



SAT-3 and Six Zone Controller Installation Setup Guide





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Applies to: Zone Controller Circuit board version 1, part number 201-000-150,
Software version 1.0 or later and SAT-3 room temperature
controller, part number 201-000-146

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1. Quick Start Guide

1.1. General



To adjust the settings of the SAT-3 controller press  or  to scroll through the different settings and press  or  to adjust a setting. The SAT-3 display shows the setting being adjusted.

The system may include one SAT-3 or two. If two SAT-3s are installed they are configured as main and clone controllers. The main SAT-3 is expected to be installed in zone 1 and stores the control settings of the air-conditioner.

1.2. Main SAT-3 Setup

1.2.1. Installation Settings





Apply power to the system with the main power switch.


Set the main SAT-3 controller in installer mode by holding down  and  together for 3 seconds.

Adjust the required installation settings. At a minimum adjust the following settings.




1. If the unit is not reverse cycle, disable heating mode.
2. Enable zone control.
3. For each installed zone set the zone size to the number of outlets installed in that zone.
4. If the system includes a second SAT-3 controller, change the modbus address of the main SAT-3 controller to 7.

This abbreviated list shows the essential settings. A complete list of the settings is included in section 2.1.

Setting	Display	Range	Notes
Enable/disable Heating mode	i 	1 = On or 0 = off	Default 1, on
Enable/disable zone control	i ZONE En	1 = On or 0 = off	Default 0, disabled
Zone 1 Size	i 	1 to 5	Default 1
Zone 2 to 6 Sizes	i  to 	0 to 5	Default 0 = not installed
Set modbus device address	i Ad	1 to 99	Default 8 DO NOT USE 60 to 63 inclusive


When the required changes have been made, exit installer mode by pressing .

1.2.2. Clock Setting

Hold down the  or  key for 3 seconds to start adjusting the clock. The clock symbol  will start to flash as well as the presently selected day of the week. Set the day

of the week and time using the keys detailed in section 1.1. When the time is set leave the SAT-3 for 15 seconds to return to normal operation.



1.2.3. Configuration Complete

Make sure the SAT-3 is in the off mode (no zones or operating mode displayed). If the SAT-3 is on press the  button to switch the SAT-3 to the off mode.

1.3. Clone SAT-3 Setup

If the system includes a second SAT-3 controller perform the following setup with that controller.

1.3.1. Clone Installation Settings


Enter installer mode by holding down  and  together for 3 seconds. Repeat any configuration changes made to the main SAT-3 controller in section 1.2.1 but do not adjust the modbus address (it should remain at the default value of 8).

Note: it is not required to enable zone control, set the temperature sensor calibrations, zone sizes or set the clock on the clone SAT-3.

When the required configuration changes have been made exit installer mode by pressing



1.3.2. Clone Configuration Complete

Make sure the clone SAT-3 is in the off mode (no zones or operating mode displayed). If the SAT-3 is on press the  button to switch the SAT-3 to the off mode.

1.4. Self Calibration




With the main power switch, remove power to the unit for 10 seconds and then re-apply power. Wait 90 seconds for the system to connect to the SAT-3(s) and initiate damper calibration. While the dampers are calibrating the code A1 will be displayed in the bottom right corner of the SAT-3 display.

If codes other than A1 are displayed refer to section 5, SAT-3 Fault Indications, for troubleshooting.

Damper calibration takes approximately 4 minutes with Polyaire Zonemaster Neat dampers.

1.5. Fan Setup




When all codes have cleared from the bottom right digits switch the main SAT-3 on with the

 button and enter fan setup mode by holding down  and  together for 3 seconds.



1. Adjust the low fan control voltage to a suitable low level monitoring the airflow in zone 1.
2. Adjust the high fan control voltage to a suitable high level monitoring the airflow in zone 1.
3. Advance the menu to adjusting the balance of any zone. Walk throughout the zones confirming that air supply is balanced between zones adequately. Reduce the balance value of any zone supplying excess air. If airflow into a zone or group of zones is too low, set that or those zones balance to 100% and reduce the balance of the other zones until the airflow is even and then re-adjust the fan control voltages to appropriate levels.

