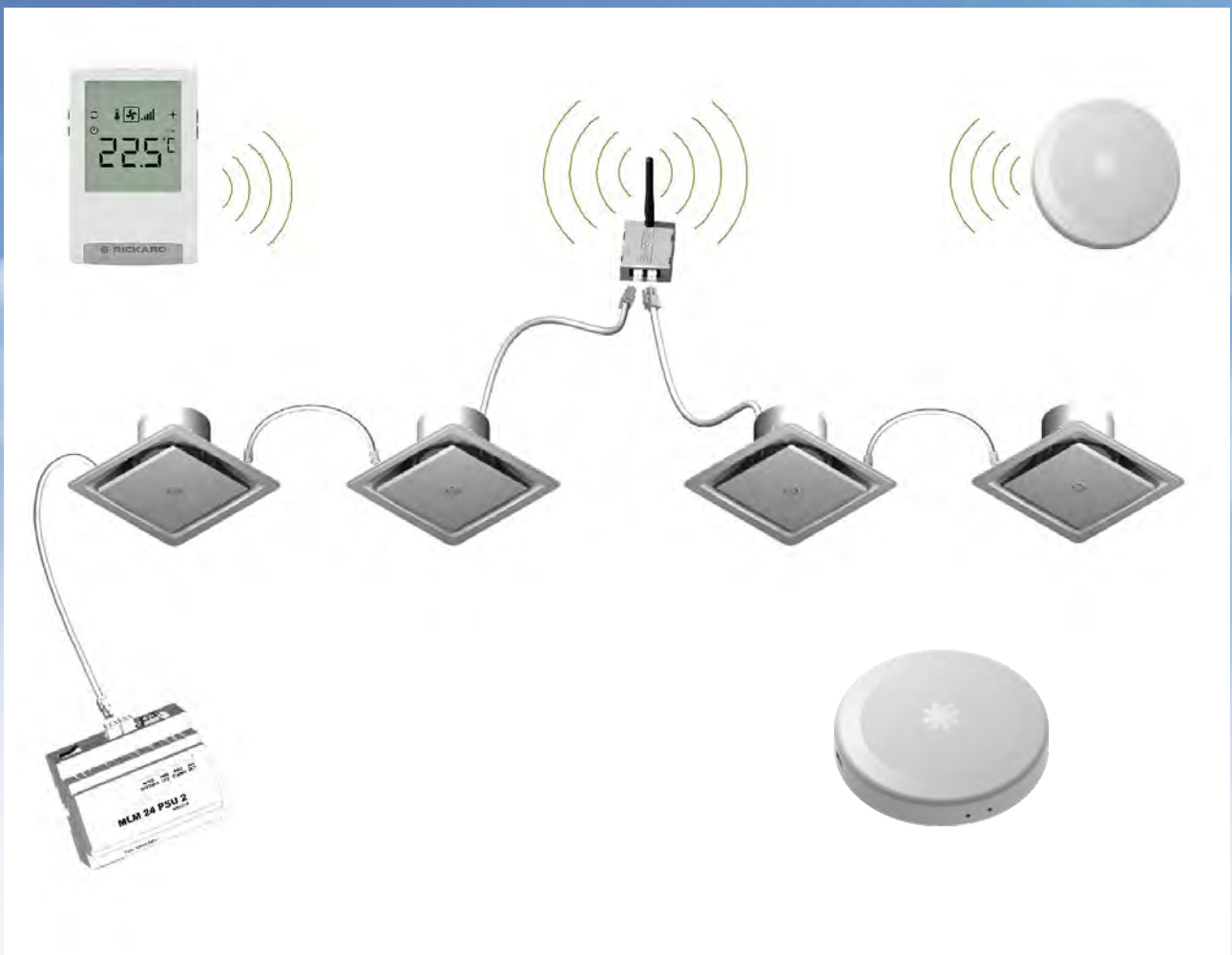


# MLM RF WIRELESS WALL THERMOSTAT & POD SENSOR OPERATING MANUAL



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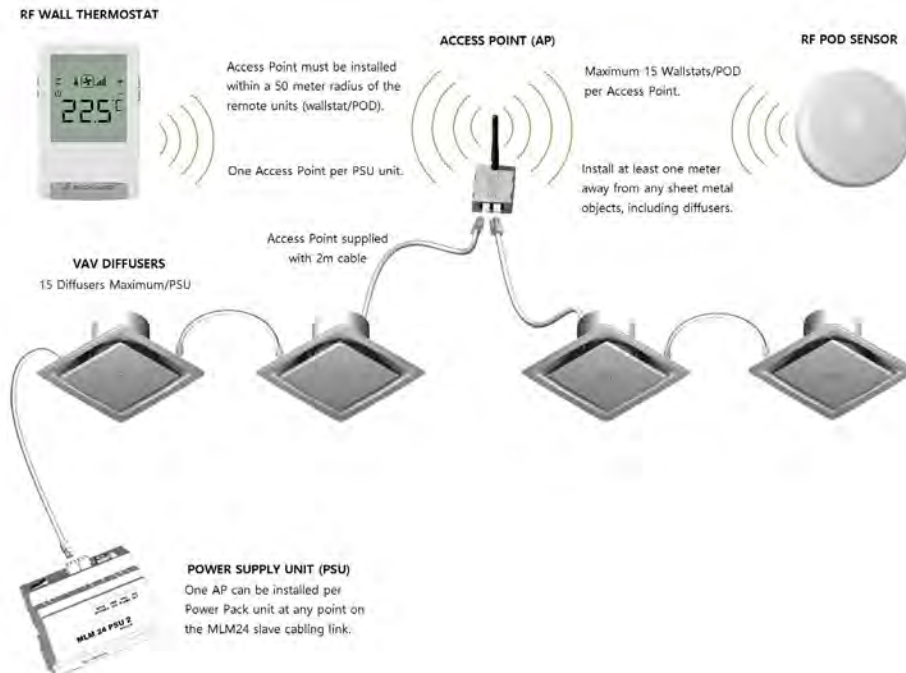
## Table of Abbreviations

AP	Access Point	RF base station module
ED	End Device	RF Wallstat or POD Sensor
LI	Link	Remote device mode
LIM	Link Mode	MLM Tool mode
MLM	Multi Loop Modular	VAV distributed control system
RF	Radio Frequency	
PS	POD Sensor	RF thermostat no display
RSSI	Receive Signal Strength Indication	Signal strength
SA	Share Address Mode	Remote Device mode
SAM	Share Address Mode	MLM Tool mode
SP	Set Point	Temperature control point
WS	RF Wallstat	RF wall mounted Thermostat with LCD
MCTI	Maximum Communication Transmit Interval	

## MLM RF Overview

The MLM RF consists of the following hardware units: an Access Point, the RF Wall Thermostat (Wallstat) and a RF POD Sensor. This hardware unit in combination with the MLM Tool application software, revision 8.16 or later, comprise the MLM RF system.

The MLM RF system allows for the remote placement of Wall thermostats and POD sensors without any cabling restrictions. The installation will typically comprise of one Access point per Power Supply Unit connecting remotely to a maximum of 15 Wall Thermostats or POD Sensors, allowing for up to 60 remote units per MCU. See 'MLM 24 RF Installation Diagram' below:



The Access point is powered by the MLM bus. The remote RF units are each powered by a pair of Lithium AAA batteries, with a typical operational life of 3- 5 years. To conserve power, the RF communication between units is adaptive and could vary between 1 and a maximum of 20 minutes (the default maximum is set at 10 minutes), depending on the operational requirements of the control system. During commissioning however, this period is reduced to once a minute.

## Adaptive Communication

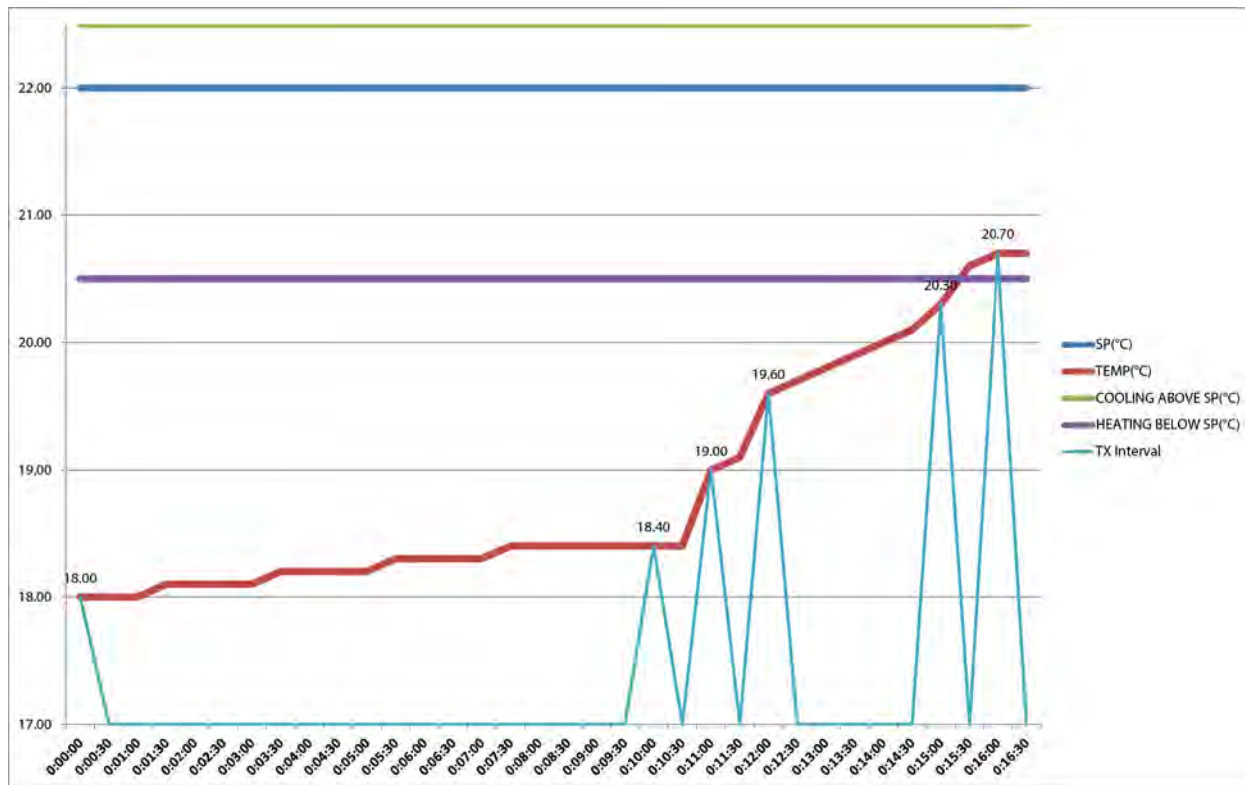
In order for the RF End Device (ED) to conserve power an adaptive communication interval has been implemented between the ED and AP.

