ACES 2 (Cooling Only)
User Manual
BDOC999 | Issue No 4 | March 2020

Important Safety Information

This manual may not be altered or reproduced in whole or in part by any means without the express written consent of Best Energy Saving Technology Ltd.

The information contained in this document is believed to be accurate at the time of publication, however, Best Energy Saving Technology Ltd assumes no responsibility for any errors which may appear here and reserves the right to make changes without notice.

Please read this manual carefully before installation, operation and maintenance of the ACES 2 unit. The following symbols in this manual are used to provide warning of danger or risk during the installation and operation of the unit.

Electric Shock Symbol: Carries information about procedures which must be followed to reduce the risk of electric shock and danger to personal health.

Safety Alert Symbol: Carries information about circumstances which if not considered may result in injury or death.

Installation and maintenance of the ACES 2 should only be performed by qualified, competent professionals who have received training and should have experience with current devices.

Best Energy Saving Technology Ltd shall not be responsible or liable for any damages caused by improper installation.

Considerations When Installing the ACES 2

Installation of the ACES2 must be performed by qualified personnel only, who follow standard safety precautions through the installation procedures. Those personnel should have appropriate training and experience of Aircon systems and electrical systems. Appropriate safety gloves, safety glasses and protective clothing are highly recommended.

During normal operation the device uses DC voltage and low current draw, But DC voltage can still be dangerous and may appear on parts of the ACES2, including the exposed circuit boards (when unit open). AVOID contact with any current-carrying surfaces.

The ACES2 is NOT designed as primary protection devices and shall NOT be used as primary circuit protection or in an energy-limiting capacity. The ACES 2 can only be used as secondary protection. AVOID using under situations where failure of the ACES2 may cause injury or death. AVOID using the ACES2 for any application where risk of fire may occur.

Applying more than the maximum voltage to the ACES2 will permanently damage the unit. Please refer to the specifications for all devices before applying voltages.

• Best Energy Saving Technology Ltd recommends using a dry cloth to wipe the The device.

Important Note: if the equipment is used in a manner not specified by the Manufacturer, the protection provided by the equipment may be impaired.

ACES2 Description
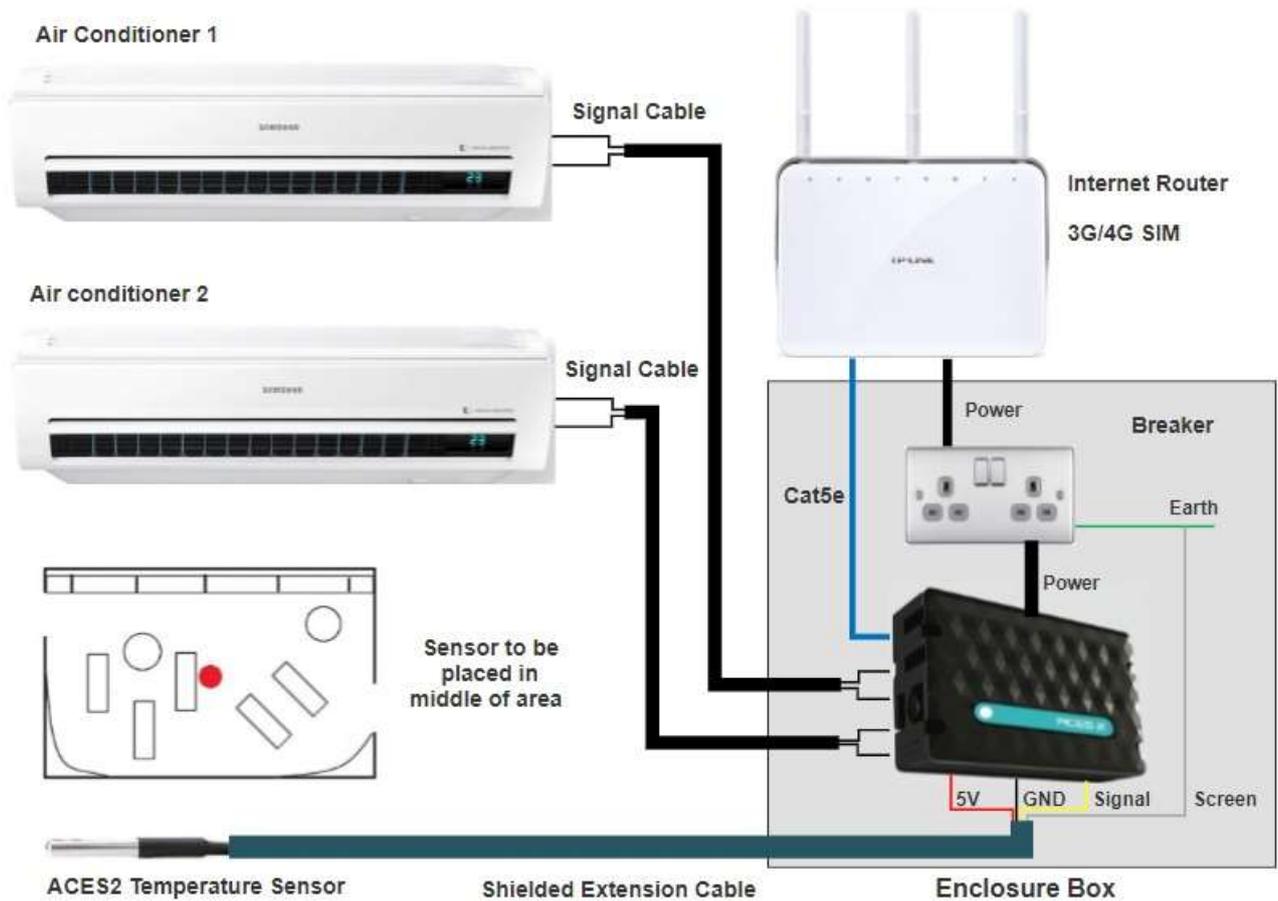
The ACES2 enhances your energy management with automated intelligence, by fixing your aircon temperature to desired value (no one can alter the settings via remote) and scheduling your multiple aircon systems on or off depending on the time of day or demand.

The Hardware

ACES2 is a plug-and-play system, easily and safely installed by an electrician. It offers the chance to transform energy management in a facility with automated intelligence that switches your energy hungry Aircon systems equipment on and off automatically.

That functionality can work on the basis of logic controls; a set of rules which, if satisfied, 'trigger' the on or off function. Or you can control it manually, switching equipment off yourself when you see (with Eniscope's analytics) that consumption is excessive or active out-of-hours, for example.

A single ACES2 unit can control up to 4 Aircon units, to switch your devices on or off and has the ability to monitor up to up to 6 temperature sensors.

The Software

The ACES2 uses on-board software to display live input readings, and allow you to programme the logic controller and switch your output relays on or off manually.

You can also view your data remotely on temperature graphs dating back a month or in table format along with the recorded aircon states on our website, via MQTT.

From this website you can setup remote scheduling for your aircon systems, such as ensuring they off outside of operating hours or scheduling multiple units to be all on at peak day heat, while operating just 1 aircon for the evening or overnight conditions.

You can also setup instant email alerts if temperature goes outside desired range and even remotely increase the temperature without having to make another on site visit (or set different temperature ranges for different times of the day).

Contact your Best Energy Saving Technology Distributor today to learn how your organisation can benefit from the ACES2 system.

ACES 2 Identification
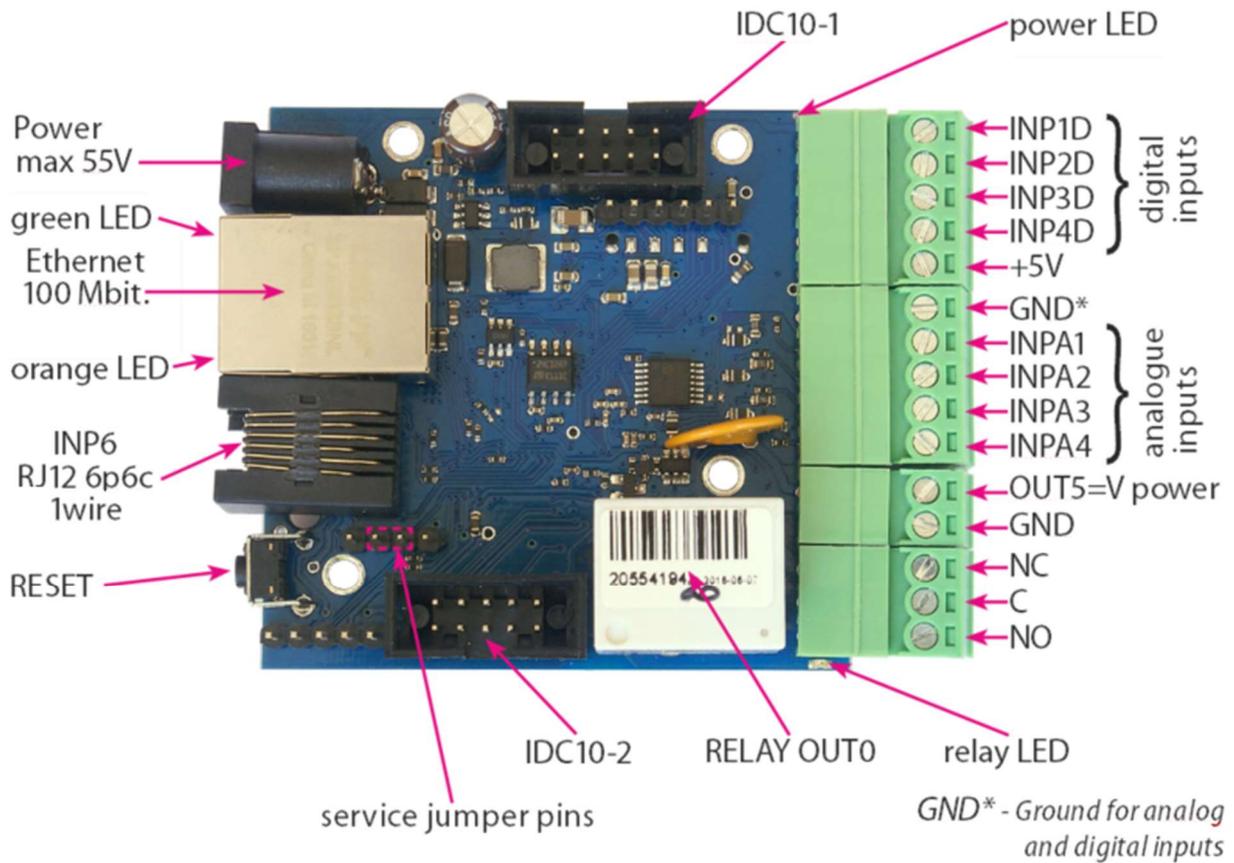
PIN/Component	Description
Power	Power supply 8V ÷ 55V DC
power LED	LED indicator on – power on board
relay LED	LED indicator on – relay active
green LED	LED indicator on – eth link active
orange LED	LED indicator on – data transmitted
IDC10-1	Additional Inputs / Outputs PWM1÷3
IDC10-2	Additional outputs transistor OC standard, for example, relays
INP1D÷INP4D	Logical inputs Low=0~0,8V, High=0,8V~20V Also supports a pulse counter
+5V	For sensors supply
GND*	Ground for analog and digital inputs
INPA1÷A4	Analog inputs
OUT5	Transistor output (+), voltage = power supply, max 1A
GND	Ground for transistor output (–)
NC	Relay OUT0, normally closed contact
C	Relay OUT0, common contact
NO	Relay OUT0, normally open contact

