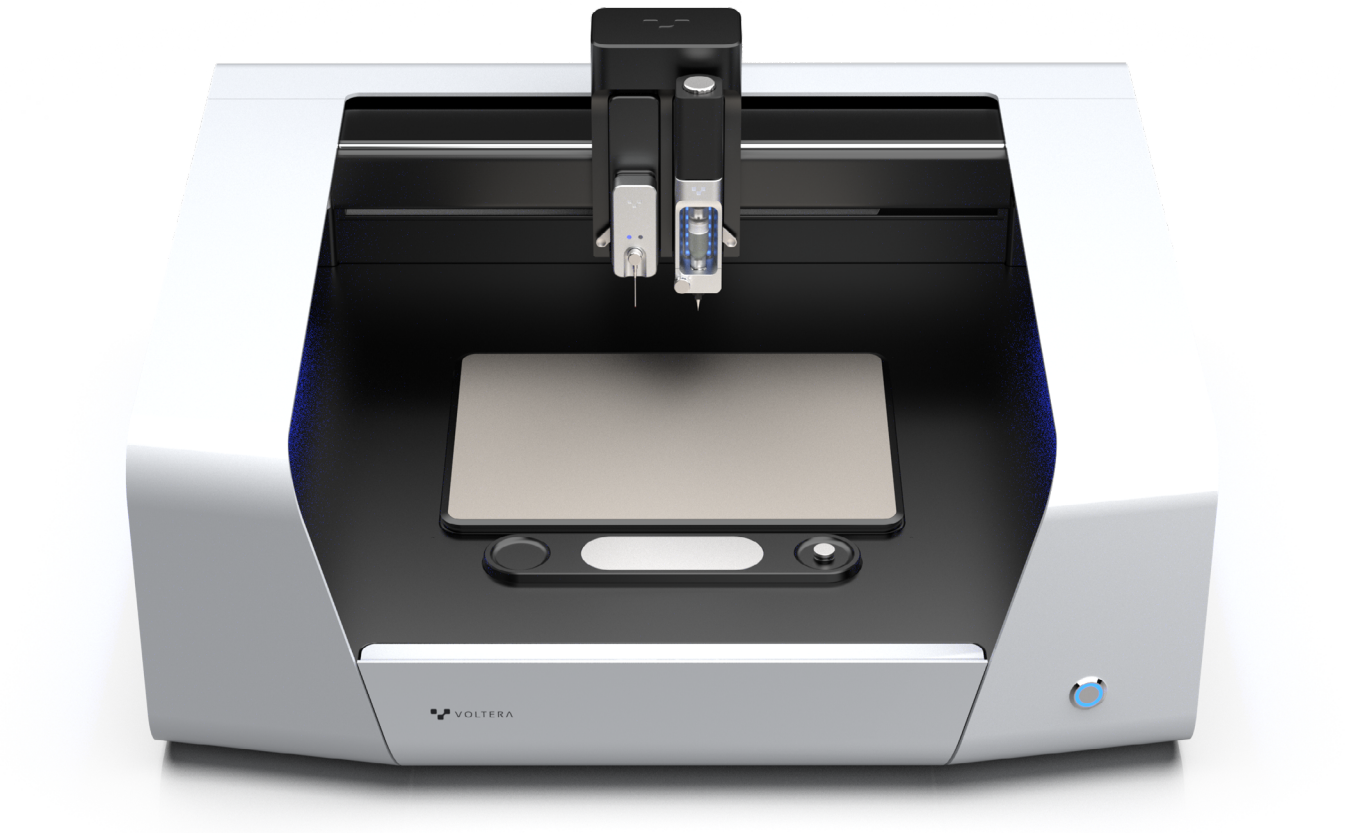
NOVA



Setup Guide & Manual

VOLTERA

What's in the Box

1x Voltera NOVA

1x Smart Dispenser

1x Smart Probe

1x Brush

1x Wi-Fi Dongle

1x Power Cable

1x Power Adapter

4x Anchor Mount

4x Swivel Mount

4x Thumbscrews

1x Nozzle Wrench

4x 225 µm Nozzle

8x 150 µm Nozzle

4x 100 µm Nozzle

3x Pressure Sensor

4x UV Blocking Cartridges

4x Clear Cartridges

1x Ethernet Dongle

4x Luer Couplers

3x Tip Cap

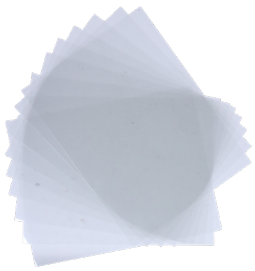
16x Pistons

1x Conductive Ink

1x Ethernet Cable

1x Vacuum Module

10x PET

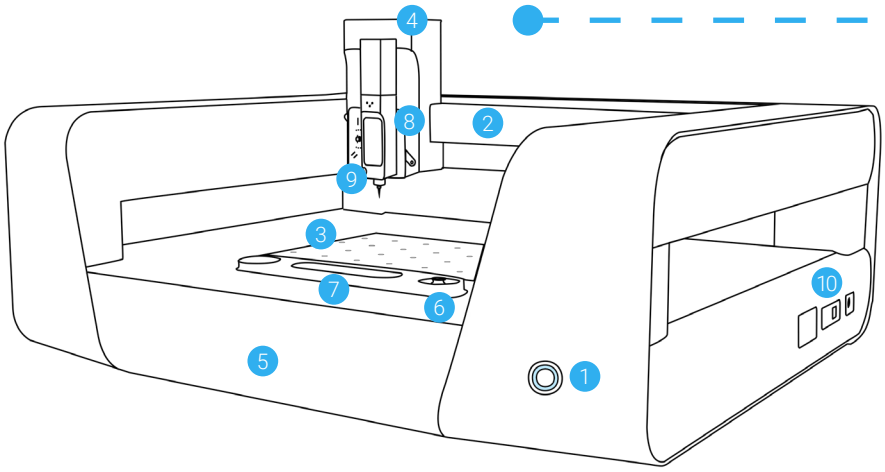


