

Skybox MA01 EP

Technical Documentation V 1.4 – 2026.07.14



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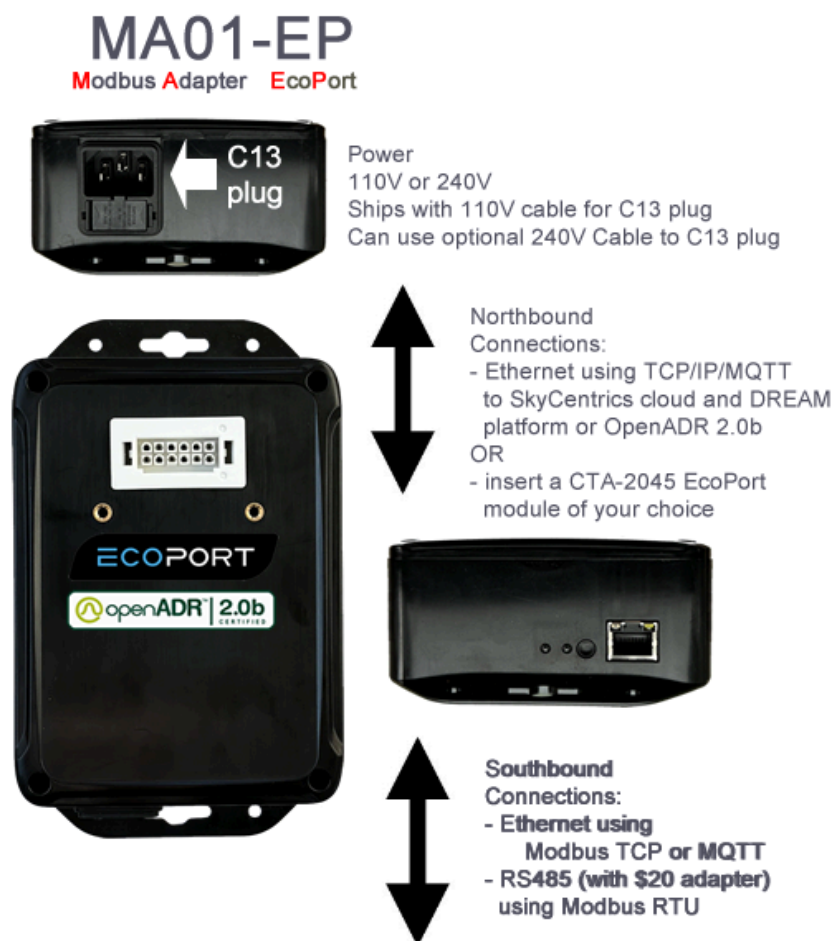
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SkyBox Overview

This document contains a technical description of the SkyCentrics *Skybox* MA01-EP functionality and provides instructions for getting started with it. Please contact Skycentrics if you have any questions while working through this guide.