When adjustment is complete press  to exit fan setup mode.

This abbreviated list shows the essential settings. A complete list and description of the available settings is included in section 2.2.



Setting	Display	Range	Notes
Low level fan control voltage	 SET Lo	2.0 to 8.0 Default 5.0	Steps of 0.333 e.g. 2.0, 2.3, 2.7, 3.0, etc.
High level fan control voltage	 SET Hi	4.0 to 10.0 Default 8.0	Steps of 0.333 e.g. 4.0, 4.3, 4.7, 5.0, etc.
Zone 1 balance	 ① bL	10 to 100% Default 100%	Steps of 10%

1.6. Air-Conditioner Commissioning


Activate commissioning mode by holding down  and  together for 3 seconds. Test the cooling cycle and (if installed) heating cycle operation of the air-conditioner.


2. Detailed SAT-3 Configuration










2.1. Installation Settings

To place the thermostat in installer mode hold down  and  together for 3 seconds. When the unit is in installer mode the symbol **i** will be shown.

Installer mode allows adjustment of a number of settings that are not normally required by the user.

To confirm and save the new setting(s) press . The thermostat will return to normal operation and the new settings will apply.

To cancel changes to the settings at any time press . Any changes made will be discarded and the thermostat will return to normal operation using the old settings.

Setting	Display	Range	Notes
Minimum setpoint temperature	i SET Ct	5.0°C to Ht	Steps of 0.5°C
Maximum setpoint temperature	i SET Ht	Ct to 50.0°C	Steps of 0.5°C
Temperature differential	i td	0.5 to 1.5°C	Steps of 0.5°C
Indoor fan type	i Ft	1 or 3	Single- or three-speed fan Default 3-speed
Enable/disable Heating mode	i 	On or off	Default on
Enable/disable Cooling mode	i 	On or off	Default on
Enable/disable Cool/Heat (auto) mode	i  	On or off	Default on (see note 1)
Enable/disable Fan Only mode	i 	On or off	Default on
Enable/disable Dry mode	i 	On or off	Default off (see note 2)
Enable/disable Quiet mode	i 	On or off	Default on
Enable/disable Sleep mode	i 	On or off	Default on
Enable/disable Economy mode	i 	On or off	Default on
12 or 24 hour clock	i tC	12 or 24 hours	Default 24 hours
Number of stages	i St	1 or 2	Default 1, not used by zone controlled systems
Room temperature sensor	i rt	1, 2, 3 or 4	Default 1 (internal, see note 3)

Zone 1 temperature sensor calibration	i	①	OF	-4.0 to +4.0°C	Steps of 0.1°C, default 0 (see note 4)
Zone 2 temperature sensor calibration	i	②	OF	-4.0 to +4.0°C	Steps of 0.1°C, default 0
Zone 3 temperature sensor calibration	i	③	OF	-4.0 to +4.0°C	Steps of 0.1°C, default 0
Zone 4 temperature sensor calibration	i	④	OF	-4.0 to +4.0°C	Steps of 0.1°C, default 0
Zone 5 temperature sensor calibration	i	⑤	OF	-4.0 to +4.0°C	Steps of 0.1°C, default 0
Zone 6 temperature sensor calibration	i	⑥	OF	-4.0 to +4.0°C	Steps of 0.1°C, default 0
Enable/disable zone control	i	ZONE	En	On or off	Default off
Maximum difference of zone setpoint from zone 1 set point	i	ZONE	SP	2.0 to 10.0°C	Steps of 1.0°C default 2.0°C
Minimum number of zones that must be on	i	ZONE	nn	0, 1 or 2	Default 1
Zone 1 Size	i	①		1 to 5	Default 1
Zone 2 Size	i	②		0 to 5	Default 0 = not installed
Zone 3 Size	i	③		0 to 5	Default 0
Zone 4 Size	i	④		0 to 5	Default 0
Zone 5 Size	i	⑤		0 to 5	Default 0
Zone 6 Size	i	⑥		0 to 5	Default 0
Programmable timer function	i		tF	1 or 2	Default 1 (standard, see note 5)
Set display backlight duration	i		bd	0 to 59 s	Default 30s
Set display backlight intensity	l		bL	0 to 10	Default 10
Set modbus device address	i		Ad	1 to 99	Default 8 DO NOT USE 60 to 63 inclusive.
Set RS485 baud rate	i		br	1 to 4	1:4800 2: 9600 3:14400 Default 4: 19200
Zone controlled auto mode dead band	i		Ab	0 to 10.0°C	Steps of 0.5°C default 2.0°C (see note 6)

