



NEBRA

NEBRA OUTDOOR HOTSPOT MINER DATASHEET



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Product Overview

Introducing the Nebra HNT Outdoor Hotspot Miner

Earn HNT cryptocurrency by mining Helium and building coverage for The People's Network using the Nebra HNT Outdoor Hotspot Miner. Anyone can join The People's Network and provide hundreds of square miles of wireless network coverage, while mining HNT on the Helium Blockchain just as hotspot miners do.

The Outdoor HNT Hotspot Miner opens up a plethora of opportunities, such as the ability to mount a hotspot to the side of buildings, houses and roofs. It's an ideal solution for wider coverage applications across villages, towns and cities.

- Efficient miner for a new cryptocurrency, Helium (HNT)
- Complete set-up in minutes using a smartphone
- LongFi™ technology maximises range and battery life
- Low Power – uses as much power as a broadband router (15W)
- Easily manage Hotspots and tokens from the mobile app

LongFi™ Technology

Helium LongFi™ is a technology architecture that combines a leading wireless technology, LoRaWAN, and the Helium Blockchain. LongFi™ is optimised for miles of range, and long battery life for IoT devices.

Frequency Selection

The Nebra HNT Outdoor Hotspot Miner comes in three different frequency variants:

- 470 MHz (CN470) - this is suitable for China.
- 868 MHz (EU868, IN865, RU864) - this is suitable for EU, India, Russia and a variety of other countries.
- 915 MHz (US915, AU915, KR920, AS923-1/2/3) - this is suitable for USA, Australia, New Zealand and lots of countries in South America and Asia.

If you are unsure which frequency you need to order you can take a look at our "[Helium Region](#)



[Tool](#)" .

In the Nebra HNT hotspot miners, the frequency plan for the LoRa concentrator (for example US915 or AU915) is determined automatically based on the location that you choose for the "location assert". This means that within the frequency variants (470 MHz, 868 MHz, 915 MHz) you can move it to a new location with a different frequency plan and it will auto-update. This only works within a single frequency - for example you can change from a US915 to AU915 location. But you can't change from a US915 location to EU868 or CN470 without changing the concentrator module.

Proof of Coverage

The Nebra HNT Outdoor Hotspot Miner earns HNT Helium tokens when devices connect, and for validating wireless coverage delivered by peers. Using a system called Proof-of-Coverage, Hotspot Miners earn more HNT when they're in range of other miners, but need to be at least 300 metres apart.

The range depends on the environment:

- Rural areas: ~10 miles or more.
- Dense areas: ~ 1 mile.
- Single HNT Hotspot Miners earn less as they can only issue Challenges over the internet, and can't participate in Proof-of-Coverage.

Specification

SPECIFICATION	OUTDOOR HOTSPOT
Ingress Protection	IP67*
Dimensions	300x200x100mm (Ex Antenna)
Rated Ambient Temperature	-25 - 80°C
Weight	1.25 Kg
Power Requirement	802.3af/at 48V PoE or 9-16V DC @ 15W
Average Power Consumption	~12-15W**
Annual Power Consumption	~105-130 kWh
Maximum Tx Power	24-27 dBm***
Network Connectivity	10/100 Ethernet, 2.4GHz 802.11N Wi-Fi, 4G (Optional)
Antenna Connection	N-Type Female
Base SoM	Raspberry Pi CM3+
CPU Specification	Broadcom BCM2837B0, Quad Core Cortex-A53 64-bit SoC @1.2GHz
High Endurance Storage	32GB eMMC
Memory	1GB LPDDR@ SDRAM
Outer Dimensions (without connectors)	235x155x75mm