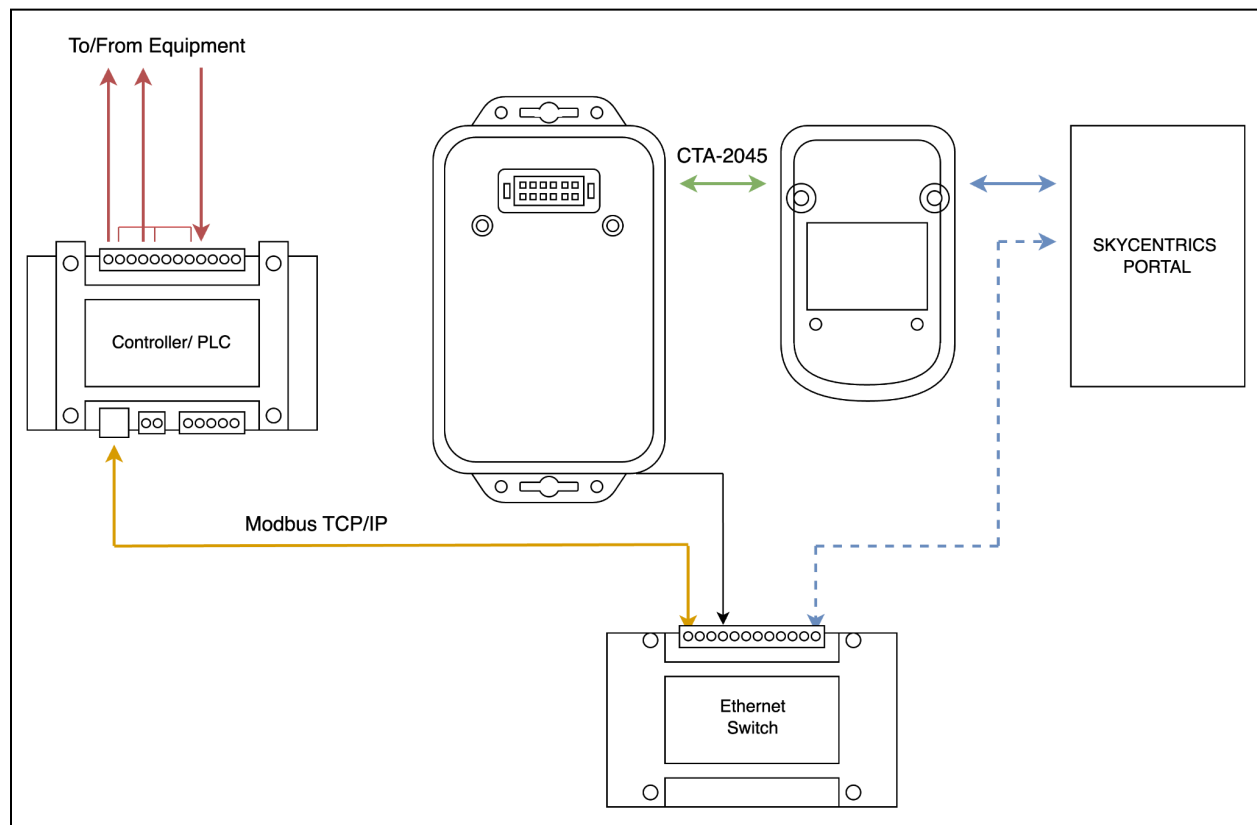
The Skybox MA01-EP is a device that provides instant CTA-2045 EcoPort certification to equipment with flexible power consumption. SkyBox is a CTA-2045 EcoPort to Modbus AC Smart Grid Device (SGD) adapter that facilitates bidirectional communication between building equipment and the internet. SkyBox provides instant CTA-2045-B Level 2 certification, by translating CTA-2045 signals to Modbus TCP or MQTT, (compatible with Modbus RTU with an external adapter). SkyBox can operate as both a Modbus TCP/IP server and client.

Installation

1. Connect the Skybox to a local network using an Ethernet cable so it can be assigned an IP address. A network switch can be used to connect the Skybox, modem, and other devices when multiple devices need to share the same network.
2. Next, connect the power cord provided in the Skybox package to a standard 110V AC power source to power up the Skybox.
3. If the Skybox is expected to send data to the cloud, ensure the network it is connected to has an active internet connection.

Note: The Skybox can also be connected directly to a Programmable Logic Controller (PLC) or other device using Ethernet to communicate via Modbus. If you plan to do this, first configure the Skybox's IP address and then connect it to the device. By default, the Skybox is configured to receive an IP address automatically when powered on (DHCP). You can change this setting through the Skybox [web configuration page](#).

Example use-case: Wiring and Connection setup



Left Section (Sensor/Controller Module)

- Wiring (Red Arrows): This Controller has several inputs/outputs that are connected to sensors and other control devices.
- Modbus Communication (Yellow Arrow): The controller and the Skybox talk using Modbus communication. The controller gathers sensor data (indicated by the red arrows) and sends this data via Modbus to the Skybox. The Skybox processes the sensor data, it prepares the information to be sent over to the Skycentrics cloud platform.

Middle Section (Skybox and CTA-2045 UCM)

- Connection to Device 1 (Green Arrow): A green arrow shows utility related data communication between the Skybox and the UCM via CTA-2045 protocol.
- Communication to Skycentrics Cloud (Blue Arrows): Both the devices send the data received to the cloud.

Right Section (Skycentrics Cloud and Data Flow)

- Data Flow (Dashed Blue Lines): The Skycentrics platform collects data from the gateway and shares it with third-party services such as utilities or aggregators. These services use the data for monitoring, control, or demand-response actions.

Modbus Register Map

The following registers are supported by the device and can be accessed using the *Read Holding Registers* (0x03), *Write Single Register* (0x06) and *Write Multiple Register* (0x10) functions. Attempts to write into read-only registers are ignored. That is, a response is returned but data is discarded.

#	Address	Name	R/W	Bytes	Description
1	0 (0x00)	DEVICE	R/W	2	Modbus unit address (default=0x01).
2	1 (0x01)	SERIAL01	R	2	First part of the serial number.
3	2 (0x02)	SERIAL02	R	2	Second part of the serial number.
4	3 (0x03)	SERIAL03	R	2	Third part of the serial number.
5	4 (0x04)	MODEL	R	2	Device model.
6	5 (0x05)	HARDWARE	R	2	Hardware version.
7	6 (0x06)	FIRMWARE	R	2	Firmware version.
8	7 (0x07)	COMMAND	R/W	2	System command. 1 = Soft Reset 2 = Reset 3 = Factory Reset
9	8 (0x08)	MODE	R/W	2	Operating mode.