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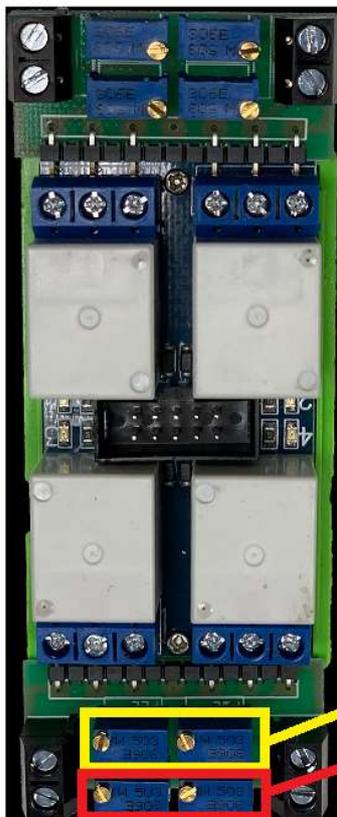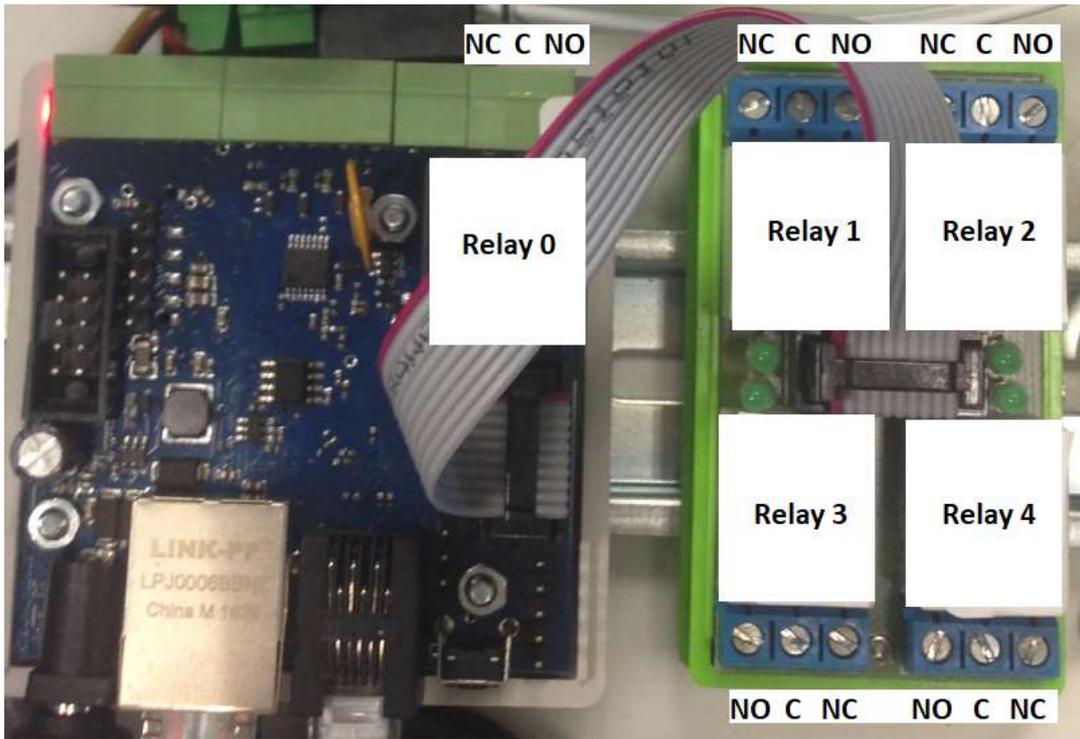
Note: The Relay circuit board has the numbers identification printed on the board.

NC = Cold Signal

NO = Hot Signal

ACES2 Tools and Consumables

Tools:

1) Screwdriver set including a 2mm flat head screwdriver.

2) Wire strippers

3) Wire cutters

4) RJ45 Crimpers

5) Multimeter (for resistance measurements 0 – 50k)

6) Drill and Masonry drill set

7) Ferrule crimping tool

8) Cat5 tester

9) Accurate/calibrated portable temperature probe

Consumables:

1) RJ45 connectors

2) CABLE - 2 wire 26AWG or larger signal cable for each aircon control.

3) CABLE - 3 wire SCREENED 26AWG or larger Cable for Temperature probe.

4) Screws and raw plugs for mounting ACES2 to wall.

5) 0.5 (20 AWG, 0.5 mm²) and 0.25 (26 AWG, 0.25 mm²)

6) Electrical Tape

7) Terminal block (CH2 Spring Wire Connectors for instance)

8) Diode 1N5817
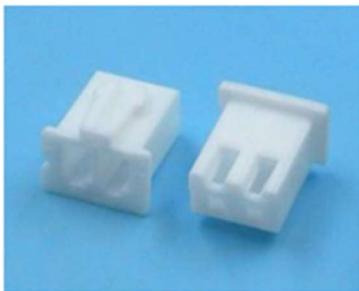
JST XHP-2 is a common connector

9) Optional: Connector Plug, Pins and crimper (Usually JST XHP-2, varies based on aircon model)

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SECTION 1
INSTALLATION

Important Safety Notice

SAFETY AT WORK

The owner, installer and user of this ACES2 device are responsible for its correct installation and use, and must ensure that;

a) Only qualified persons install the unit.

b) Isolate Power Supply before installation.

c) The installation complies with the information contained in this publication.

d) All units must be installed in accordance with the current National Electrical Code.

Best Energy Saving Technology Ltd, or their agents do not assume any liability, expressed or implied, for any consequences resulting from inappropriate, negligent or incorrect installation, application, use or adjustment of this device.

A. Mounting the ACES2

Opening the ACES2

There are 4 screws on the back of the ACES2 Enclosure, once removed the front lid will come off and you can see the boards inside.

Please note you will need to screw the lid down again before final mounting to the wall.
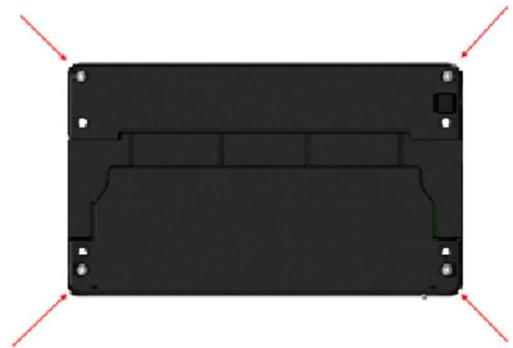
Environmental

There are no specific ventilation requirements however, please check the environment, temperature and humidity to ensure the ACES2 is within the correct operating conditions. Also before you begin to mount the ACES2.

The ACES2 is Type 1, for indoor use only.
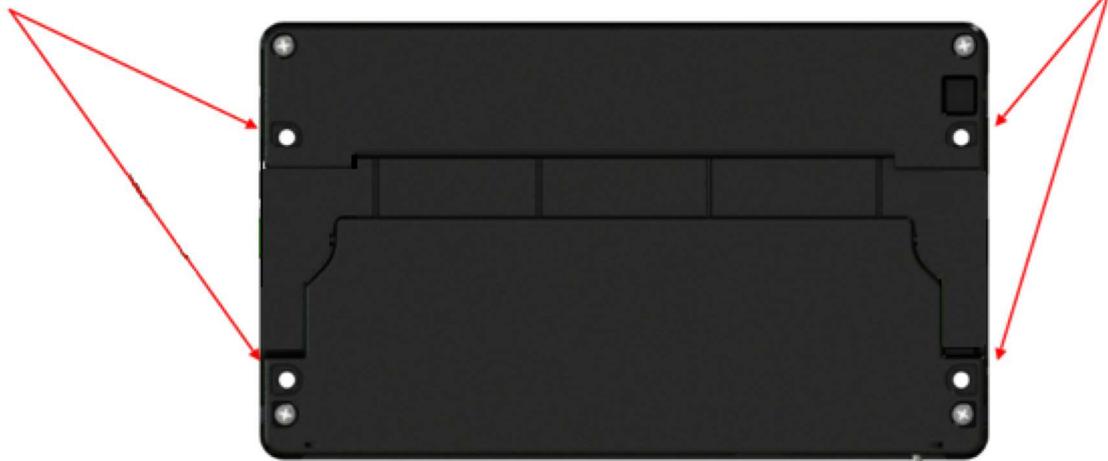
The ACES2 is designed to be mounted on a vertical surface within an electrical cabinet or wall mount, using the provided glands for incoming cables. ACES2 can be mounted using the corner mounting holes.

Dimensions

Height 144 mm
Width   236 mm
Depth   60 mm

B. Location

ACES2 Location

You will need to consider the best location of the ACES2 unit to get all the connectivity options.

The ACES2 unit will need:

- Internet access via rj45
- An earthing point for the shielded cable
- Wall socket (100-240V) for power point
- 2 wire cable for each evaporator temperature sensor or thermostat to take control.
- 4 Wire screened cable for the temperature probe.

Normally we see partners installing the ACES2 unit near the Eniscope (So they can share the same network access point and use the Eniscope earth point).

Temperature Probe Location

You need to decide the best locations for the temperature probe(s) and quantity needed, we recommend 1 per Aircon unit or at least 1 per 5m2 floor area.

Obviously, you need to use your onsite observation for the best positions, but we recommend the sensor being place in the middle of the area/room being covered and near the ceiling. If you have 1 sensor per aircon unit, then again position as such that it is near the aircon but away from the walls, corners or obstructions.

Other considerations of places **not** to put the temperature sensor include:

- In direct flow path of aircon unit (remember we want the average room temperature, not the evaporator air temperature like ACES1 use to).
- In the direct path of any fans installed on site.
- Above the ceiling tiles or ceiling of a room.
- Next to lights or heat sources.
- Keep away from doorways or windows (where you have temperature variation both sides).
- Keep the sensor out of direct sunlight.
- Touching metals, etc that could be hot or cold.

C.   Cables and Wiring

Power Cable
The unit comes with a UK plug end and a 110-240v supply, (The Smart Switch requires 8 to 55V DC supply) to plug into a wall socket, we recommend you use an existing wall socket point or create one from the Distribution board with a switch. If your country uses a different plug you can keep the power supply and just get a cable with figure 8 C7 adaptor or replace the plug directly.

Ethernet Cable
Run the Ethernet cable between your ACES2 unit and the nearest internet access router so data can be uploaded to the MQTT site and remote instructions can be sent to the unit.