Notes:



1. Auto cool/heat mode can only be enabled if both cooling and heating mode are also enabled.

2. Dry mode (de-humidification) can only be enabled if cooling mode is also enabled.
3. Room temperature sensor: 1 = internal, 2 = external, 3 = average of internal and external, 4=zone 1 temperature (from modbus).
4. Zone 1 temperature calibration is applied to the room temperature from the selected source described above in note 3.
5. Programmable timer function: 1 = standard, 2 = advanced.
6. Auto mode dead band sets a difference between heating and cooling set points in auto mode.

2.2. Fan Settings










Fan settings should not be adjusted until the zone board has calibrated the connected dampers. This process occurs when the thermostat is off and the air-conditioner is not performing any function. Damper calibration typically takes 4 minutes with Polyaire Zonemaster Neat Dampers (15 seconds drive open/closed time) but may take up to 36 minutes with slow acting dampers (2 min drive open/closed time maximum). Code "A1" is displayed on the SAT-3 LCD until all the dampers indicated by the zone size configuration settings are calibrated.

Where two SAT-3 thermostats are installed the fan settings from the lower addressed (main) SAT-3 are used. The zone control does not respond to fan setup mode or fan settings from the higher addressed (clone) SAT-3 thermostat.

To activate fan setup mode hold down  and  together for 3 seconds. When


Fan Setup Mode is active the symbol  on the display flashes on and off.


Settings in Fan Setup Mode are as follows:

Setting	Display	Range	Notes
Low level fan control voltage	 SET Lo	2.0 to 8.0 Default 5.0	Steps of 0.333 e.g. 2.0, 2.3, 2.7, 3.0, etc.
High level fan control voltage	 SET Hi	4.0 to 10.0 Default 8.0	Steps of 0.333 e.g. 4.0, 4.3, 4.7, 5.0, etc.
Additional zone voltage increase	 SET Ad	0 to 950 Default 300	Steps of 50
Zone 1 balance	 ① bL	10 to 100% Default 100%	Steps of 10%
Zone 2 balance	 ② bL	10 to 100% Default 100%	Steps of 10%
Zone 3 balance	 ③ bL	10 to 100% Default 100%	Steps of 10%
Zone 4 balance	 ④ bL	10 to 100% Default 100%	Steps of 10%
Zone 5 balance	 ⑤ bL	10 to 100% Default 100%	Steps of 10%
Zone 6 balance	 ⑥ bL	10 to 100% Default 100%	Steps of 10%



As the settings are adjusted the zone controller adjusts its operation to allow the settings to be evaluated:


Setting	Zone controller operation
Low level control voltage	Zone 1 operates with Fan Low setting
High level control voltage	Zone 1 operates with Fan High setting
Additional zone voltage increase	Operation switches between zone 1 at medium airflow setting and all enabled zones at medium airflow setting every 2 minutes. This parameter compensates the fan voltage as additional zones are opened and the airflow increases. When this parameter is set correctly the airflow into zone 1 should remain constant regardless of how many zones are operating although there will be temporary changes as the dampers open and close.
Zone 1 – 6 balance	All enabled zones are operated at medium airflow. The airflow to any zone can be reduced by decreasing the corresponding balance setting.


If the  key is pressed or if no key is pressed for 15 minutes the SAT-3 will return to normal operation using the updated settings.

If the  button is pressed the SAT-3 will discard the updated settings and resume normal operation with the previous settings.

2.3. Commissioning Mode

To activate or de-activate commissioning mode hold down  and  together for 3 seconds. When commissioning mode is active the symbol **i** on the display flashes on and off.