					0 = Modbus TCP/IP Server 1 = Modbus RTU Server (via Adapter)
10	9(0x09)	CLOUD	R	2	Cloud connection status. 0 = Not Connected 1 = Connected
11	10(0x0A)	UCMSTATUS	R	2	UCM connection status. 0 = Not Attached 1 = Attached/Not Connected 2 = Attached/Good Connection 3 = Attached/Poor Connection Note: This relies upon the UCM using the <i>outside comm status</i> command to report its connection state every 1 to 5 minutes.
12	11(0x0B)	MODBUSSERVER	R	2	Modbus Server connection status 0 = Not connected 1 = Connected Note: The Skybox will report 'connected' each time a Modbus function is used to read/write registers on the SkyBox in server mode.
13	12(0x0C)	MODBUSCLIENT	R	2	Modbus client connection status 0 = Not connected 1 = Connected Note: The SkyBox successfully reads/writes registers on the remote Modbus node in client mode.

#	Address	Name	R/W	Bytes	Description
101	100 (0x64)	STATE	R/W	2	Operational state. 0 = Idle Normal 1 = Running Normal 2 = Running Curtailed 3 = Running Heightened 4 = Idle Curtailed 6 = Idle Heightened 11 = Idle Opted Out 12 = Running Opted Out

102	101 (0x65)	OVERRIDE	R/W	2	Override status. 0 = No Override 1 = Override
103	102 (0x66)	POWER01	R/W	2	First part of instantaneous power (MSW).
104	103 (0x67)	POWER02	R/W	2	Second part of instantaneous power.
105	104 (0x68)	ENERGY01	R/W	2	First part of cumulative energy.
106	105 (0x69)	ENERGY02	R/W	2	Second part of cumulative energy.
107	106 (0x6A)	PSCAP01	R/W	2	First part of present storage capacity.
108	107 (0x6B)	PSCAP02	R/W	2	Second part of present storage capacity.
109	108 (0x6C)	TSCAP01	R/W	2	First part of total storage capacity.
110	109 (0x6D)	TSCAP02	R/W	2	Second part of total storage capacity.
111	110 (0x6E)	APSCAP01	R/W	2	First part of present ALU capacity.
112	111 (0x6F)	APSCAP02	R/W	2	Second part of present ALU capacity.
113	112 (0x70)	ATSCAP01	R/W	2	First part of total ALU capacity.
114	113 (0x71)	ATSCAP02	R/W	2	Second part of total ALU capacity.

#	Address	Name	R/W	Bytes	Description
201	200 (0xC8)	EVENT	R	2	Event type. 0 = No Event 1 = Shed 10 = Critical Peak Event 11 = Grid Emergency 12 = Advance Load Up 23 = Load Up
202	201 (0xC9)	DURATION	R	2	Remaining event duration in seconds. 0 = No event or duration is not specified.

Web Configuration Page Guide

The web configuration page is an interface used to configure the settings of the Skybox. It can be accessed only when your computer is connected to the same network as the Skybox.

Finding the IP address assigned to the SkyBox:

The Web Configuration page can be accessed using the SkyBox's IP address on any internet browser. By default, the Skybox operates in DHCP mode, allowing the router to automatically assign an IP address.

Using this assigned IP address, the page can be accessed at `http://<ip_address>:80`

Be sure to add ":80" after the assigned IP address, otherwise you will not be directed to the Web Configuration Page.

1. Go to Terminal (If using a MAC) or Command Line if using Windows.
2. Type "**arp -a**" (arp<space>-a) and hit 'enter' key.
 - a. You will find a list of devices on your network with corresponding IP addresses. Look for the mac address that corresponds to the serial number of your SkyBox with ':interspersed. The serial number can be found on the label of the Skybox under "s/n"