Temperature Probe Extension Cable
Extend the temperature probe(s) up to 50m maximum, by using a 3wire (or 2 pair) screened (shielded) signal cable (AWG26 or larger), connecting the temperature probe to the end via either soldered connection or terminal block and put in the diode. **Also ensure the screen is connected to earth otherwise noise will effect the temperature probe!**

If having more than 1 sensor, you must connect them in 'daisy chain' or line bus format and not a star network. This means there only ever be 1 set of wires going to the ACES2 unit (rather than each sensor wires return to the ACES2 unit which would form a star network).
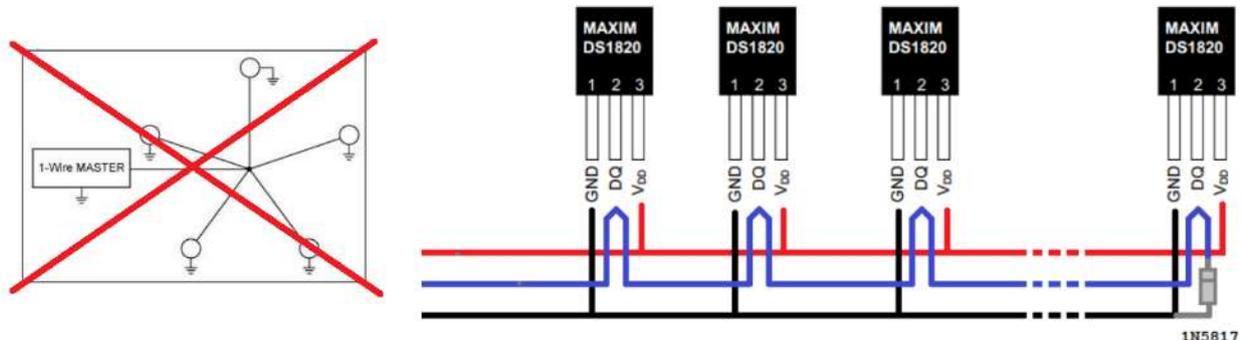
You can connect the screen to earth by connecting to the Distribution Board Earth bar or alternatively to the Eniscope Earth connector (but ensure the Eniscope itself is connected to the Earth bar in the DB).
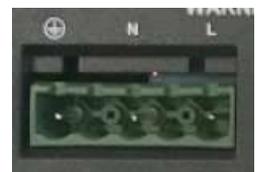
Temperature Probe Wiring

Use the RJ12/RJ11 cable provided with your ACES2 and connect to the mainboard and the splitter like shown below:
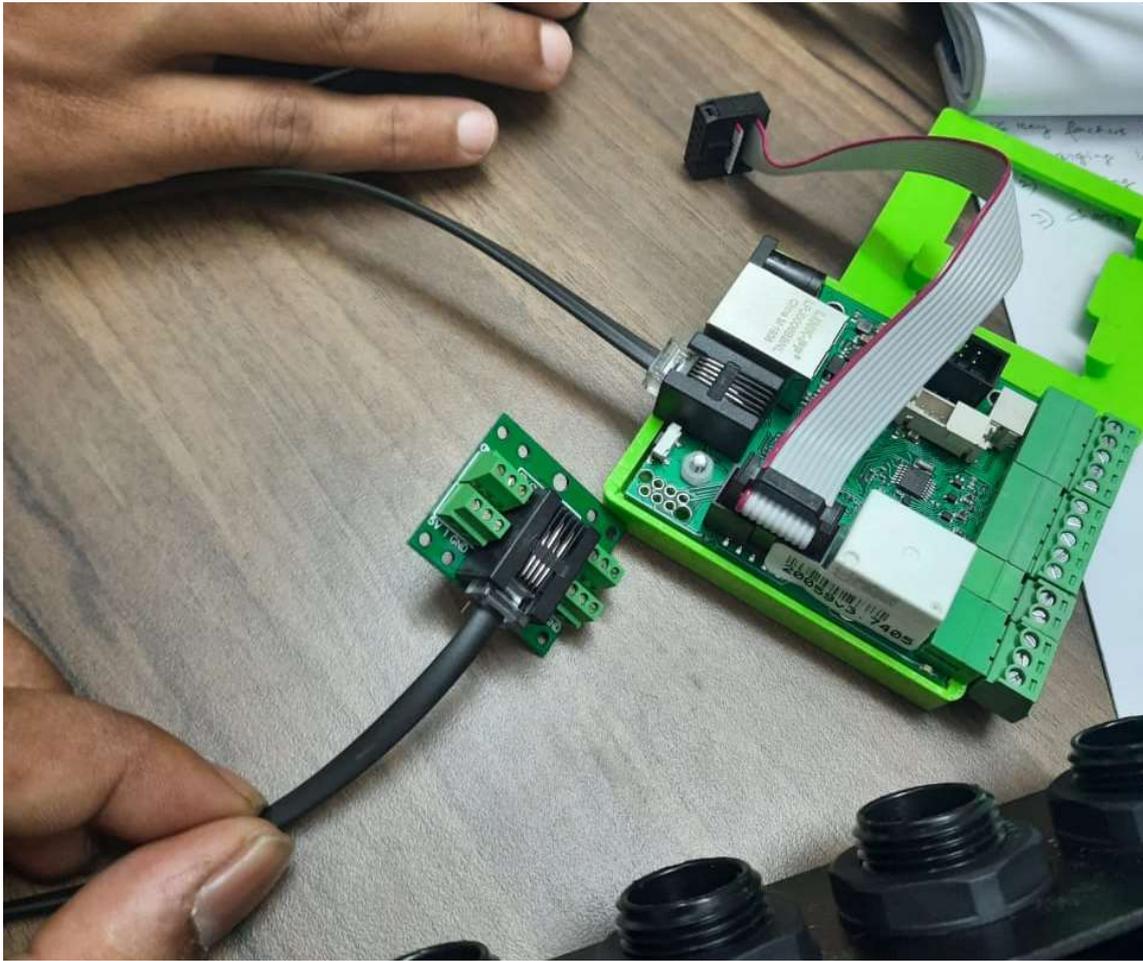
Below are the Splitter wiring details:

1-Wire input splitter (screw terminals) for Lan Controller, allowing connection of up to 4 DS18B20 temperature sensors.
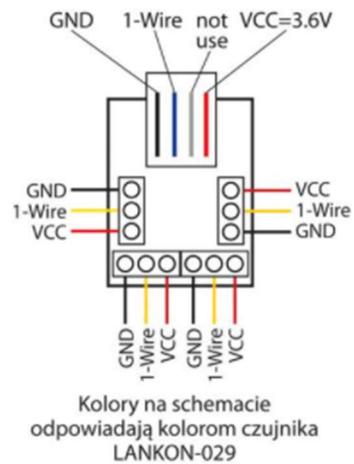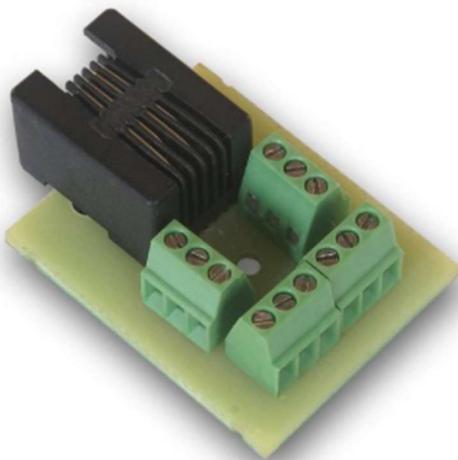
If you decide not to use the splitter and you have cut the RJ12/RJ11 cable for direct connection, then pin2 (Vcc), pin4 (Data) and pin5 (ground).
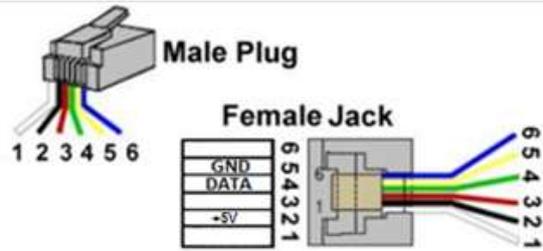
The temperature sensor will come with 3 wires:
Red = Vcc (5v)
Black = Ground
Yellow = Data (1 Wire)
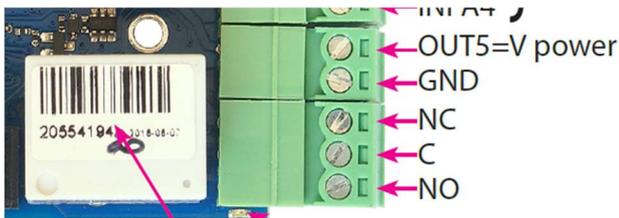
The sensor Data wire should be routed through the relay0 NC (normally closed) and C (common) pins using the green connector provided. This will allow us to remotely reset the sensor by operating the relay.

The final wiring should look like:

Temperature sensor Wiring

Please ensure the Data wire (1 Wire) goes through the relay 0 (out0) so we can remotely reset the sensor.
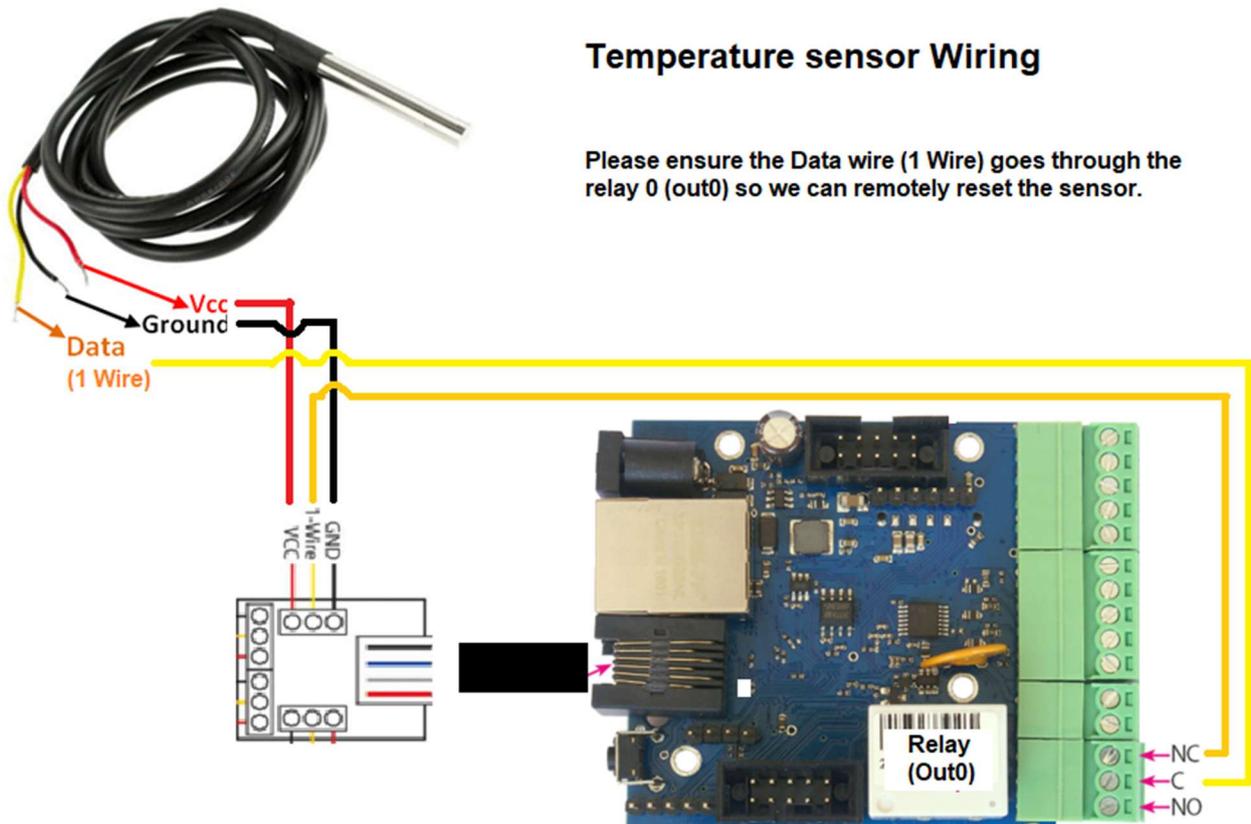
Aircon Signal cables

Please use 26AWG 2 wire (1 pair) or larger, you will need 1 cable per aircon system and all cables must lead back to the ACES2 unit.