2x Polyimide

5x TPU

Printer Anatomy

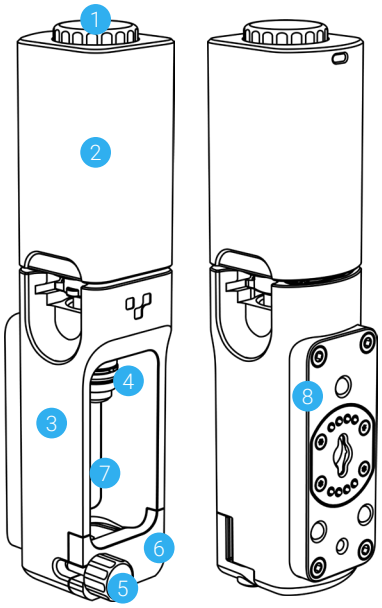
NOVA



1. Power button
2. The bridge
3. Mounting grid
4. Module hub
5. Drawer
6. XYZ positioner
7. Calibration plate
8. Module port
9. Smart Dispenser
10. Connection ports

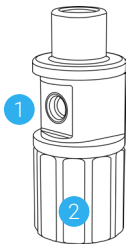
Smart Dispenser

1. Actuator override dial
2. Actuator
3. Dispenser body
4. Plunger
5. Dispenser door lock
6. Dispenser door
7. Status indicator LEDs
8. Module side interface

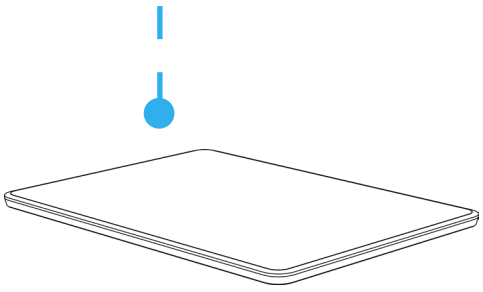


Pressure Sensor

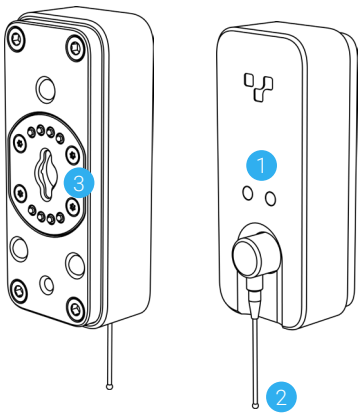
1. Pressure sensing membrane
2. Nozzle lock