*User must follow waterproofing guide

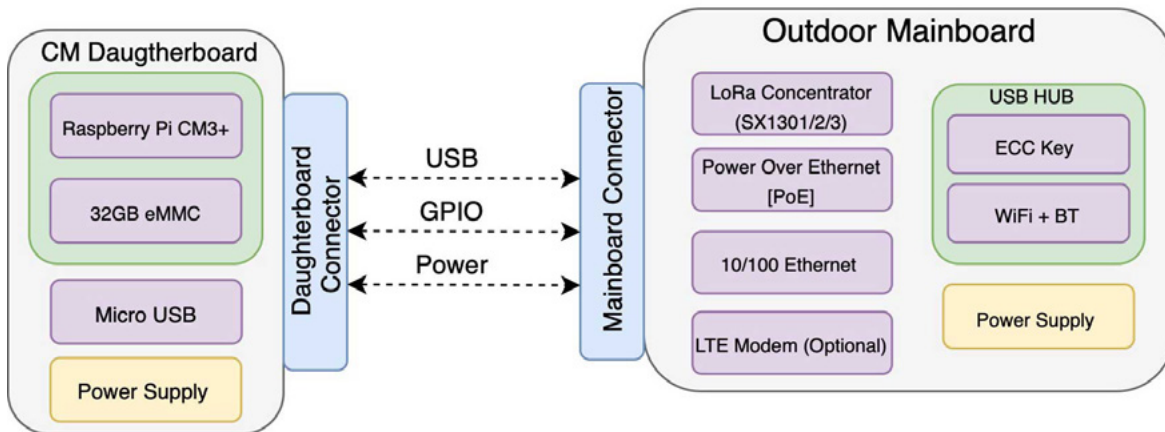
**Average power consumption measured at mains, higher average consumption when the optional 4G module is used

***Maximum Tx power may be capped to a lower amount in some regions

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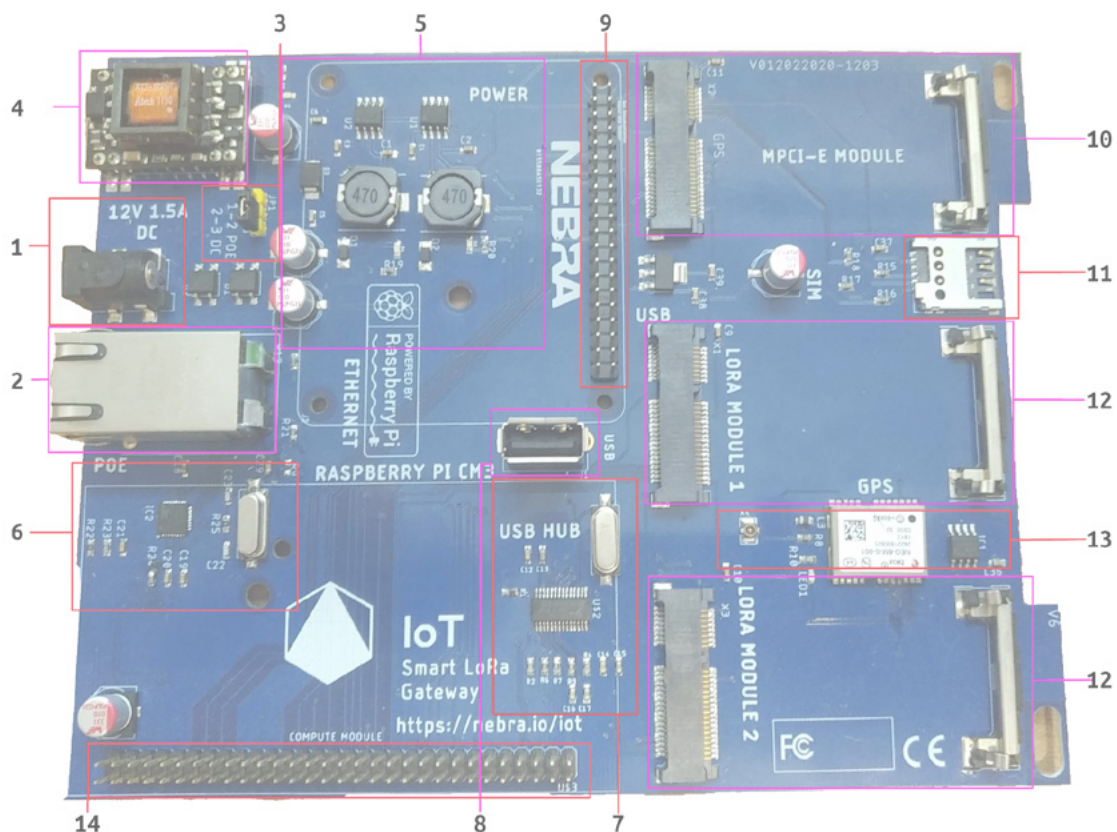
Block Diagram

The figure below summarises the basic building blocks of the Nebra Outdoor Miner. The outdoor miner is the central hardware solution for all LoRa based radio communication. It receives and transmits radio messages. The processing of the radio messages as well as the protocol tasks is done by the embedded system, which is the Raspberry Pi. Received and processed radio messages are being sent to the Helium servers.