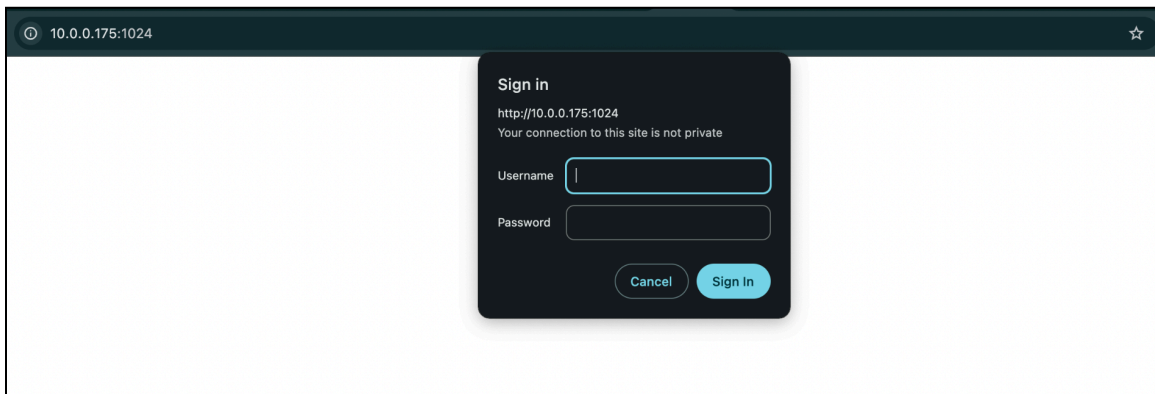
Example: *If the serial number of Skybox is FCC23D4F0A08 , then find the IP address (LEFT) corresponding to fc:c2:3d:4f:a:8*

```
[engineer2@SCNs-MacBook-Pro ~ % arp -a
? (10.0.0.1) at d4:b9:2f:dc:c3:bb on en0 ifscope [ethernet]
? (10.0.0.108) at d0:88:c:71:1c:a9 on en0 ifscope [ethernet]
? (10.0.0.150) at a6:fb:9f:39:85:4e on en0 ifscope [ethernet]
? (10.0.0.164) at fc:c2:3d:4f:a:8 on en0 ifscope [ethernet]
? (10.0.0.175) at (incomplete) on en0 ifscope [ethernet]
? (10.0.0.226) at 52:ca:8c:1b:67:50 on en0 ifscope [ethernet]
? (10.0.0.228) at (incomplete) on en0 ifscope [ethernet]
? (10.0.0.255) at ff:ff:ff:ff:ff:ff on en0 ifscope [ethernet]
mdns.mcast.net (224.0.0.251) at 1:0:5e:0:0:fb on en0 ifscope permanent [ethernet]
]
engineer2@SCNs-MacBook-Pro ~ %
```

The IP address in this case would be `http://10.0.0.164:80`. Copy **The IP Address** (NOT the serial number) into your browser window, being sure to add ":80" to the end of the address.

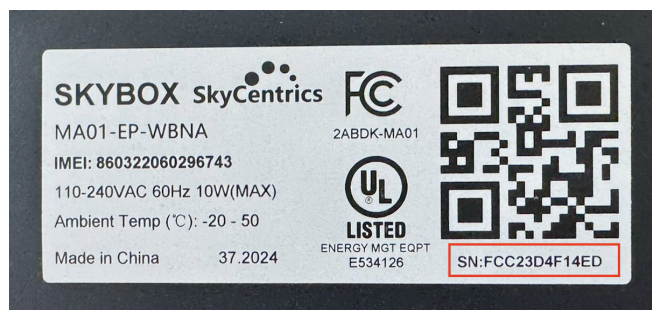
Accessing the Web Configuration Page

To access the Web Configuration Page, you must provide username and password.

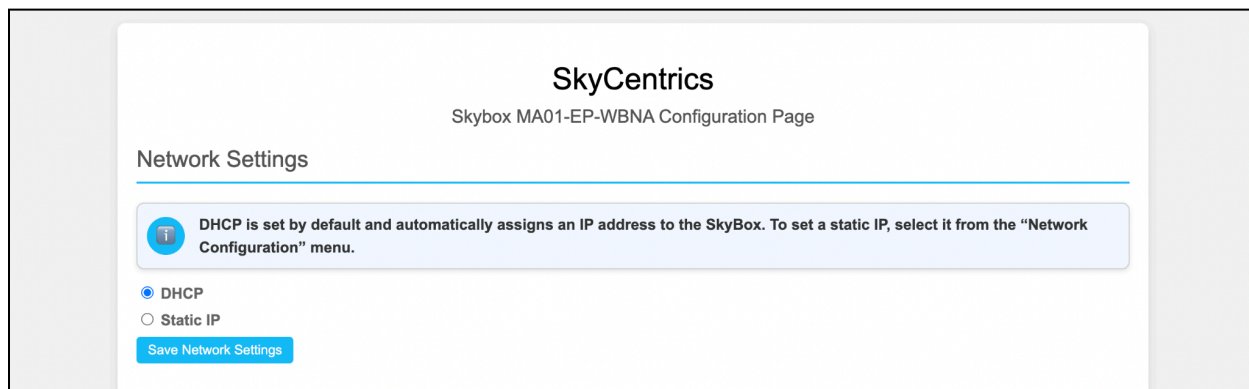


Instructions for authentication:

- By default, the username is set as 'admin'.
- The password is the Serial Number of the Skybox (all caps). This can be found on the label of Skybox (Marked in red below). **The password in this case would be FCC23D4F14ED**