Vacuum Module



Smart Probe



1. Status indicator LEDs
2. Probe stylus
3. Module side interface

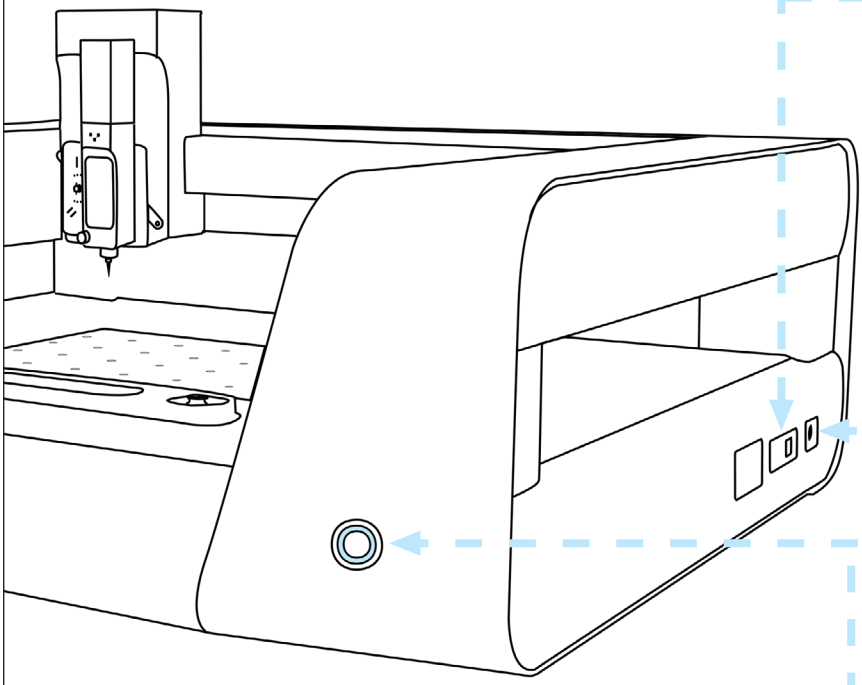
First Time Setup Guide

1

Connect NOVA to computer with ethernet cable

2

Plug wifi dongle in to NOVA's USB port



3

Plug in Power Cable

5

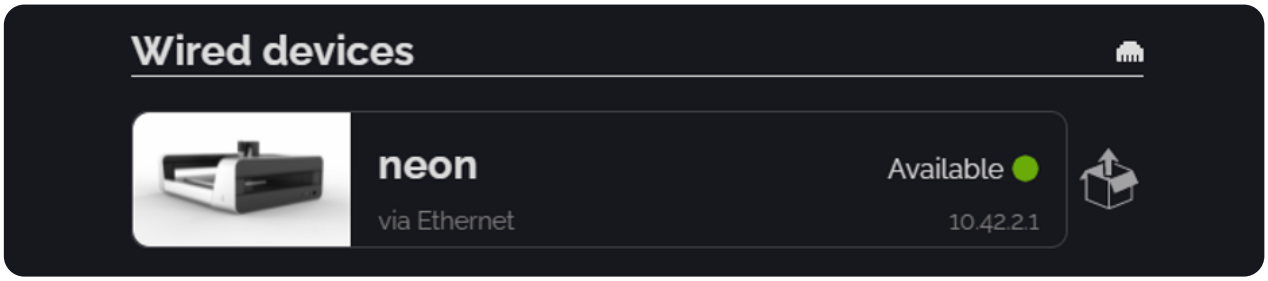
Proceed to Step 5 of the document

4

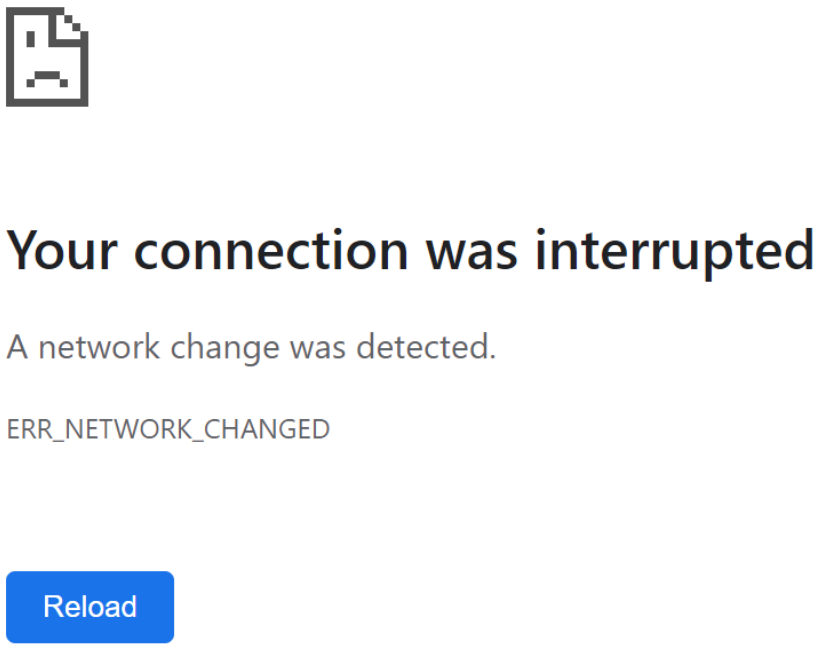
Power on NOVA

Step 5

1. Make sure your laptop has a stable Wi-Fi connection.
2. Open your browser and navigate to https://www.myvoltera.io/
3. Follow the instructions to create a Voltera account.
4. Your device should be available in the Wired Devices section.
   Click on the device, and follow the instructions to connect NOVA to Wi-Fi.



When connecting your computer to NOVA with an ethernet cable, your computer will typically view NOVA as a router and try to connect to the internet through NOVA. If NOVA does not have a stable connection, this can cause your computer to lose internet connection, and your browser may indicate an interrupted connection (see below, for example, on Chrome).



If your computer internet connection is interrupted, proceed to step 5a (for Windows users) or b (for MacOS).

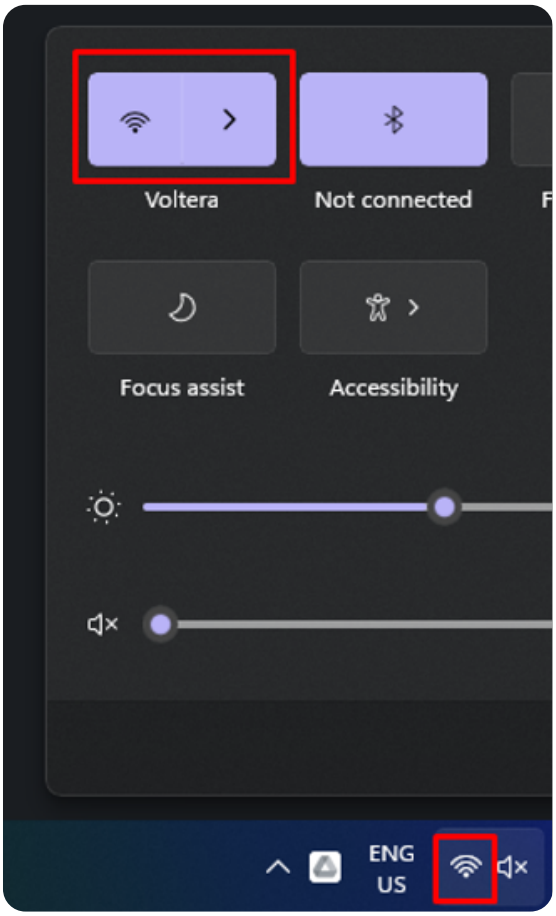
Step 5a -
For Computers Running Windows

1. Wait for the System to Recover

In the majority of cases, Windows computers will restore their internet connection in 2-3 minutes. If the connection doesn't recover, continue to the following steps.

