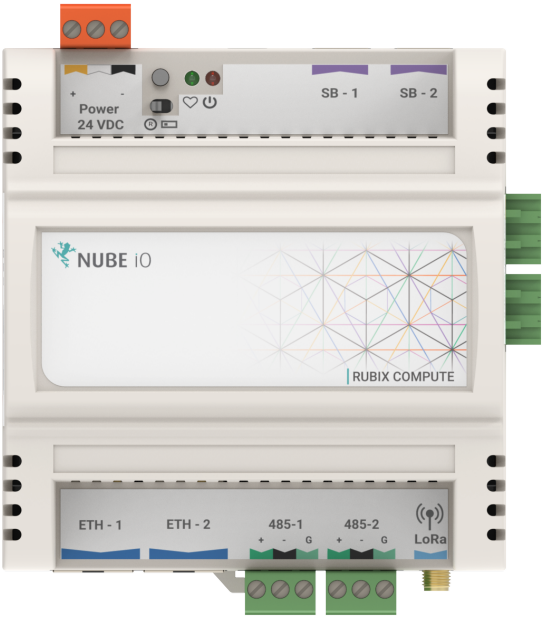
Nube-iO
Rubix Compute
Installation and User Manual



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1. Document Summary

This Installation Manual contains technical specifications, installation instructions, ordering info, and communication guidelines for the Rubix Compute Gateway Controller.

2. Product Description

The Rubix Compute is Nube-iO's fully programmable IoT gateway controller. It is perfect for developing BMS solutions and aggregating all types of building data.

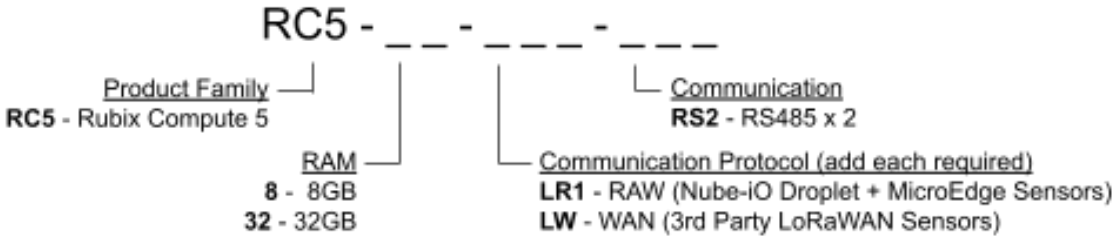
Data collected from wired and wireless peripherals can be easily exported to local/cloud databases, ported to other protocols, or used as inputs to onboard programmable logic.

The Rubix Compute is easy to integrate with BACnet, Modbus, LoRa and LoRaWAN. It supports services like MQTT, Rest APIs, Database Services and more.

Onboard browser based configuration and live programming means you can program from any locally or remotely connected computer, with no software downloads or licensing required.

Rubix IO modules can be connected wirelessly, using wired RS485, or plugged directly into the side of the Rubix Compute. Onboard logic programming allows for complex control of physical outputs based on all types of input data and other cloud resources.