Mainboard Layout

The Outdoor miner comes with a number of interfaces for its operations and current status indicator. It is designed to be fully automated with very little physical interaction required.



1. DC Barrel Jack - 2MM Pin, 6.5MM Barrel centre positive. Recommended PSU 12V @1.5A.
2. LAN Connector - RJ45 Connector wired to the Ethernet & POE Modules.
3. Power Jumper - 3 Pin jumper to select power source, place in position 1-2 for POE, or 2-3 for DC Jack.
4. POE Module - Negotiates 802.11AF compliant connection and outputs 12V DC into the power section.
5. Power Section - Takes the 12V power source and regulates it down to 5V & 3V3 rails.
6. Ethernet Controller - 10/100 Ethernet to USB 2.0 Adaptor, Maxlinear XR22800IL32-F. Connected to USB Hub.
7. USB Hub - 4 Port USB Hub, wired to Ethernet controller, USB port & M-PCIE connector.
8. USB Port - USB 2.0 Type A Connector, recommended max power 250mA.
9. "Raspberry Pi" Header - 40 Pin RPi style header, please note only the first 24 pins are wired. (Refer to 1.1.X)
10. M-PCIE connector - M-PCIE Connector wired up to USB for connectivity, has Micro SIM Card connected to it.
11. Micro Sim Card Slot - For use with 3G/4G Module in M-PCIE slot
12. Lora Module Connector - Designed for use with select M-PCIE LoRa Concentrators, these only have wired up SPI, plus GPS PPS from the GPS Module.
13. GPS Module - NEO-6M GPS module, connected to UART1 on the compute module. Plus PPS signal to LoRa modules for accurate timings. PLEASE NOTE: this is not used by the Nebra Helium Hotspots and is only present on the first batch.
14. Daughterboard Connector - Connects to Compute Module Daughterboard.

Status LEDs

12V LED - Indicates the mainboard has power located near the jumper.

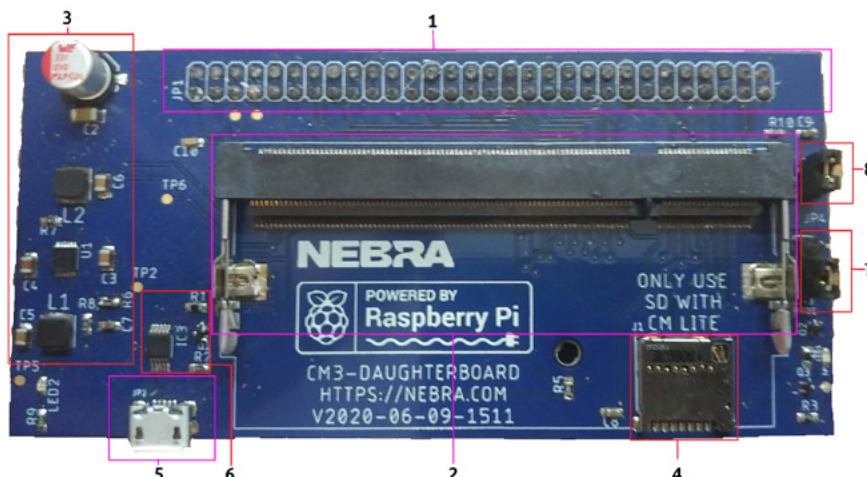
5V LED - Indicates the 5V regulator is operational located in the power section.

3V3 LED - Indicates the 3V3 regulator is operational located in the power section.

Daughter Board

The standard daughterboard supports both the Compute Module 3 and Compute Module 3+ (including Lite) variants.

While also compatible with the CM1 we recommend using the CM3 / CM3+ / CM3 Lite / CM3+ Lite for the extra power and RAM as well as larger onboard storage options.