2. Refresh your Wi-Fi Connection

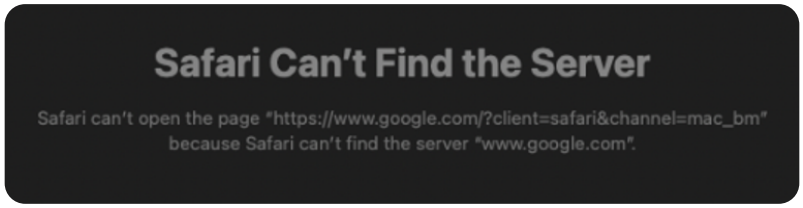
Refresh your Wi-Fi connection. Disable your Wi-Fi adapter, wait 10 seconds, then re-enable your adapter. If necessary, reconnect to your preferred Wi-Fi network. Your Wi-Fi icon should now show a connected state.



Open a new browser window, and try to access the internet (for example, https://www.google.com). If you are still not able to connect to the internet, contact support.

Step 5b - For Computers Running MacOS

Unlike Windows, computers running MacOS will not typically recover on their own. When your computer connects to NOVA over an ethernet cable, it will automatically configure NOVA as a new ethernet connection, which has a higher priority than Wi-Fi by default. When this happens, your browser will give an error — for example, in Safari:

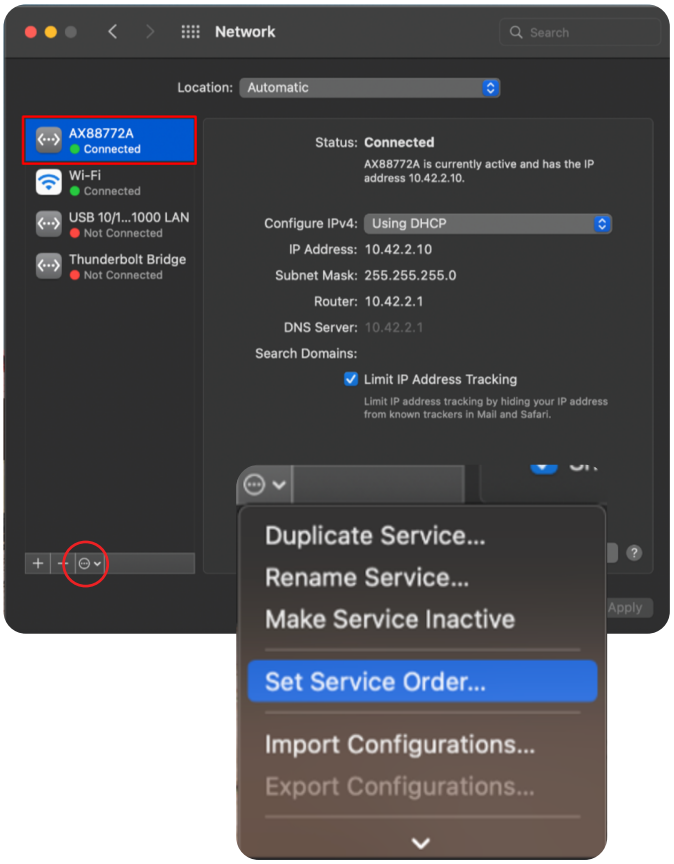


Follow the steps below to give priority to your computer's stable internet connection.

Change Port Priority

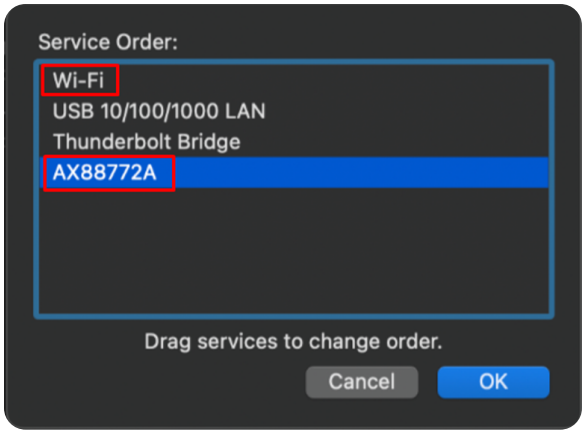
To re-establish an internet connection, you have to manually give your Wi-Fi network or other stable internet connection top priority. A guide for changing port priority can be found on the Apple support website, but instructions are also included below.

1. Ensure that a USB Wi-Fi Dongle is plugged into NOVA.
2. Power off NOVA.
3. Connect your computer to NOVA with an ethernet cable.
4. On your Mac, choose Apple menu > System Preferences, then click **Network.**
5. **Power on NOVA;** when it boots, confirm that a new network connection is available in the Network panel options.
6. Click the three dots in the bottom left of the network panel to open the **Action Pop-up Menu**, and select **Set Service Order**.



Step 5b -
For Computers Running MacOS

7. Drag your stable internet connection (typically Wi-Fi) to the top of the list, and drag NOVA's connection to the bottom.



8. Click **OK**, then click **Apply** to make the new settings active.

Your computer should now have internet access, you can proceed with setup.

If you are still not able to access the internet, contact Voltera Support. If you're trying to connect to the Internet at an institution that has a dedicated IT Department, refer to the User Manual (4.0).