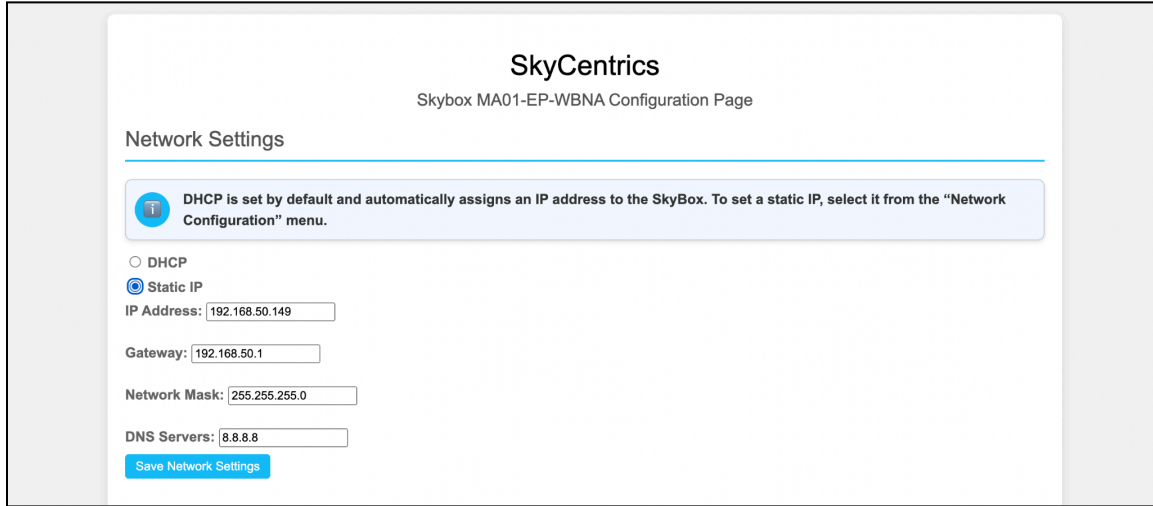
Once signed in, the web configuration page will load.



Network Settings

To configure a static IP address, select the "Static IP" option. This will allow users to manually input the IP address, gateway, subnet mask, and DNS settings.

Once the desired configurations have been entered, click the "Save Network Settings" button to save the changes made.



The screenshot shows the 'SkyCentrics Skybox MA01-EP-WBNA Configuration Page' with the 'Network Settings' section active. A blue box at the top states: 'DHCP is set by default and automatically assigns an IP address to the SkyBox. To set a static IP, select it from the "Network Configuration" menu.' Below this, the 'Static IP' option is selected with a radio button. The configuration fields are as follows:

- IP Address:** 192.168.50.149
- Gateway:** 192.168.50.1
- Network Mask:** 255.255.255.0
- DNS Servers:** 8.8.8.8

A blue 'Save Network Settings' button is located at the bottom of the form.

After the Skybox is restarted, the device will utilize the set static IP address. The Skybox can be restarted by clicking on the 'Apply Changes' button at the bottom of the web configuration page.

Note: Since the IP address has changed, the Web Configuration Page will now be accessed with the newly set IP address.

Modbus Settings

The Modbus settings section of the web configuration page allows users to configure the Skybox to operate in two modes: **Server** and **Client**.

1. Server Mode

In Server mode, which is the default setting, the Skybox functions as a Modbus server, making its data available via Modbus protocol. Users can view the available Modbus points directly on the web configuration page.

Modbus Settings

Select Mode

Server

Port Number: 502

Unit ID: 1

Data Points

ID	Data	Units	Type
ADV_CAPACITY	0	Wh	Energy
CAPACITY	0	Wh	Energy
IP_ADDRESS	0.0.0.0		State

The device's IP address, which also serves as the hosting address for the webpage, is also displayed in the table. Default port is 502 and unit ID 1.

2. Client Mode

To configure the Skybox in Client mode, users can select this option from the dropdown menu.

Modbus Points

Select Mode

Client

Server

Data Points

ID	Data	Units	Type
POWER	0	W	Power
FW_VERSION	2.1		Status

In Client mode, users can specify custom Modbus points using which the Skybox will retrieve data from a Modbus server. The server details, including the IP address, port and unit ID, can be entered in the corresponding input fields as illustrated below.

