



SAT-1 & SAT-2 Support Information

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Before returning a controller as faulty, please try resetting the controller using the reset procedure – refer clause 22.

1. Indoor Coil Sensor

If not fitted then, Error 5 will appear on wall plaque screen.

Fitting the sensor to the outdoor coil by mistake would most likely cause an HP trip in the Heat Mode as the indoor fan would not start but the system would run normally in Cool Mode.

In Auto Mode where the indoor fan runs continuously it may cause an HP trip as the fan will not move from low speed. There will be no fault indication other than the fan not ramping up and down in the heating cycle.

2. Indoor Fan Operation

MODE Button Functions:

FAN MODE Selectable: High, Med and Low speeds. Compressor will not run.

DRY MODE Compressor cycles on cooling only. Fan runs on Low speed only. Only available on SAT-1, not available on SAT-2 or 2.1.

COOL MODE Selectable: Various fan speeds and 'auto fan'. The option of the fan running in dead zone or stopping in dead zone is also selectable (by dip switch 4). Indoor fan will start on initial start up if dip switch 4 is OFF. Compressor operates on cooling only.

HEAT MODE On SAT-1 automatically controls the fan speed and stops fan in dead zone. On SAT-2 the fan behaviour is selectable to continue running or not in dead zone (by dip switch 8). However it should be noted that the indoor fan does not start on initial start up until indoor coil is warm. On both controllers compressor operates on heating only.

AUTO MODE Selectable: various speeds and fan runs continuously though it does ramp up and down dependant on coil temperature/indoor coil sensor, however it should be noted that in heating cycle the indoor fan does not start on initial start up until indoor coil is warm. The dead zone width is selectable via dip switch 3. There is a time delay (10 minutes) built in to prevent changeover from cooling cycle to heating cycle or vice versa too quickly. Compressor operates on both cooling and heating.

FAN Button Functions:

AUTO MODE Automatically selects the fan speed to suit and maintain set temperature.

HIGH/MEDIUM/LOW Manually select speed desired.

MODE/FAN Setting Combinations:

HEAT MODE + AUTO FAN Compressor runs only in heating and fan ramps up and down stopping in dead zone allowing HOT START and HOT KEEP to function properly. (unless forced to run on low speed by setting dip switch 8 to off position). On initial start up the fan will not run until the indoor coil is warm.

HEAT MODE + SELECTED FAN SPEED Compressor runs only in heating and fan runs on selected speed stopping in dead zone allowing HOT START and HOT KEEP to function (unless forced to run on low speed by setting dip switch 8 to off position). Note: Selected speed may be overridden and moved to a higher speed if the coil temperature becomes too hot, to prevent HP trips.

On initial start up the fan will not run until the indoor coil is warm.

COOL MODE + AUTO FAN Compressor runs only in cooling and fan ramps up and down with the fan running or stopping in dead zone being selectable (by dip switch 4 on the SAT-2 or 2.1, or dip switch 5 on the SAT-1). In cool modes only, on initial start up, the fan may run immediately.

COOL MODE + SELECTED FAN SPEED Compressor runs only in cooling and fan runs on selected speed with the fan running or stopping in dead zone being selectable (by dip switch 4 on the SAT-2 or 2.1, or dip switch 5 on the SAT-1). In cool modes only, on initial start up, the fan may run immediately.

AUTO MODE + AUTO FAN Compressor is able to operate both in cooling and heating cycles, fan ramps up and down, runs continuously and continues to run in dead zone. There is a 10 minute delay when changing between heat and cool cycles or vice versa.

Note: **On initial start up, the indoor fan will not run if heating cycle** is being called for, until the indoor coil warms up.

AUTO MODE + SELECTED FAN SPEED Compressor runs both in cooling and heating and fan runs continuously on selected speed and continues running in dead zone. There is a 10 minute delay when changing between heat and cool cycles or vice versa. Note: On heating the selected speed may be overridden and moved to a higher speed if the coil temperature becomes too hot, to prevent HP trips.

Note: **On initial start up, the indoor fan will not run if heating cycle** is being called for, until the indoor coil warms up.

CONTINUOUS FAN OPERATION The only way to achieve the **indoor fan running continuously under all conditions**, including initial start up, is to wire the fan via a contactor that is then connected to the OUT6 terminal (normally utilised for the Zone Control operation). This terminal has a voltage (230V or 24V depending on the voltage input on OUT5 terminal) at all times the controller is turned on. Some larger units (generally 24 Volt) must have the fan running before the compressor is allowed to start so continuous fan operation is imperative.