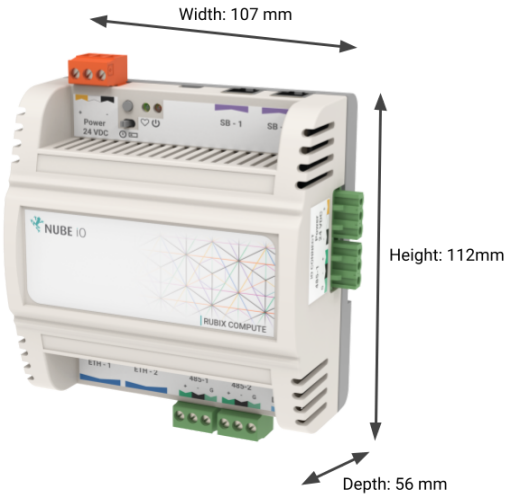
3. Ordering Information



RC5-8	Rubix Compute - Base Model - 8GB
RC5-32	Rubix Compute - Base Model - 32GB
RC5-8-RS2	Rubix Compute - 2x RS485 - 8GB
RC5-32-RS2	Rubix Compute - 2x RS485 - 32GB
RC5-8-LR1-RS2	Rubix Compute - LoRa (For Nube Wireless Devices) - 2x RS485 - 8GB
RC5-32-LR1-RS2	Rubix Compute - LoRa (For Nube Wireless Devices) - 2x RS485 - 32GB
RC5-8-LW-RS2	Rubix Compute - LoRaWAN (For 3rd Party Devices) - 2x RS485 - 8GB
RC5-32-LW-RS2	Rubix Compute - LoRaWAN (For Nube Devices) - 2x RS485 - 32GB
RC5-8-LR1-LW-RS2	Rubix Compute - LoRa (For Nube Wireless Devices) - LoRaWAN (For 3rd Party Devices) - 2x RS485 - 8GB
RC5-32-LR1-LW-RS2	Rubix Compute - LoRa (For Nube Wireless Devices) - LoRaWAN (For 3rd Party Devices) - 2x RS485 - 32GB

4. Technical Specifications

4.1. Physical Attributes



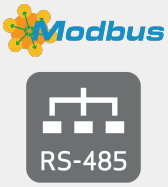
Dimensions	**Height:** 112 mm / 4.41 inches
	Width: 107 mm / 4.21 inches
	Depth: 56 mm / 2.20 inches
Operating Temperature	0°C to 60°C
Enclosure	ABS Plastic, DIN Rail Mount, IP40 Rated

4.2. Power Requirements

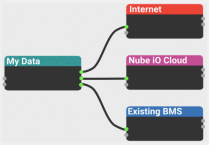
Power Via Screw Terminal	**Power Supply**	24V DC/AC ±10%
	Consumption	**Base**: 9.6W (400mA at 24 VDC) **Max**: 15W (625mA at 24 VDC)
	Recommended Transformer Size*	625mA / 15VA

* Transformer should be sized based on Base Current plus the power requirements of all connected output devices

4.3. Communication Options

	**Ethernet x 2** All Models	2 x RJ45 Ethernet Ports for LAN Connection / Networking.
	**Modbus RS485 x 2** Optional Comms Card	Read/Write points on Modbus RTU Slave devices via RS485. **Connection:** EIA-485 (BUS A,B) Three-wire, Half Duplex **Speed**: 9600, 38400, 19200 **Data Bits**: 8 **Parity**: None, Even, Odd
	**Lora Raw Wireless** *Optional Radio Module Add-on*	Receive data from Nube-iO LoRa wireless devices. **Supported Frequencies:** AU915, US915, AS232, EU863 **Spreading Factor:** 7 **Bandwidth:** 250 kHz
	**LoraWAN Wireless** *Optional Radio Module Add-on*	2-Way communication via LoRaWAN with 3rd party wireless devices. **Supported Frequencies:** AU915, US915, AS232, EU863
	**BACnet IP / TCP** All Models	**BACnet/IP Master:** Read/Write BACnet IP devices. **BACnet/IP Server/Gateway:** Expose all Rubix Compute points to other networked BACnet IP devices. **BACnet/IP Gateway:** Expose data points (Modbus, BACnet, LoRa, LoRaWAN, Rest API, etc) to other networked BACnet IP devices. **BACnet/IP Master:** Read/Write BACnet IP devices.
	**Modbus IP / TCP** All Models	Read/Write points on Modbus TCP Server devices. **Connection:** Ethernet
	**SSH** All Models	Rubix Compute can have ssh port (22) exposed for remote access.
	**REST API HTTP Server** All Models	REST API can be implemented to communicate with web services. On board HTTP server available for programmatic management of the Rubix Compute via REST APIs. Add/delete points, write/update point values, and perform device configuration (ex. installing and updating modules).
	**MQTT / Mosquitto** All Models	Publish and Subscribe to MQTT topics from local or remote MQTT Brokers.