Your first step is to open the Aircon Evaporators and identify the air temperature sensors. Please note we want the room air sensor, not the coil temperature sensor.

Example of the common sensor

Next unplug the temperature sensors from the aircon control board (do not remove, keep fixed in unit so can be plugged in again in future) and make note of the connector types, you will then need to order the connectors and the pins to put onto your control wire (along with the crimping tool if needed). Or otherwise obtain permission to cut the sensor wire in the middle and join onto the existing wire with terminal connector.
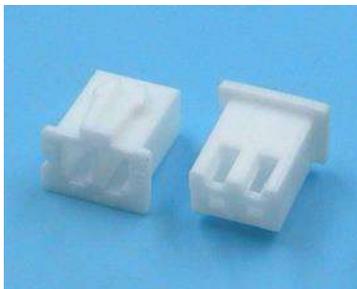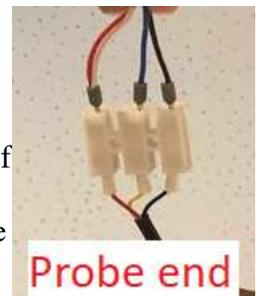
JST XHP-2 is a common connector

Now you need a warm and cold signal resistance value to record for ACES2 settings, to do this connect a multimeter set to resistance to the end of the temperature sensor and place the sensor inside a fridge for 1 minute, then record the resistance (usual values are around 16-19KOhms).

Next place the sensor on a hot source, such as hold tightly in the palm of your hand for 2-3 mins until the value settles (usually values are 4 to 8kOhms). Write these values down onto the commissioning sheet as will be needed later.
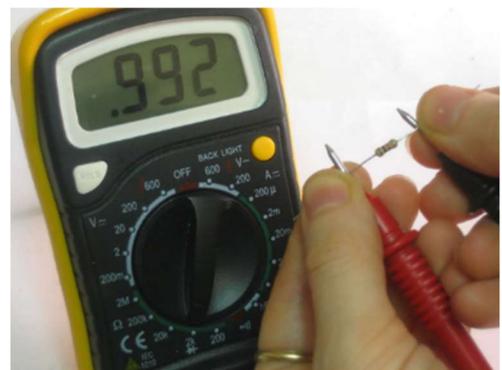
Finally you can connect the end of your signal cable directly to the Aircon control board and close the unit.
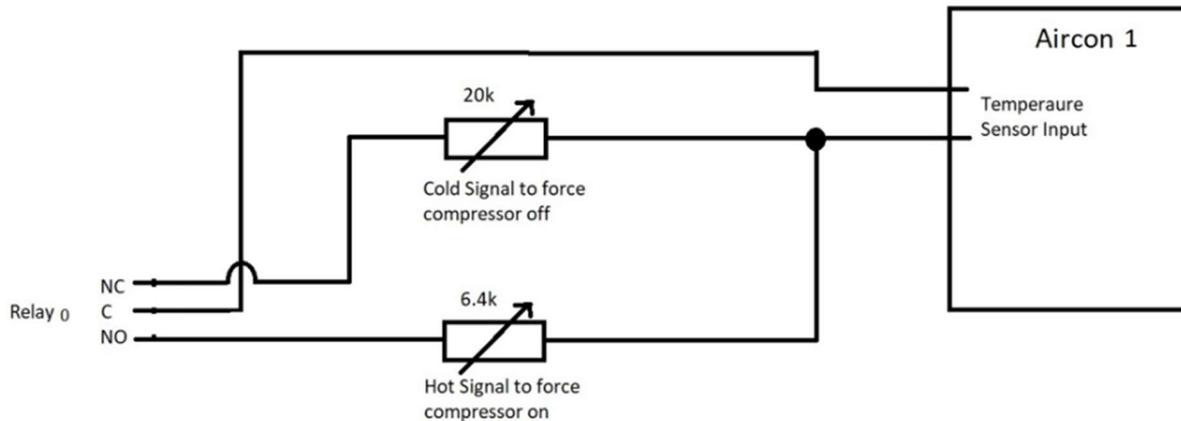
Note: Remember a cold signal is used to turn the system off (0) and hot signal is used to bring cooling on (1).

Now for terminating the signal cables to the ACES2 unit, pass the up to 4 signal cables (up to 4 Aircon control) through the glands and wire to the black terminals of the relay outputs.

For a cooling only system, we want:

out?=0 to be Off mode

out?=1 to be Cooling mode on
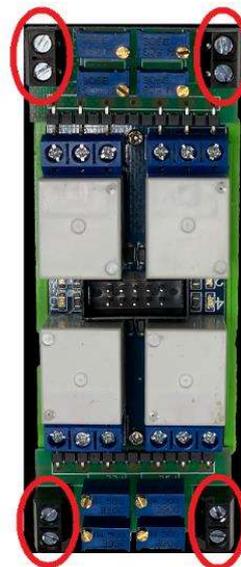
Note that Relay 0 is on the Microcontroller board and then Relay 1 to Relay 4 are on the separate relay board (you do not wire the aircon signal cables to relay 0, start at relay 1). The numbering can be seen on the circuit board also.
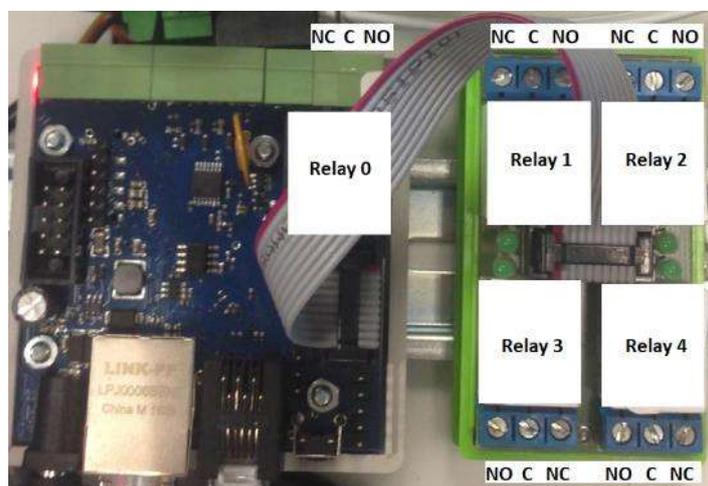
D.   ACES2 Access and Network Setup

Login
Login using the default IP 192.168.1.100 and user admin, password admin. You can login by typing the IP into the browser like with Eniscope (but do not need /admin).
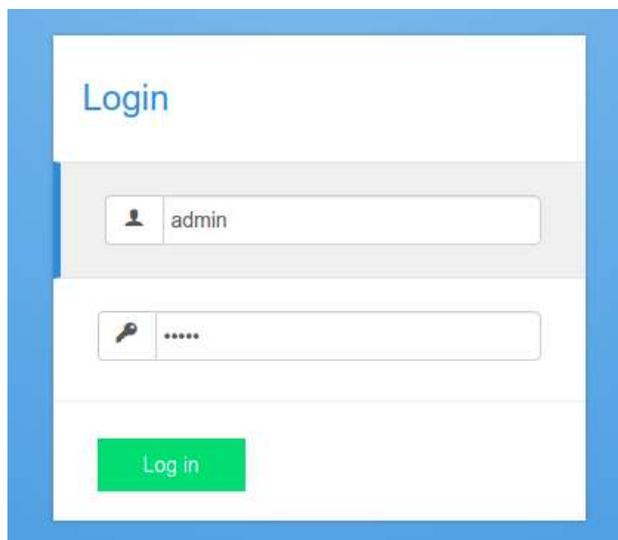
You will find it best to connect to the ACES2 unit with a direct cat5 cable from your laptop (bypass any router for now).

Setting the IP Address
Click 'Config/Network', Change the IP settings to the required static IP, do not use DHCP.
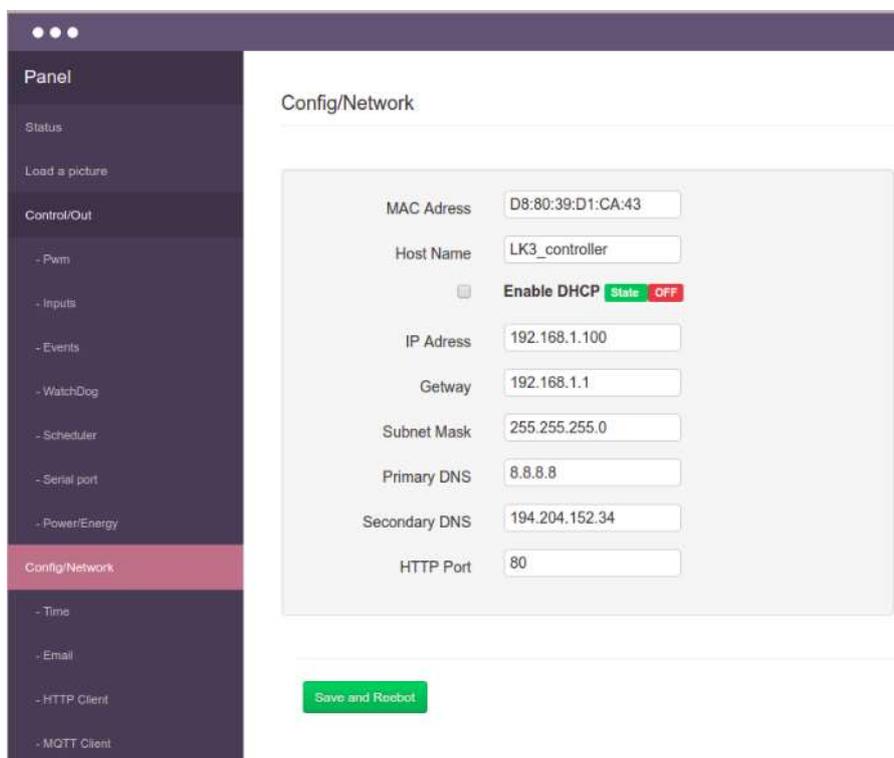
Now press 'Save and reboot' option, please remember to login in again on the new IP address. Remember that it is important to put in the correct IP range, gateway and DNS settings that match your router. After the settings are correct, you can connect both your ACES2 unit and your laptop to the router.

