HDL®

User Manual

Air-conditioner Controller

SB-DN-HVAC (MAC01.331)



buspro

Document updates:

Version	Data	Description
V1.0	2015.05.25	Finish new document

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1. Overview

The SB-DN-HVAC (MAC01.31) is a centralized HVAC or FCU control module. Using a HDL panel(with air conditioning function) and its built in smart algorithms, temperature and fan speed settings can be changed and controlled.

2. Main Functions

- Triple relays to control cooling, heating, and humidification.
- Triple relays to control low, medium, and high fan speeds.
- A smart control algorithm can control an air-conditioner efficiently.
- Four HDL DS18B20 digital temperature sensors can be connected to the module.
- One master module can control eight slave modules.
- Online upgrading is supported.

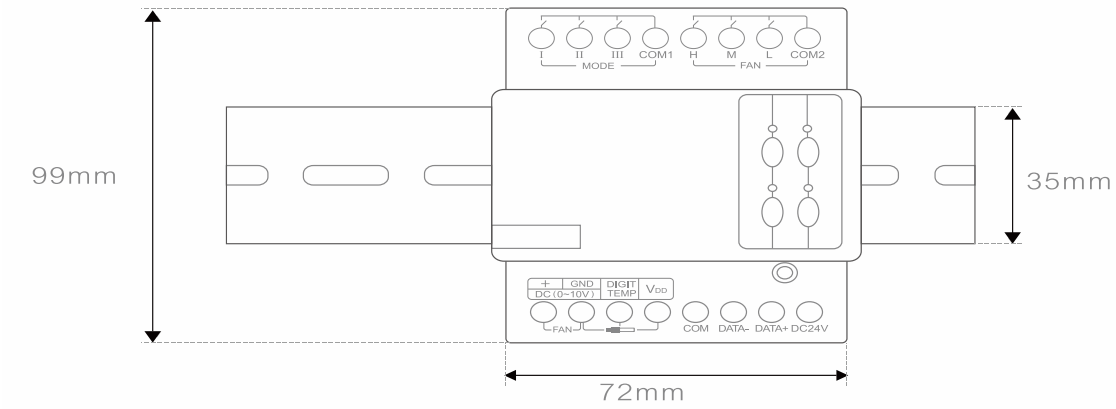
3. Basic Parameters

Electric Parameters:	
BUS power supply	DC15-30V
BUS power consumption	95mA/DC24V
Maximum current per CH	2A
Relay life time	60000
Environmental Conditions:	
Working temperature	0℃~45℃
Working relative humidity	Up to 90%
Storage temperature	-20℃~+60℃
Storage relative humidity	Up to 93%
Approved	
CE	

RoHS	
Production Information:	
Dimensions	72×90×66 (mm)
Weight	240.5(g)
Housing material	Nylon, PC
Installation	35mm DIN rail installation
Protection degree	IP20

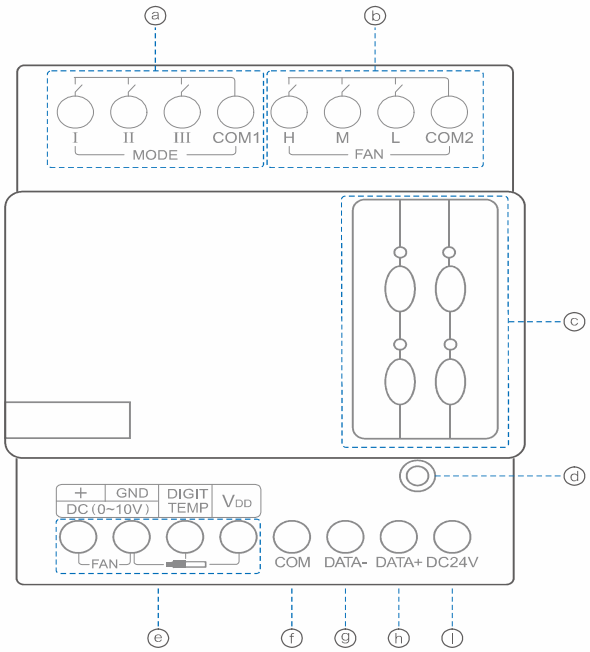
4. Dimensions and specifications

4.1 Dimensions



- DB box Installation

4.2 Device Description



a) Relay 1,2,3 for mode connection

b) H,M and L=connect to Fan motor , COM2=AC220-240V

c) Manual control button for mode and fan speed.

d) Programming button.

e) DC0-10V for fan control, and digital temperature sensor input port.

f) F,G,H,I and J are HDL Buspro interface.

4.3 Precautions

HVAC systems draw large amounts of electricity when in use, which means that improper installation can result in a risk of electrical fires, shocks and short circuits. Some states have specific building codes that govern HVAC systems, including their wiring. Electrical codes also apply to HVAC wiring and require electricians and builders to use wires and devices that are compliant and safe.

Safety Precautions

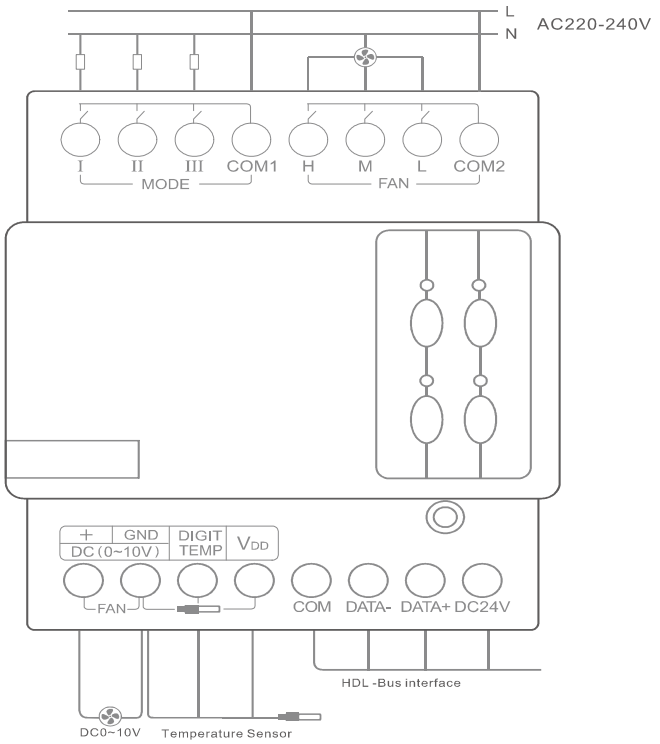
- It is recommended that the power input be connected to a MCB, or suitable fuse.
- When installing the module do not exceed a tightening torque of 0.4Nm.
- The power cable(relay output) should be：0.75mm^2 to 2.5mm^2 wire.
- The module should be mounted inside a distribution box.
- Care should be taken when connected the module to the Bus interface.