NOVA User Manual

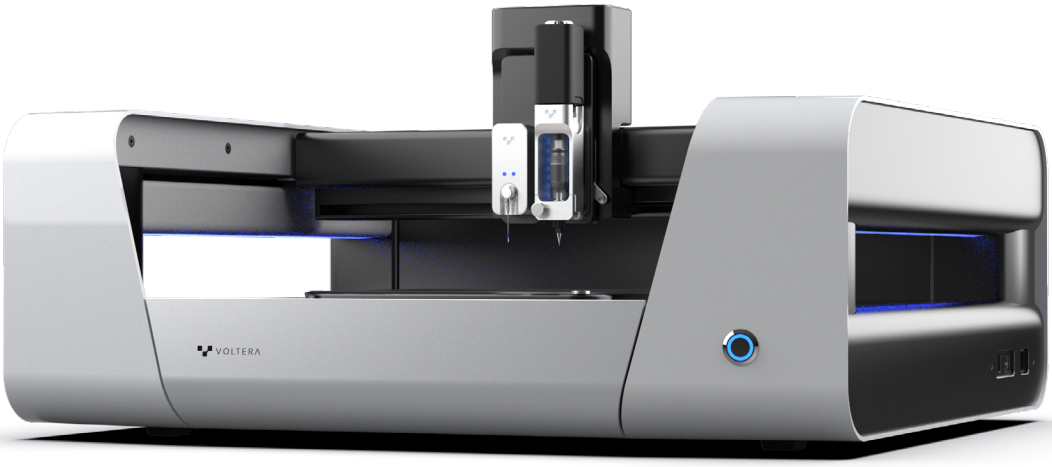
1.0 Introduction

NOVA is a modular, benchtop precision dispensing system, specifically designed for prototyping and development of additive electronics. This system includes two (2) module slots, a built-in camera for alignment and inspection, multiple connection ports, Wi-Fi or Ethernet network connectivity, a dedicated priming area for flow calibration, and an optical breadboard work area for custom fixturing with a drop-in vacuum table.

NOVA is a flexible and accessible platform which is designed to be easy to use. However, proper training and supervision is required to ensure safe operation. As with any lab equipment, NOVA and the accompanying materials and modules should be handled with care, and you should read this manual carefully before using NOVA.

NOVA is for use as-is. Any modifications to the machine or improper use without explicit approval or direction from Voltera may damage the machine, may cause bodily harm, and will void your warranty.

In case of emergency or prior to performing any maintenance, please ensure that the power cable is disconnected from NOVA.



2.0 Safety Markings & Warning Statements

2.1 Pinch, Crush and Sharp Surface Hazards

Gantry Bridge

Keep hands safely away from any moving parts. The gantry system has belt and screw drive components which can cause harm if handled during operation.

Dispensing Nozzles are Sharp

Handle dispensing nozzles with care. The dispensing nozzles have fine points down to 50 micrometer diameter, which can pierce the skin with enough force. Ensure hands are clear of the dispensing tips while the machine is in operation.

2.2 Hot Surfaces

Smart Dispenser Heater

The Smart Dispenser contains a 20W heater that is configured to maintain temperatures at or below 40°C (104°F), up to a maximum of 65°C (149°F). It has a built-in temperature monitoring and control system as well as a thermal fuse. If the control system fails, this temperature can reach 80°C (176°F). Take care when handling a hot dispenser.

2.3 Two Person Lift

Heavy Equipment

NOVA weighs 35 kg (77 lbs), and should always be lifted by two people to avoid injury. Use proper lifting technique when relocating. Failing to do so can cause muscle strain or back injury.

Place NOVA carefully, as dropping the equipment on limbs or digits can cause serious harm. When moving the NOVA, each person should lift by the base with two hands. Avoid lifting the machine by the bridge to avoid ruining the calibration of your unit.

2.0 Safety Markings & Warning Statements

2.4 Use Personal Protective Equipment

Hearing Protection

NOVA contains vacuum pumps which can run loud at maximum power. If the pumps are run above 30% duty cycle for extended periods, wear hearing protection.

Eye Protection

Wear eye protection if using the Smart Probe Module with custom fixturing, printing on 3D structures, or when using mounting accessories. If the Probe Stylus accidentally contacts a hard surface during travel, it can fracture and create shrapnel.

Protective Gloves

Wear protective gloves when handling conductive inks, solvents, or other electronic materials. Consult the SDS before using.

2.5 Electric Shock

Unplug Power Cord Before Maintenance

If you are performing any approved maintenance on NOVA or transporting NOVA, ensure all cords are unplugged and the machine is powered off.

Only Mount Approved Modules

Never touch the electrical contact pins while the Locking Lever on the Module Hub is engaged. NOVA will only accept Voltera-approved modules. The module hub supplies 24V and 2A which can lead to electric shock if used improperly. Overcurrent protection is enabled but this is not a replacement for proper handling precautions.

Do Not Disassemble

Except at the express direction of Voltera, do not open or disassemble NOVA, or any Voltera Modules, or equipment. Doing so can irreparably damage the equipment, or present hazards including electric shock, crushing injuries, or pinch points.

3.0 Physical Installation & Setup

3.1 Unbox the Machine

Your NOVA will arrive in a box on a pallet. Before installing NOVA, make sure you have another person available to help lift the equipment.

1. Open the box and lift NOVA out.
2. Place NOVA on a flat, level surface. Be sure to position NOVA so the power and communication ports are clear and easily accessible.
3. A well-ventilated area is recommended.
4. Make sure to keep all packaging in case the product must be transported in the future.

3.2 Prepare to Connect

You must have a computer with an ethernet port to set up NOVA. If your computer does not have an ethernet port, use an ethernet-to-USB adapter.

