefore normal to potentially call for 3<sup>rd</sup> stage heating almost instantly 0.5°C below the heating set point.

If you choose not to use commissioning mode you may see various words and icons flashing in the LCD whenever a time delay is in use. For example, the word “HEAT” may flash to indicate heating is required but being held off by the 4 minute Anti-Rapid Cycle Timer. Or the word “HEATING” may be flashing to indicate set point has been achieved however heating is being held ON by the minimum run timer.

***The golden rule with the TZT-100 is anything that flashes is a timer over-riding what would normally be expected to occur. Either a function is being held on or off momentarily. Please be patient.***

#### **Test fan operation.**

With the thermostat OFF (tap the mode button to show OFF in the LCD). Simply tap the fan button to cycle through the available fan speeds. As the LCD changes to show the fan speed or fan mode you should here faint “clicks” as the TZT-100 internal relays change, the equipment fan speed should change accordingly.

#### **Test heating and cooling (if both fitted).**

Turn the TZT-100 to Auto season change mode by tapping the mode button until the words “Heat” and “Cool” are shown on the LCD.

Using the temp ▲ or Temp ▼ button set the desired temperature a few degrees above the ambient temperature. After a few moments you will hear a click and the word “Heat” will change to “Heating”.

Verify that the heating system is on and operating correctly. If stage 2 heat is being called the full stop “.” on the end of the word “MODE” will be seen to indicate 2<sup>nd</sup> stage heat. Stage 3 of heat is indicated by the full stop flashing.

Using the temp + or Temp – button set the desired temperature a few degrees below the ambient temperature. After a few moments you will hear a click and the word “Cool” will change to “Cooling”. Verify that the cooling system is on and operating correctly. When stage 2 cool is being called, the full stop “.” on the end of word “MODE” mode will be seen to indicate 2<sup>nd</sup> stage cool has been called.

Tap the mode button turn the TZT-100 OFF. After any necessary timers have expired all heating, cooling and fan functions should stop. Verify that the system has shut down.

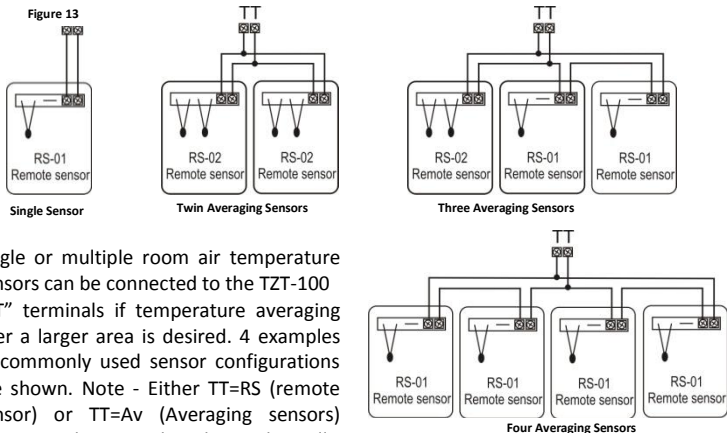


**Please Note** - In HP mode (SW2=ON) it is normal for the reversing valve to remain energised after the compressor has stopped. This is done to prevent de-compression “HISS” and to limit the wear on the reversing valve. The reversing valve will de-energise 120 minutes after the last heating call to conserve power.

**If commissioning mode has been used it is important that this function be turned OFF before handover to the user.**

Using the User Manual as a guide set the real time clock and the preferred user program (if applicable). Explain equipment & thermostat operation to the user. Commissioning is complete.

## Using Remote Temperature Sensors



Single or multiple room air temperature sensors can be connected to the TZT-100 “TT” terminals if temperature averaging over a larger area is desired. 4 examples of commonly used sensor configurations are shown. Note - Either TT=RS (remote sensor) or TT=Av (Averaging sensors) value must be set in the advanced installer menu for these sensors to be used.