- Do not let the module come into contact with water.
- Do not connect the Bus wire to a AC220V supply.
- Ensure that the valve matches the input voltage.
- Ensure that the fan you wish to control uses a power supply of AC 0-10 volts.

5. Wiring

5.1 Wiring Diagram

The wiring diagram shown below must be followed exactly.



5.2 HDL Buspro Description

Connector info

Buspro	
DC24V	Red
COM	Black
DATA -	White
DATA +	Yellow

5.3 Commissioning

Method One:

1. Run the HDL-BUS Pro Setup tool.

2. On the module long press the “programming button” for three seconds until the LED turns red.

3. Using the software, click “Address management”, and then select “Modify address”, the window below will then be displayed.



4. Click on “Indicate initial address”, and the current subnet/device ID of the device will then be displayed. To modify the address, fill in the new address, and click the “Modify initial address” then click the “+Add” button. The device will now be added to the “ON-line devices list”.

Method Two:

1- Run the HDL-bus pro tool.
2- Search for online devices by clicking the search button, any online device will then be displayed in the “online device list”.

6. Software Configuration

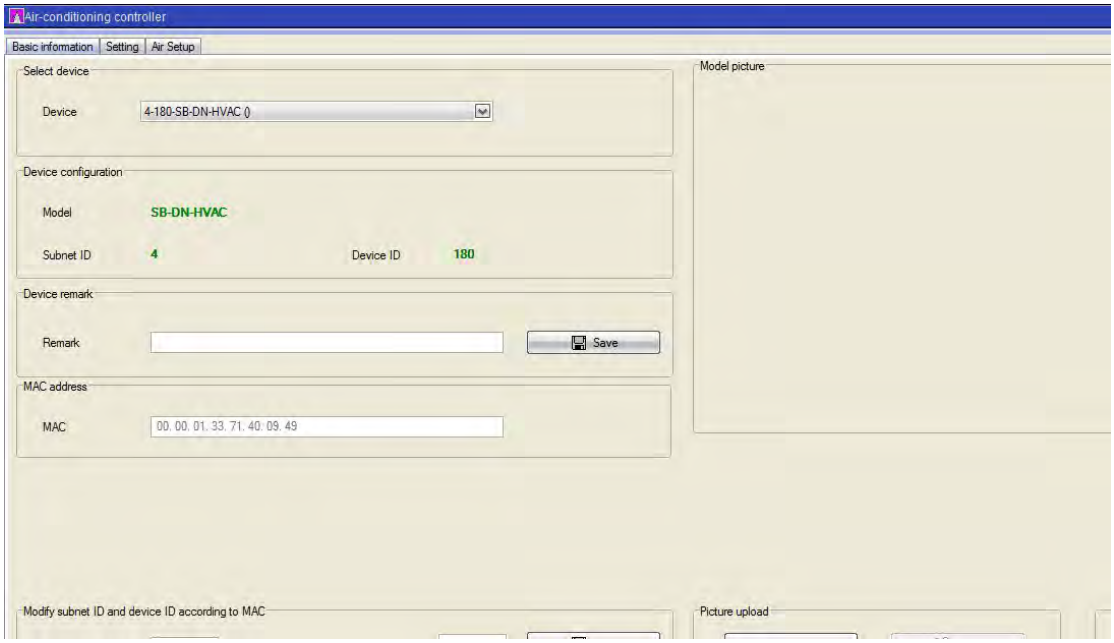
The module can be controlled via a HDL DLP panel; because of this, both the HVAC module configuration will be explained as well the configuration of the DLP.

6.1 Basic Information

The basic settings tab displays the basic device settings and information.

6.1.1 Changing the device ID

Each HDL device has a unique Subnet and Device ID number, each module's Device ID must be different from other devices on the same Bus. The Subnet ID should be the same as the HDL-Bus gateway (typically the SB-DN-1IP or HDL-MBUS01IP.431).

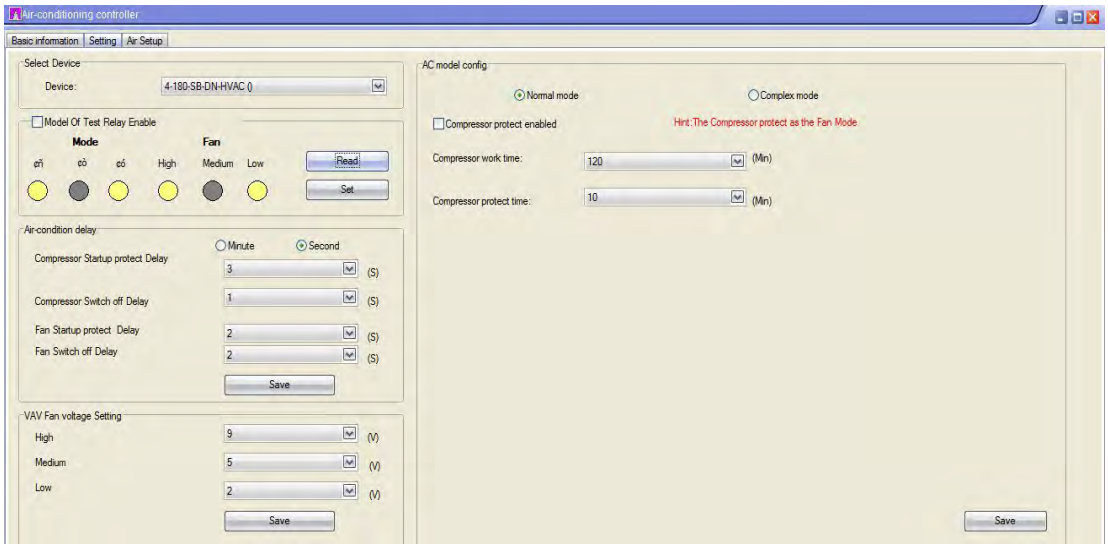


6.1.2 Remark

It is recommended that the module be named as this will aid module identification in complex installations.