Set the Time

Click the 'time' menu option and select the NTP option (or set the time manually) and save. Also click the 'set time in RTC' to save to controller. Also you can select your timezone.

To check the operation is successful go to the 'status' screen and check the date and time displayed up top.

E.   Set the Potentiometers and test

Now all the wiring is in place it is time to set the potentiometers to the values you recorded from testing the AC sensors, do this using a multimeter set to resistance and set the pots shown below.

NC = Cold Signal

NO = Hot Signal
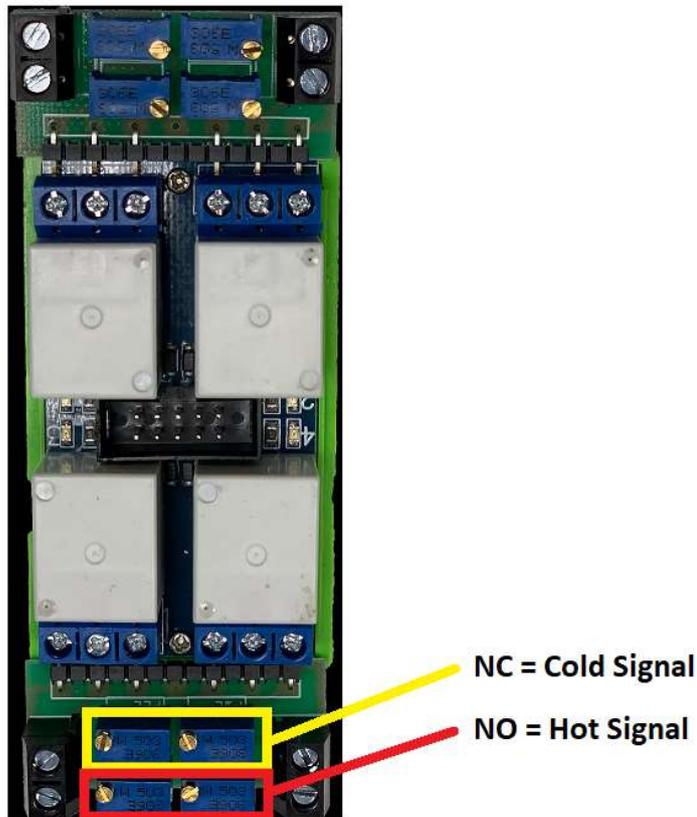
Note that you should disconnect 1 wire while setting the pots and manually change the state of the relay to set the 2 values, once set reconnect the wire.

If your aircon unit is controlled by a thermostat instead of a temperature sensor in the evaporator unit. Please remove the small circuit with the potentiometers and wire the control wires directly to the common © and Normally open (NO) terminals of the relay as a resistance value is not needed.
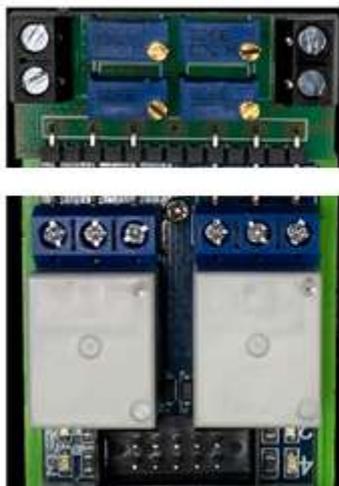
Check your Relays and temperature sensor readings
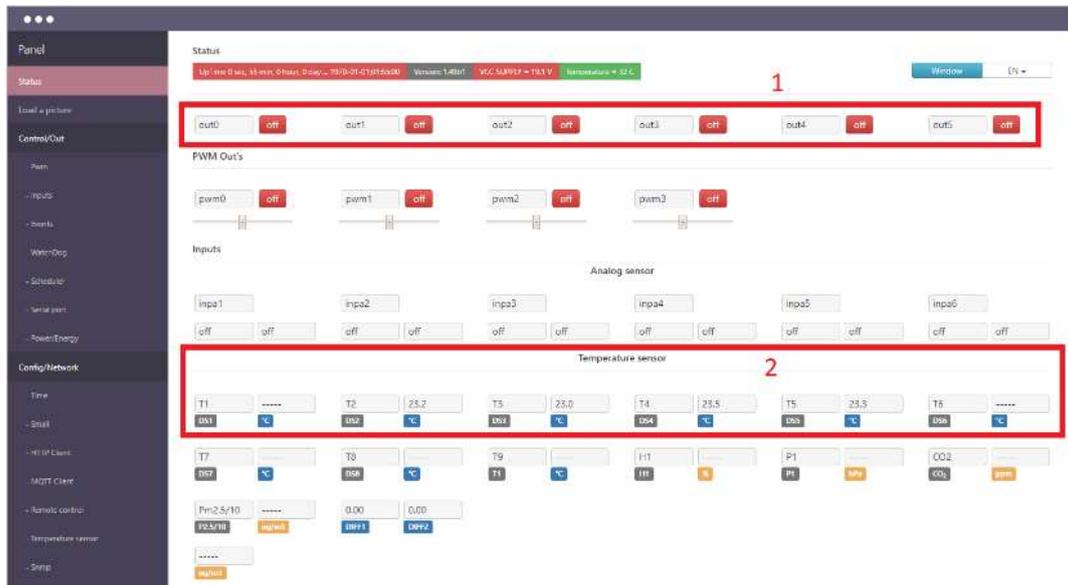
Manual Switching checks:

Stage 1:
Select the Status menu tab and check that turning on out1, 2, 3, 4 turns on the corresponding relays (turn off when finished) in the software. Also check that when you manually turn on an output that the relay board LED comes on for that output (each relay has its own LED).

Stage 2:
Now lets check that the compressor comes on and off with our outputs. Leave outputs 1-4 (depending on number of AC connected) off and monitor for 15 minutes at least that no cold air is provided via aircon and compressor does not come on. Next switch on all AC outputs 1-4 and monitor for 15 minutes at least that you can feel cold air and compressor comes on.

If you have an Eniscope installed you can use this to also check when compressor comes on and off watching the current usage.

If stage 2 is unsuccessful try the below:

1) disconnect the connector for the aircon (JST connector or alike) and measure with a ohm meter the resistance you see at the end. Check you get your cold and hot resistance readings depending on the relay switch state. If not check the pot settings at the ACES2 and the cable integrity.

2) If your compressor does not come on when you send the hot signal (output/relay on) try lowing the resistance by 1kohms. Keep lowering by 1kOhms until it comes on.

3) If your compressor is always on, increase the cold resistance (output/relay off) by 1kohm increments to a maximum of 45k.

4) If the aircon has a flashing light indicating error, check your connections and resistance settings. Also note for some aircon models they can detect when a resistance range is to large. For instance if you set the cold resistance to 25k, try lowering to 16k to see if error stops.

Temperature sensor checks:

Also check you can see your temperature sensor reading under the DS1 to DS8 selection on the status screen. To move the sensor reading to DS1 or assign a missing sensor go to the 1 wire option.

Temperature sensor

| Read ID | DS18 ID = 28:FF:AF:52:45:16:3:6B |
| Save to | [   ] Position |

DS18-1 ID = 0:0:0:0:0:0:0:0
DS18-2 ID = 0:0:0:0:0:0:0:0
DS18-3 ID = 0:0:0:0:0:0:0:0
DS18-4 ID = 28:FF:AF:52:45:16:3:6B
DS18-5 ID = 0:0:0:0:0:0:0:0
DS18-6 ID = 0:0:0:0:0:0:0:0
DS18-7 ID = 0:0:0:0:0:0:0:0
DS18-8 ID = 0:0:0:0:0:0:0:0

From the 1 wire option menu click the Read ID (it should produce a unique MAC number) and then save to position 1-6.

Note: if you are using multiple sensors, you will need to have only 1 sensor at a time connected to the ACES2 to read ID and assign a position. Once done you can then connect all sensors to ACES2.

If you want to remove a sensor from a position, disconnect all sensors (unclip the white ribbon cable), click read ID and it will produce 0. Now save the ID to position you wish to blank. Reattach the sensors when finished.

best.
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F. Setting the Programmable Logic

Understanding the Events Screen
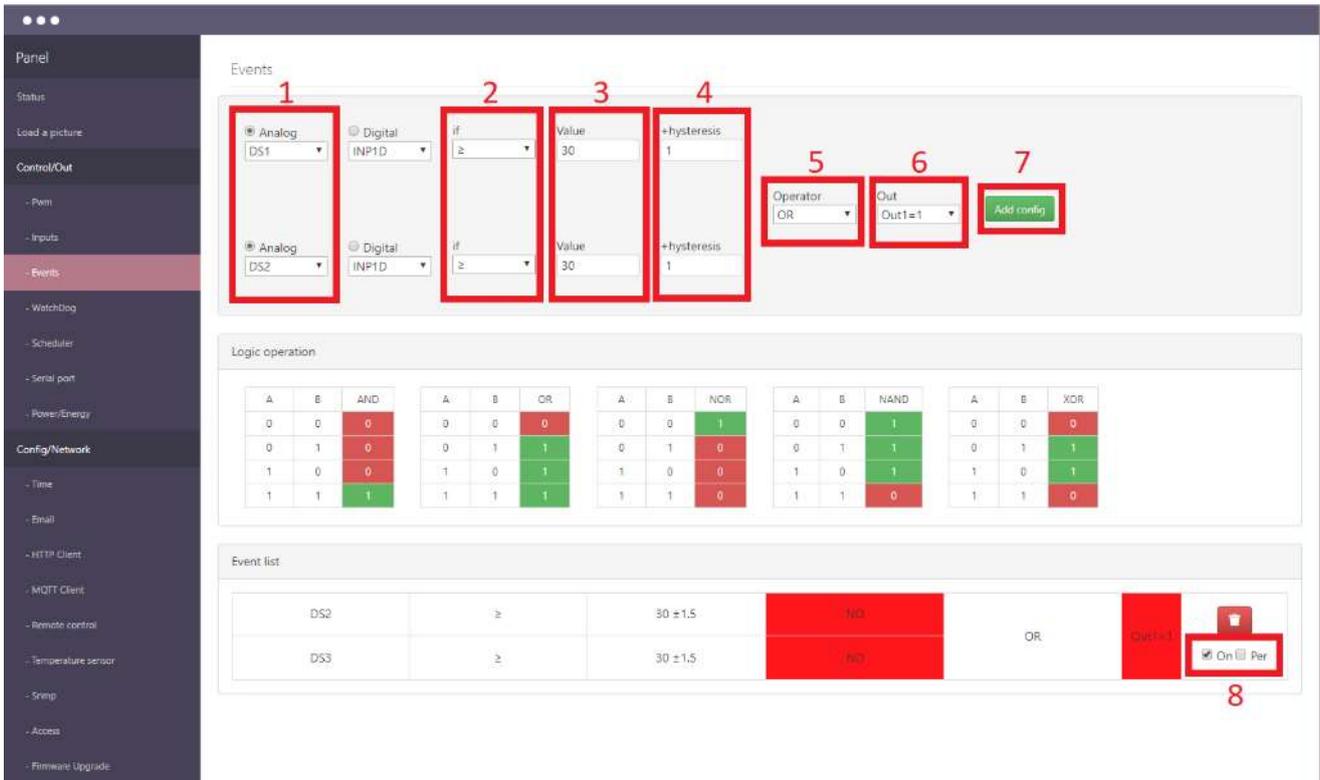
On the Events screen we can see the programmable logic for setting our relay outputs based on the temperature or digital/analogue inputs thresholds.