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1. Daughterboard Connector - Connects to the Mainboard.
2. SO-DIMM connector - Raspberry Pi Compute Module connects here.
3. Power Regulator - Power Circuitry required for the compute module.
4. SD Card Slot - SD Card Slot for if a CM3/CM3+ Lite is used.
5. Micro USB Connector - Used to re-flash the EMMC on the Compute Module.
6. USB Switch - IC responsible to allow switching between Micro USB and Mainboard.
7. USB Jumper - Used to switch between normal operation and flash mode, ensure it is in position 1-2 for normal operation and 2-3 for programming.
8. Power Jumper - Allows the module to be powered from the Micro USB connector. Only connect when programming from PC and ensure mainboard is not connected.

Status LEDs

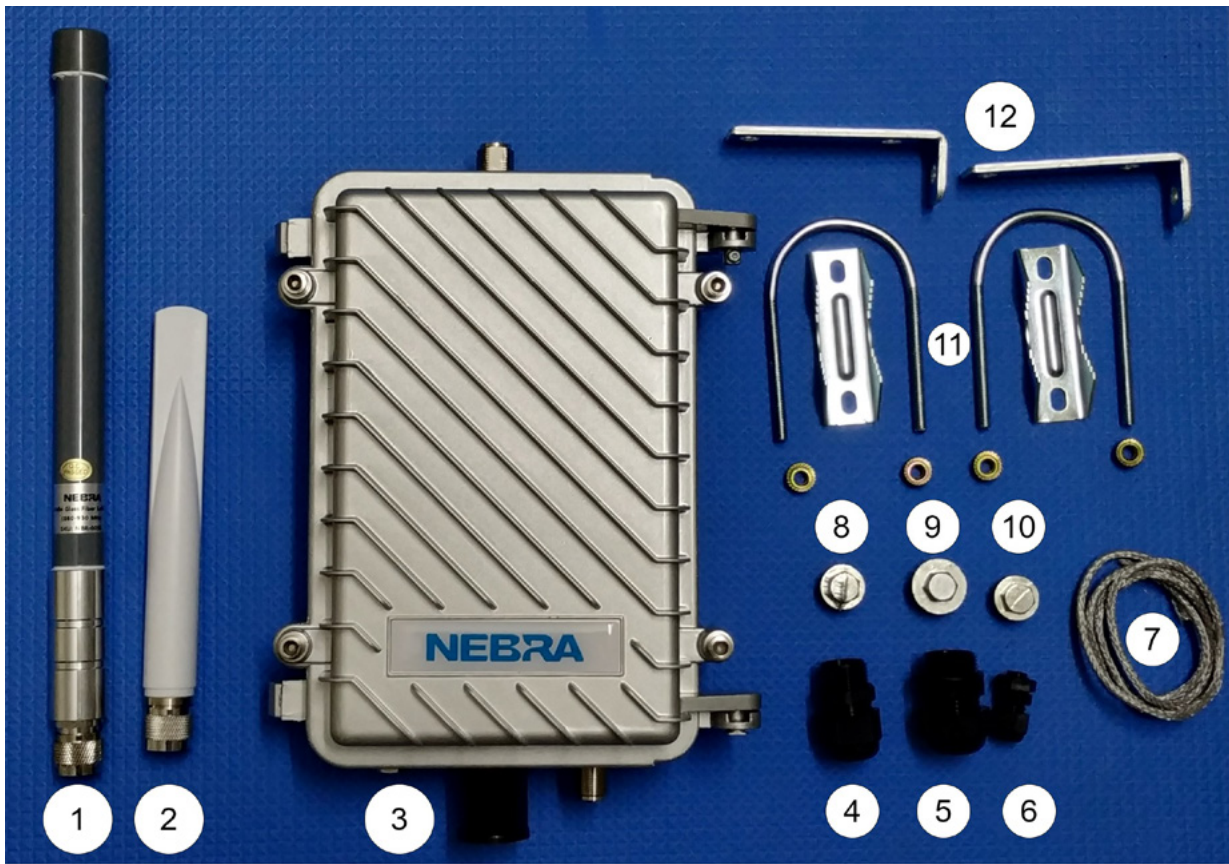
The board has 2 Status LEDs which do the following:

- Power LED - Indicates the board has power. (Blue)
- ACT LED - Indicates Read / Write operations on the storage. (Green)