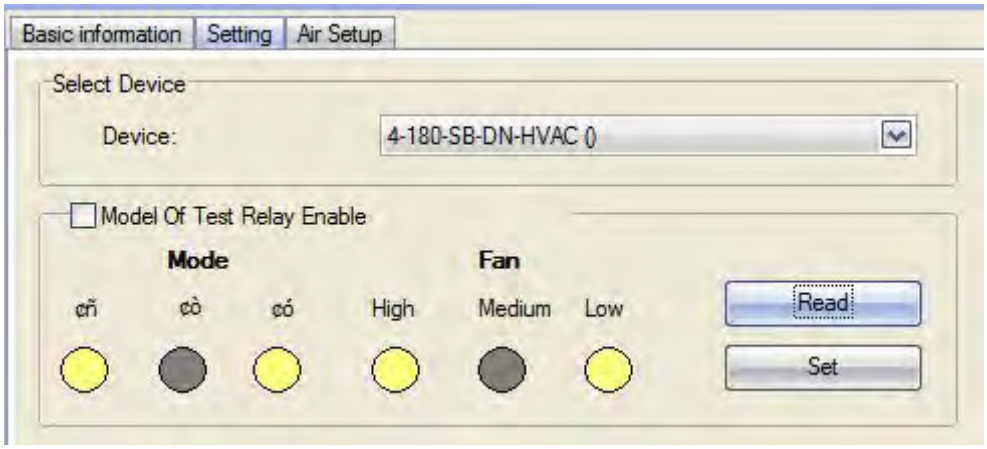
6.2 Settings

The settings tab is the central location in which the module can be configured from:



6.2.1 Testing the wiring

The wiring test ensures that every relay has been wired correctly, and that the system can operate safely. Before programming the end-user panel, the relay wiring should be tested.



Steps: To test the wiring of this module a user should follow the below steps:

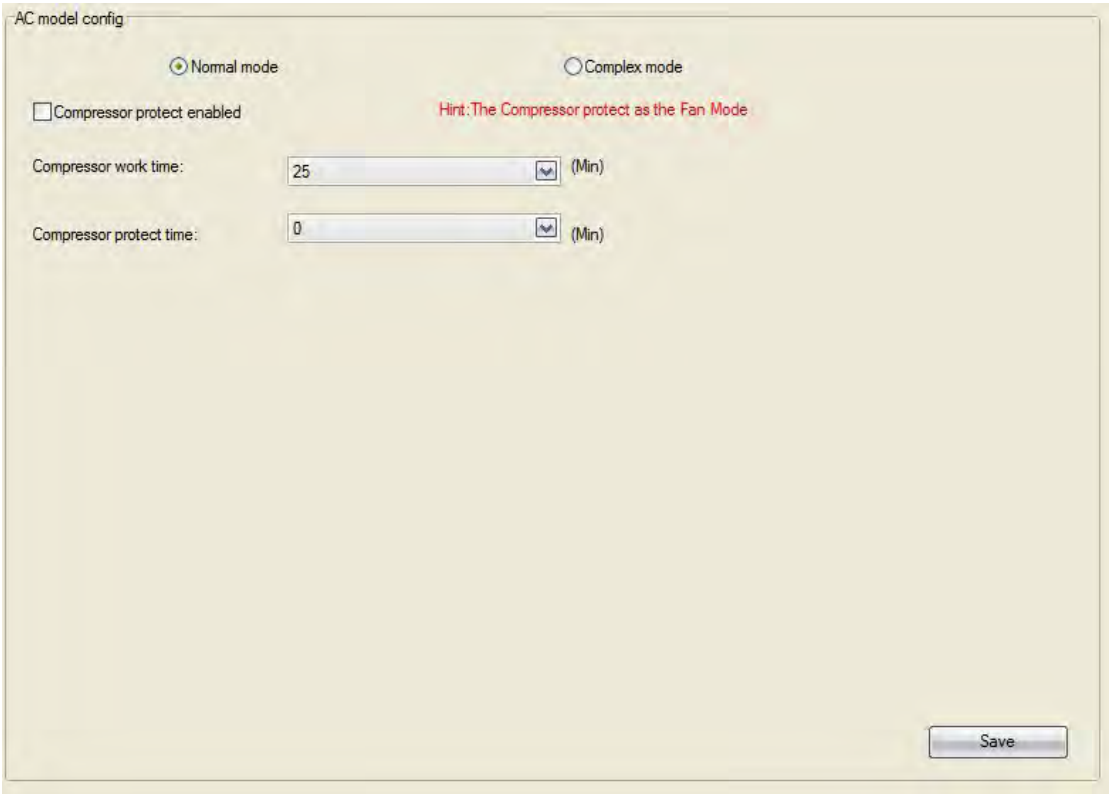
a) On the “Settings” tab tick the “Model of test relay enable” option, the test mode will then be activated.
b) The status of each relay can be read by clicking on the “read” button.
c) Click the “set” tab to test each relay.

6.2.2 Air-conditioner delay settings

The compressor delay function serves to safeguard the HVAC module, because of this it is recommended that the function be activated. To set these delay times, please refer to the manual of FCU manufacturer.



6.2.3 AC model configuration



1) Mode Selection

The air conditioner settings can be configured in two ways:

a) Normal Mode: This mode is the default mode and corresponds to the module's default wiring diagram, below is the normal wiring method for this module:

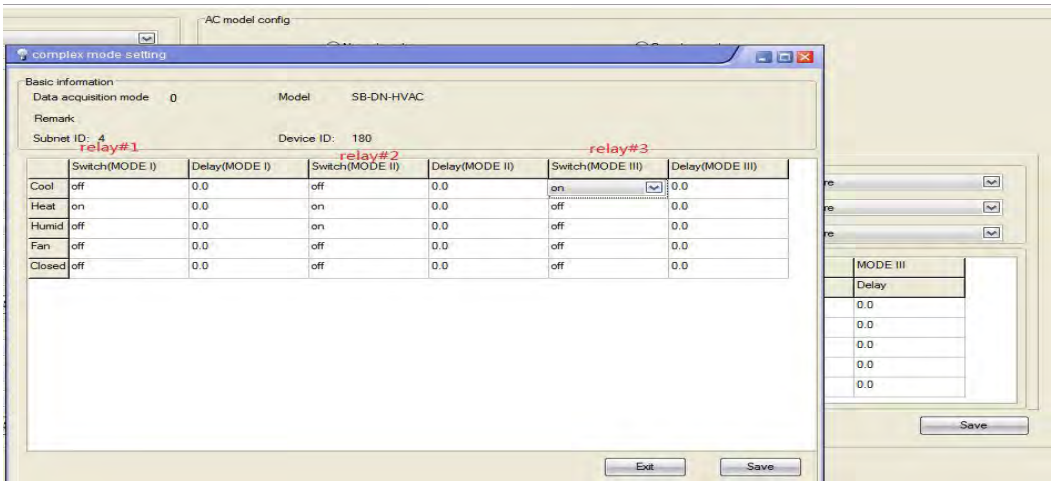
Default wiring: Relay-1=Cooling, Relay-2=Heating, Relay-3=Dehumidification.

b) Complex Mode: This mode is only used when the default wiring method is not used.

If for example relay#1&relay#2 is heating, relay#2 is dehumidification and relay#3 is cooling, then the below steps should be followed:

1) Select Complex mode

2) Double click on the "HVAC settings" table to modify the settings, and change the settings in the pop-up window.