3. Temperature Control

The differential is +/- 0.5°C of set point with 10 minute minimum changeover delay between heat and cool cycles in Auto Mode. Do not expect this to control a space temperature this closely. Expect control to within +/- 1.0°C where the controller wall plaque (or remote sensor) is located.

4. Remote Sensors/Averaging of Sensors/Twin Wall Plaques

Up to 4 remote sensors can be connected to the PCB (in indoor unit control box).

As soon as any remote sensor is connected the wall plaque sensor becomes disconnected - unless the zone related to that remote sensor is de-activated.

If more than one sensor is connected then they automatically average providing that the zones related to those sensors are activated.

Likewise if two Wall Plaques are connected to the PC board they will also automatically average.

As an example, if remote sensors were connected to Return Air 2 and Return Air 3 terminals then if Zone 2 and Zone 3 were activated then the controller would average between them. If only one of the Zones was activated then only that sensor would be seen, if both zones were de-activated then the controller would default to the wall plaque sensor (Zone 1)

If the controller finds a sensor to be faulty it automatically keeps that sensor out of any averaging consideration.

5. Hot Start

Operates on initial power up in Heat mode and on the Heat cycle in Auto Mode unless one of the constant fan modes is selected.

In Auto mode as the mode crosses from Cool to Heat, fan will stop unless a constant fan mode is selected.

Indoor fan starts (on Low speed) only once 33°C is reached at indoor coil sensor

Indoor fan changes to Med speed when 39°C is reached at indoor coil sensor

Indoor fan changes to High speed when 45°C is reached at indoor coil sensor

6. Hot Keep (Heat Mode or Heat Cycle in Auto Mode)

Operates during dead zone when in a heating mode unless a constant mode has been selected.

Ramps the fan speed down to a stopped condition when heating stops. The fan speeds back up when heating resumes according to the following criteria:

Indoor fan changes to Med speed when 39°C is reached at indoor coil sensor

Indoor fan changes to Low speed when 33°C is reached at indoor coil sensor

Indoor fan stops when 27°C is reached at indoor coil sensor

Indoor fan starts on Low speed only once 33°C is reached at indoor coil sensor

Indoor fan changes to Med speed when 39°C is reached at indoor coil sensor

Indoor fan changes to high speed when 45°C is reached at indoor coil sensor

7. Cooling Only System

Should be set in COOL MODE only.

Dry Mode (in SAT-1 only) and Fan Mode are also acceptable.

Cannot be set in Auto mode otherwise cooling would run when heating is called for.

In COOL only mode the reversing valve does not operate; the electric heating signal will operate only if dip switch 2 is ON. If dip switch 2 is set to OFF heating cannot be selected.

8. Indoor Freeze Protection

Compressor stops if it has run for 4 minutes with the indoor coil at 1.0°C; restarts when 10°C is reached continuously for at least 1 minute and providing OUC anti-rapid cycle time constraints are satisfied.

9. External Time Clock Compatibility

There are two ways to involve an external time clock or other method of controlling the unit external to the on-board SAT-1 or SAT-2 time clock. They are:

(a) Use of Fault Interlock

There are fault interlocks available that could be used for this purpose, DI-6 (HP), DI-5 (LP), DI-4 (Float Switch) and DI-3 (Hydronic Pump). Any of these could be used, though we recommend DI-4 on Air Cooled systems. An external switch can be wired between any of these terminals and the 'COM' terminal to effect on/off control. The only drawbacks are that an Error Code will appear on the display when the external time clock breaks the circuit and local override is not available.

(b) Mains Power Wiring

Disconnection of the mains power by the external time clock or any other external switching device. As power is lost to the board the battery backup will get heavier use than option (a). This cannot be over ridden, if the circuit is broken for any reason then no control is available at the wall display keypad i.e. local over-ride not available.

Board wakes up live as though there had been a power cut.

(c) New Version SAT-2.1 (released 2010)

The connection of an external time clock (with volt free contacts) or any other external switching device such as a fire trip can be achieved by removing the link across the terminals 'COM' and 'DI-1' to switch the SAT-2 controller off and on.

Power remains on to board at all times – no battery usage.

This can be overridden by utilising the By-Pass function – as detailed on page 8 of the User Operating Instructions.

PC Board wakes up in the same mode as when it was switched off, if in a time clock mode it will respond to the current time clock setting.

On board timers can be used as well as the external time clock.

As the 'COM' terminal has a voltage output controllers cannot be connected in parallel or series with any other SAT-2.1 controller they must be independently wired or have interposing relays to isolate them.

10. BMS

No specific facility is provided to allow for connection to a BMS system.