Case Dimensions



Whats Included in the box



1. 3dBi N-Type Glass Fiber Antenna
2. Wi-Fi Antenna
3. Nebra Outdoor Hotspot (IP67)
4. M20 General Cable Gland
5. M10 General Cable Gland
6. M22 General Cable Gland
7. Sealing ring (see waterproofing guide)
8. Spare Blanking plug N-Type
9. Spare Blanking plug N-Type
10. Spare blanking plug M20
11. L shaped mounting bracket x2
12. Z clamp brackets x2 (Pole mounting)
13. Serial number QR code stickers x2
14. Nebra stickers x2

Unit Identification

Each unit has a sticker located inside the unit. This includes the following important information:

- **Model:** Model number
- **ETH MAC:** Ethernet MAC address
- **WiFi MAC:** WiFi MAC address
- **Nebra S/N:** Nebra Serial Number
- **Device S/N:** Device Serial Number
- **Frequency:** Frequency of LoRa module

You will require some of this information when linking your unit to our remote management dashboard.



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RF Characteristics

Operating Frequencies

Frequency	Nebra SKU	Barcode
433MHz (EU433)	NBR-0009	TBC
470MHz (CN470)	NBR-0010	TBC
868MHz (EU868, IN865, RU864)	NBR-0006	TBC
915MHz (US915, AU915, KR920, AS923-1/2/3/4)	NBR-0014	TBC

RF Features

- Mini PCIe form factor with mounted heatsink
- SX1301 base band processor emulates 49 x demodulators, 10 parallel demodulation paths. Supports 8 uplink channels and 1 downlink channel
- Built-in FT2232H
- 2x SX125X Tx/Rx front-ends high/low frequency
- Tx power up to 27 dBm, Rx sensitivity down to -139 dBm @ SF12, BW 125 kHz

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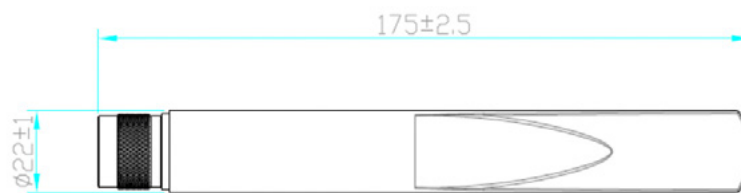
Antenna Specification

Wi-Fi



Antenna Dimension

The antennas mechanical dimensions is shown below:



Antenna Parameters

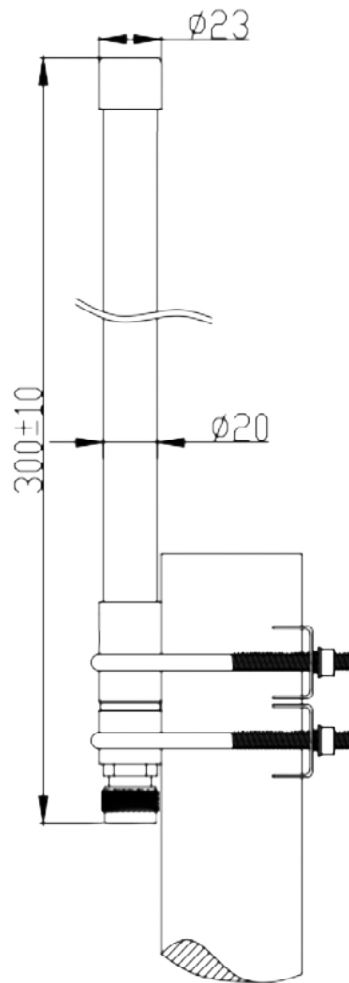
SPECIFICATION	Wi-Fi Antenna
Frequency	2.4GHz
Gain	3dBi
Length	175mm
Connector Type	N-Type Male
Polarization Type	Line polarizaion
Input Impedance	50 Ohms
Operating Temperature (C)	-30 ~ +85
Colour	White

LoRa Antenna



Antenna Dimension

The antennas mechanical dimensions is shown below:



Antenna Parameters

SPECIFICATION	868MHz Model	470MHz Model
Frequency	860-930MHz	420-480MHz
Gain	3 dBi ±0.2	3 dBi ±0.2
Length	300mm	300mm
VSWR	< 1.5	< 1.5
Connector Type	N-Type Male	N-Type Male
Polarization Type	Vertical	Vertical
Input Impedance	50 Ohms	50 Ohms
Colour	White or Grey	White or Grey