Please note the configuration of RS-01 & RS-02 sensors in the examples provided above. Other sensor configurations are also available.

A typical maximum of 10 metres is permitted for sensor runs with unshielded cable. If longer distances are required a larger diameter (0.3mm) shielded cable should be used.

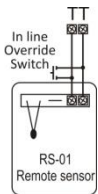


Figure 14

When used in Start / Stop commercial programmable mode (SW6=on SW8=off), the afterhours run timer can be toggled on or off as required with a momentary press button on the remote sensor. See figure 17.

As the TZT-100 “Auto detects” sensors connected to the “TT” terminals, temperature sensors can also be switched on and off as required by placing a switch in the sensor wiring to open circuit the sensor loop. See figure 16.

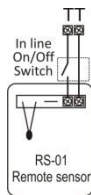


Figure 15

## Advanced Functions

### ModBus Communications

The TZT-100 has integrated ModBus communications capabilities. Using a remote PC or a Direct Digital Control (DDC) system, many of the TZT-100 functions can be viewed or adjusted remotely.

It is not the scope of this manual to provide detail on the communication capability of the TZT-100. ModBus communication detail will be available for download from [www.temperzone.com.au](http://www.temperzone.com.au). This information will be updated as changes are made.

The communications port of the TZT-100 has 3 terminals used for communication. “A”, “B” & “T”. Terminals “A+” & “B-” are used for data communication, the terminal “T” ( a shared terminal from the thermostat T T input) is used as a Vss (screen ground to protect the integrity of the communication signal).

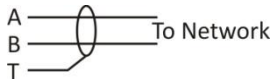


Figure 16

A maximum of 32 TZT-100s can be connected to any single hub. Each TZT-100 on the hub must have a unique network address (factory default is 7). These settings are adjustable from the advanced installer menu. See page 18 for more detail on setting the communications address.

A typical ModBus wiring example is given below. If using a common power supply to power all thermostats on a network, it is highly recommended that all thermostats power is wired in phase, i.e. “R” to “R” and “C” to “C” and NOT crossed.

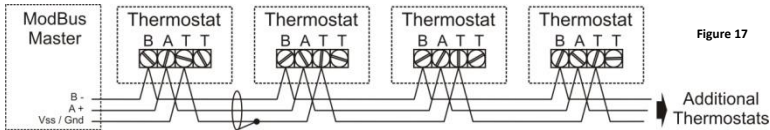


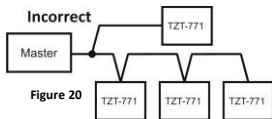
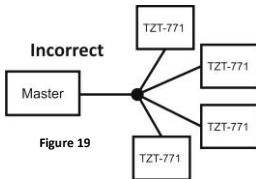
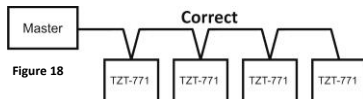
Figure 17

In many cases where multiple thermostats are used in a single network or on a long network run, the two DIP switches located between the “R” & “R/Com” terminals on **the last thermostat on the node** should be switched on to improve network reliability.

It is essential that the network be wired as a daisy chain as shown in fig 20.

Figures 21 & 22 show examples of how **NOT** to wire a ModBus network.

Short communication runs, 1mm (18 gauge) twisted pair unshielded wire can be used, however for longer runs or where electrical noise may be present twisted pair with shield should be used.



### **Factory Test Mode**

The TZY-100 is fitted with a simple factory Test Mode where you can confirm that all relays outputs functions and the current configuration of the thermostat.

- Ts = 0      Factory Test Function is OFF.
- Ts = 1      Display DIP switch configuration code.
- Ts = 2      Relay test mode. All relays cycle on then off in an endless loop.
- Ts = 3      Factory Software reset – Press Fan button to confirm.

### **High and Low balance points**

The TZT-100 is fitted with both High and Low Balance Point control capability. For these functions to operate the Installer setting must be TT=OA (outside air temperature sensor fitted), the outside air sensor must be installed and SW1 must be OFF (Single fan speed mode).