3. Adding Modbus Points

Modbus Settings

Select Mode

Client

Modbus Server Information

Server IP Address: 192.168.86.36

Server Port Address: 1502

Unit ID: 1

Upload CSV (columns: Type,Point_type,register_offset,Point_name,size,Units)

Choose File no file selected

Upload CSV

No CSV uploaded

To configure which Modbus registers the Skybox reads from (or writes to) a connected device, use the Upload CSV button to upload a comma-separated file that defines each data point.

```
Type,Point_type,register_offset,Point,size,Units
holdingregister,FLOAT32,0,Supply_Temp,2,F
holdingregister,FLOAT32,0,Zone1_Temp,2,F
holdingregister,FLOAT32,0,Chiller_Out,2,F
holdingregister,FLOAT32,0,Hot_Water_Temp,2,F
holdingregister,FLOAT32,2,Return_Temp,2,F
holdingregister,FLOAT32,2,Zone2_Temp,2,F
holdingregister,FLOAT32,2,Cooling_Return,2,
holdingregister,FLOAT32,2,Heating_Return,2
holdingregister,FLOAT32,6,Flow_Rate,2,
holdingregister,FLOAT32,6,Water_Flow,2,
```

The file must contain exactly the following five columns in order:

Type, Point_type, register_offset, Point_name,size and Unit.

- The **Type** column specifies the Modbus register category and must be one of: holdingregister, inputregister, coil, or discreteinput.
- The **register_offset** column is the zero-based register address as defined in the connected device's Modbus map.
- The **Point_name** column is a unique label used to identify the point in the cloud data payload.
- The **size** column specifies how many consecutive 16-bit registers the point occupies: use 1 for 16-bit types and 2 for 32-bit types.
- The **Point_type** column controls how the raw register data is interpreted and must be one of: UINT16, INT16, FLOAT16, UINT32, INT32, or FLOAT32. All multi-byte types are processed in big-endian (network) byte order - for 32-bit points spanning two registers, the first register holds the most significant 16 bits and the second holds the least significant 16 bits, which are then combined and decoded as a standard IEEE 754 big-endian value. FLOAT16 values are decoded using IEEE 754 half-precision format (1 sign bit, 5 exponent bits, 10 mantissa bits).
- **Units**- An optional, free-text label describing the engineering unit of the point (e.g. kW, V, A, F, %). Leave it blank if there's no meaningful unit (e.g. a status/state coil).

Note: Do not use a comma anywhere inside a Units value (or any other field, including Point_name). Use a single token like kW, degF, or %RH instead of "kWh, AC" - a comma will misalign that row's columns and corrupt or drop the point.

Choose the file and click on the 'Upload CSV' button. After uploading, the page will display the number of points successfully loaded.

Modbus Settings

Select Mode

Client

Modbus Server Information

Server IP Address: 192.168.12.196

Server Port Address: 502

Upload CSV (columns: Type,Point_type,register_offset,Point_name,size)

Choose File no file selected

Upload CSV

96 points loaded

Save Modbus Settings

Please click on the 'Save Modbus Settings' button after choosing your desired list of points. The changes will be applied once the Skybox is restarted.

Receiving DR Signals on the Skybox

The Skybox MA01-EP can receive and relay demand response events in both Server mode and Client mode. In either mode, the Skybox receives DR signals from the SkyCentrics cloud over MQTT and updates its internal event state accordingly.

- In **Server mode**, the connected device acts as the Modbus master - it simply polls the Skybox's Modbus map and reads the event and duration holding registers directly whenever it needs to know the current event state.
- In **Client mode**, the Skybox acts as the Modbus master and writes DR event data directly to holding registers on the connected device each polling cycle. The Skybox only writes a register if its corresponding Point_name is present in the uploaded CSV. So the device manufacturer controls exactly which values are exposed by declaring the relevant names. The register_offset for each point can be any valid address in the device's Modbus map; the manufacturer assigns these to whatever registers their device exposes. The **reserved Point_name values** the Skybox will write are:

Point_name	Description
event	CTA-2045 event code
duration	Remaining event duration in seconds (counts down to 0)
state	CTA-2045 device state
override	Override flag

power01	First part of instantaneous power (MSW)
power02	Second part of instantaneous power
energy01	First part of cumulative energy
energy02	Second part of cumulative energy
pscap01	First part of present storage capacity
pscap02	Second part of present storage capacity
tscap01	First part of total storage capacity
tscap02	Second part of total storage capacity
apscap01	First part of present ALU capacity
apscap02	Second part of present ALU capacity
atscap01	First part of total ALU capacity
atscap02	Second part of total ALU capacity