Environmental Requirements

For ideal hotspot placement please the documentation here - <https://helium.nebra.com/#/handy-guides/hotspot-ideal-location>

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Safety Instructions

To avoid malfunction or damage to this product, please observe the following:

Do not expose components to water or moisture (Please follow waterproofing guide)

Do not expose to any source of heat. The outdoor miner is designed for reliable operation and has been tested at normal ambient room temperatures (25°C)

Take care when handling to avoid mechanical, shock, vibration or electrical damage to the connectors or components inside

Any modification to the outdoor miner will void any warranty

Compliance Information

Certification

We are working on getting the Nebra Indoor Hotspot certified in multiple regions. Below is a list of approved regions with links to certification for viewing.

Approval	Country	Hardware Frequency	Status	Frequency Plan
CE	European Economic Area	868MHz	Completed	EU 868
UKCA	United Kingdom	868MHz	In Progress	EU 868
FCC	United States of America	915MHz	Completed	US 915
ISED	Canada	915MHz	In Progress	US 915
RCM	Australia & New Zealand	915MHz	In Progress	AU 915
MIC	Japan	915MHz	In Progress	AS 920
SRRC	China	470MHz	In Progress	CN 470
EAC	Russia	868MHz	In Progress	RU 864
WPC	India	868MHz	In Progress	IN 865

Certification Codes

Certification	Code
FCC	2AZDM-HNTOUT
ISED	27187-HNTOUT

RoHS

All our outdoor miners have been tested under the EU RoHS Directive 2011/65/EU and its amendment directive 2015/863/EU. You can view the certification here - <https://github.com/NebraLtd/Helium-Guides/tree/main/docs/certifications/indoor/rock-pi/RoHS>

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Software

Firmware

The Nebra Hotspots run a customised software to provide high reliability and ensure your units are as up to date as they can be.

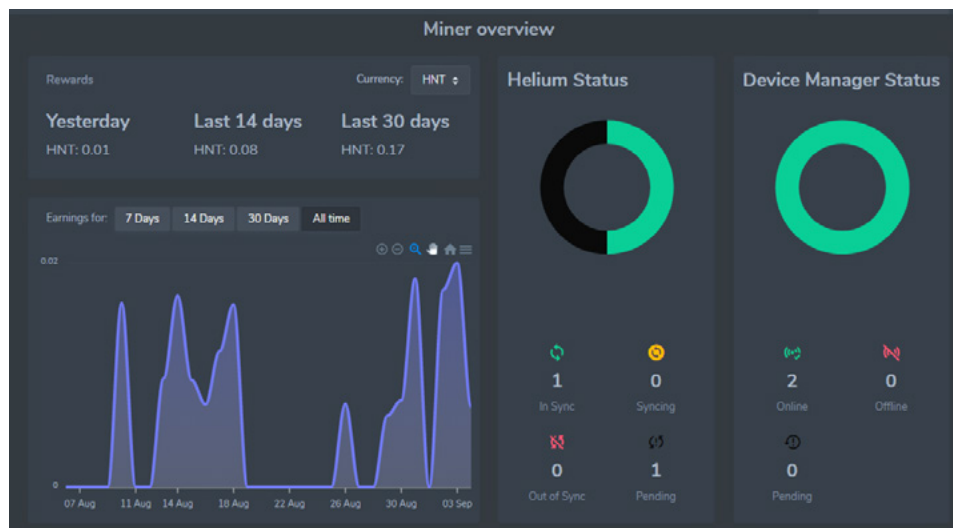
Approximately your hotspot will update once a week in an automatic process, we will announce updates via various social media platforms when they happen.

The software is open source and available on our Helium Miner Software repo on [GitHub](#).