1. Select the temperature sensor(s) or digital/analogue input you wish to monitor.
2. Select if the relay switching should be when temperature is equal to or greater than or below option (i.e. switch when equal to or above 30 degrees, switch when below 20 degrees).
3. Set the temperature threshold for switching (i.e. 30 degrees).
4. Set the hysteresis or leave as default 1. This will mean the for example if threshold is 30, that the relay will switch on at 31 degrees (with hysteresis set to 1), then switch off again at 29 degrees.
5. Select your Logic operation, if in doubt, keep to an 'OR' for most applications. Examples are displayed on screen.
6. Select the Relay outputs (output 0-4 and 1 for on, 0 for off). Don't select Auto as this is a continuous toggle on/off.
7. Once the configuration is complete hit the 'add config' to save.
8. To turn the configuration on select the On tick box.

Now you under stand the interface please set the below logic for the 2 or 3 Aircons:

Finding your temperature threshold

Before setting the events you need to work out the temperature difference between your sensor position (usually in the roof which warmer than room below) and the temperature of the room at chest height. Use a digital thermometer like shown below and measure in the centre of the room around waist-chest height. Compare this to the sensor reading you get in ACES2 to find the difference. Now add this difference to 24 to get your threshold setting for the events (replace the 24 you see in the event settings below)

i.e. your digital thermometer says 25.2degs. The ACES2 says 27.2degs. The difference is 2degs.

Therefore on the events you se the threshold as 24 + 2 = 26degs.

Temperature offset Test

For this test we want to manually switch on the aircon compressors until the room temperature (via your handheld thermometer in the middle of the room) reaches 22 degrees. Now turn off the aircon units with their remote controls or power switches. Take readings every 2mins of the ACES2 temperature sensor and your handheld thermometer readings until the room reaches 26 degrees. Write the results in the commissioning report.

Now compare the figures of the ACES2 temperature sensor readings and your hand held thermometer readings from the middle of the store and see what the difference is over the range. Check that the threshold difference you set in the events is correct or if it needs adjustment.

Example:

Handheld thermometer	ACES2 Sensor	Offset
22	24.2	2.2
23.2	25.5	2.3
24.5	26.7	2.2
26	28.1	2.1

Then with a desired room temperature of 24 our events setting between 26 and 26.2 would be correct.

Setting the Events

For 2 and 3 Aircon control use the below setup. For 4 Aircon system contact BEST to discuss the best arrangement.

2 Aircons

3 Aircons

Events control Test

Last test is to let the room heat up to 26 degrees then turn on the events control (tick the boxes) and remember to let only the number of aircons you expect to be on at any one time to be active (i.e. 2 aircons in store, but you plan 1 to work days the other unit nights then only 1 ac should be used for the test).

Monitor the room temperature on your thermometer as the ACES2 events brings it down to approximately 24 degrees and switch off. Now monitor the store for 20minutes to make sure the events maintains the temperature around 24 degrees. If successfully you have completed the testing.

Setting up the cloud connection

Select the 'MQTT Client' in the ACES2 to set up communications and then in a browser type: aces2.eniscope.com

Login to your account, if you don't have an account yet then please contact BEST for one.

Now enter a name for the ACES2 and choose the LK3 option. Click add device.

You will now be asked to tick the 'active' box for the parameters you wish to see on the mobile app.

To begin with tick all outputs (out0-5) and the temperature sensors DS1 up that are in use.

Click save series settings when done.

Now on the left hand menu select 'quick configuration' (note this will only work if your computer is on the same local network as the ACES2). Type in the IP address of the unit and click 'Perform Quick Configuration'.

You can now return to the ACES2 web menu and refresh the 'MQTT Client' menu. You should find that the MQTT is Connected (top left in green background) and that the connection settings have been filled in for you.

If you have trouble with the quick configuration you can also set the MQTT connection manually, to do this go back to Devices menu

Now click on the blue banner titled 'to add a new device' and follow the instructions.

SECTION 2
COMMISSIONING OPTIONS

A. The Remote options

Device Menu

Under the Device menu selection, you can see your ACES2 listed and besides them is a chart and table option.

Temperature Chart

Selecting the chart option, you can see data for the last month for the ACES2 temperature sensor, if setup correctly you should see a reasonable controlled tight formation like the above example. If your temperature varies to much, you can scroll to a specific time or day with the sliders at the bottom of the graph to analyse.

Temperature Table

Here you can analyse your ACES2 system more closely than the chart and compare the various output states against the temperature reading to check if the unit is triggering on the correct logic.

Also on the top of the Table screen you have the ability to download the data in a CSV format.

Control Panel menu

Services

This section is where you set the address of the items we want to communicate with, in this case we use the smtp service to publish a message to an email and the mqttpub service to point to the CMD (command console) of a particular ACES2 unit we wish to control.

Reactions

Reactions section has a large variety of usage, we can set alerts so that when a sensor goes outside a set range it send an email alert. We can also set an auto trigger to disconnect and reconnect a sensor when failed and remotely adjust the temperature threshold up for the compressor trigger.

Tasks

The task section is essentially where we can schedule compressors on or off during the day. For instance for a 24hour store with 2 AC, we can schedule one AC for 12hours and the other for the next 12hour.

MQTT Client
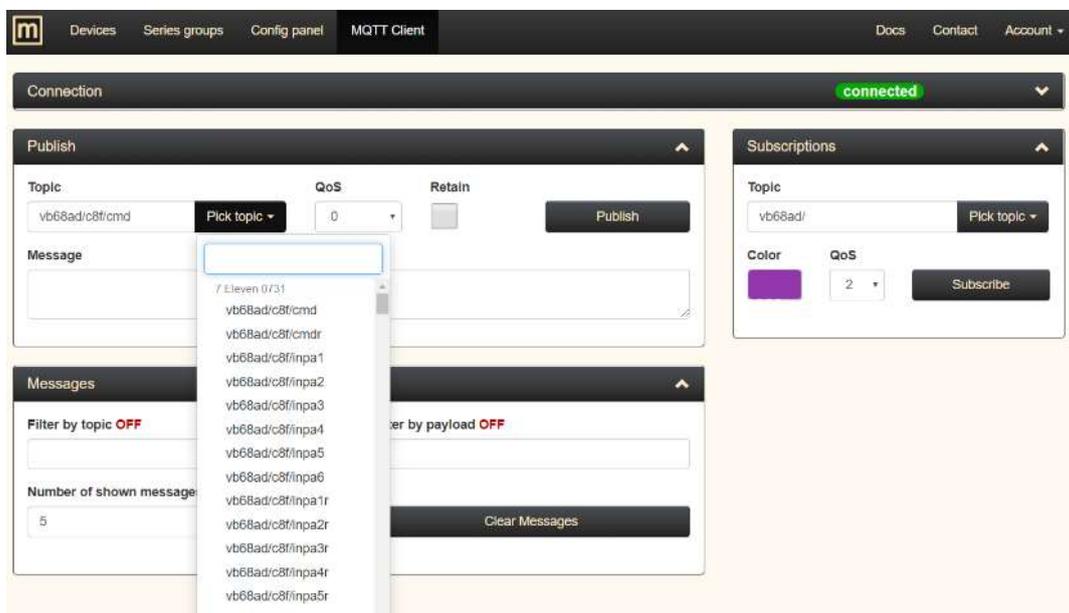
The MQTT client can be used to send instant manual commands remotely, firstly check for the green connected symbol in top right corner. Next select topic and choose the cmd (command console) of your device. Now type the output you wish to switch the state of and hit Publish.

i.e. out0=1   Note: the system is capital lock sensitive, so use lower case.

B.   Setting up the Standard 1 Sensor Remote Logic

As well as the onboard programmable logic option, you can activate your outputs/relays remotely using the config panel such as remote scheduling of AC on and off to working hours of site. We will now list the recommended logic controls to use on your ACES2.

Important note: We cannot switch outputs controlled by onboard ACES2 EVENTS directly, but can indirectly control them via out4 and out5 for a 2 and 3 aircon system.

Services Setup
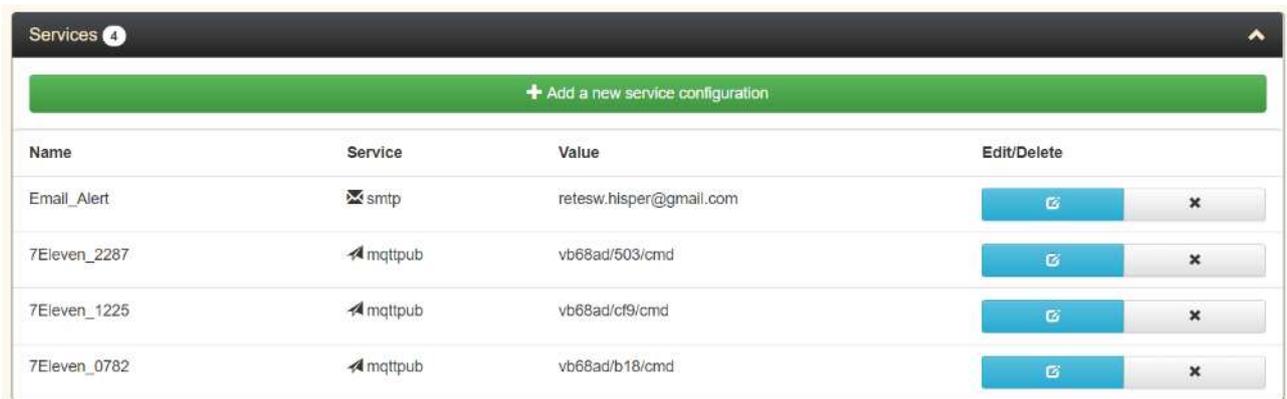
Use the smtp service to point to your email you wish to receive alerts and use the mqttpub service for pointing to your ACES2 command console (cmd), like in the example above.
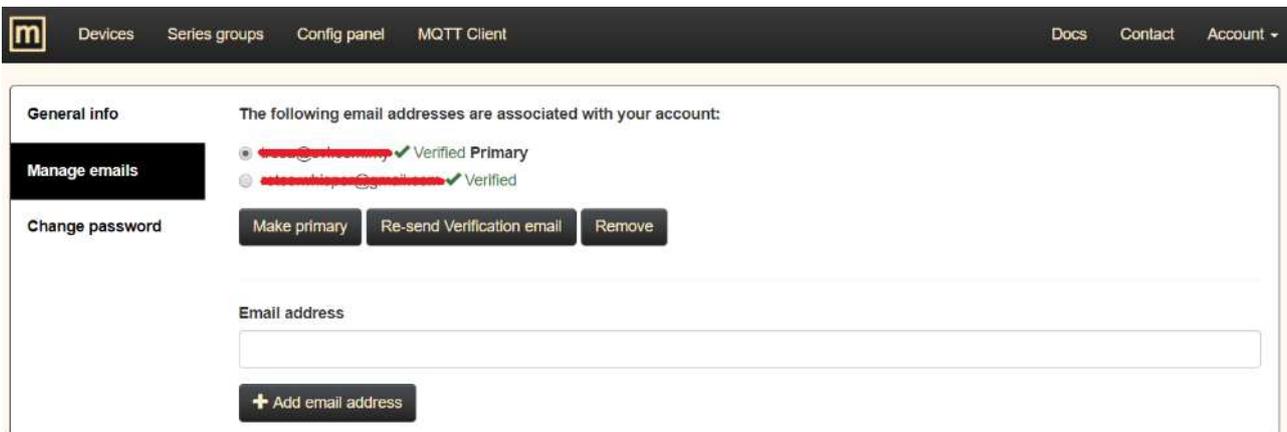
Please note you need to go to the 'Account' and then 'Manage emails' section to add your email and verify before you can select in the service menu.