4.4. Programming Options

	Rubix Platform All Models	Nube-iO's browser-based graphical user interface is pre-installed on the Rubix Compute for configuring the device, monitoring and controlling physical IO, and communicating with other protocol points.
	**Rubix Wires** All Models	Nube-iO's browser-based function block flow editor is pre-installed on the Rubix Compute for implementing custom logical programming. Advanced pre-built function blocks provide extensive control capabilities.
Node-RED	**Node-RED** All Models	Node-RED runs as a native service on the Rubix Compute. Node-RED is an alternative/complementary programming platform that can be used to make efficient workflows with built in JavaScript programming and a wide selection of community built modules.
{REST}	**REST API** All Models	On board HTTP server available for programmatic management of the Rubix Compute via REST APIs. Add/delete points, write/update point values, and perform device configuration (ex. installing and updating modules).

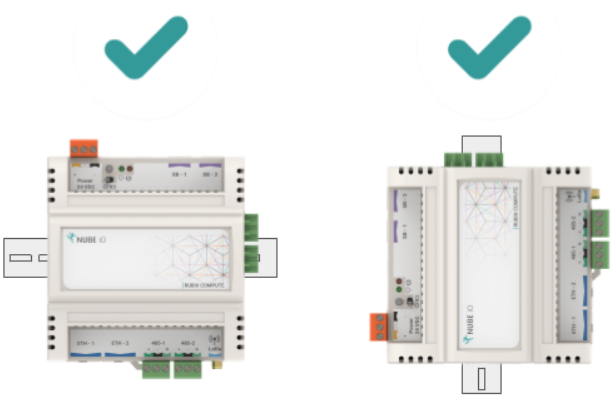
4.5. Regulatory Compliance

Type	Details
BACnet Vendor Details	**Number:** 1173 **Company Name:** Nube iO Operations Pty Ltd **Device Name:** Rubix Compute 4
LoRa End Node Radio	**FCC:** Class B 3M Radiated
LoRaWan mPCIE 2AF6B-RAK2247	**Full LoRaWAN:** 1.0.2 stack support **FCC**: FCC IDENTIFIER: 2AF6B-RAK2247 **Radio Spectrum**: EN 300 220-2 V3.1.1 (2017-02) **EMC**: EN 301 489-1 V2.2.0 (2017-03), EN 301 489-3 V2.1.1 (2017-03) **Safety**: EN 60950-1: 2006 + A11: 2009 + A1: 2010 + A12: 2011 + A2: 2013 **Health**: EN 50663: 2017, EN 62479: 2010
Compute Module (SOM)	**FCC:** FCC part 15 subpart C **RHOS**

5. Installation and Configuration

5.1. Mounting

The Nube-iO Rubix Compute is 112mm x 107mm. It is designed to be mounted on electrical DIN rail. It can be mounted vertically or horizontally. The controller should always be mounted in a location such that it will not experience very high or low temperatures, liquids or high humidity.



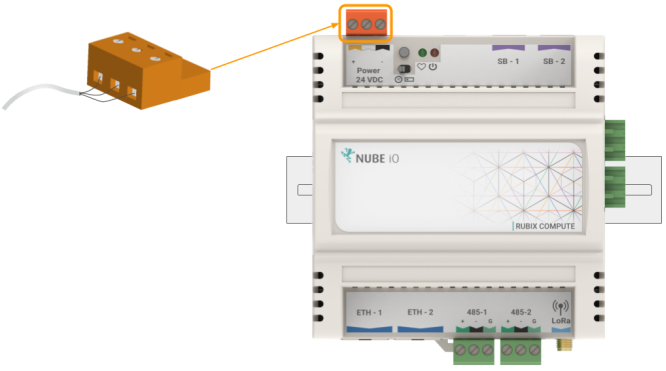
Vertical Mount Position Horizontal Mount Position

5.2. Connecting Power

The Nube-iO Rubix Compute is powered by a 24v AC or DC power supply on the `24 AC/DC POWER` terminals as shown below.

Pin 1 (+)	24v AC/DC
Pin 2 ( )	Do Not Connect*
Pin 3 (-)	AC Neutral / DC Ground

* For 24VAC Full Wave Center Tapped Transformer, see Knowledge Base Article "Rubix Compute: Power Requirements and Wiring" for additional instructions.