Local Diagnostics

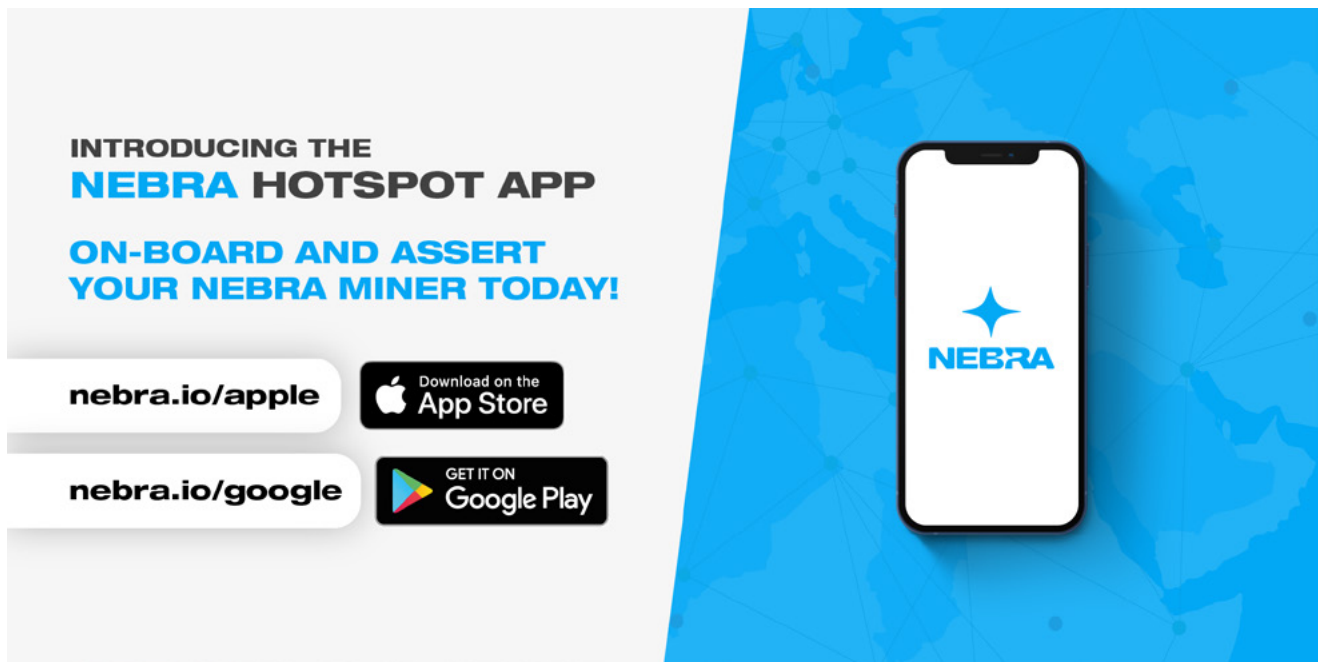
Each outdoor miner ships with a local diagnostic tool built-in that you can easily access from another computer or device on the same network or you can alternatively connect the miner through Bluetooth and access through the Helium application or Nebra mobile application. For further information on how to access the local diagnostics page view the documentation listed here - <https://helium.nebra.com/#/handy-guides/local-diagnostics>

Nebra Dashboard



The Nebra Dashboard allows you to view all of your Nebra hotspot statistics in one place: keep track of rewards, sync status, and device status. You can sign-up to use the dashboard at <https://dashboard.nebra.com/register/>

Nebra App



Initially, our Nebra Hotspot app simply takes over the core functionalities provided by the Helium Hotspot app - onboarding and asserting location.

As we further develop the app over the coming months in 2022, we are planning to add a lot more features including integration and single-sign-on with our Nebra dashboard which will bring remote management of your devices to the app as well as a vast array of diagnostics tools. It also will mean that any future dashboard features are also more readily available in the app.

Download the Nebra Application

The Nebra mobile app is available for both Android and iOS devices and can be found in the relevant app store for your device. Click on one of the links below to be redirected to the app store.

[iOS Store](#)

[Android Store](#)

Trademarks

Nebra, the Nebra Logo are all trademarks of Nebra LTD t/a Pi Supply (UK Company Number 06732600)

Raspberry Pi and the Raspberry Pi logo are all trademarks of Raspberry Pi Trading

Warranty Information

All goods supplied by Nebra Ltd are warranted free from defects for 12 months from the date of supply. Warranty will cover hardware only and where possible we will repair or replace if sufficient evidence is provided of a possible defect.

Any modification to the hardware or software will void the warranty.

Contact Information

United Kingdom, London

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East Sussex, TN3 9BJ, England

Change Notes

Version	Date	Change	Initials
v1.0	20/05/2022	Draft	CR
v1.1	08/06/2022	Published	CR