Reactions Setup

Email Alerts

The email alert system will send a message every 5 minutes when outside the trigger range, so we know when our site is getting to hot or cold.

In this example above, it would trigger the alert if the temperature goes above 30 degrees or below 20 degrees based on (filter) settings.

The sensor (topic) we are monitoring is DS1 of the ACES2 unit in question, note if you have more than one temperature sensor on site you need to add multiple alerts and select each sensor in turn.

The message (Format), will be what you see in the email alert, note that 'payload' will be replaced with actual temperature value and 'topic' replaced with the sensor in question. While the services section you select the email to be alerted.

Auto Reconnect of ACES2 Sensors

In rare instances, the digital temperature sensor could state 85degrees, which is a misread error and the unit should recover from. But if it prints -60, then the sensor has failed and needs to be restarted via out0 switching on and off (which from our installation process is the data wire) to do a hard reboot. We have created an automated commands that can quickly resolve this if experienced.

211_Auto	a3469d/3e7/ds1	V: >40 or <10 S: 600	out0=1	mqttpub:7Eleven_211	☑	✖
211_Auto2	a3469d/3e7/out0	V: >0	out0=0	mqttpub:7Eleven_211	☑	✖

The issue occurs due to the sensor line being sensitive to noise issues and hence why we need to use shielded cable.

Auto Instruction

Name	211_Auto	
Topic	a3469d/3e7/ds1	Pick topic ▾

Filter (value) ❶	Advanced - eg. (V > 2) and (V < 4)					▾
	> ▾	40	or ▾	< ▾	10	

Filter (time) ❶	hh:mm:ss	hh:mm:ss

Suppression ❶	600	seconds

Format ❶	out0=1

Services	mqttpub:7Eleven_211 ▾

Save

The example above is the first instruction, it is set to monitor the temperature sensor DS1 (Topic) and to see if it goes above 40degrees or below 10 degrees to catch the 85 and -60 readings (Filter (value)).

This instruction will only check and execute every 10minutes as we have set the wait time (Suppression) to 600 seconds.

If triggered, the instruction out0=1 (Format) is sent to the ACES2 Unit via its cmd, command console (Services).

This will trigger out0 on (switch relay state) and cause the temperature sensor to be disconnected from the system (following our events logic from earlier).

Auto2 Instruction

Name	211_Auto2
Topic	a3469d/3e7/out0 Pick topic ▾
Filter (value) ❶	Basic - eg. V > 2 ▾
	> ▾ 0
Filter (time) ❶	hh:mm:ss hh:mm:ss
Suppression ❶	Empty so it will not be used. seconds
Format ❶	out0=0
Services	mqttpub:7Eleven_211 ▾

Save

The second instruction above, basically monitors the state of out0 on the ACES2 system (Topic), if it is 1 (Filter (value)), it will reset it back to 0 (Format) by sending the command to the ACES2 (Services).

Take note on this setup we do not use a delay time (suppression) so can act as soon as updated from ACES2 unit.

This command execution, reconnects the temperature sensor to the system creating a reset and bringing the sensor back online.

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Tasks Setup

Tasks section, can be used to schedule an output on and off, such as to have more unit running during a midday heat and a single unit at night. Or if you have a 24hour site and 2 aircon you could schedule 1 to run during the day and the other at night, giving them a off cycle and energy saving.

2 Aircon example for 24hour store
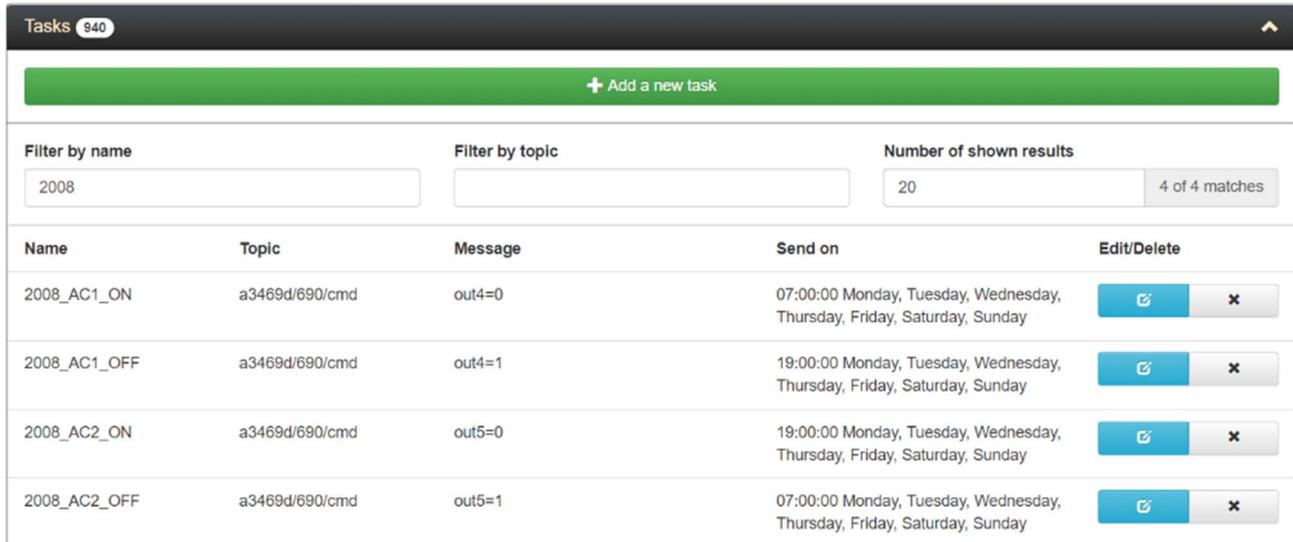
Name	Topic	Message	Send on	Edit/Delete
2008_AC1_ON	a3469d/690/cmd	out4=0	07:00:00 Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday	
2008_AC1_OFF	a3469d/690/cmd	out4=1	19:00:00 Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday	
2008_AC2_ON	a3469d/690/cmd	out5=0	19:00:00 Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday	
2008_AC2_OFF	a3469d/690/cmd	out5=1	07:00:00 Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday	

(Tasks 940 — Filter by name: 2008 — Number of shown results: 20 — 4 of 4 matches)

As you can see in the above example we are turning AC1 on at 7am everyday with out4=0 (looking at our events setup this is the output to force compressor off when = 1) and then off at 7pm with out4=1. AC2 is switched on with out5=0 at 7pm and switched off with out5=1 at 7am.

So 1 aircons run during the day and 1 aircon at night.

3 Aircon example for a 24hour store
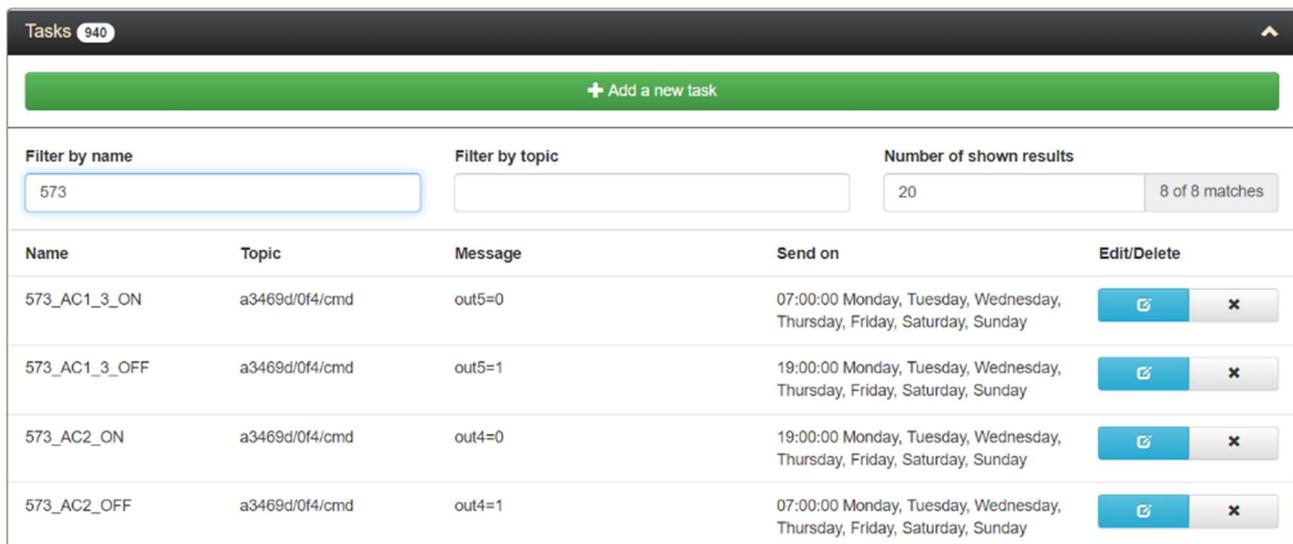
Name	Topic	Message	Send on	Edit/Delete
573_AC1_3_ON	a3469d/0f4/cmd	out5=0	07:00:00 Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday	
573_AC1_3_OFF	a3469d/0f4/cmd	out5=1	19:00:00 Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday	
573_AC2_ON	a3469d/0f4/cmd	out4=0	19:00:00 Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday	
573_AC2_OFF	a3469d/0f4/cmd	out4=1	07:00:00 Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday	

(Tasks 940 — Filter by name: 573 — Number of shown results: 20 — 8 of 8 matches)

In this example, AC1 and 3 are linked to out5 (1 off, 0 on), while AC2 is linked to out4 (1 off, 0 on) referring to our 3 aircon events settings. So for the above schedule we are turning AC1 and 3 on between 7am to 7pm and AC2 on between 7pm and 7am.

C. (Optional) Remote Temperature Adjustments

It is possible to remotely adjust the temperature threshold for switching on the compressors up from the value set via the onboard events on the ACES2. But we cannot reduce the value down (for this you will need a site visit to edit the events temperature threshold or port forwarding setup).