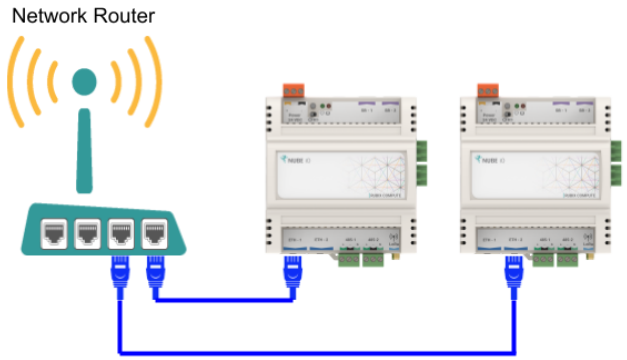
5.3. Connecting Ethernet Networks

In order to connect to the Rubix Compute the controller must be connected to an Ethernet network. The best way to connect to the Rubix Compute Controller is via a router. Alternatively the Rubix Compute Controller can be connected directly to a PC.

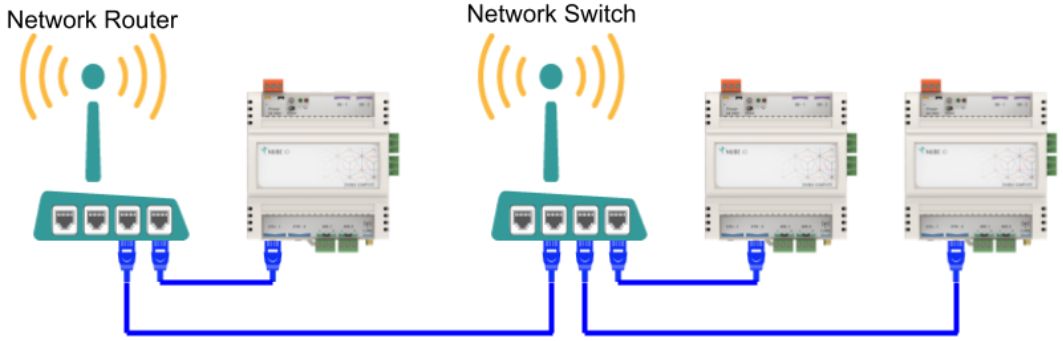
5.3.1. Network Architecture

To add a Nube-iO Rubix Compute Gateway Controller to a network, an ethernet cable must be connected to one of the Ethernet ports on the controller; generally this will be using the ETH-1 port. The other end of the Ethernet cable must be connected to the Network Router. The cable architecture back to the Network Router can be via a number of Network Switches. Below are examples of valid networking architectures.

5.3.1.1. Direct Connection to Network Router



5.3.1.2. Connection to Network Router via Network Switch(es)



5.3.2. Default Network Details

When a Rubix Compute Controller is reset to factory defaults the 2 x Ethernet ports will be configured as follows:

Ethernet Port	Default Configuration
ETH-1	**Static IP Address: 192.168.15.10** Connected devices must be set to the same subnet to communicate.
ETH-2	**DHCP:** IP Address is set automatically when connected to a router.

Note: The 2 Ethernet ports on the Nube-iO Rubix Compute Gateway Controller are for connecting to 2 separate networks. They cannot be used to extend a single network.

5.3.3. Connection via Router (recommended)

When connecting to the Rubix Compute Controller via a network router, ethernet port **ETH-1** should be used (at default network settings). Once connected via an ethernet cable, find the automatically assigned IP Address by using the router's admin user interface; or by running an IP Scanning Software.

When you think you have found the correct IP Address, try running a PING check on that IP Address; If successful, unplug the Rubix Compute Controller, and re-run a PING check to see that the PING check now fails.