For a room temperature between 0.5°C above and 1.5°C below Setpoint, the ED response is more 'active'. In this scenario, the ED will transmit information to the Access Point for every 0.2°C change in room temperature, at 1 minute intervals. If the temperature change is less than 0.2 °C for the entire duration of the Maximum Communication Transmit Interval (MCTI), the ED will transmit every MCTI minutes. The MCTI can be set via MLM Application for each ED to a maximum of 20 minutes.

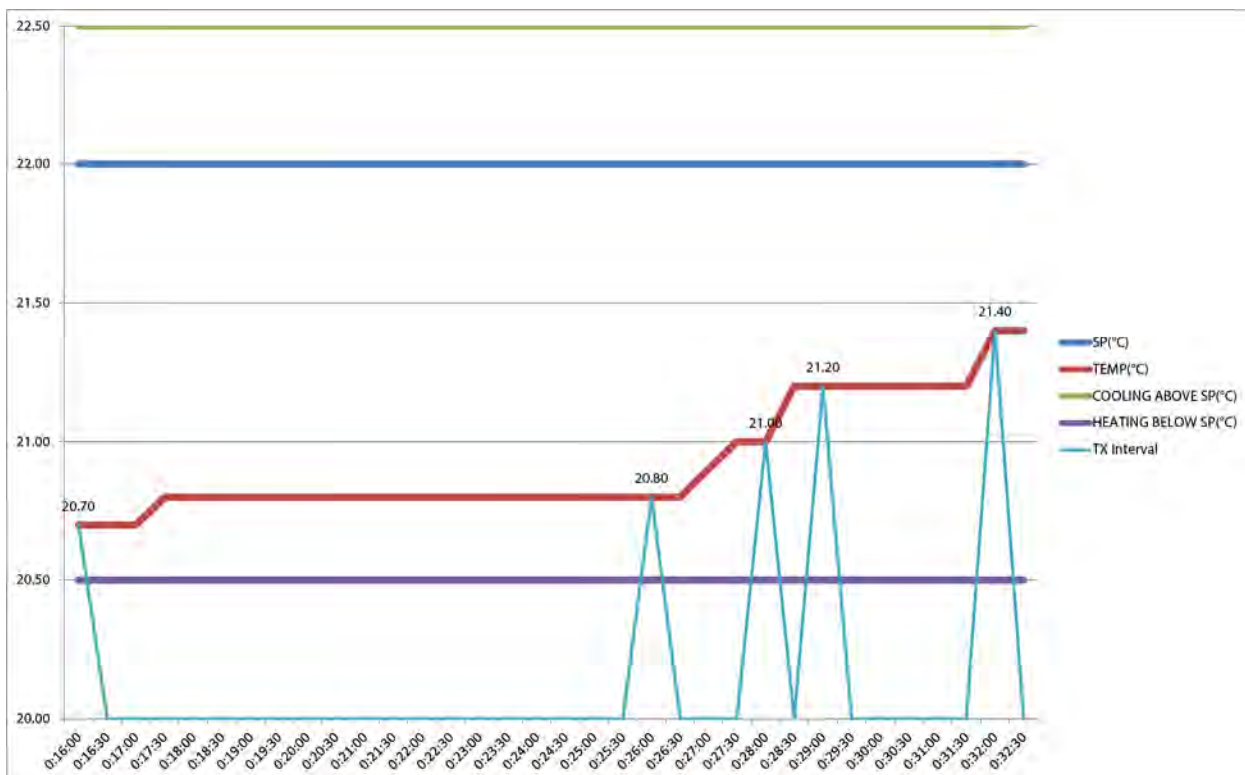
For a room temperature above 0.5°C and below 1.5°C from Setpoint, the ED response is more 'passive'. The ED will transmit information to the Access Point for every 0.5°C temperature change in room temperature, at 1 minute intervals. If the temperature change is less than 0.5°C for the entire duration of the Maximum Communication Transmit Interval (MCTI), the ED will transmit every MCTI minutes.

The two graphs below shows communication in the 'active and 'passive' regions. In this instance the MCTI is set to the default of 10 minutes, but can be set between 1 and 20 minutes. Increasing the MCTI value will significantly increase the battery life of the ED.

The graph below shows the EP transmit response with Room Temperature changing from the 'passive' into the 'active' region.



The graph below shows the response inside the 'active' band. Note with a temperature change below 0.2°C the MCTI period is applicable.



The following MLM RF hardware models are available:

- BU2011-2 MLM 24 RF Access Point
- BU2111-2 MLM 24 RF Wallstat
- BU2211-2 MLM 24 RF Remote Thermostat

### Installation and Commissioning

The MLM RF units are fitted onto a standard MLM 24 installation. It interfaces to the MCU 2 V6.20, with the MLM Tool V8.16, used for commissioning and diagnostics.

Note that when reference is made in this document to the End Device it refers to both the Wallstat and POD sensor devices, the main difference between devices being the Wallstat LCD display.

### Hardware Installation

The RF system requires an AP (Access Point) to be installed within a 50 meter radius of the remote units, either Wallstat or POD sensor. One AP can be installed per Power Pack unit at any point on the MLM24 slave cabling link. Ensure the AP is installed at a central vantage point, normally inside a ceiling void. Ensure the antennae wire protruding from the AP enclosure is flexed in a vertical position. The AP is supplied with a 2m cable, install at least one meter away from any sheet metal objects. Ensure the AP is securely fixed.

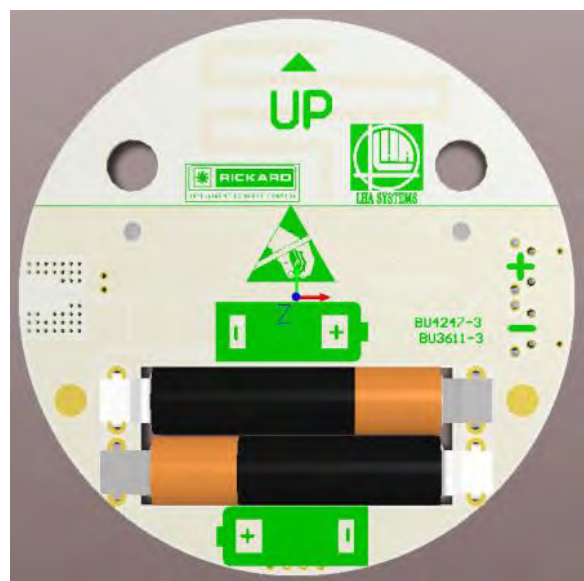
A maximum of 15 Wallstats or POD sensors can be installed per AP. Any combination of Wallstat and POD sensor is allowed provided the total does not exceed 15 units. Please follow the installation instructions provided indicating how to fit the remote unit back shell to a wall. Fit two of the correct battery types to each remote unit, ensuring the correct polarity as indicated in pictures below. The batteries to be used are 1.5V AAA lithium cells. Clip the remote unit onto the back shell. The remote unit will be in sleep mode with the LCD screen switched off.