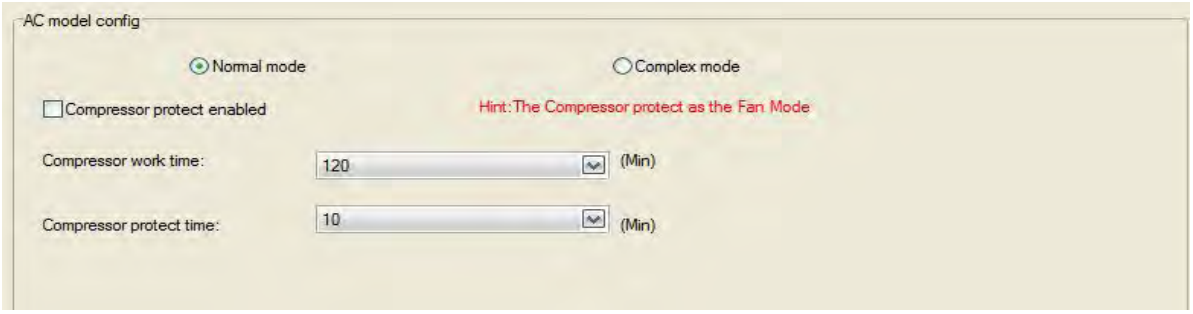
Relay power restore:

If this tab is selected the module will save each mode status before being powered off, and implement them when powered on.

This function is only available in the relay mode, as the screen shot below shows.



2) Compressor Protection



Compressor protection will stop the air conditioner operating after a set period of time. The compressor work time is how long the AC will operate before it enters into protection mode, the compressor protect time is how long the AC will remain in the protection mode.

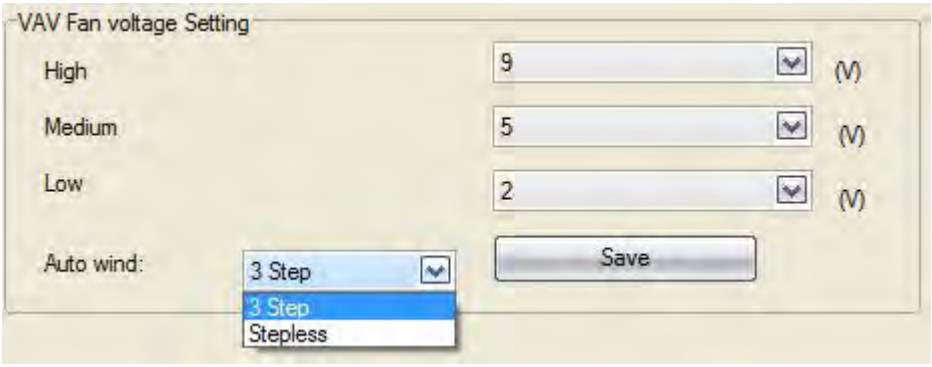
For example: If we set the compressor time for 120 minutes and the compressor protect time for 10minutes, then after the compressor is used continuously for 120 minutes it will stop and then restart after 10 minutes has elapsed.

6.2.4 VAV fan voltage settings

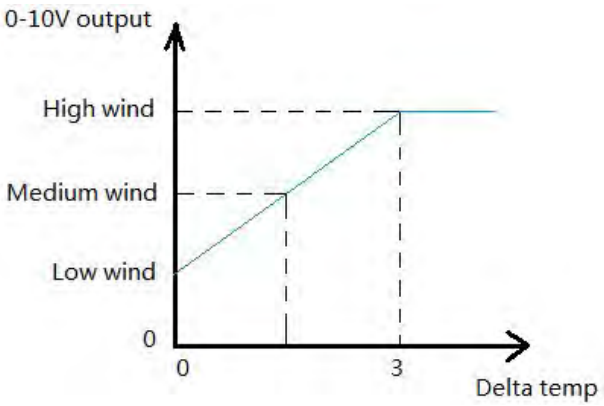
The VAV fan settings allow the fan voltage to be controlled, the fan speed will increase with a voltage increase, and vice versa.

Note:

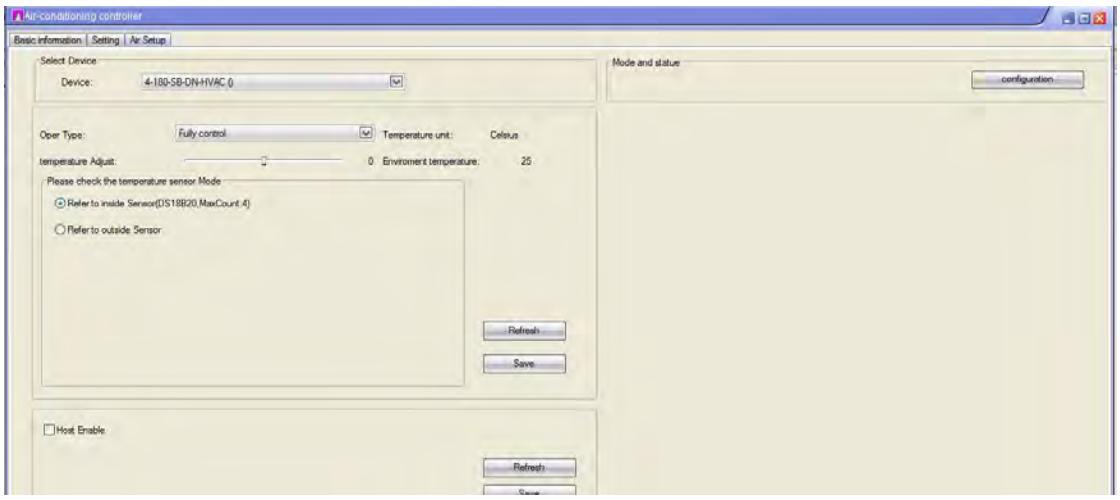
Different parameters can be set for each fan, the minimum voltage available is 0V and the maximum is 10V. To set the voltage value for each fan, please refer to the manual of FCU manufacturer.



For auto wind, there are two options: 3 step and stepless(firmware version:HDL_V03.08U_2015/01/20). If stepless is selected, the 0-10V output varies continuously according to the temperature difference between desired temperature and room temperature.