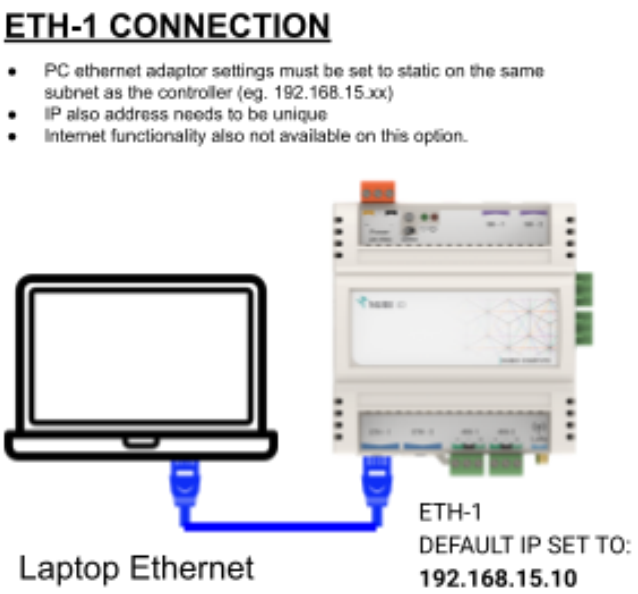
5.3.4. Direct Connection to PC

When connecting to the Rubix Compute Controller directly via an ethernet cable, ethernet port **ETH-1** should be used (at default network settings). Ensure that your PC has self-assigned a static IP Address in the same subnet range as the Rubix Compute (default 192.168.15.xxx); Note that there cannot be identical IP Addresses on the same network.

Once connected, and PC IP Address is configured, try running a PING check on the Rubix Compute IP Address (default: 192.168.15.10).

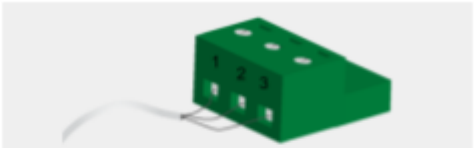
This method is not recommended as it is quite difficult to provide the Rubix Compute Controller an internet connection to update applications when connected directly to a PC. It is recommended to connect via a network router (see Section 5.3.2).

1.1.1.1. Direct connection to PC

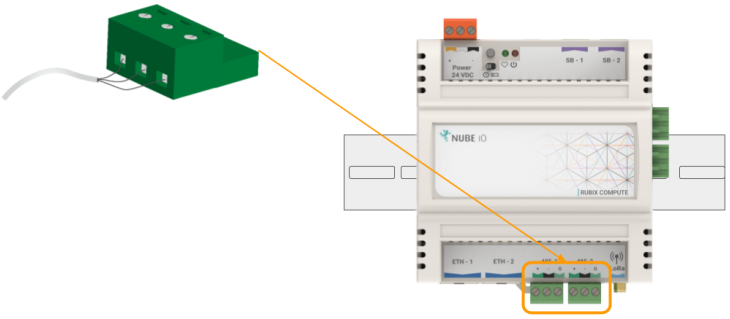


5.4. Connecting RS-485 Network (Wired Network)

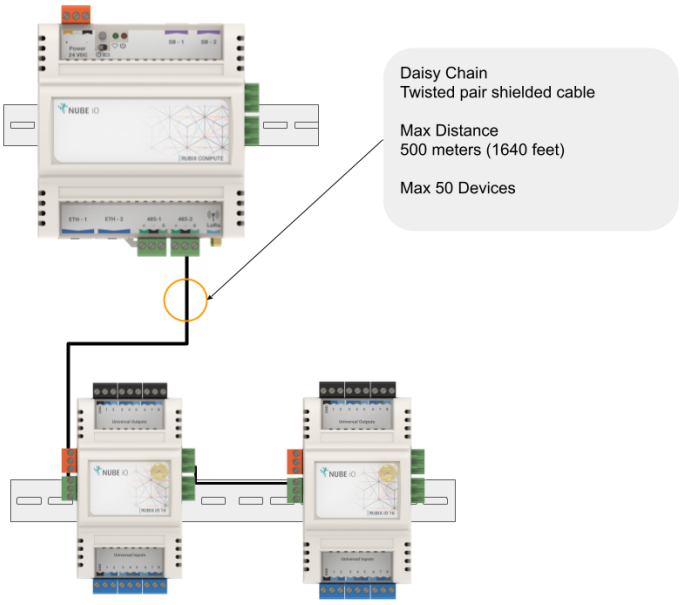
To establish communication with Modbus RS485 devices, the RS485 connectors are terminated and installed as shown below.