### Battery Polarities

RF Wallstat



RF POD Sensor

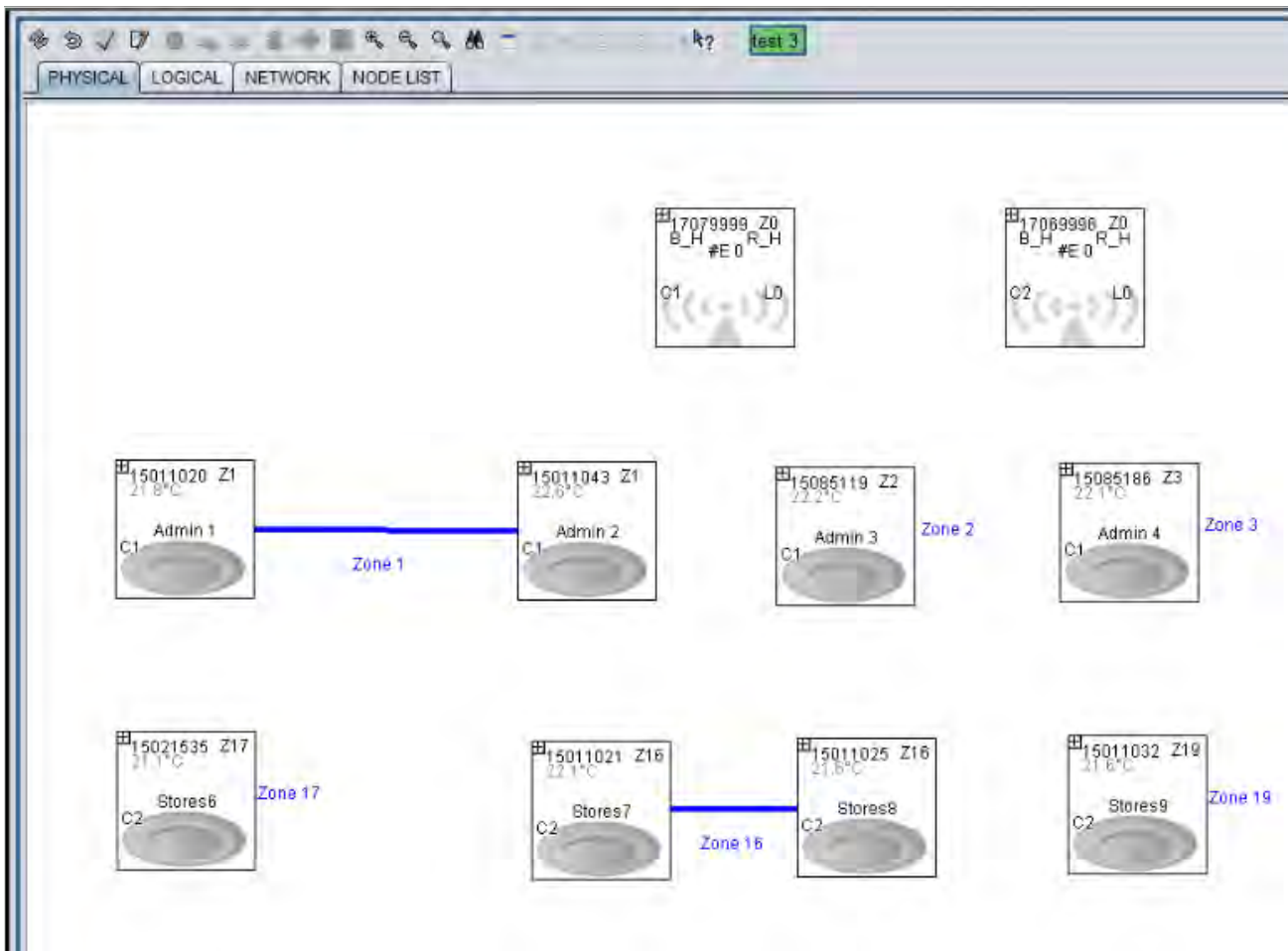


### Installing the RF devices

The following describes the process of installing the RF devices to the MLM network.

### Installing the MLM network

Ensure the MLM network is powered up and running, with the MLM Tool connected to the section (MCU) containing the RF units to be linked. Verify that all the wired nodes are visible in the MLM project. Select the edit function in the MLM Tool and zone the diffusers into the required control zones. Verify that the Access Points are visible on the MLM Tool as indicated. The diffusers should be in idle mode as no master controllers are selected at this stage.



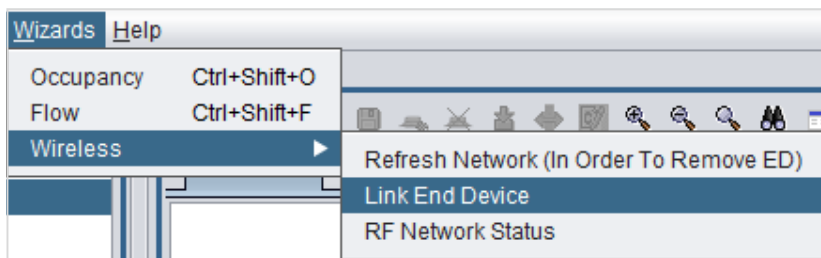
### The RF binding process

The RF binding process is a three stage process designed to seamlessly integrate the RF end devices into the MLM network. The three steps are as follows:

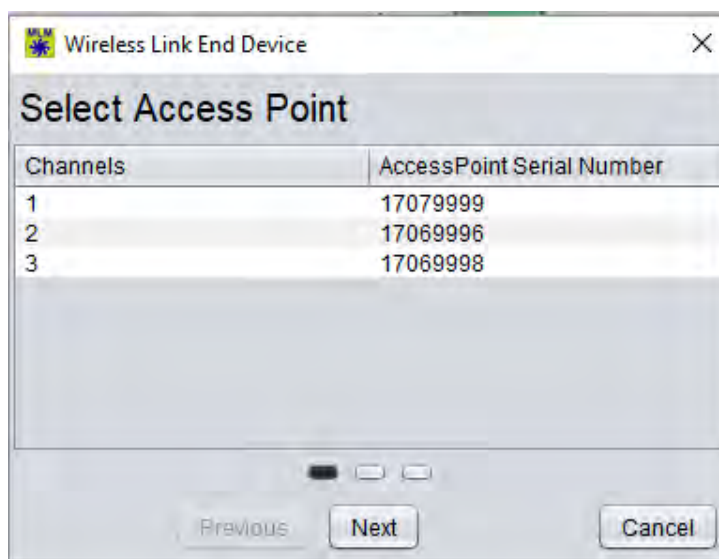
1. Discover - the Access point is activated to discover which RF end devices are visible to that Access Point.
2. Link – the discovered RF end devices are linked (saved) to the activated Access point.
3. Group –the linked RF end devices are connected to host diffusers, i.e. allocated to control zones.

**Discover the RF end devices**

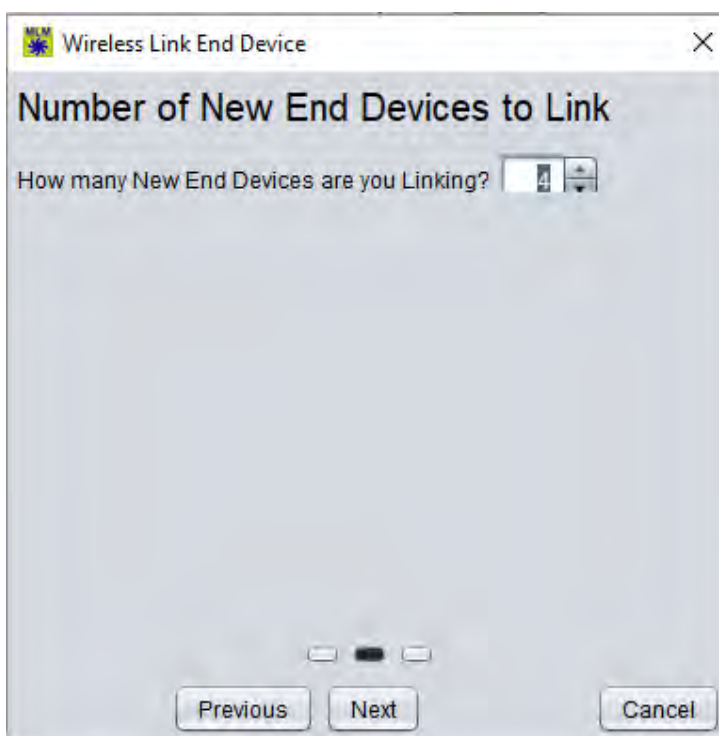
From the menu select 'Wizards/Wireless/Link End Device' as shown in this image.



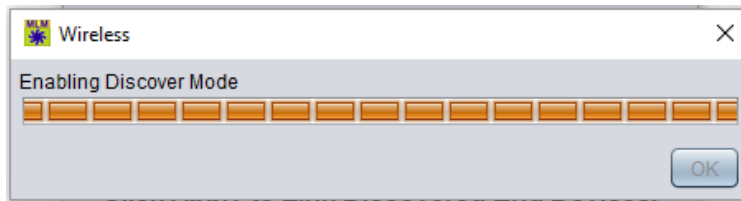
A list of Access Points will show. Select the AP you wish to bind the end devices to and click Next.



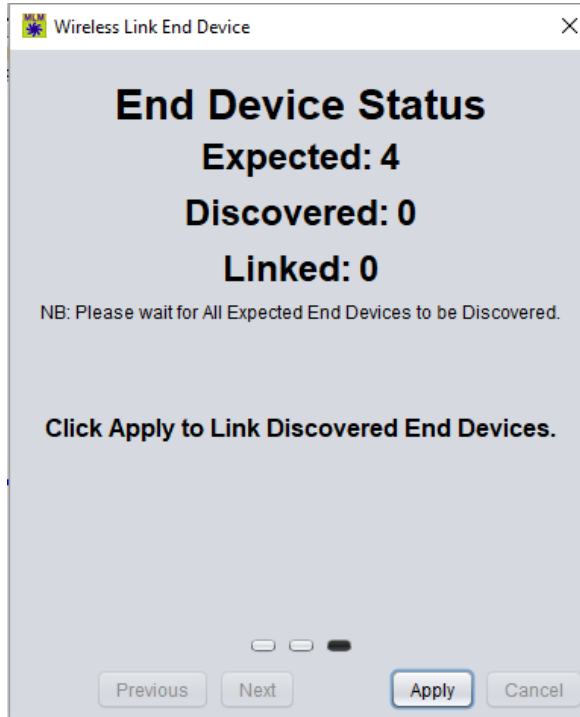
Select the number of End Devices you need to discover for that Access Point. Should the End Device(s) that needs to be discovered be in addition to previously linked devices, only enter the quantity of additional units.