Commissioning mode automatically ends after 30 minutes and the thermostat returns to normal operation. Commissioning mode also can be terminated by again pressing 

and  together for 3 seconds or by removing and then re-applying power to the thermostat. Operation in commissioning mode is identical to that in normal mode except that safety timer durations are made shorter as follows:

Delay	Normal	Commissioning
Minimum compressor on-time:	90 seconds	10 seconds
Minimum compressor off time:	90 seconds	20 seconds
Minimum time from compressor-on to next compressor-on:	6 minutes	30 seconds
Minimum cooling-to-heating change-over time:	10 minutes	1 minute

Minimum heating-to-cooling change-over time:	10 minutes	1 minute
Power on delay prior to starting compressor	2 minutes	2 minutes

Entering Commissioning mode also causes all dampers to be scheduled for re-calibration immediately. This can be used in service to test dampers have been correctly installed.

3. Zone controller DIP Switch Setting

The DIP switch SW1 on the zone controller controls the communication settings for the modbus master (thermostat) and slave (outdoor unit) connections. It should not be necessary to adjust the DIP switch from its default settings.

3.1. Slave Communication Settings

Default values are **bold**.

Parameter	Setting	Dip Switch Configuration	
Baud Rate	4800	DIP 1,2	OFF, ON
	9600	DIP 1,2	ON, OFF
	19200	DIP 1,2	OFF, OFF
	38400	DIP 1,2	ON, ON
Parity	Even (1 Stop bit)	DIP 3,4	OFF, OFF
	Odd (1 Stop bit)	DIP 3, 4	OFF, ON
	None (2 Stop bits)	DIP 3, 4	ON, OFF

3.2. Master Communication Settings

Default values are **bold**.

Parameter	Setting	Dip Switch Configuration	
Baud Rate	4800	DIP 5,6	OFF, ON
	9600	DIP 5,6	ON, OFF
	19200	DIP 5,6	OFF, OFF
	38400	DIP 5,6	ON, ON
Parity	Even (1 Stop bit)	DIP 7,8	OFF, OFF
	Odd (1 Stop bit)	DIP 7,8	OFF, ON
	None (2 Stop bits)	DIP 7,8	ON, OFF

4. Zone Controller Status Indication And Troubleshooting

The LED on the Zone controller printed circuit board is used to display codes indicating the status of the Zone controller.

LED Pattern	
Boot Loader	
On 100ms, repeats every second	Boot Loader waiting state – persists for 10 seconds following power on unless an update program is detected.
Three short flashes per second, even on/off time (167ms)	Boot Loader waiting to receive program
Ten very short flashes per second, even on/off time (50ms)	Boot Loader programming

Two short flashes 100ms each every second, 100ms off between flashes	Boot Loader complete, main program will start soon
Normal Operation	
On 1.5 seconds, off 1.5 seconds	Normal operation, SAT-3 is off
On 0.5 seconds, off 0.5 seconds	Normal operation, SAT-3 is on
Fault Indication	
LED off 2 seconds, LED on 2 seconds, followed by a number of 0.1 second flashes with 0.4 seconds between them	Fault indication, the number of short flashes indicates the error number in the table below.

Number of flashes	Software System	Fault Sources	Solutions
1	Thermostat	No interface	Check the connections to the SAT-3. Check that the A and B wires have not been reversed. Check that the 12V and 0V wires are connected correctly.
		Not started	
		Slow processing	
2	Modbus Slave	Bad CRC	Check the connections between the Outdoor Unit Controller (UC6/UC7/UC8) and the zone controller. Check that the A and B wires have not been reversed.
		Time Out	
		No Communications	These faults are not anticipated in normal operation. Check that a third party device has not been connected to the RS485 bus between the zone controller and outdoor unit controller.
		Unknown Function	
Overflow			
3	Modbus Master	Un-expected condition	This fault is not anticipated in normal operation and is unlikely to impair proper operation. Check that a third party device has not been connected to the RS485 bus between the thermostat and zone controller.
4	SAT-3	Timeout	Check the connections to the SAT-3. Check that the A and B wires have not been reversed. Check that the 12V and 0V wires are connected correctly.
		Communications error	
5	Damper	Continuous Current fault	A damper has continued to draw current during calibration for longer than the maximum allowed calibration time of 2 minutes. Check the damper wiring.
		Not connected	A damper indicated as installed by the thermostat settings recorded an operating period of less than 5 seconds during calibration. Check the damper wiring.