On the upgraded 2009 version of the SAT-2 controller, on and off control will be available via the terminals 'COM' and 'DI-1' – refer 9(c) above.

On the SAT-1 and earlier versions of SAT-2 the same could be achieved by using the terminals described in 9(a) above with the same drawbacks.

External fault alarm can be achieved by fitting an external alarm relay (part no 201 000 105) to the pins provided on the PC board.

There is no intention of providing for the BMS to be able to alter any control parameters.

11. Dip Switch Changing

Always power off before changing dip switch settings.

This is always good practise and some changes may not take effect if this is not done. Removal of the battery is not necessary.

12. Dip Switch Settings (PC Board)

SAT-1:

	OFF	ON	Factory Setting
DIP 1	Cool only operation	Heat pump r/c operation	On
DIP 2	No electric heat operation	Electric heat operation	Off
DIP 3	1.5°C diff control	1.0°C diff control	On
DIP 4	No outdoor board available	Outdoor board fitted	On
DIP 5	Indoor fan runs in cool mode dead band	Indoor fan off in cool mode dead band	Off
DIP 6	Air cooled system	Hydronic w/c system	To suit

SAT-2:

	OFF	ON	Factory Setting
DIP 1	Cool only operation	Heat pump r/c operation	On
DIP 2	No electric heat operation	Electric heat operation	Off
DIP 3	1.5°C diff control	1.0°C diff control	On
DIP 4	Fan on in dead zone in cool mode	Fan off in dead zone cool mode	Off
DIP 5	Air cooled unit	Hydronic unit	To suit
DIP 6	Two stage operation	Single stage operation	-
DIP 7	Alarm relay activated on lockout only	Alarm relay on every fault	Off
DIP 8	Indoor fan runs on low speed in heat dead band	Indoor fan off in heat dead band (cold draft prevention)	

13. Voltage Selection

There is none. SAT-1, SAT-2 and SAT-2.1 are all 230 volt controllers only, however, a 24V version is now available as a kit (July 2010).

14. Auto Restart

If the power switch is on when the power supply failed, control will automatically restart/resume when power is restored.

If the power switch is off when the power supply failed, control will not restart when power is restored, it will await being switched on or a time clock start.

15. Sleep Mode

Reduces set point temperature in winter 3°C over a 2 hour period and holds this offset temperature until the sleep button is pressed again to reset. Increases set point temperature in summer 2°C over a 2 hour period and holds this offset temperature until the sleep button is pressed again to reset.

Only works in COOL, HEAT and AUTO modes, not in DRY or FAN ONLY mode.

16. Temporary Cancellation of Time Clock Functions (eg for Holiday)

By using the TIMER, DAY and CANCEL buttons the time settings can be cancelled temporarily (stored in the memory - not lost).

By using the TIMER, DAY and CANCEL buttons the time settings are restored.

17. Boost Heat

Terminal OUT2 provides a boost heat signal when the temperature deviates by 3.5°C below set point in any heating cycle.

18. Error Codes

Not all above protection devices are connected so some error codes would never activate. Where multiple errors occur the codes will show one following the other.

SAT-1:

ER 1 – Room Sensor #1 failure

ER 2 – Room Sensor #2 failure

ER 3 – Room Sensor #3 failure

ER 4 – Room Sensor #4 failure

ER 5 - Indoor Coil Sensor #1 failure

ER 6 - Outdoor Coil Sensor #1 failure

ER 7 – Low Refrigerant Charge

ER 8 – Compressor Overload

Heat Cycle Indoor Coil Sensor cuts out compressor at 68°C

Cool Cycle Outdoor Coil Sensor cuts out compressor at 68°C (unless outdoor board or hydronic selected)

ER 9 – Low Pressure (LP) failure

ER 10 – High Pressure failure (HP)

ER 11 – Room Sensor #5 failure at Wallpad B

SAT-1 (cont'd):

ER 12 – Room Sensor #6 failure at Wallpad A

ER 13 – All Room Sensors failure

ER 14 – Water Pump/Float Switch failure

ER 15 – Low Safety Thermostat failure

ER 16 – Communication failure

ER 17 – Hydronic Pump Switch failure

SAT-2:

Sensors highlighted are applicable to 'Hydronic' HWP units only. Should these highlighted error codes appear on an air cooled system, check and change dip switch 5 to OFF position.