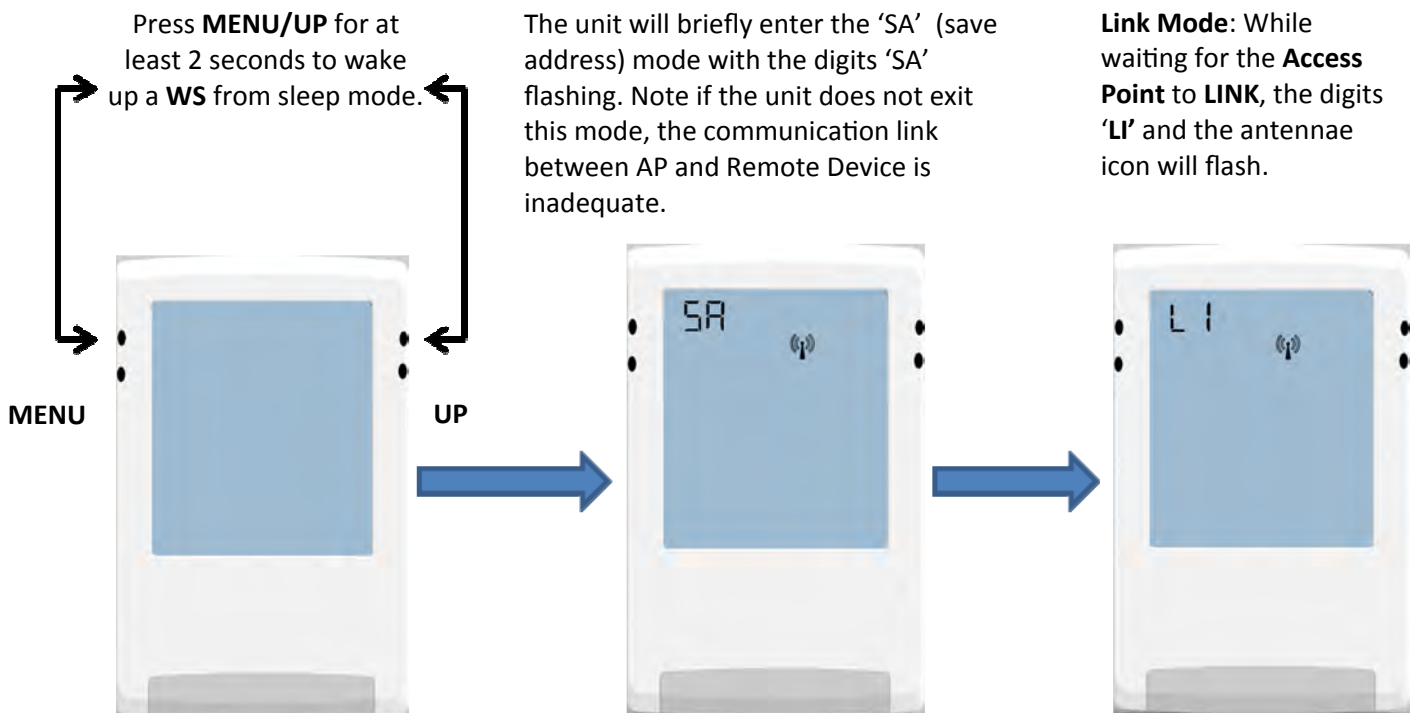
Click next



The Access Point is now ready to discover End Devices. The Access Point buzzer will beep periodically.

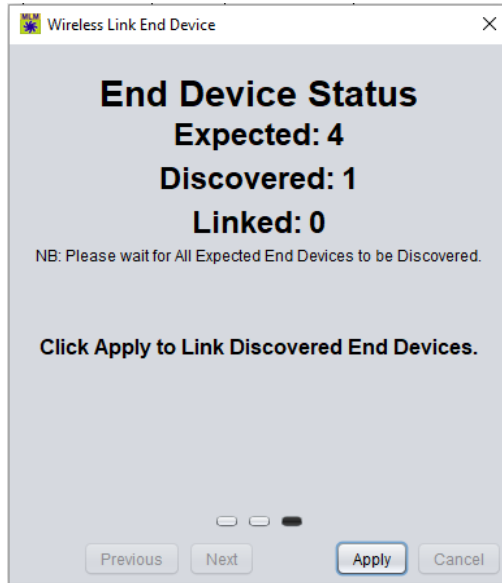


The next step is to go to an End Device to be bonded to a particular Access Point. Note the End Device must be in sleep mode - indicated by a blank display on the RF Wallstat. While in discover mode the RF end devices will beep every 5 seconds.





In the MLM Tool, the discovered quantity of End Devices will now be incrementally displayed.

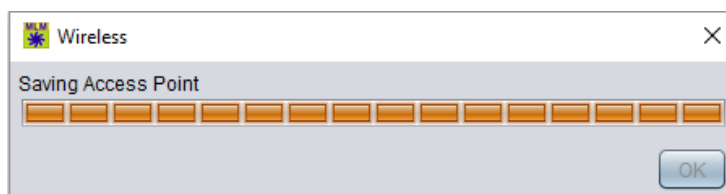


Repeat the process with the RF end devices until all the units requiring connecting to the selected Access Point is shown on the Discovered count.

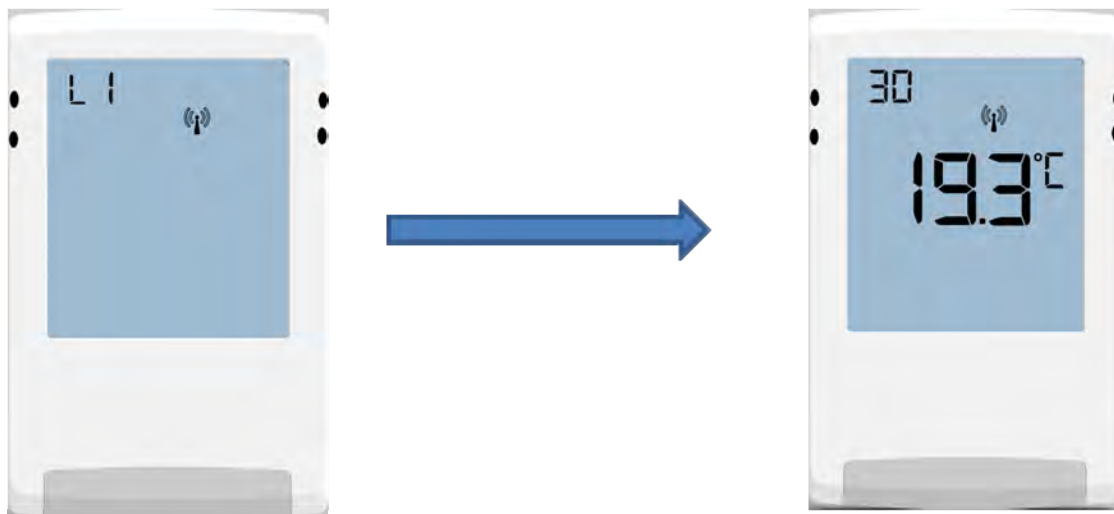
Note at this stage the individual RF end devices are already in 'Link' mode and ready for the permanent linking process to begin. The Access Point will stay in 'discover' mode to allow for all the RF end devices to be detected.



Once the Expected and Discovered counts are equal, the Link process will proceed automatically. Note the Access Point now re-connects to the end devices in a permanent (Link) mode. This process can take a few minutes to complete.



During this process the Wallstat display will revert from Link mode to the normal operating mode. Note the RSSI indicator in the top left display and the RF icon permanently on.



Once completed, the End Device icons are now grouped to the right of the Access Point on the MLM Tool Network screen. Note also our linked End Device count matches the discovered count on the Access Point icon.

Access Point		
ID:1	TC6	PC:BU20
Serial	1707999t	
BATT_L	Discovered:	4
RSSI_L		
Comms		
	Linked:	4

Wireless Wallstat		
ID:1	TC7	PC:BU32
Serial	1709001t B R C	
	°C °F	
Sen	20.7	Co 0.0
SP	22.0	BO 1.8
Zone Flow :0 l/		

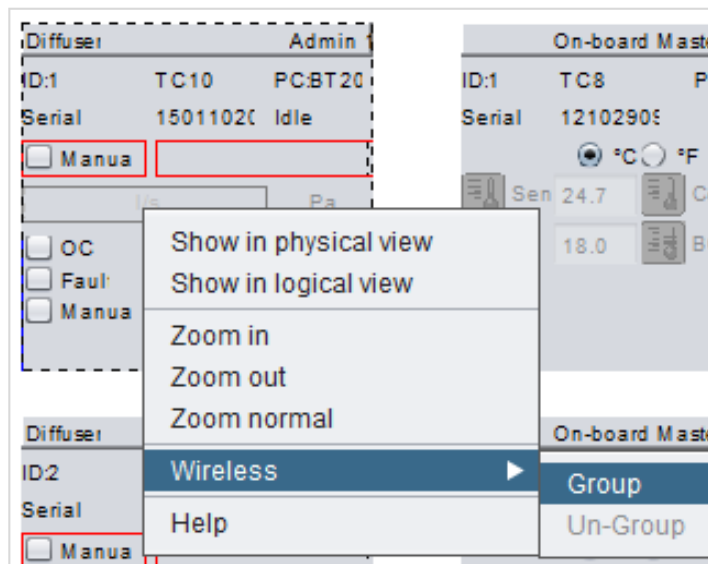
Wireless Wallstat		
ID2	TC7	PC:BU32
Serial	1708000t B R C	
	°C °F	
Sen	20.5	Co 0.0
SP	22.0	BO 1.8
Zone Flow :0 l/		

Wireless Wallstat		
ID:3	TC7	PC:BU32
Serial	1709001t B R C	
	°C °F	
Sen	20.5	Co 0.0
SP	22.0	BO 1.8
Zone Flow :0 l/		

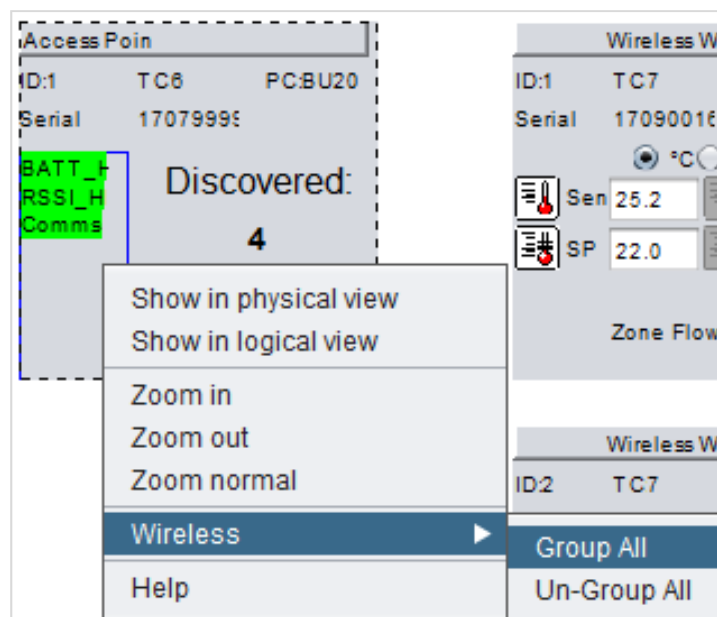
### Grouping the Remote units

The next step is to group each End Device to a specific diffuser in a control zone. By connecting an End Device to a diffuser, it is grouped to the zone that diffuser belongs to. Any one diffuser in a zone can be selected to bind an End Device to that zone.