5. Plug in the provided Wi-Fi Dongle into one of NOVA's USB ports.
6. Connect the provided ethernet cable between NOVA's ethernet port and your computer.
7. Plug in the power cable to NOVA.
8. Push the power button to turn on NOVA. NOVA's LED lights should turn on as well and cycle white.

4.0 Getting NOVA Online (For IT Department Involvement)

Voltera strongly suggests connecting NOVA to the internet via a wireless or wired connection, as described in the following subsections. **The computer being used to operate NOVA must be connected to the same network as NOVA.**

4.1 NOVA's MAC Address

NOVA's MAC address and device name will be emailed to you at time of shipping, giving you plenty of time to register your device if necessary. Once your device has been set up and connected, the MAC address can be found any time through the Network window in NOVA's web app.

4.2 Static vs. Dynamic IP Lease

A dynamic IP lease for NOVA is fine. NOVA does not require a static IP lease, but it can be set up if desired.

4.3 Connecting NOVA via Wi-Fi

If only a password is required to connect to the Wi-Fi network, then the standard Wi-Fi connection process can be followed:

1. Make sure that your computer is connected to your chosen Wi-Fi network
2. Plug in a Wi-Fi adapter (such as the one provided) into one of NOVA's USB ports.
3. Connect the provided Ethernet cable between NOVA's Ethernet port and the computer. If the computer does not have an Ethernet port, use an Ethernet-to-USB adapter.
4. Plug in the power cable to NOVA.
5. Push the power button to turn on NOVA. NOVA's LED lights should turn on and pulse white.
6. Open a browser window on the computer and navigate to www.myvoltera.io
7. Your NOVA should be available in the Wired Devices section, identified with the appropriate device name. Click on the device whose name matches the sticker on the right side of your unit.
8. Follow the instructions until the Network Setup step is reached.
9. Make sure that the Wi-Fi tab is selected. Click the desired network name and enter the password to connect NOVA to the Wi-Fi network.

4.0 Getting NOVA Online (For IT Department Involvement)

NOVA does not currently support WPA2-Enterprise or 802.1x authentication (ex. eduroam or networks that require logging in through a captive portal with a user account). IT departments can typically register the MAC address so that NOVA can be connected on a separate non-802.1x network. Some users may be able to register the MAC addresses themselves (ex. following the same procedure as connecting smart devices or gaming systems to the network).

After the MAC address is registered, the standard Wi-Fi connection process described above can be followed.

4.4 Temporarily Connecting NOVA to a Mobile Wi-Fi Hotspot

In some cases, you may need to connect to the internet without an available Wi-Fi or ethernet network. If this is the case, you can connect over a **mobile Wi-Fi hotspot.**

1. On your mobile device, create a mobile Wi-Fi hotspot with the following credentials:
    a. SSID: NOVA
    b. Password: NOVA1234
2. Connect your laptop to this network.
3. If NOVA is powered on and has a Wi-Fi Dongle connected, it will automatically connect to this network.

4.5 Connecting NOVA via Ethernet

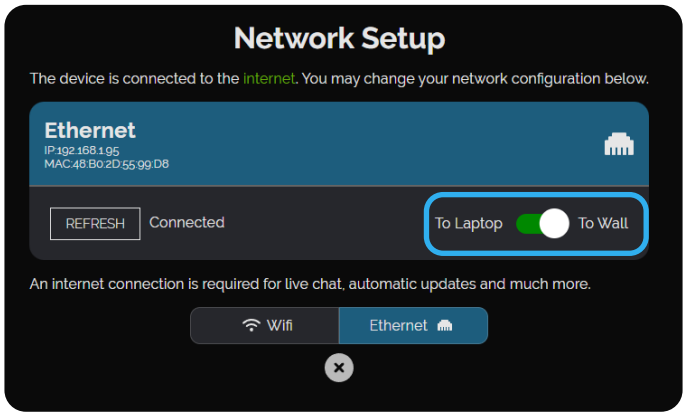
NOVA can also connect to a network over an Ethernet cable, but only through a router or wall port (computers will not share their internet connection with NOVA by default). Registering the MAC address of NOVA may or may not be required, depending on how the LAN is set up. Users can contact their IT department to determine the next steps, which usually only consist of registering the MAC address and/or activating a switchport. Once any necessary steps are taken:
Before connecting NOVA to a network over Ethernet, you must connect to either a Wi-Fi network (see section 4.3) or Wi-Fi hotspot (see section 4.4).

1. Once you have connected to NOVA over Wi-Fi or mobile hotspot, navigate to the Network Tile in the bottom left corner of the web app.

2. Connect NOVA to an Ethernet port, either through the wall or directly into a router.

4.0 Getting NOVA Online (For IT Department Involvement)

4.5 Connecting NOVA via Ethernet - Continued



3. Select the Ethernet tab in the app.
4. Click the "To Wall" slider button.
5. When the configuration is complete, the machine may disconnect from the browser.
6. Connect your computer to the same network as NOVA.
7. Navigate to www.myvoltera.io and log in again if necessary.
8. NOVA should appear under "Your Devices."

4.6 Connecting NOVA in Offline Mode

If you are unable to establish an internet connection with NOVA, the system is available in Offline mode. While this will grant you access to the core features, some functionality will be limited, and updates will be inaccessible.
To connect in offline mode:

1. Plug in a Wi-Fi adapter (such as the one provided) into one of NOVA's USB ports. If NOVA does not see a wifi adapter on startup (even if it is not in use), it will display an error message.
2. Connect the provided Ethernet cable between NOVA's Ethernet port and the computer. If the computer does not have an Ethernet port, use an Ethernet-to-USB adapter.
3. Plug in the power cable to NOVA.
4. Push the power button to turn on NOVA. NOVA's LED lights should turn on and pulse white.
5. Open a browser window on the computer.
    a. If your computer has internet access, navigate to https://connect.myvoltera.io
    b. If your computer does not have internet access, navigate to http://10.42.2.1
6. You should now have access to NOVA in offline mode.