All of the above must be declared in the CSV with Type set to holdingregister, Point_type set to UINT16, and size set to 1. When an event expires or a No Event (code 0) is received, the event and duration registers are reset to zero automatically. No write-back from the device is required. An example of how these entries should appear in the CSV file is shown below. Please add these registers after the existing registers that are already configured to be polled from the server device.

```
holdingregister,FLOAT32,0,Setpoint_Cooling,2,
holdingregister,FLOAT32,2,Setpoint_Heating,2,
holdingregister,UINT16,200,event,1,
holdingregister,UINT16,201,duration,1,
holdingregister,UINT16,100,state,1,
holdingregister,UINT16,101,override,1,
holdingregister,UINT16,102,power01,1,
holdingregister,UINT16,103,power02,1,
holdingregister,UINT16,104,energy01,1,
holdingregister,UINT16,105,energy02,1,
holdingregister,UINT16,106,pscap01,1,
holdingregister,UINT16,107,pscap02,1,
holdingregister,UINT16,108,tscap01,1,
holdingregister,UINT16,109,tscap02,1,
holdingregister,UINT16,110,apscap01,1,
holdingregister,UINT16,111,apscap02,1,
holdingregister,UINT16,112,atscap01,1,
holdingregister,UINT16,113,atscap02,1,
```

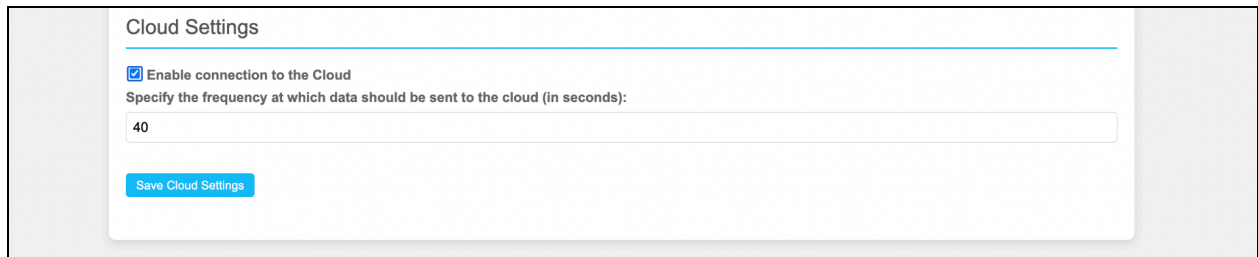

Cloud Settings

The **Cloud Settings** section enables data transmission from the **Skybox to the cloud**. Ensure that the **checkbox is enabled** to allow data to be sent.

- **In Server Mode:** The Skybox default points (mentioned in the Modbus Map) are transmitted to the cloud.
- **In Client Mode:** The datapoints polled using the custom Modbus points list from an external Modbus server will be transmitted to the cloud.

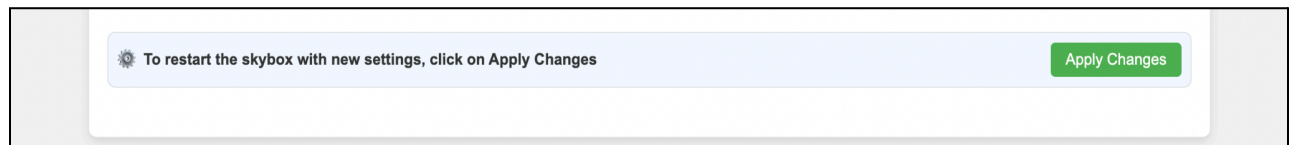
Additionally, the frequency at which the data should be sent can be specified. The minimum frequency that can be set is 10 seconds and maximum is one hour.

NOTE: if transmitting data over the cellular network, 10-second frequency will consume high amounts of data