ER 1 – Room Sensor #1 failure

ER 2 – Room Sensor #2 failure or LST Sensor #2 failure if set on 2 stage

ER 3 – Room Sensor #3 failure or Indoor Coil Sensor #2 failure if set on 2 stage

ER 4 – Room Sensor #4 failure

ER 5 - Indoor Coil Sensor #1 failure

ER 6 – LST Sensor #1 failure

ER 7 – Low Refrigerant Charge system #1

ER 8 – Compressor #1 Overload

Heat Cycle Indoor Coil Sensor cuts out compressor at 68°C

Cool Cycle has no function as no outdoor coil sensor fitted

ER 9 – Low Pressure (LP) failure

ER 10 – High Pressure (HP) failure

ER 11 – Room Sensor #5 failure at Wallpad B

ER 12 – Room Sensor #6 failure at Wallpad A

ER 13 – All Room Sensors failure

ER 14 – Water Pump/Float Switch failure

ER 15 – LST #1 failure

ER 16 – Communication failure

ER 17 – Hydronic Pump Switch failure

ER 18 – Insufficient Refrigerant system #2

ER 19 – Compressor #2 Overload

ER 20 – LST #2 failure**ER 21 – Discharge Sensor #1 failure****ER 22 – Discharge Sensor #2 failure****ER 23 – Discharge Temperature #1 failure****ER 24 – Discharge Temperature #2 failure**

Note: 'LST' is Low Suction Thermostat

19. Activating a Remote Fresh Air and/or Exhaust Fan

Terminal OUT3 which is designated 'Zone Motor' can be used to drive a 230 volt relay that could then operate a remote fresh air fan or exhaust fan or any other item that needs to operate continuously when the air conditioning is running.

20. Remote Indication

As for clause 19 above the Zone Motor output OUT6 could be used to provide a remote indication signal to show the system is in operation.

21. Temperature Sensor Calibration (available on SAT-2.1 version)

There is no sensor temperature calibration function available on SAT-1 or SAT-2 versions.

The sensor calibration function on the SAT-2.1 can be used to calibrate any of the temperature sensors connected including the one in the wall pad and also any remote sensors that are connected to the main board. This function can only be activated when the thermostat is in standby mode.

To activate this function (during Stand-By mode), hold down  and 'MODE' buttons for a couple of seconds. The main temperature display will show "EP" (Enter Password). The Timer area of the display shows "0---". This indicates the first digit of the password required to enable sensor calibration mode.

The password required is "8699". Press  or  button to edit the first digit until "8" is displayed. Press  to confirm the entry of this digit. The password entry display will then show "-0--". This indicates the second digit of the password is awaiting entry. Follow the same procedure as above to enter the digit "6". Complete the password entry for all four digits. A beep will indicate the 4-digit password has been entered correctly. If an incorrect password is entered 3 times consecutively, or a 60 second delay with no password entry expires, the thermostat will exit this mode automatically. The user will then need to repeat the process to enter the password.

After successful password entry, the temperature display area shows the submenu selection and timer display area shows the temperature offset value for each sensor.

Submenu	Sensor Position	Default Offset	Remarks
d0	Within the Wall pad	0	Set range -5°C to 5°C
d1	Connected to AD3	0	Set range -5°C to 5°C
d2	Connected to AD4	0	Set range -5°C to 5°C
d3	Connected to AD5	0	Set range -5°C to 5°C
d4	Connected to AD6	0	Set range -5°C to 5°C
d5	Connected to AD1	0	Set range -5°C to 5°C
d6	Connected to AD2	0	Set range -5°C to 5°C
d7	Connected to AD7	0	Set range -5°C to 5°C
d8	Connected to AD8	0	Set range -5°C to 5°C

Press 'Time -' or 'Time +' button to select the sub-menu relating to the sensor you want to calibrate. Some sub-menus may be unavailable depending on the model of the main board.

Press '-' or '+' button to edit the temperature offset value for each selected sensor.

Hold down '+' and 'MODE' buttons to exit this function or the system will exit automatically, 60 seconds after the last button press.

22. Reset Procedure

Turn power off, remove battery back up. Check voltage of back up battery. If it is satisfactory (3V) reinstate and turn power back on. If unsatisfactory replace with a fresh CR 2032 battery and turn power back on. Removal of the battery with the power off clears all the memory and re-programming will be required.

23. Zone Control

The Zone Control Board if fitted needs to be connected to the SAT-1 or SAT-2 PC board using the connecting ribbon cable supplied with the Zone Control Kit. A power supply (most commonly 230V) also needs to be connected to terminal OUT5 on the main PCB and from terminal OUT6 to the four zone common terminals on the Zone Control Board.

For a Zone to be active press the relevant Zone button on the wall plaque. Zone 1 can be operated independently or in conjunction with any other zone but to disable Zone 1 then two other zones will need to be operational. Zone 1 should therefore be the largest zone e.g. lounge area in a residence. This is to avoid strangling the unit's total air flow through one small outlet.