#### **High Balance point.**

Set the installer menu value "HB=XX".

When the outside air temperature is above this value, second or third stages of heating are held off regardless of the room and set temperature.

Set this function is designed to prevent the excessive consumption of energy for heating when the outside air temperature is warm.

#### **Low Balance point**

SW2=on, H3 =EH (Emergency Heat Mode) Set the installer menu value "LB=XX".

When the outside air temperature is below this value the TZT-100 will automatically switch to emergency heat mode when heating is required. If the outside temperature is above this LB=XX value the emergency heat mode can be selected manually at anytime with the "MODE" button.

### **Setting up the Heat & Cool Off functions**

To conserve energy, the TZT-100 can suspend the heating or cooling functions if the outside air temperature is within a prescribed installer set range.

If the outside air temperature is above the HO=XX (heating OFF) value, heating will not be called regardless of the room and set temperature. If the outside air temperature is below the CO=XX value, cooling will not be called regardless of the room and set temperature. “Heat” or “Cool” and the word “Locked” will flash on the LCD to show that these modes have been restricted.

### **Adaptive recovery**

Only available in programmable mode (sw6=on).

The adaptive recovery function of the TZT-100 permits the user to program a time that a desired set temperature is required, letting the thermostat calculate the most energy efficient time to turn on to achieve the desired temperature at the selected time.

If the user typically returns home at 5:00pm at the end of the work day, setting program #3 (if used in residential programmable mode) to 5:00pm the TZT-100 will calculate the most energy efficient time based on the set and room temperatures as well as a history of temperature change to bring on the equipment prior to 5:00pm to meet the desired set temperature by 5:00pm. For example, when heating is required the heating may start at 4.32pm so that the set temperature is reached at 5:00pm

Adaptive recovery may also prevent the TZT-100 from running for a few moments just prior to a program change occurring.

“RECO” is shown in the LCD when ever Adaptive recovery is being used.

## Specifications

Input Voltage	24VAC 50/60 Hz +/- 15%.
Relay rating	24VAC @ 1Amp maximum per relay.
Operating Temperature	0-50°C (32 to 122°F).
Operating RH	0-95% (non condensing).
Storage Temperature	0-65°C (32 to 150°F).
Size	113 x 103 x 23mm.
Display Size	74 x 55mm.
Temperature Sensor(s)	10K NTC type 3.
Accuracy	+/- 0.3°C @ 25°C. (77°F)
Stage Delays	Minimum temperature change over time method.
Timed upstage Delay	5~90 minutes.
Anti-Rapid Cycle Delay	Either "Off" or "4-minutes".
Maximum hourly cycles	Unlimited, 30, 10 or 6. (Installer set)
Display resolution	0.1° C (0.2°F).
Control Range	Off to 38°C (100°F).
Outside Air temp display range	-8 ~ +60°C (17 ~ 140°F).
Back light	Blue EL.
Backlight life	3,000 hours to half brightness.
Adaptive recovery method	Time to Start versus Temp Differential method - updating.
Communications Protocol	ModBus – contact Smart Temp or temperzone for objects list.
Fan speeds	Based on difference between room and set temp.
Approvals	FCC (Part 15) (pending), C-tick.

## Sensor Resistance v Temperature Table

KΩ	24.3	22.0	20.0	18.1	16.2	14.3	13.7	12.5	11.4	10.4	10.0	9.57	8.75	8.05
C	6	8	10	12	14	16	18	20	22	24	25	26	28	30
F	42.8	46.4	50	53.6	57.2	60.8	64.4	68	71.6	75.2	77	78.8	82.4	86