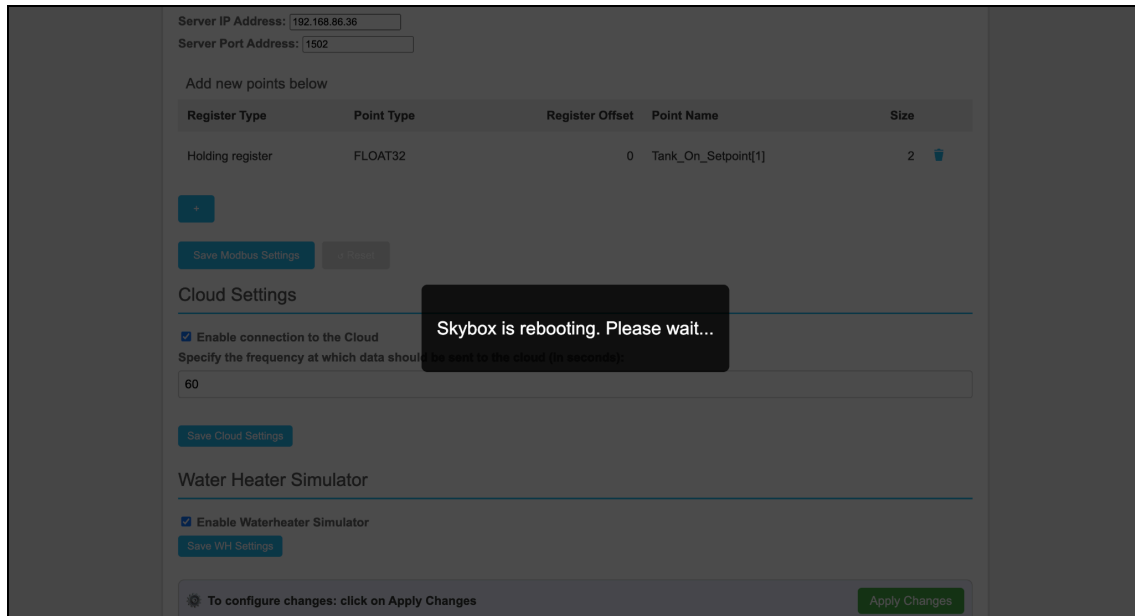


Click the 'Save Cloud Settings' button to save the configuration. Changes will be applied once the Skybox is restarted.

To apply all the changes and restart the Skybox, click on the 'Apply Changes' button at the bottom of the web configuration page.



After clicking the Apply changes button, please wait for the Skybox to reboot and for the page to be reloaded automatically. This process will take between 45 seconds - 1 minute.



Server IP Address: 192.168.86.36
Server Port Address: 1502

Add new points below

Register Type	Point Type	Register Offset	Point Name	Size
Holding register	FLOAT32	0	Tank_On_Setpoint[1]	2

+
Save Modbus Settings Cancel

Cloud Settings

☒ Enable connection to the Cloud
Specify the frequency at which data should be sent to the cloud (in seconds):
60

Save Cloud Settings

Water Heater Simulator

☒ Enable Waterheater Simulator
Save WH Settings

To configure changes: click on Apply Changes Apply Changes

Skybox is rebooting. Please wait...

Web Configuration Page General Notes:

- The corresponding 'save settings' button of each part must be clicked on after making changes.
- For the changes to take effect, the Skybox must be rebooted.
- The Skybox can be rebooted at the end, after making necessary changes from all the parts.
- The page might take some time to load completely (since there are other functions running in the background)
- Please refresh the web configuration page if it has not loaded completely. The page must display all of the above settings.

Troubleshooting your Skybox

1. LED indicators

LED Status	Meaning	Recommended Action
No LEDs are on	During boot, the Skybox should blink the white and blue LEDs five times. If this does not occur, the device may not be receiving power, or may not be receiving sufficient power.	Verify the power supply is connected properly and providing adequate power to the Skybox.
White LED blinking (never becomes solid)	The Skybox cannot initialize its network connection. <i>This may occur if the device is not connected to a network or cannot obtain an IP address from the DHCP server. If using a static IP configuration, it could indicate a loose or disconnected network cable.</i>	Ensure Ethernet cables are securely plugged in and confirm the network connection is active.
Blue LED blinking (never becomes solid)	The Skybox is continuously attempting to connect to the internet but is unable to do so.	Confirm that the network the Skybox is connected to has an active internet connection.

2. IP Address and MAC Not Found in arp -a

If the Skybox MAC address and IP do not appear when running the ‘arp -a’ command, the ARP table may not have updated yet. Wait a few seconds after the Skybox connects to the network (solid white LED) and run the command again. If it still does not appear, you can perform a network scan to sweep the entire network and ensure all IP addresses are contacted. This forces the ARP table to refresh and may allow the Skybox to appear in the list.

For example, **on Windows** you can run:

```
for /L %i in (1,1,254) do ping -n 1 -w 50 192.168.1.%i >nul
```

On Mac :

```
for i in {1..254}; do ping -c 1 192.168.1.$i >/dev/null & done
```

After the scan completes, run ‘arp -a’ again to check if the Skybox IP address and MAC address appear in the table.

3. Web Configuration page is not reachable

Some versions of Google Chrome restrict or block direct HTTP requests, especially when accessing devices on a local network from a secure (HTTPS) page. This is due to Chrome's mixed-content and private network access security policies.

If the configuration page does not load on Chrome, please try accessing it using **Firefox** or **Safari**, which may allow the connection.

4. The Modbus tables in Web Configuration page takes time to load

The webpage may occasionally take 2–3 seconds to load the Modbus Server or Client tables. This can happen when background processes are running, but the page should still load within this time. If it does not, please refresh the page.

5. Using the 'Reset' button:

The 'Reset' button on the SkyBox is located next to the ethernet port. The 'Reset' button can be used to reboot the Skybox, or reset it to original settings.

To Use:

- Pressing the 'Reset' button for 3-4 seconds will reset the Skybox to original/ default settings (DHCP mode, Modbus Server mode, WH simulator OFF ,Cloud ON).
Please remember to refresh the webpage after pressing the 'Reset' button to view the new settings after reset.
- Pressing the 'Reset' button for greater than 7 seconds will reboot the Skybox (*same function as Apply changes button on webpage*)