2281_AC2_ON	a3469d/edd/cmd	out4=0	19:00:00 Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday	
2281_AC2_OFF	a3469d/edd/cmd	out4=1	07:00:00 Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday	
2281_AC1_3_ON	a3469d/edd/cmd	out5=0	07:00:00 Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday	
2281_AC1_3_OFF	a3469d/edd/cmd	out5=1	19:00:00 Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday	

In this example we have a 3 aircon system, note that AC1&3 is linked to out5 and AC2 is linked to out4 which we use for the scheduling (Tasks) as seen above. **The events threshold on the ACES2 was set to 24.5 degrees.**

2281_Temp_Adjust1	a3469d/edd/ds1	V: >25.5 T: 07:00:00 - 18:55:00	out5=0	mqttpub:7Eleven_2281		
2281_Temp_Adjust2	a3469d/edd/ds1	V: <25 T: 07:00:00 - 18:55:00	out5=1	mqttpub:7Eleven_2281		
2281_Temp_Adjust3	a3469d/edd/ds1	V: >25.5 T: 19:00:00 - 06:55:00	out4=0	mqttpub:7Eleven_2281		
2281_Temp_Adjust4	a3469d/edd/ds1	V: <25 T: 19:00:00 - 06:55:00	out4=1	mqttpub:7Eleven_2281		

Now the above commands are placed in the reactions section, there are 2 reactions per AC group control. So Temp_Adjust1 and Temp_Adjust2 deal with AC1&3 (out5) which from our schedule operates between 7am and 7pm, so we set a (Filter (time)) time of 7am to 18:55pm to ensure we not conflict with the 7pm schedule change command. And in this example the aircon is linked to sensor DS1 (Topic).

Name	2281_Temp_Adjust1
Topic	a3469d/edd/ds1 — Pick topic ▾
Filter (value) ❶	Basic - eg. V > 2 ▾
	> ▾ — 25.5
Filter (time) ❶	07:00:00 — 18:55:00
Suppression ❶	Empty so it will not be used. — seconds
Format ❶	out4=0
Services	mqttpub:7Eleven_2281 ▾

Save

Temp_Adjust1 allows the compressor to come on at the new desired temperature (Filter (value)) in this example it is 25.5 degrees which is 1 degree increase from the events setting. It then allows compressors on (format) by sending to the ACES2 unit out5=0 (Services).

2281_Temp_Adjust1	a3469d/edd/ds1	V: >25.5 T: 07:00:00 - 18:55:00	out5=0	mqttpub:7Eleven_**2281**	☑	✕
2281_Temp_Adjust2	a3469d/edd/ds1	V: <25 T: 07:00:00 - 18:55:00	out5=1	mqttpub:7Eleven_**2281**	☑	✕
2281_Temp_Adjust3	a3469d/edd/ds1	V: >25.5 T: 19:00:00 - 06:55:00	out4=0	mqttpub:7Eleven_**2281**	☑	✕
2281_Temp_Adjust4	a3469d/edd/ds1	V: <25 T: 19:00:00 - 06:55:00	out4=1	mqttpub:7Eleven_**2281**	☑	✕

Temp_Adjust2 is used to turn the compressors off when it drops below 25 degrees, by sending out5=1 (Format) to theACES2 (Services). It uses the same reaction time and sensor as the first command.

Name	2281_Temp_Adjust1
Topic	a3469d/edd/ds1 Pick topic ▾
Filter (value) ❶	Basic - eg. V > 2 ▾
	> ▾ 25.5
Filter (time) ❶	07:00:00 18:55:00
Suppression ❶	Empty so it will not be used. seconds
Format ❶	out4=0
Services	mqttpub:7Eleven_2281 ▾
	Save

Temp_Adjust3 and Temp_Adjust4 work on the same principles but is controlling AC2 during the night period which needs to be set to 7pm to 6:55am again not to interrupt the 7am schedule change.

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D.   Setting up the Remote Logic for Multiple Sensors (Optional)

Please see the below Events recommendations if using 2 sensors setup.

2 Aircon

Event list						
DS1	≥	24 ±0.5	YES	AND	EVENT5=1	🗑 □ On □ Per
OUT4	=	0	NO			
EVENT5	=	1	YES	OR	Out1=1	🗑 □ On □ Per
OUT0	=	1	NO			
DS2	≥	24 ±0.5	YES	AND	EVENT6=1	🗑 □ On □ Per
OUT5	=	0	YES			
EVENT6	=	1	NO	OR	Out2=1	🗑 □ On □ Per
OUT0	=	1	NO			

3 Aircon

DS1	≥	24 ±0.5	YES	AND	EVENT5=1	🗑 ☑ On ☑ Per
OUT5	=	0	YES			
EVENT5	=	1	YES	OR	Out1=1	🗑 ☑ On ☑ Per
OUT0	=	1	NO			
DS2	≥	24 ±0.5	YES	AND	Out2=1	🗑 ☑ On ☑ Per
OUT4	=	0	YES			
DS2	≥	24 ±0.5	YES	AND	EVENT6=1	🗑 ☑ On ☑ Per
OUT5	=	0	YES			
EVENT6	=	1	YES	OR	Out3=1	🗑 ☑ On ☑ Per
OUT0	=	1	NO			

Please ensure DS1 is positioned near to AC1 (not directly in airflow) and 2 meters away from the door or window. DS2 position between AC2 and AC3 but out of direct airflow.

Also note if you decide to use 3 or 4 sensors to match the number of AC, then you can refer to the unique sensor assigned.

On the next page we will going over an example to explain for a 2 sensor for 3 aircon setup.

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Example

In this example we will have 3 AC system with 2 sensors, idea is only 2 AC will work during the day (AC1&AC3) and 1 at night for a 24hour store (AC2).

Logic:

Basically, DS1 will control AC1 exclusive when operating during the day, AC1 is near the door/window and will work the most.

DS2 will control AC3 during the day and AC2 during the night.

Remote setting changes:

Tasks/Schedule no change.

Reactions: Need to have additional alert and auto function like below:

E. Making Edits in ACES2.Eniscope.com

When you want to add new commands to Reactions, Tasks or MQTT Client you need to login via incognito window. This ensure no one can accidentally change setting while viewing.
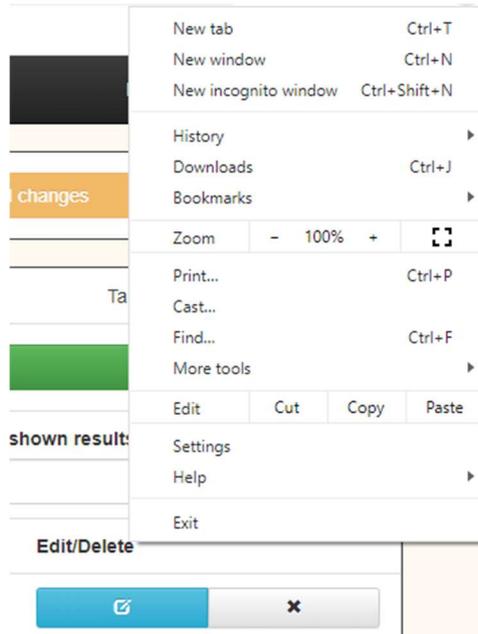
All major browsers have a incognito mode and above is an example for google chrome.

If the mode is working correctly you will see the MQTT On in the bottom left corner.
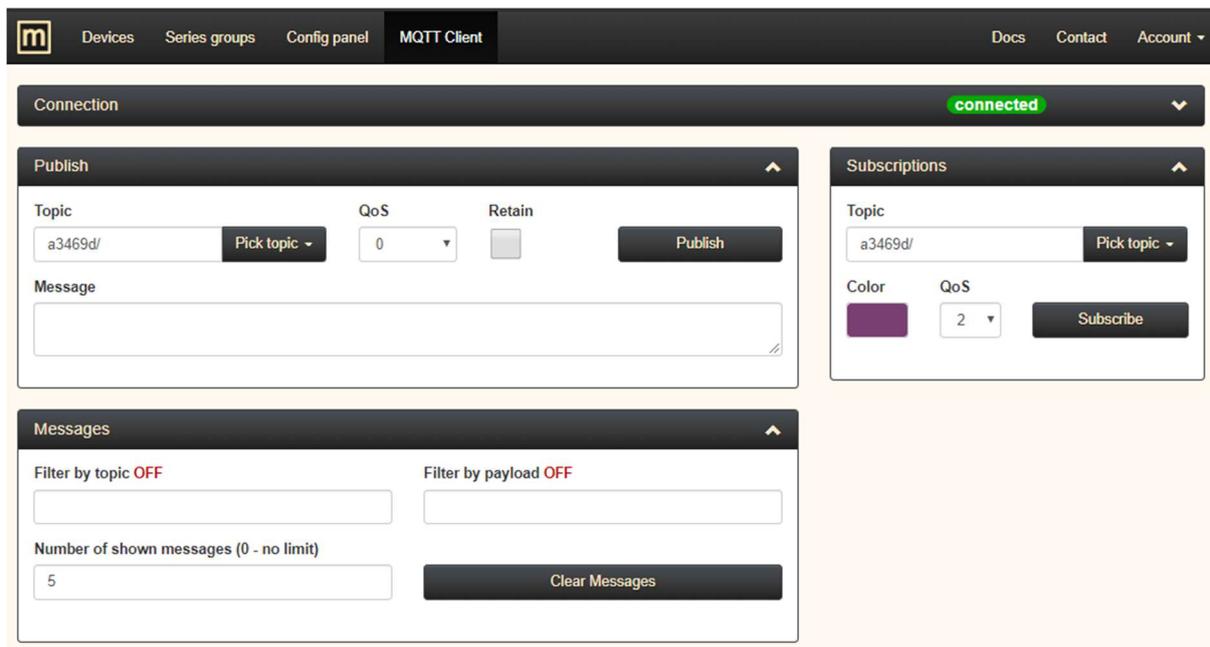
Or you will see the Connected sign for the MQTT Client

SECTION 3
TROUBLESHOOTING

A.   Factory Reset
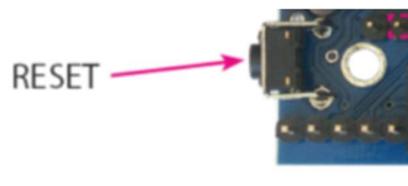
Pressing the reset button for about 0.5 seconds to change state relays, and hold for longer (up to five seconds) will change all settings (both network and configuration) on the factory reset.

Confirmation of the settings is fast switching on and off the relay.

SECTION 4
SPECIFICATIONS

Supply voltage: 8 to 55 V DC
Power consumption: 0.5W
Interface: Ethernet 100 Mbit/s
Relay: 255 V AC 10 A
Operating temperature: –20 to +85 °C

INPUT / OUTPUT:

4 Analogue Inputs INPA1 to INPA4 with amplifier
2 input voltage ranges:

The scope of of measured voltage for a range of 3.3 V
gain=1   from 0 to 3300 mV
gain=10 from 0 to 330 mV
gain=50 from 0 to 60 mV

The scope of of measured voltage for a range of 33 V

gain=1   from 0 to 33000 mV
gain=10 from 0 to 3300 mV
gain=50 from 0 to 600 mV

for voltages between 0 to 5 mV, the measurement is not sure.

2 Analogue Input without gain INPA5 & INPA6:
range of measured voltage of 0.1 to 3.3 V

1 Digital Input in standard 1-WIRE and I2C (connector 6P6C RJ12):
measurement 6 temperature probes DS18B20.

4 Logic Input:
VLow - max 1,1 V
VHigh - min 1,5 V, max 12 V

RELAY:
10   A / 240 V AC, 15 A / 24 V DC