## Troubleshooting

Symptom	Suspected Fault	Suggested remedy
Temperature display seems inaccurate	Air from the wall cavity may be leaking into the rear of the thermostat / sensor enclosure.	Plug holes in wall with tape to prevent leaks
	A remote sensor rather than the fitted sensor is in use.	Check the temperature at the remote sensor location for accuracy. Calibrate if necessary if long cable runs are used.
	The internally fitted temperature sensor is folded back inside the enclosure and not being exposed to the room air temperature.	Carefully move the room temperature sensor bead so that it is correctly placed in the sensor cavity in the plastic case.
	External heat or cool source such as lamps, televisions or drafts from open doors affecting the accuracy of sensor.	Move lamps, vents or other sources of abnormal temperature away from sensors
	Sensor calibration may setting are incorrect	Adjust C1=XX value in installer mode to correct perceived sensor inaccuracy. Page18
"Locked" appears on LCD and heating or cooling will not operate.	This is not a fault. Outside air temp to high to require heating Outside air temp to low to require cooling.	The Ho=XX &/or Co=XX value is inhibiting heating or cooling calls. Change these values in the installer menu, details on page 18.
Heating or cooling runs in dead band.	TZT-100 incorrectly set to HP mode. (TZT-100 keeps reversing valve energised after heating / cooling has stopped to limit decompression noise from AC system.)	Set SW2=OFF and retest heating & cooling operation.
	Minimum run period has not yet expired. Words "Heating" or "Cooling flash in the LCD	Sw7 sets minimum run period from 2 or 6 minutes.
	Compressor and reversing valve wiring crossed in HP mode (sw2=on)	Check W1 & Y1, Y2 for correct connections.
TZT-100 has no display	Power failure or faulty TZT-100	Check for 24VAC on the 24 & 24C terminals
Reversing valve remains energised after heating or cooling has stopped.	This is not a fault	The reversing valve remains energised after the heating/cooling has stopped to limit decompression hiss. Reversing valve will de-energise within 2 hours of the last call.
Spanner Symbol flashes on LCD	This is not a fault Commissioning mode enabled.	Exit commissioning mode before handover to user. See page 20

Symptom	Suspected Fault	Suggested remedy
The word OFF is flashing in the LCD. Mode button has no effect.	This is not a fault	TT=Of in advanced installer menu. The thermostat is being held OFF by a remote device.
Some buttons do not appear to operate. Padlock is show on LCD.	Key board lock is on.	LC=XX value in advanced installer mode set the lock values, see page 18.
Cannot enter heat or cool modes	TZT-100 thermostat set for Heating or cooling only modes	Heating or cooling mode not available on your air conditioning system
Cannot set heating and cooling to desired value. Padlock symbol flashes	This is not a fault.	HL=XX (heating set point limit) and CL=XX (cooling set point limit) restrict control range. See page 18 for more detail.
Outside Air Temp display is showing dashes	Outside air temperature air sensor has failed.	Check wiring and outside air sensor. Replace outside air sensor
	No outside air sensor fitted.	Change TT=AO to TT=RS in advanced installer menu.
“Heat” or “Cool” is flashing in the LCD. Heating or cooling has not started.	This is not a fault. Heating or cooling will start shortly.	Anti cycle delay in progress. This can be disabled if required for commissioning. See page 20.
The Fan runs on for some time after the heating or cooling stops, even when I turn the TZT-100 OFF.	This is not a fault.	The fan purge mode is set. FP=XX value
TZT-100 displays wrong mode (C or F).	The TZT-100 can operate in both Deg C and Deg F mode as set in installer menu.	See page 18 for changing the CF=XX value
Cannot select multiple fan speeds	SMT-700 set for single fan speed Sw=OFF	Turn SW1 to ON. NOTE, 3 fan speed mode can only be used on single stage systems.
E.Heat or E.Heating is shown on LCD without manually selecting it.	This is not a fault.	LBP reached, outside air too cold for reliable HP operation. Set LBP with the LB=XX value in the installer menu, details on page 18

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This product has been manufactured by STA who hold all testing and approval certificates.

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This product is Patent Pending.

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