5.0 Hardware Overview & Network Capabilities

NOVA is a precision dispensing platform for additive electronics. NOVA's software independently runs on its own standalone compute module, the **NVIDIA Jetson Nano**. The Nano module integrates a **Realtek RTL81119ICG Gigabit Ethernet controller.** To connect the Nano module to the Internet, a Wi-Fi adapter or an Ethernet cable must be plugged into NOVA.

The Wi-Fi adapter that is shipped with NOVA is a **TP-link TL-WN725N 2.4 GHz USB Wi-Fi Adapter**. A different Wi-Fi adapter can be used instead of the one provided by Voltera if desired, but Voltera cannot guarantee it will be compatible with NOVA's system.

NOVA receives commands from users through a browser-based web app. A network connection, whether local or on the internet, is required between NOVA and a computer for operation. Various connection methods are detailed in sections 4.3-4.6.

6.0 Communications

6.1 Websites

6.1.1 Balena

Balena is an Internet of Things (IoT) deployment and device management platform. Voltera uses Balena to remotely deploy updates to NOVA's software and firmware. The operating system on the Nano module is read-only.

6.1.2 Google Firebase

Google Firebase is a mobile and web application development platform. NOVA uses its Authentication and Cloud Firestore services for our user management, user data, and analytics systems.

6.1.3 myvoltera.io

https://www.myvoltera.io is used to initially setup NOVA and connect it to the network.

6.0 Communications

6.2 Ports

Port	Service(s)	Description
53	Balena	DNS: used by devices to resolve Balena hostnames for connection to the Balena service
123	Balena	NTP: used by devices to synchronize time
443	Balena	HTTPS: used by devices to poll Balena for updates and to download releases and host OS updates OpenVPN: used by devices to connect to Balena to provide real-status, control, and an interactive terminal
	www.myvoltera.io	Used by devices to communicate with user's computer for online operation
3080	Google Firebase	Cloud Firestore
9099	Google Firebase	Authentication
80	connect.myvoltera.io	Used by devices to communicate with user's computer for offline operation

6.3 Traffic

NOVA requests software updates if they are available and network information once every hour if it is sitting idle. During operation, NOVA sends the data detailed in section 8.0 to Voltera for product improvement.

7.0 Privacy Policy

Please view Voltera's most up-to-date privacy policy on our website.

8.0 Data NOVA Collects

Voltera collects certain data to assess device performance and improve diagnostic accuracy when troubleshooting.

User account data such as profile preferences, material settings, and camera captures are stored in a secure database.

We **do not** collect sensitive information, such as:

1. Wi-Fi network passwords
2. User account passwords
3. Design files (ex. Gerber files)

9.0 Service & Maintenance

9.1 Software Updates and Network Connectivity

NOVA's Application software and NOVA's firmware update frequently to account for feature updates, improvements, security, and any potential bug fixes.
An internet connection is required to receive auto-updates to NOVA's firmware. If you are not able to regularly update either the firmware or software, it is possible that the functionality may be compromised, and so we would ask that you ensure that you are able to connect your machine to the internet. If you are not able to connect to the internet, contact Voltera for assistance.

9.2 Suggested 3rd-Party Tools & Software

NOVA allows you to pattern flexible or rigid substrates with your materials of choice. However, oftentimes, you may need programs, processing equipment, or additional materials to achieve the full functionality of your device. Based on your discretion, we recommend making any arrangement necessary to access the following:

9.2.1 Consumables and Equipment

1. **Curing Systems:** Whether thermal, UV, or other, you should be able to post-process your materials as necessary.
2. **Functional Materials:** While Voltera has a standard conductive ink and a variety of substrates available, NOVA is designed to handle a wide range of fluids and substrates.
3. **Luer-Lock Nozzles:** If your application requires it, the Voltera Dispensing Module can accept any Luer-Lock nozzle up to 30mm in total length.

9.0 Service & Maintenance

9.2.1 Consumables and Equipment - Continued

4. **Cleaning Solvents & Sonicating Bath:** The Smart Dispenser's Pressure Coupler may require cleaning. A sonicating bath is the only acceptable cleaning method.
5. **Any other equipment or consumables** as deemed necessary by you to accomplish your goals.

9.2.2 Design Software

NOVA requires Gerber files as the standard input format. The Gerber specification is the standard implementation for electronic design files, and Gerber files can be exported natively from any electronics design software.

If you do not have access to electronics design software, we suggest downloading the free version of Autodesk EAGLE or KiCad. There are many free resources and tutorials readily available online which should allow you to quickly learn how to design and export Gerber files, if required. Voltera also has Gerber export guides for EAGLE, KiCad, and Altium available on the Voltera website.

9.3 Clean the Pressure Sensor When Not in Use

NOVA is intended to print high-quality patterns with a variety of screen-printable inks. NOVA comes with three included Pressure Sensors. The Pressure Sensor must be cleaned under the following conditions:

- Clean the sensor if it is removed from a cartridge for an extended period (longer than a quick switch-over).
- Clean the sensor if you want to dispense a different material or a different batch of the same material.
- Clean the sensor if a nozzle is removed for an extended period (longer than a quick switch-over), exposing the material in the sensor to air.