6	Thermistor		This fault is set if a thermistor fails short or open circuit, the CPU temperature exceeds 80°C or the CPU voltage is out of specification.
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Fault Indications above 6 are reserved for temperzone use and do not indicate a failure of the zone controller or system.

5. SAT-3 Fault Indications

The SAT-3 indicates some faults that may be useful during installation. Faults are indicated in the bottom right area of the LCD.

Following each configuraton change cycle power to the unit to restart the self initialisation procedure.

Wiring changes should only be made with the power disconnected.

Code displayed	Description	Remedy
A1	Damper calibration has not completed	Wait for calibration to complete before setting fan and damper control parameters (see section 2.2). Calibration only proceeds when the SAT-3 is off and the air-conditioner is not performing any operations such as fan run-on.
A2	Damper calibration failed	Check damper connections and that the zone sizes set in the thermostat correspond to the physically wired damper connections. This error will occur if a zone is indicated as installed in the SAT-3 setup but a damper is not connected to or not properly wired to the corresponding zone board connector.
A3	No communications between zone controller and outdoor controller	Try moving jumper J1 on the Zone Controller circuit board from one pair of pins to the other pair. Check the wiring between the zone controller and IUC board and between the IUC and the outdoor unit. Check the zone controller is configured for 19200 baud even parity with the slave communication settings (see section 3.1). Check the SAT-3 baud rate setting is 19200 baud (see section 2.1).
t1	SAT-3 internal temperature sensor error	The internal temperature sensor of the SAT-3 is damaged. Replace the SAT-3.
t2	SAT-3 external temperature sensor error	Check the external temperature sensor connected to the Sat-3.

t3	No communications between SAT-3 and zone controller	Try moving jumper J2 on the Zone Controller circuit board from one pair of pins to the other pair. Check the wiring between the zone controller and the SAT-3. Check the SAT-3 baud rate is set at 19200 baud (see section 2.1) and the zone controller is configured for 19200 baud even parity with the master communication settings (see section 3.2).
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6. Operation Overview

6.1. SAT-3 Controller Configuration

When power is applied the zone controller detects the SAT-3 controllers connected to the modbus master RS485 bus. If two SAT-3's are detected they are ordered by their modbus address.

The following parameters are then read from the lower addressed SAT-3 and used to control the operation of the zone controller:

- Fan low voltage setting
- Fan high voltage setting
- Fan increase setting
- Zone balancing settings
- Zone temperature sensor calibration settings
- Installed zone size settings
- Auto mode dead band setting

The following parameters are copied from the lower addressed SAT-3 to the higher addressed SAT-3:

- Time settings
- Installed zone sizes

Additionally the zone control enabled bit of each SAT-3 is written on and timer programming on the higher addressed SAT-3 is disabled.

If the address of a SAT-3 is changed with the installer settings, power must be removed from and re-applied to the zone controller to re-initiate the detection and configuration process.

If the configuration settings of a SAT-3 are changed they will not be read by the zone controller until the power to the zone controller is removed and re-applied.

6.2. Temperature Sensors

During operation the temperatures detected in each zone are written to the SAT-3('s) and can be reviewed by pressing the button of the corresponding zone.

If no temperature sensor is connected to the zone 1 temperature input the temperature sensor in the lower addressed SAT-3 is used as the zone 1 temperature.

If a temperature sensor is not present in any zone configured as installed, then the zone 1 temperature is used for control purposes in that zone.

6.3. Dampers

By default the dampers are driven to the fully open state. When the unit operates the dampers controlling zones that are off or have no demand are fully closed. Dampers

controlling operational zones are controlled between fully open and closed to supply the required amount of air into each zone.