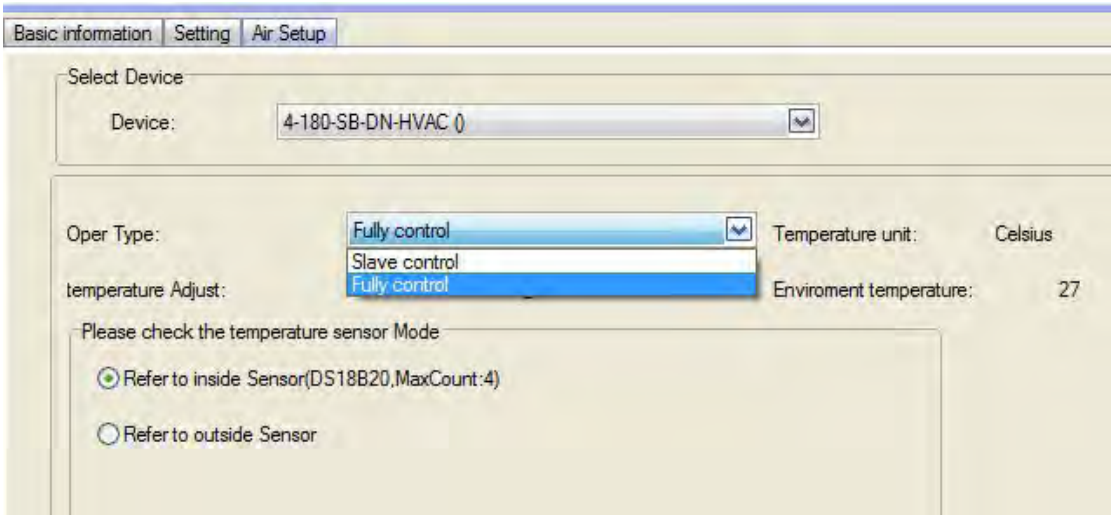


6.3 Air conditioning control



6.3.1 Operating modes

There are two different operating modes are available.



a) Fully control: When the ‘Fully control’ option is selected, the module has the ability to control itself and be controlled directly from the i-Life application.

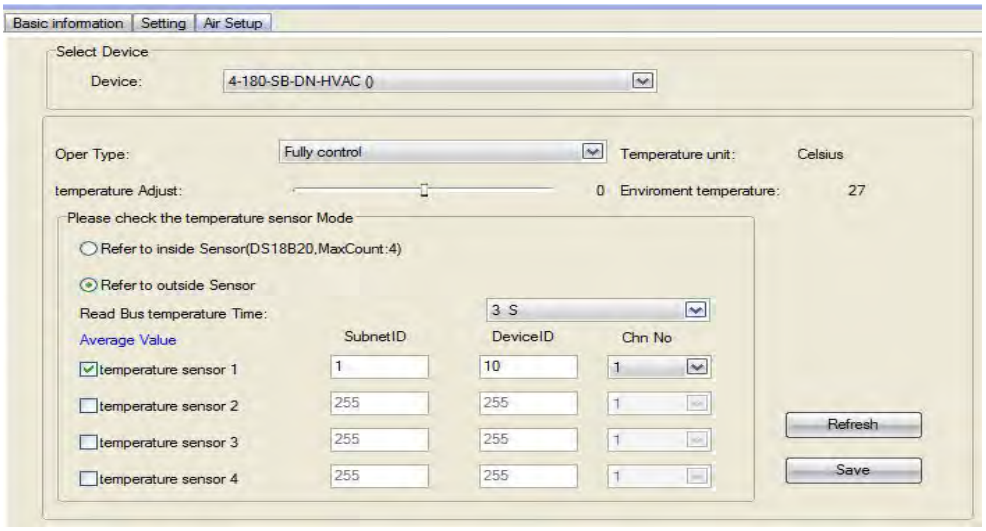
b) Slave control: When the slave mode is selected, the module can only be controlled via a DLP, other devices(e.g. i-Life) can only control HVAC through the DLP.

6.3.2 Temperature sensor settings

The module can support 4 temperature sensors, the temperature readings can be received in two ways:

a) Refer to inside sensor: When this option is selected the module will receive the temperature readings from local sensors which are connected to the module, these sensors provide the ‘indoor temperature sensors’.

b) Refer to outside sensor: When this option is selected the module will receive the temperature readings from another module which has a temperature sensor. This could be another HVAC module, FH module, or any other HDL device with an ability to sense temperature. These sensors are known as ‘outdoor temperature sensors’.



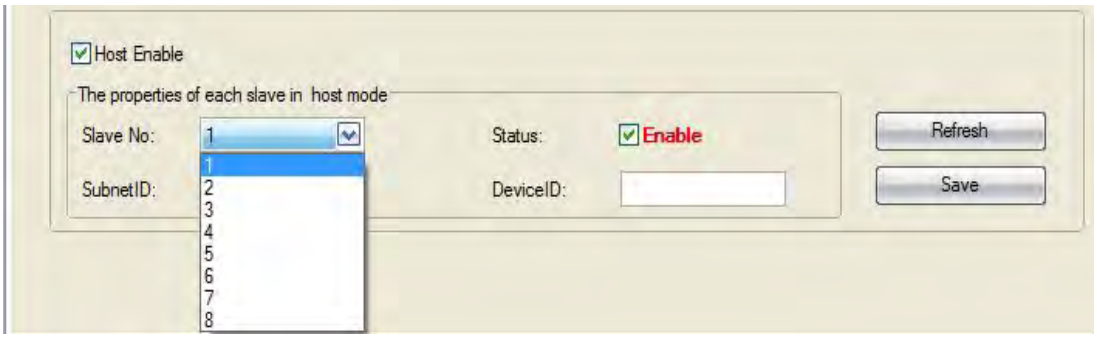
Steps:

a) Select ‘refer to outside sensor’ on the Air-setup tab.

b) Tick the checkboxes on any of the 4 temperature sensors and fill in the subnet/device ID of the module that the temperature will be broadcast from.

6.3.3 Host settings

As previously mentioned, one master HVAC module can be the host and control 8 slave modules, this enables the slave modules to receive the fan speed and mode settings from the master module.



Steps:

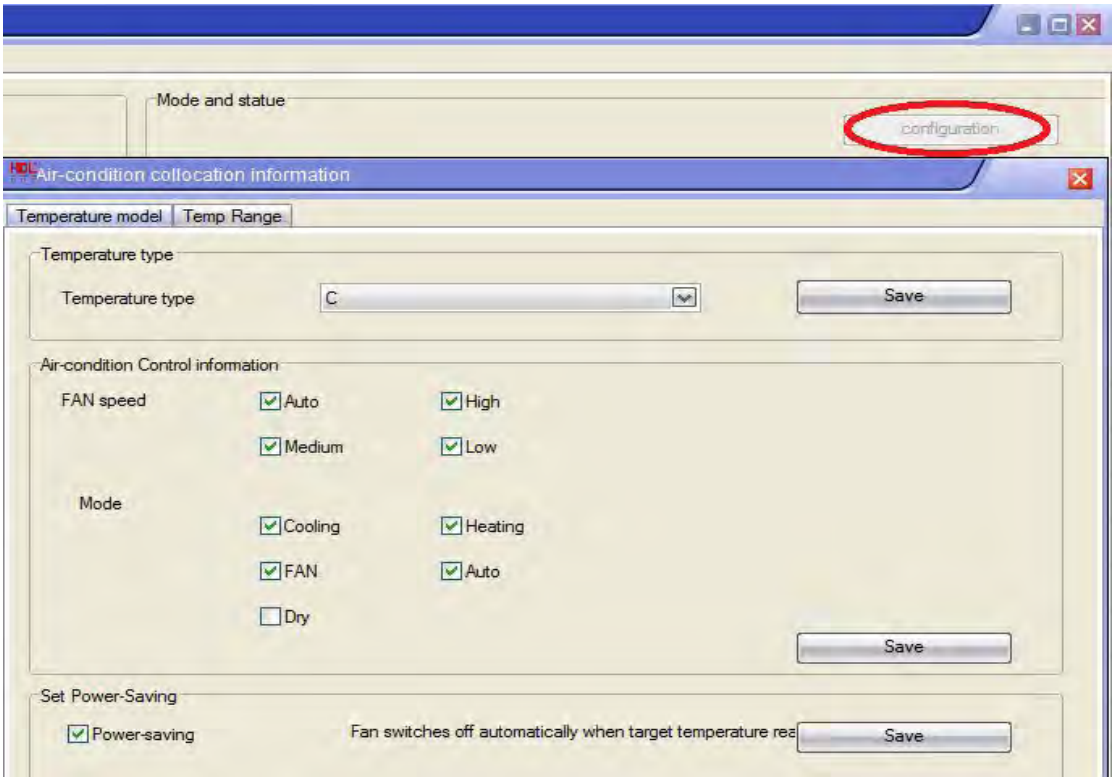
a) Tick the option “Host Enable”to enable the function.

b) Select the “Slave No”.

C) Tick on “Enable” to enable the hosting function for the specified module.

6.3.4 Mode and status configuration

This section focuses on the AC settings and how they can be modified.



1) temperature format:

The temperature can be measured in either Celsius or Fahrenheit, select the unit of measure you require a) Celsius (°C) b) Fahrenheit (ºF)

2) air-conditioner control

This section allows you to enable or disable the functions that control the air-conditioner, simply check or uncheck the tick box to enable/disable the function and then click save.

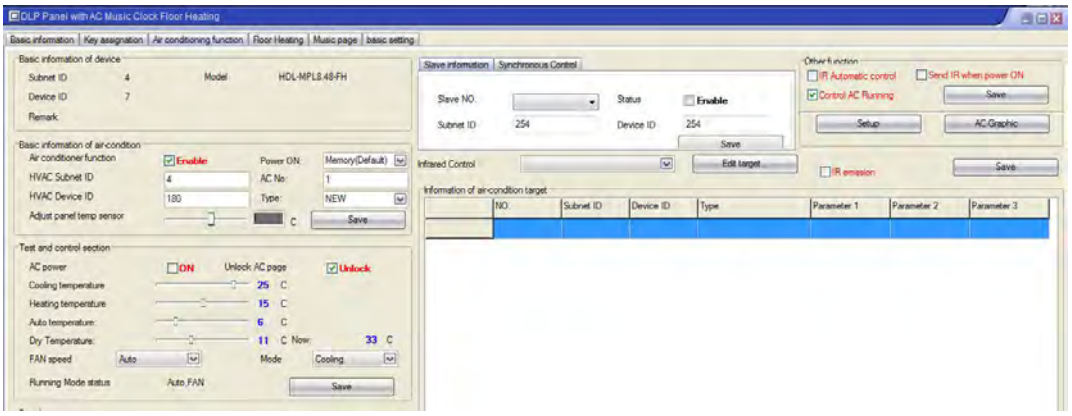


6.4 Configuring the DLP

Before configuring the DLP, ensure that the air conditioning option tick box is checked to activate.

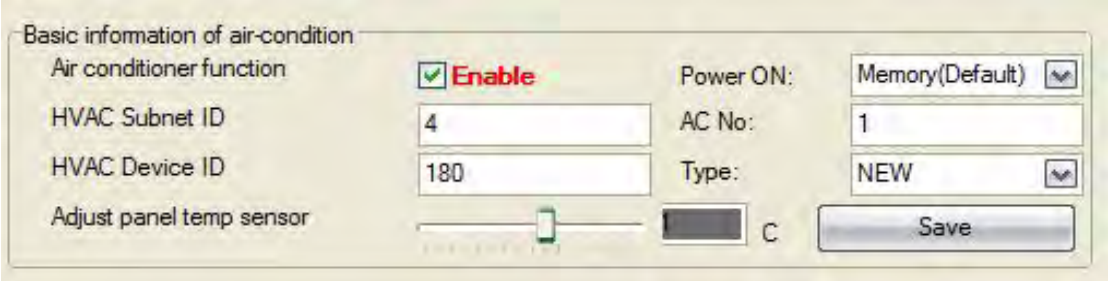


After activating the AC page, switch to the DLP's air-conditioning function page.



6.4.1 Basic Information

This section shows the basic control settings for the HVAC module.



a) First enable the air-conditioner function by ticking the “enable” check box.

b) Enter in the subnet/device ID of the HVAC module.

c) Select the AC type, by default the AC type is set as “NEW”.

For SB-DN-HVAC(5-relay outputs), select ‘OLD’; for HDL-MAC01.331(6-relay outputs), select ‘NEW’.

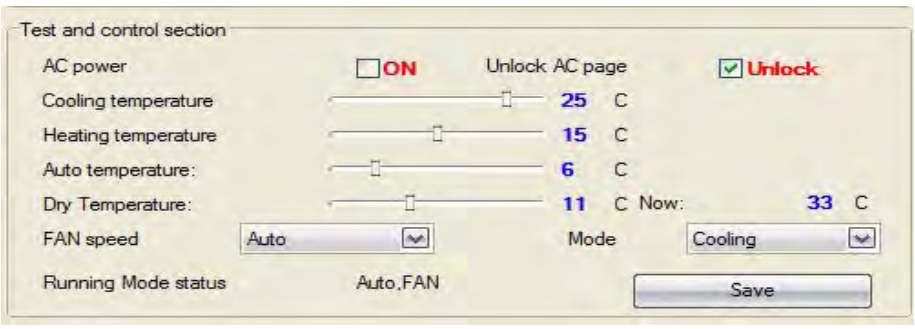
d) Enter the AC No.

For SB-DN-HVAC/ HDL-MAC01.331, they only can be used to control one AC, then the AC No. is 1; for SB-DN-RS232(AC version), you will need to set the corresponding AC No. for different AC unit.

6.4.2 Testing and control

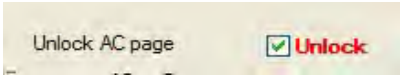
a) Test: This section allows us to test the wiring of each relay and determine if it is operating correctly. Each relay can be tested in turn by selecting the corresponding air-conditioner mode.

b) Control: The control settings of the air conditioner are also included in this section. A temperature level can be set for each mode enabling the HVAC to automatically stop when the desired temperature is achieved.