To group a single End Device to a particular diffuser, right click on the diffuser icon and follow the Wireless/Group link.

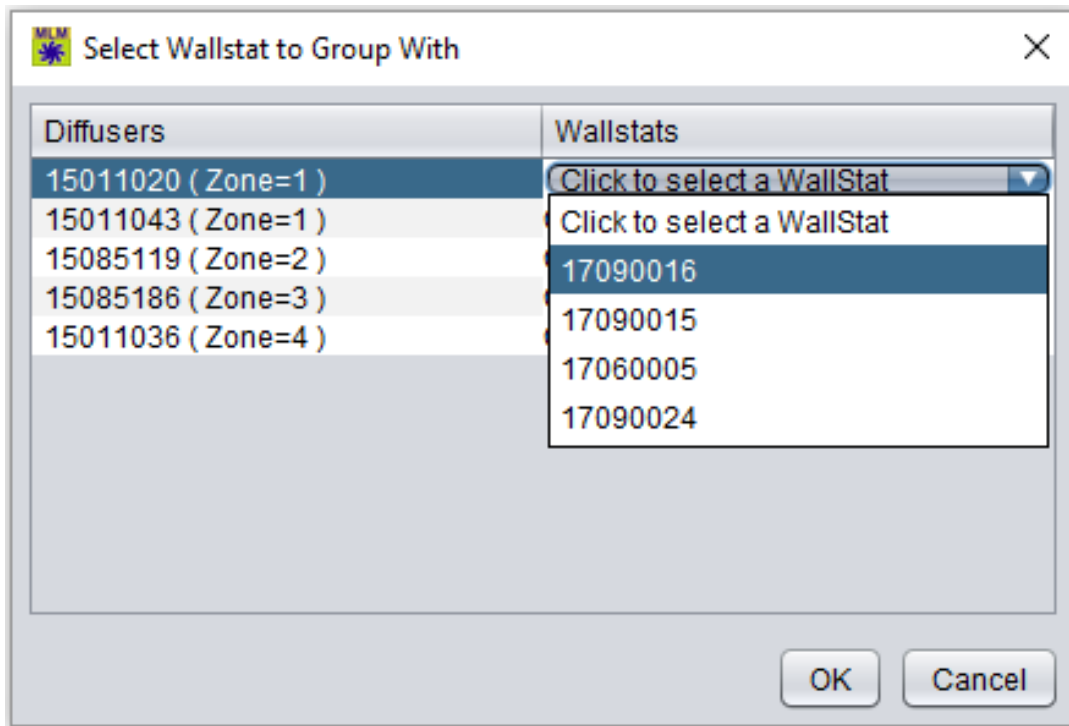


To group multiple End Devices, right click on the Access Point icon and follow the Wireless/Group All link.

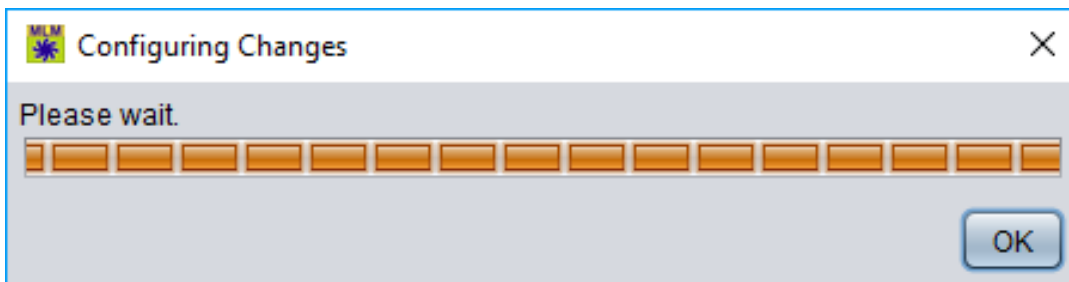


From the listed diffusers, select a diffuser in the required zone to group the End Device to. Note the zone numbers are indicated for easy selection.

Under the Wallstats heading, select the tab directly opposite the selected diffuser (zone) and choose an End Device from the dropdown list.



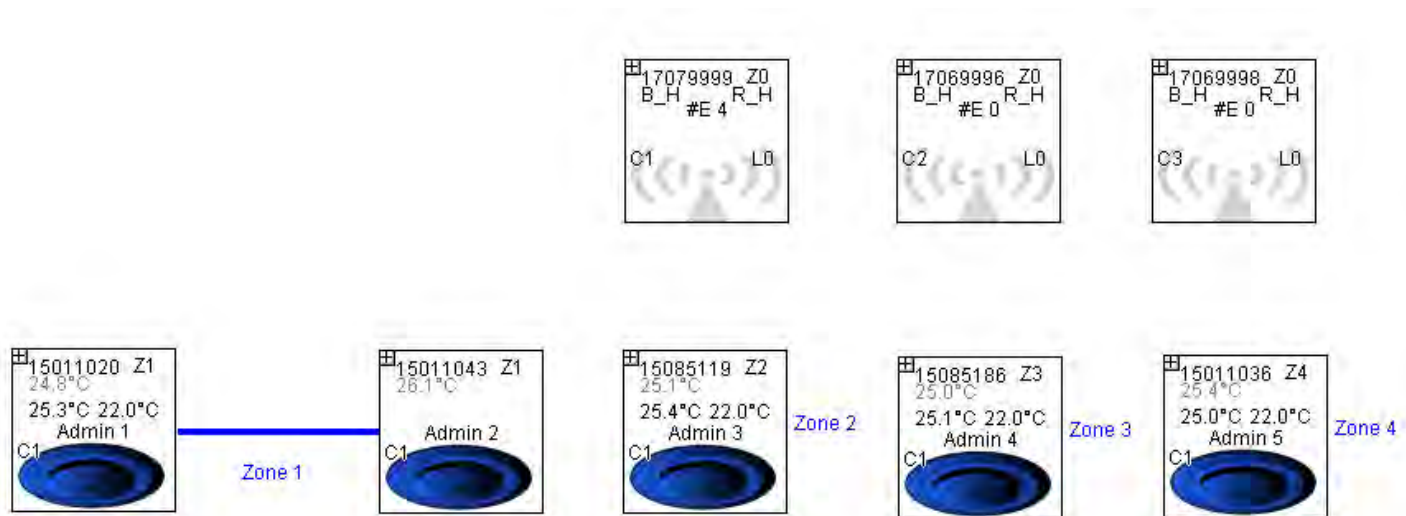
Press OK once all the End Devices are selected. The final binding configuration is now being saved.



The End Devices are now grouped to their respective zones as shown in the Physical view..

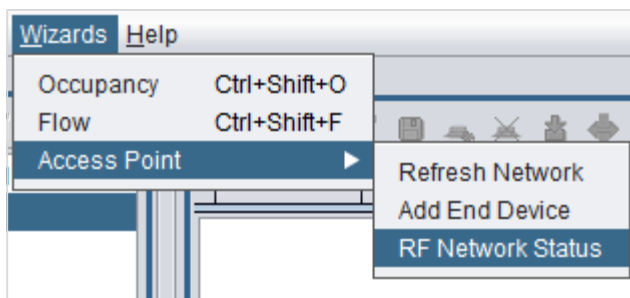


The diffuser control modes will now exit idle mode for active control operation.



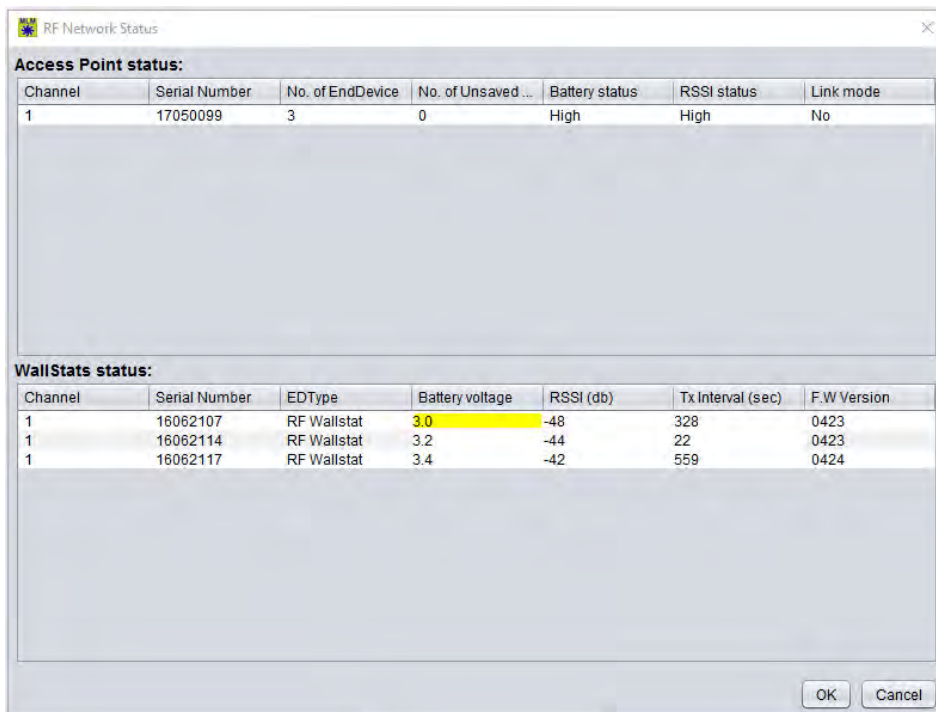
### Verify and Replace End Devices

To check the RF network status and health, select 'Wizards/Access Point/ RF Network Status'.