Pin 1 (+)	**A** or **+** of RS485 Network
Pin 2 (-)	**B** or **-** of RS485 Network
Pin 3 (**G**)	**C** or **Ground**

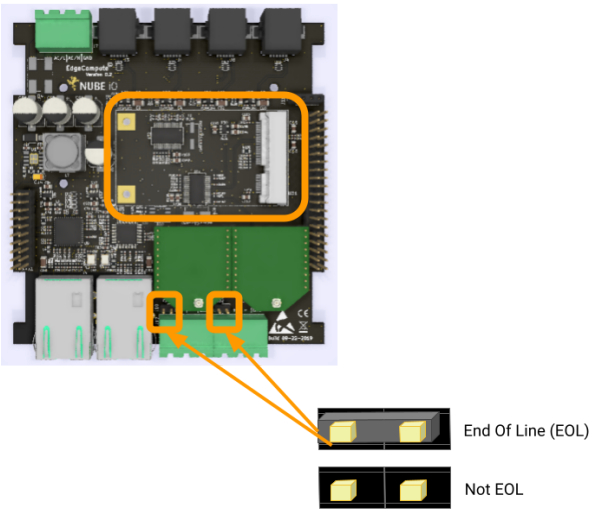


When Networking multiple Devices to the Rubix Compute on an RS485 network, each controller is connected in a `Daisy Chain`. Controllers that are connected between 2 other controllers will have 2 wires (one from the previous controller and one from the next controller) in the same terminal. Ensure **A/+** and **B/-** wires are kept consistent for all controllers on the network.



5.4.1. End Of Line Resistor

When connecting a RS485 network, the first and last device on the network must have an End Of Line (EOL) resistor installed. On the Rubix Compute this is done via an Onboard Jumper. The location of the EOL Jumper is shown below. When the jumper is installed in the upper position the EOL resistor is set. When the jumper is installed in the lower position the EOL resistor is not set. There are 2 sets of jumpers, 1 for each of the RS485 networks.



5.5. Device Configuration Via Browser Based User Interface

The Rubix Compute Controller is configured via the Rubix Platform browser based user interface; For a full explanation of the Rubix Platform interface, see the Rubix Platform User Manual (link in Section 7.1).

5.5.1. Accessing Rubix Platform

Rubix Platform is a browser-based user interface. It can be accessed on any supported web browser (Chrome, Firefox, Safari, Internet Explorer, ...) by entering the IP Address, and Port Number [1414] in the browser's URL address bar. This will take you to the Rubix Platform login page.

The URL Address should take the following form **<IP Address>:<Port Number>** (For example: **192.168.15.10:1414)**