24V (or other voltage to suit the damper motors being used) can be used but a transformer needs to also be fitted in the circuit and it is this low voltage supply that is then connected to terminal OUT5 and thence from terminal OUT6 to the common terminals on the Zone Control Board.

24. Troubleshooting

Controller Dormant (Sleeping – fault)

There have negligible incidences of this occurring on either the SAT-1 or SAT-2 controller. If this should occur use the reset procedure detailed in clause 22 above. If the problem persists contact temperzone Engineering.

Cools but does not send signal for Heating

Most likely cause is the incorrect polarity of the line filter wired to the main PC board. Check that the white wire is connected to the 'L' terminal and the black wire to the 'N' terminal.

Temperature swinging out of control or incorrect temperature display reading

The problem may be that the sensor bulb is not protruding sufficiently and is picking up heat from the internal PC board. The sensor bulb should protrude 4 – 5mm from the casing.

Check also that any hole in the wall at the back of the wall control is sealed so that external air is not influencing its temperature sensing.

Ensure wall plaque is not receiving air supply directly from the supply diffuser.

25. Over-ride Outside Time Clock Set Hours of Operation

The Bypass function operation is detailed clearly in the User's Operating Instructions booklet.

26. Key Lock

Key lock allows the wall plaque key pad to be locked such that no parameters can be altered until the key lock is disabled. Once the key lock function is enabled only the On/Off, + and – and CANCEL buttons will operate - allowing the controller to be turned off and on and for the bypass timer to be enacted and cancelled.

Note: the Remote Controller over-rides the key lock function.

27. Off/On Indication

The timer clock display is not an indication of the current condition it is displaying the next operation.

When the wall control's timer clock shows 'OFF' this is an indication that the next operation is to turn off.

Likewise when the wall control's timer clock shows 'ON' this is an indication that the next operation is to turn on.

28. Display of Sensor Temperatures

It is possible to interrogate the controller to establish the temperatures that the sensors are reporting, often this can be a guide to why the controller may be behaving oddly.

To do so hold down the – and FAN buttons to activate the sensor temperature display function. To end this function repeat the same sequence.

Once in this mode use the – and + buttons to scroll through the available parameters: -

C0 Dip Switch setting in Hexadecimal form

C1 Zone 1 temperature

C2 Zone 2 temperature (If Connected)

C3 Zone 3 temperature (If Connected)

C4 Zone 4 temperature (If Connected)

C5 Indoor Coil Temperature

C6 Outdoor Coil Temperature (Not Connected)

29. Swing Motor Operation

The swing motor terminal (OUT3) is activated only when the indoor fan is operational, therefore in any mode where the indoor fan is stopped such as heating 'dead zone' or 'cold start' the swing motor output is also disabled.

29. Compatibility of Versions

SAT-1: Original DX Air Cooled Systems version for ISD/L and OPA Series up to 27 kW; introduced June 2007.

SAT-2: Made suitable also for use with Hydronic units (HWP-K Series); introduced June 2008.

SAT-2.1: Updated to allow capability of sensor calibration and external remote switching via BMS or other switching device; introduced February 2010.

There is no compatibility at all between the SAT-1 controller and either the SAT-2 or SAT-2.1.

There is some compatibility between the SAT-2 and SAT-2.1.

The SAT-2.1 Wall Plaque will communicate happily with a SAT-2 Main board, but sensor calibration will not be enabled. It will appear that it is possible by pressing the appropriate buttons on the Wall Control, but nothing will happen at the Main Board end.

It is possible also to connect a SAT-2.1 Main board to a SAT-2 Wall Control.

However while it will work the Main board is the device that receives the Shut-Down signal via the Digital Input link being open or closed. The SAT-2.1 Main board would react to this and shut down or wake up, however the SAT-2 Wall Control would not know and there would be no indication to the end user that the unit was shut down.

The end user could conclude that it was faulty and call a serviceman unnecessarily.

The end user will not miss the functionality if they never had to start with, but it is important that there is a link between DI-1 (SD) to COM in place otherwise they will think it is faulty upon fitting.

30. Identification

- SAT-1:** Wall plaque has temperzone logo in grey colour on cover and a 4 pin socket bottom right of PC board.
'SAT 1' label on main board chip.
- SAT-2:** Wall plaque has temperzone logo in silver colour on cover and 'SAT-2-LCD' on chip label.
'SAT 2' part no. label on main board.
- SAT-2.1:** Wall plaque has temperzone logo in silver on cover and 'SAT 2.1' on chip label
'SAT 2.1' part no. label on main board and chip.