The Network Status Display is divided into two parts. The top part displays the Access Point status, listing a maximum of 4 Access Points on the network (one per channel). Battery and RSSI status indicated as 'High' means the level detected for the End Devices connected to that Access Point is ok, with a 'Low' requiring identification of the particular End Device in the bottom half of the screen.

The bottom part lists all the End Devices on the network. Note the yellow background for the battery voltage of the top Wallstat indicates the battery status low but still ok. A red background will indicate battery status low.



To conserve power, the transmit intervals from End Devices to the Access Point is adapted to the operational requirements, alternating from a few seconds to a maximum of 10 minutes. The 3rd Wallstat listed here indicates a transmit interval of 1210 seconds, flagged in yellow to indicate a communications break between Access Point and Wallstat.

WallStats status:

Channel	Serial Number	EDType	Battery voltage	RSSI (db)	Tx Interval (sec)	F.W Version
1	16062107	RF Wallstat	3.0	-45	379	0423
1	16062114	RF Wallstat	3.2	-47	74	0423
1	16062117	RF Wallstat	3.4	-42	1210	0424

OK Cancel

Should the communication break exceed 22 minutes, the interval field will be flagged in red, which effectively means communication loss between Access Point and Wallstat.

WallStats status:

Channel	Serial Number	EDType	Battery voltage	RSSI (db)	Tx Interval (sec)	F.W Version
1	16062107	RF Wallstat	3.0	-44	76	0423
1	16062114	RF Wallstat	3.2	-47	371	0423
1	16062117	RF Wallstat	3.4	-42	1220	0424

OK Cancel

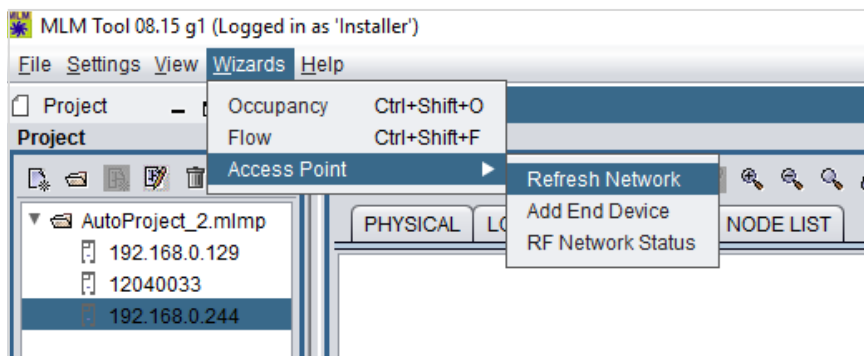
Indicated below is a Wallstat shown after a timed out communication (bottom). Notice the room temperature of zero degrees on the Wallstat icon with the diffuser in heating mode. After a minute the diffuser will revert to a neutral (idle) mode with re-heater switched off.

The image displays several screenshots of control interfaces:

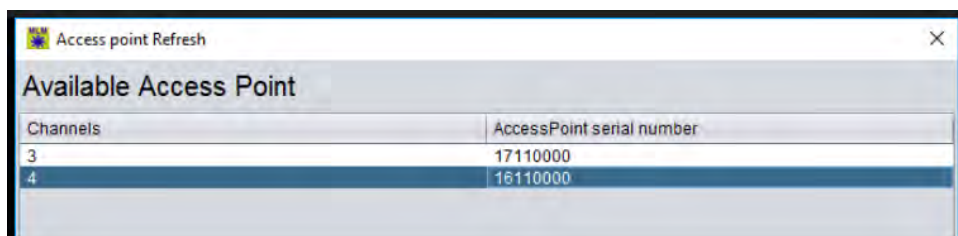
- Diffuser Controller (Top Left):** ID:1, TC:10, PC:BT20, Serial: 16042792, Cool mode. Shows flow rate (0 l/s) and pressure (0 Pa).
- Diffuser Controller (Middle Left):** ID:2, TC:10, PC:BT20, Serial: 16042790, Cool mode. Shows flow rate (0 l/s) and pressure (0 Pa).
- Diffuser Controller (Bottom Left):** ID:3, TC:10, PC:BT20, Serial: 16034001, Heat mode. Shows flow rate (0 l/s) and pressure (0 Pa).
- Wallstat (Top Middle):** ID:3, TC:7, PC:BU32, Serial: 16062117. Shows Sen: 23.3, Co: 23.3, SP: 22.0, SC: 1.3, Post WHB (green), Zone Flow: 0 l/s.
- Wallstat (Middle Middle):** ID:2, TC:7, PC:BU32, Serial: 16062110. Shows Sen: 23.5, Co: 23.5, SP: 22.0, SC: 1.6, Post WHB (green), Zone Flow: 0 l/s.
- Wallstat (Bottom Middle):** ID:1, TC:7, PC:BU32, Serial: 16062106. Shows Sen: 0.0, Co: 0.0, SP: 22.0, SC: 1.6, Post WHB (green), Zone Flow: 0 l/s.
- Access Point (Right):** ID:1, TC:6, PC:BU20, Serial: 16110000. Shows #ED 3 and #UD 0.

### Removing an End Device

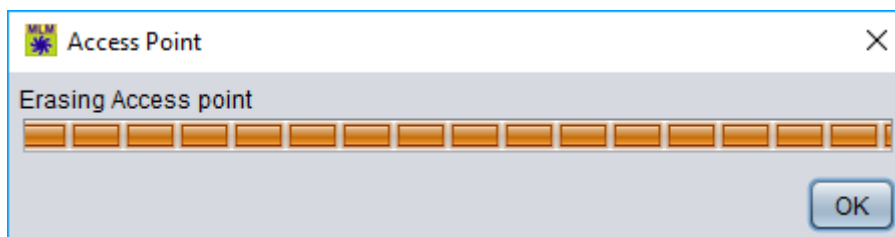
To remove a faulty or not responding End Device from the network, click on Wizards/Access Point/Refresh Network.



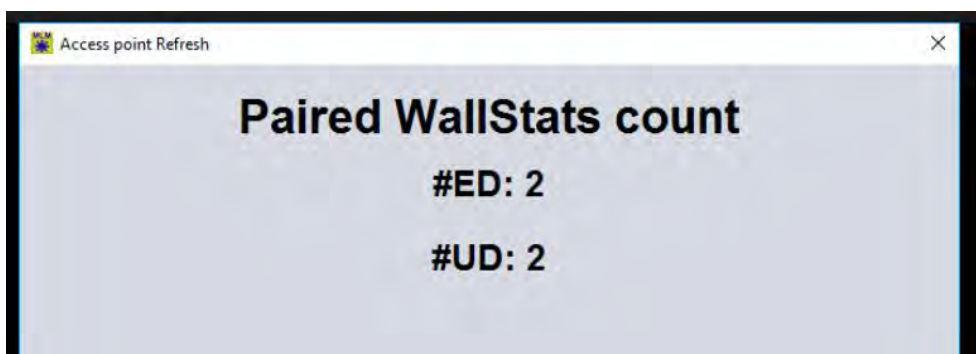
Select the Access Point of Interest



Press the 'Next' button. Note this action involves entering the 'Link' mode again and in the process any non-responsive End Devices will not show up on the count list. Allow up to 10 minutes for this process as the End Device's adaptive response time could be set at 10 minutes.

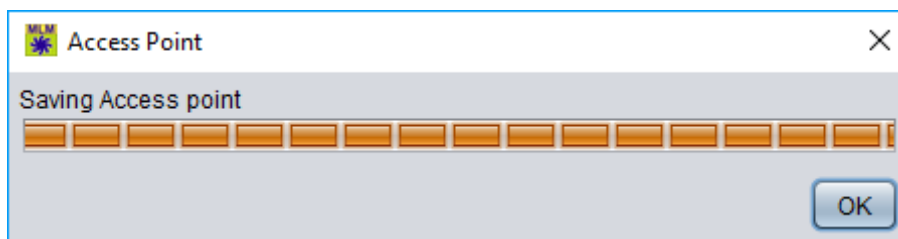


The number of paired devices is now reduced to two.

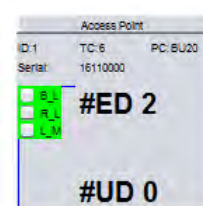
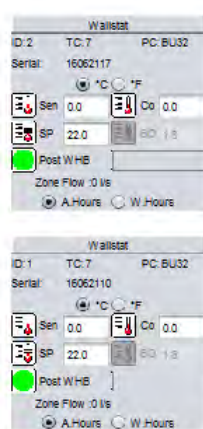
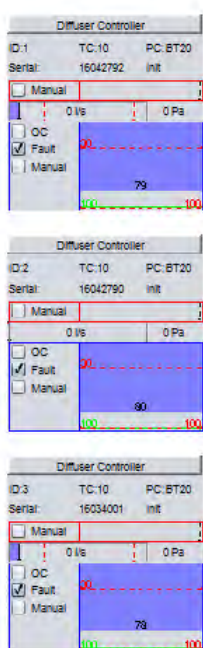




Save the two End Devices to the network.



The two Wallstats that were already Linked and zoned have retained their zone positions, with the unresponsive Wallstat removed. Note this process involved a network reset with the diffusers shown in the initialize state.