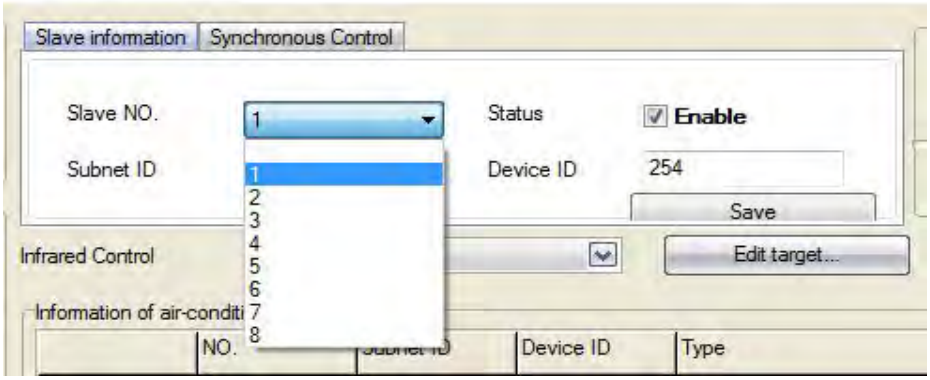
c) Unlock:

The AC functions can be locked, or unlocked. When locked its settings cannot be modified, when unlocked they can be.



6.4.3 Slave information

When the slave information tab is pressed, the settings for the slave DLP are displayed. One master DLP panel is capable of controlling and monitoring 8 slave DLP panels.



Application: -

If a user wished to monitor the temperature of an upstairs room while they were downstairs, they would simply:

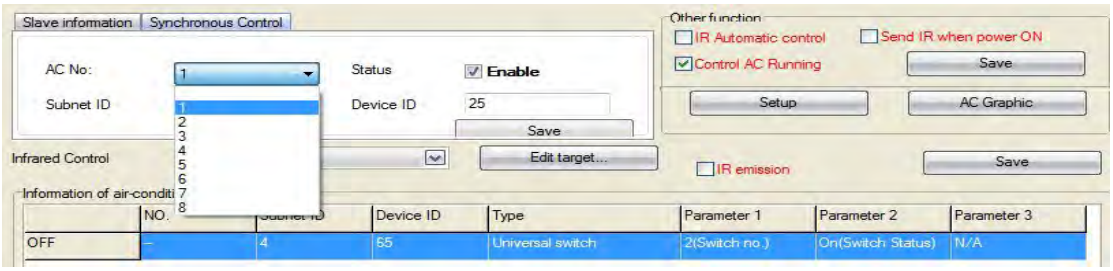
a) Select slave No. and tick on “Enable”

b) Fill in the slave DLP panel’s subnet/device ID and save.

c) Save the changes made to the system.

6.4.4 Synchronized control

A DLP panel is capable of both sending and receiving data. Eight DLP panels can share the same set up information, and then be used to control the same AC via IR.



To enable synchronous control between eight DLP panels, a user should follow the below instructions.

a) Open the DLP air-conditioning function tab and select synchronous control.

b) Select AC NO.

c) Check the ‘Enable’ tick box.

d) Enter the subnet/subnet ID of the target DLP.

e) Check the ‘IR emission’ tick box.

f) Click the ‘save’ tab to implement the modifications made.

The above process must be repeated for each DLP panel that a user wishes to control.

6.4.5 Additional functions

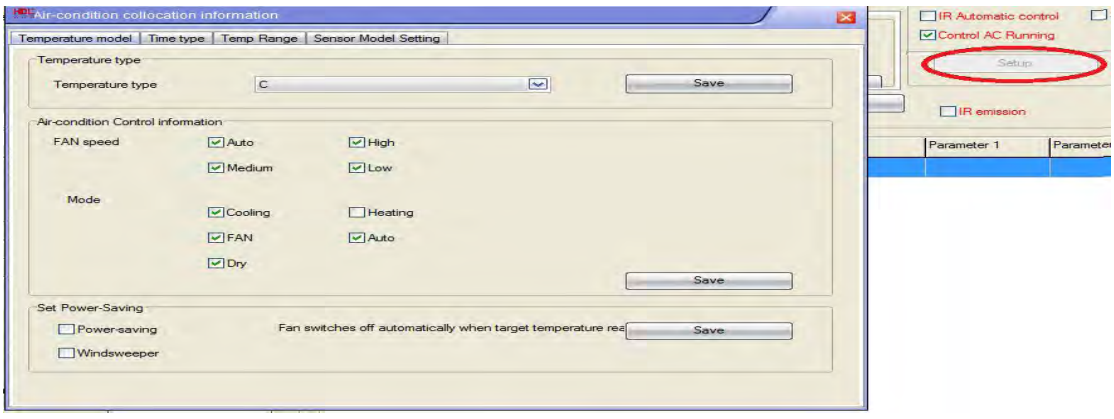
1) setup settings

This section contains many useful functions such as:

a) Temperature format: Select from ºC or ºF

b) Air-conditioner information: The functions of an air conditioner are displayed, allowing a user to enable or disable them.

c) Set power saving: If this option is selected the fan will switch off automatically when the desired (target) temperature is reached.



d) Time type: Select the time format (24hours or 12hours format) and date format (DMY or MDY).

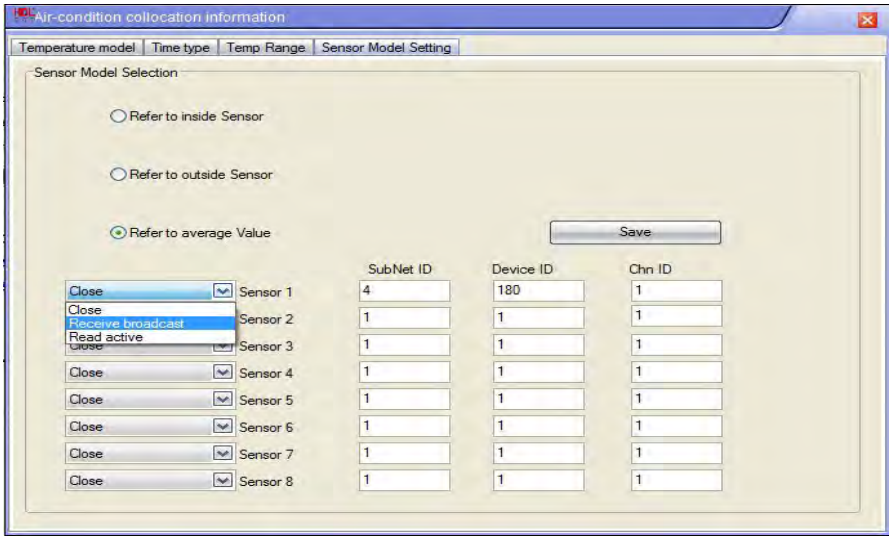
e) Temp range: Set the temperature range for each mode.

f) Sensor model settings: The temperature sensor and broadcast settings have three options:

- Refer to inside sensor: The temperature data will be collected locally from the respective HVAC module.