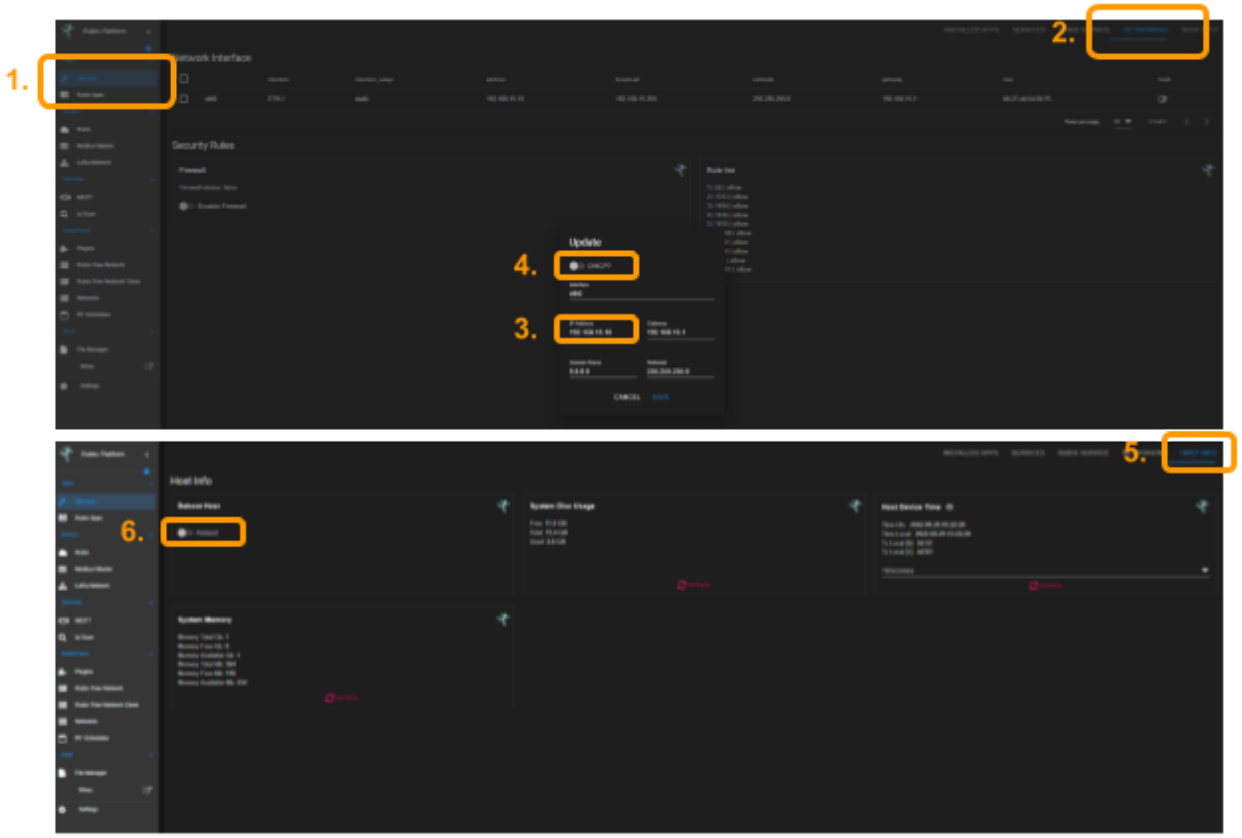
5.5.2. Logging Into Rubix Platform

The default user credentials for Rubix Platform are as follows:

Username	**admin**
Password	**N00BWires** Note: N00BWires has 2 Zeros in N00B

5.5.3. Configuring Network Settings

Once you have successfully signed into Rubix Platform, find the `**Apps > Services**` (step 1), then click the `**NETWORKING**` tab at the top right (step 2). Ethernet ports which have a cable connected will show up in the `**Network Interface**` table. To edit the Network Settings for a port, click the edit icon at the right end of the table (under the `**Tools**` column); This will open a pop-up settings interface where the Network Details can be configured (step 3). Toggle the 'DHCP' switch to change the controller's IP from static to dynamic (step 4). The Rubix Compute must be reset (power cycled) to have the changes take effect by heading into the '**Host Info**' tab (Step 5) and then toggling the '**reboot**' switch (step 6).



6. Programming

The Rubix Compute is a multi-function programmable controller. There are many services available to be configured. For further descriptions of the programming options on the Rubix Compute Controller, see the **Rubix Platform User Manual**, **Rubix Wires User Manual**, and **Nube-iO Knowledge Base** (links in Section 7.1).

7. Additional References

This section provides additional information for your reference.

7.1. Nube-iO Documentation References

Name/Code	Explanation	External Reference
Rubix Compute	Gateway Controller	Link
Edge28	Edge IO Programmable Controller	Link
Droplet	Wireless Environmental Sensor	Link
MicroEdge	Wireless Low Level Asset Monitoring Device	Link
Rubix Wires	Browser Based Flow Programming Interface	Link
Rubix Platform	Browser Based Device/Data Management Interface	
LoRa Installation Best Practices	Technical document describing the factors involved in designing, installing, and troubleshooting LoRa networks.	
Modbus RS485 Installation Best Practices	Technical document describing the factors involved in designing, installing, and troubleshooting wired Modbus RS485 networks.	

7.2. Other Technology/Service References

Name	Description	External Reference
GCP	Google Cloud Platform	Link
Edge	Edge computing is a distributed computing paradigm	Link
IO (Input/Output)	Communication process between a computer or device	Link
VPN	A virtual private network (VPN) extends a private network across a public network	Link
BACnet	BACnet is a building automation protocol	Link
MQTT	A lightweight messaging protocol for small sensors	Link
Modbus	Modbus is a building automation protocol	Link
LoRa	LoRa is a long range, low power wireless chipset and protocol	Link
LoRaWan	LoRaWan is the network layer on LoRa	Link
Haystack	Standardize semantic data models for IoT data	Link
API	Application programming interface	Link