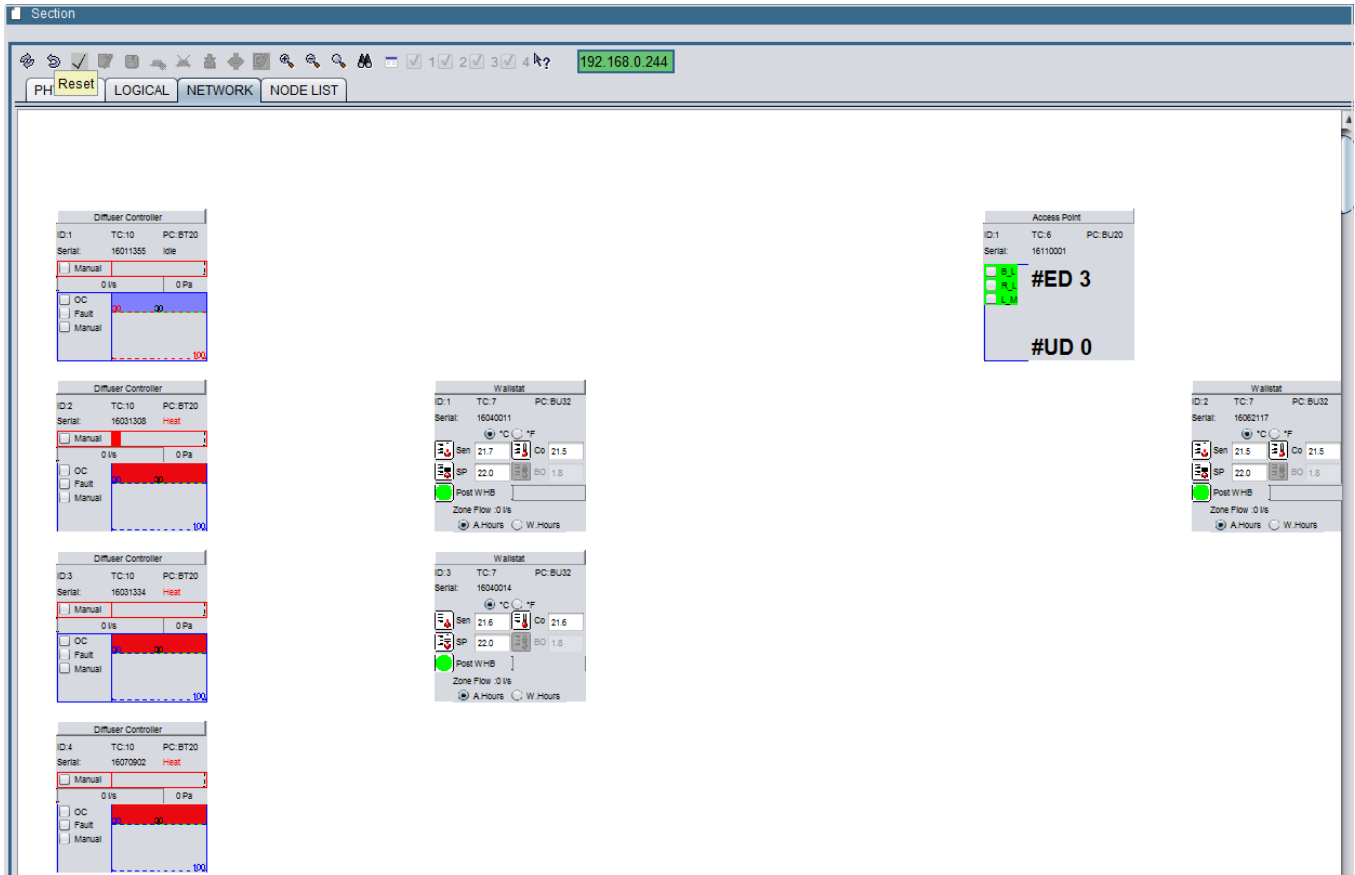


**Moving End Device to a different Zone**

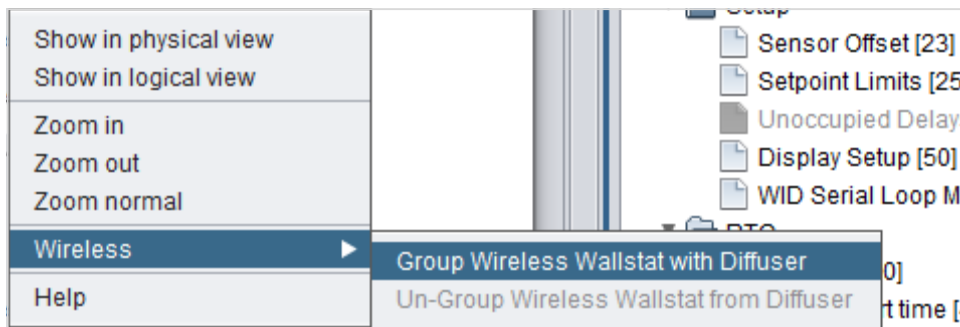
To re-zone a Wallstat, click on the Wallstat icon, select Wireless/Un-Group.. and then 'OK'. Wait for the new configuration to be saved.



The un-zoned Wallstat is now shown to the right of the Access Point.



Click on the Wallstat icon. The zoning process can now proceed as indicated below.



## Wallstat Operation

### Adjust the Wallstat Setpoint

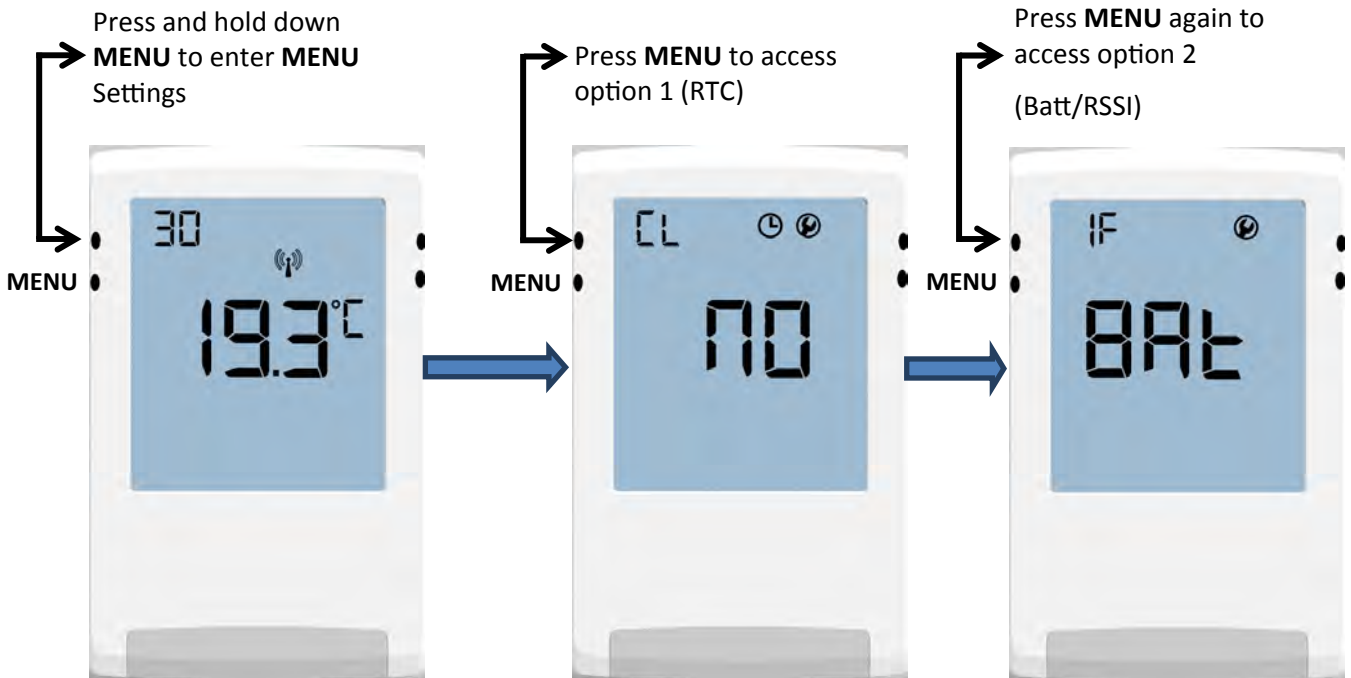
Ensure Room temperature is being displayed.



Press **UP/DOWN** to adjust the **SP**. The adjusted setpoint value will flash with 'SP' indicated as shown. Wait 5 seconds for the new SP value to be accepted and the display revert to normal.



### Set the Wallstat MENU Options



Option 1 – Set the Wallstat RTC settings

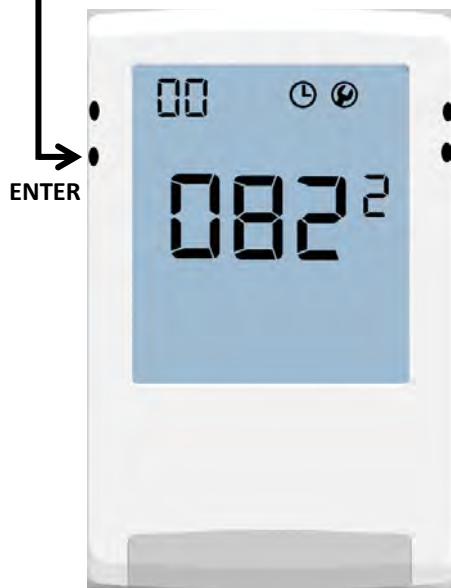
Press **UP/DOWN** to adjust the clock display options **NO / YES**.