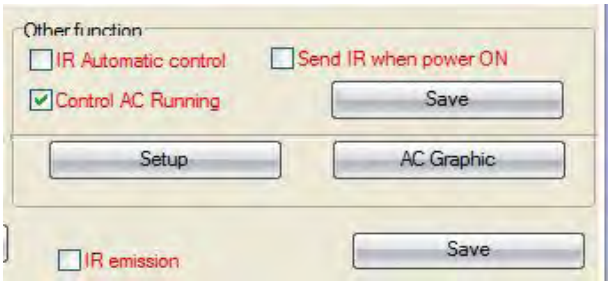
- Refer to outside sensor: The temperature data will be collected from the external temperature sensors, an outside average temperature can be collected by selecting “receive broadcast”.

- Refer to average value: An average temperature of inside sensor and outside sensor’s temperature.



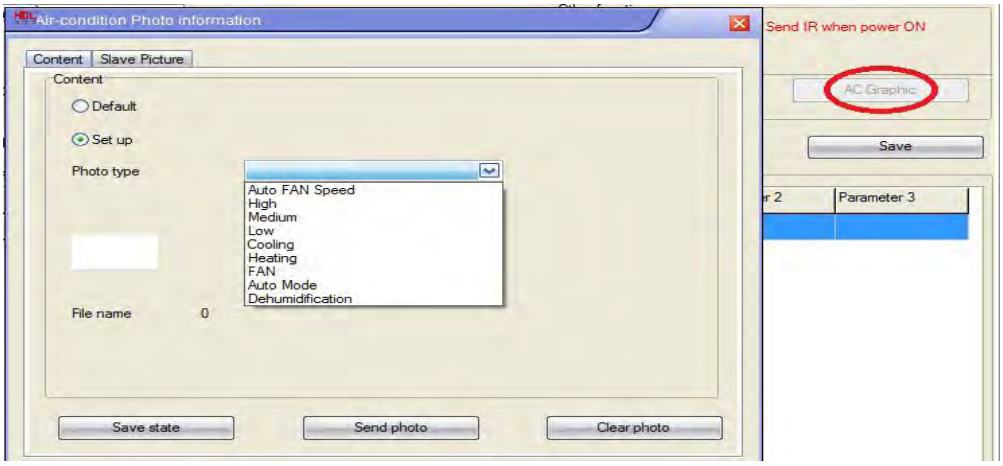
2) Control AC Running

If the ‘control AC running’ option is selected, it can smartly control the mode and fan speed, this is specially used to control the SB-DN-HVAC(5-relay outputs) which has no built-in algorithm, it needs the DLP to fully control. For the HDL-MAC01.331, it has the built-in algorithm, set it in fully control mode, then it can control the mode and fan itself, in this case, DLP just the control interface, just leave the ‘control AC running’ option un-selected.



3) AC graphics

This allows an icon to be uploaded for each mode and fan speed level, the icons will then be able to be displayed on the DLP panel.



To set an icon on the DLP panel, the below steps should be followed:

a) Double click on the ‘AC graphics’ tab which is located on the ‘air conditioning function’ window. The above window will then appear.

b) Select ‘set up’.

c) Double click on the white rectangle, a file selection window will then appear, select the icon you wish to upload to the system by double clicking on it. Any icon you wish to upload must be in bmp format.

d) Click on ‘Send photo’, and then click on ‘save state’,

An icon for a DLP slave unit can also be set by following the steps shown below:



a) Double click on the ‘AC graphics’ tab which is located on the ‘air conditioning function’ window. On the window two tabs are visible on the left hand side of the page, select ‘slave picture’. The above window will then appear.

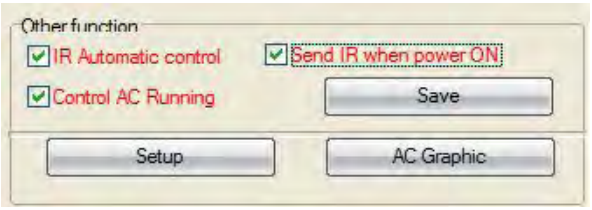
b) Select ‘set up’

c) Double click on one of the four white rectangles, a file select window will then appear, select the icon you wish to upload to the system by double clicking on it. Any icon you wish to upload must be in bmp format.

d) Click on ‘Send photo’, and then click on ‘save state’.

4) IR automatic control: this option enables the AC unit to be controlled using IR .

5) Send IR when power on: if this option is selected, The DLP will send an IR command when it is powered on.



7. FAQ

1) MAC01.331FAQ001_HDL-BUS

Q: When using the HDL-BUS Pro Setup Tool, it mentions ‘Old or New’ on the DLP AC page. What does this mean?

A: This refers to the fan speed modes, for 3 fan speeds and 2 modes select “Old”, for 2 fan speeds and 3 modes or MAC01.331 select “New”.

2) MAC01.331FAQ002_HDL-BUS

Q: What are the differences between the SB-DN-HVAC, and the MAC01.331?

A: The MAC01.331 has a terminal for a digital temperature sensor, and built-in control logic control. This enables the temperature of a room or building to be precisely regulated. The SB-DN-HVAC does not have this ability, and requires a DLP panel to operate and complete logic functions.

3) MAC01.331FAQ003_HDL-BUS

Q: If I wish to control a FCU unit I can use the SB-DN-HVAC or HDL-MAC01.331, but I can also use IR (Infrared) to control it, which method is better?

A: When possible it is recommended that IR control is used, preferably the SB-IR-EM, SB-CMS-12in1 or SB-CMS-8in1. This is preferred because if a HVAC system is connected directly to a third party controller like the SB-DN-HVAC/HDL-MAC01.331, the FCU warranty may be voided.

7.4 MAC01.331FAQ004_HDL-BUS

Q: Should I control the fan speed via a relay, or by varying the voltage?

A: Check your FCU manual to see which method is recommended, some FCU manufactures use relays to control the fan speed while others use 0-10V.

7.4 MAC01.331FAQ004_HDL-BUS

Q: A temperature has been set, but when it is reached the fan is still running. How can this be rectified?

A: If the fan speed had been set to “Low”, “Medium” or “High” but not “Auto”, the fan will continue to be active even if the desired temperature is reached. This will not affect the temperature however as the fan is blowing neither hot nor cold air. If the fan speed had been set as “Auto”, ensure that the “Power-saving” option is enabled in HDL-BUS Pro Setup Tool.

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8 Note

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