Press **ENTER (YES)** to let the **WS** display the RTC values



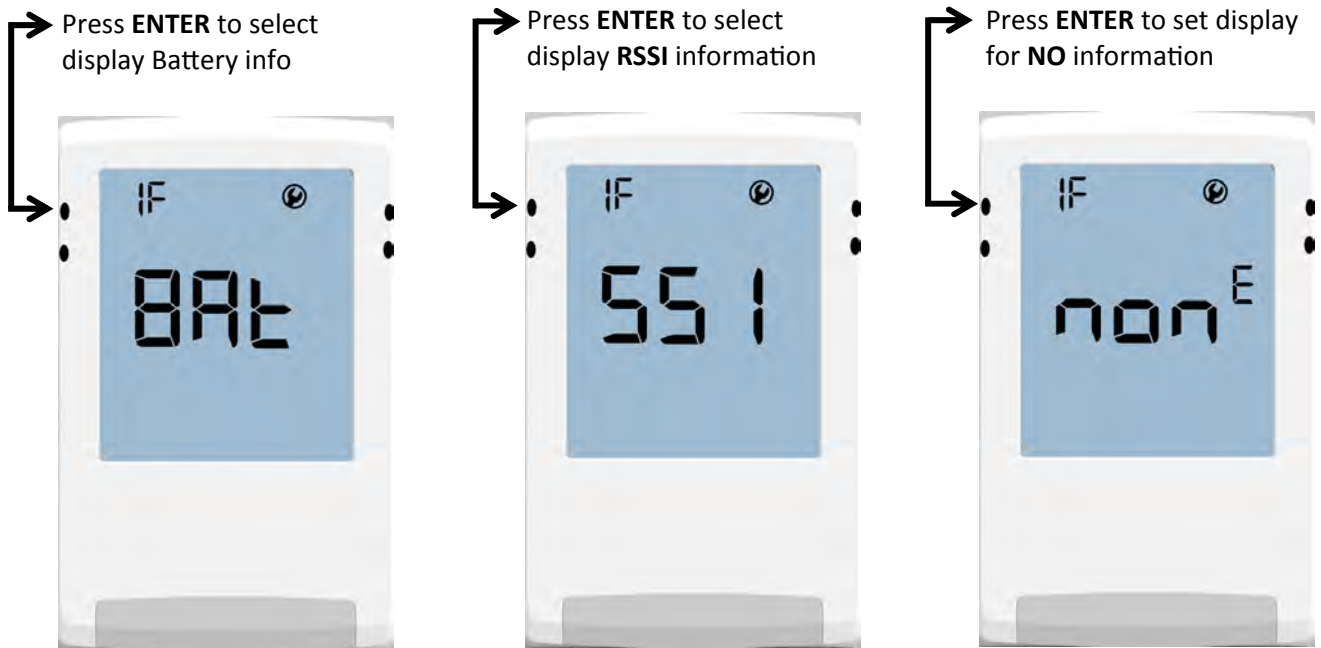
Press **ENTER** to set HH:MM:SS



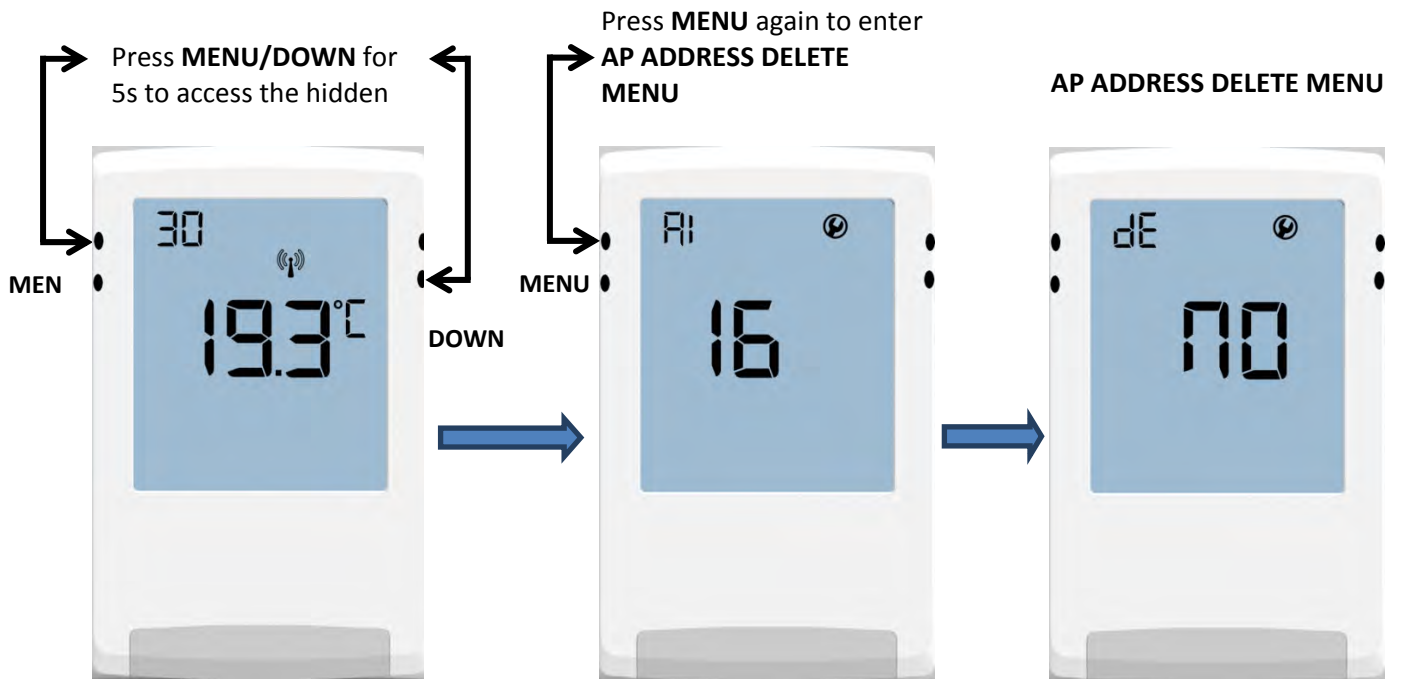
Press **UP/DOWN** to edit HH:MM:SS values.

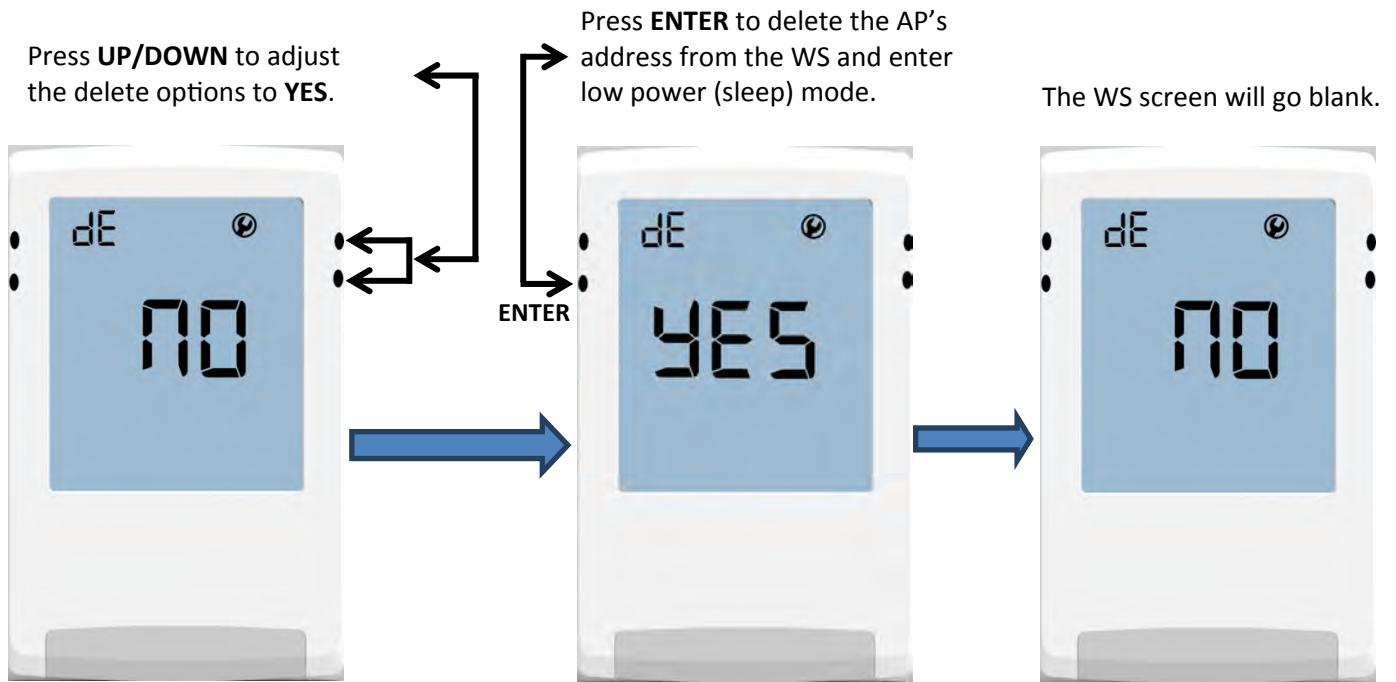


Option 2 – Set the Wallstat display for Batt/RSSI



Put the Wallstat in sleep mode (Default off state)





**POD Sensor Operation**

N.B: See Link remote units to the correct AP above to put Access Point in SAM mode.

**START POD SENSOR**

Press **PLUS (+)** and hold down for 1s and release. The device will buzz to indicate start up. The device will buzz every 5s to indicate that it is in SA mode. Once the POD is linked to AP it will stop buzzing.

**SHUT DOWN POD SENSOR**

Press **MINUS (-)** and hold down for 5s. The device will buzz. Press **MINUS (-)** again to confirm shut down. This will erase the AP's address from the POD and it will have to be linked again to AP.