Follow Voltera's online Pressure Sensor Cleaning guide when cleaning the Pressure Sensor. Never insert anything other than the included Nylon Cleaning Brush into the Pressure Sensor.

Note: Never pressurize the sensor unless it is mounted on the Smart Dispenser.

9.0 Service & Maintenance

9.4 Protect the Nozzle

The golden rule of high quality dispensing is to protect the dispensing nozzle. If the nozzle tip is dented, bent, broken, or contaminated with dry ink, print quality will suffer. To ensure optimal performance, follow the guidelines below:

1. Gently wipe the nozzle with a lint-free wipe to remove material build-up before use.
2. Dispose of nozzles before storing your dispenser or materials.
3. Use a new nozzle for each new material or after storing the dispenser.

A clogged nozzle can be identified by either no or inconsistent material flow. A clogged nozzle can be the result of many factors including improper material storage, expired material, or a damaged nozzle.

Note: Before replacing the nozzle, be sure to inspect the clogged nozzle for damage and inspect the material cartridge for its expiration date.

9.5 Inspect Pogo Pins and Electrical Contacts

The pogo pins on the Smart Dispenser Actuator must be clean for good operation. Inspect the pogo pins and electrical connections before starting any procedures. If there is any residue or dirt, wipe them down with a small amount of isopropyl alcohol on a lint-free wipe.

9.6 Wipe Down the Calibration Plate

Wipe down your calibration plate immediately after completing the Flow Check or Calibration procedures. Failure to do so will result in dried ink residue which is difficult to remove. Wiping the plate with isopropyl alcohol and a lint-free wipe will work for most inks, but consult the material's SDS or tech sheet for cleanup solvent notes.

9.7 Clean the O-ring on the Smart Dispenser Actuator

If the O-ring has ink residue, this can affect your ability to reach or relieve pressure during dispensing. Inspect the Smart Dispenser before printing, and clean the O-ring if necessary with isopropyl alcohol to maintain a good seal.

9.8 Protect the Probe Stylus

The probe stylus can fracture if it is dropped or roughly treated. Take care when handling the probe.

9.0 Service & Maintenance

9.9 Keep Vacuum Table Clean of Ink

If conductive ink gets into the pores of the vacuum table, it can clog and prevent suction. If ink gets on the vacuum table, wipe with solvent quickly and thoroughly. If the pores are clogged, contact Voltera directly.

9.10 Hold the Modules When Releasing the Locking Lever

When the locking lever on the module hub is released, there is nothing supporting your modules and they may drop off the hub. This can break your nozzles or your Probe Stylus.

9.11 Replacement Power Cables

	100-120 ACC	200-240 ACC
Length	>= 1.8 m	
Ratings	>250 V, > 10A	
Termination	C 14 to Plug Type B	C 14 to Plug Style F

10.0 Specifications

Disclaimer: Voltera reserves the right to change or update the following specifications at any time without notice. Please contact support@voltera.io for the most up-to-date information.

System Specifications

Maximum Dimensions	675 x 605 x 345 mm	26.6" x 23.8" x 13.6"
Weight	35 kg	77 lbs
Environmental Conditions		
Operating Temperature	14 - 30°C	57 – 86°F
Maximum Altitude	2000 m	1.24 miles
Relative Humidity	80%	
Pollution Degree	2	
Maximum Temperature	65°C	149°F
Ramp Rate	2° C/s	3.6°F/s
Power Requirements		
Voltage	110 – 120 ACC	200 – 240 ACC
Current	1.6A, 50/60Hz	0.8A, 50/60 HZ
Power	220W	

Expected Power Characteristics

Leakage Current	0.5mA	
AC Idle Current	0.3A	
AC Max Current	1.6A	
DC Idle Current	0.6A	
DC Max Current	7.9A	
Print Area	A4 ; 220 mm x 300 mm	8.7" x 11.8"
Communication / Connectivity	1-USB-A 2.0, 1-USB-A 3.0, Ethernet, Wi-Fi	
Gantry Step Resolution:	2.5µm (X) x 7µm (Y) x 1.25µm (Z)	
XY tool-tool Positional Accuracy:	+/- 75µm	
File Formats:	Gerber	
Interface:	Browser-based web app	
Module slots:	2	
Camera resolution:	>= 17µm/px	

10.0 Specifications

Disclaimer: Voltera reserves the right to change or update the following specifications at any time without notice. Please contact support@voltera.io for the most up-to-date information.

Dispenser Module Specifications

Maximum fluid pressure	70 PSI	
Maximum control temperature	40ºC	104ºF
Syringe Size	5cc, filled to 3cc	
Particle Size	< 6x nozzle diameter	
Nozzle geometry	Luer fit, < 30mm length	

Performance Targets

Minimum Trace Width*:	100µm (0.1mm)
Minimum pin-to-pin pitch (electronic packages)	400µm (0.4mm)

* with Voltera supplied material and appropriate calibration. Material properties may vary significantly, and must be calibrated using NOVA's calibration procedure.

11.0 Company and Product Identification

Voltera Inc.
113 Breithaupt Street, Suite 100
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ON, Canada

1-888-381-3332

For support, call or email Voltera at support@voltera.io

11.1 Markings

For consumables and replacement parts, please contact our sales team or visit our online store:

 sales@voltera.io

 +1 888-381-3332 Ext. 1

 voltera.io/store

For technical assistance, please reach out to our technical support team:

 support@voltera.io

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 voltera.io/support

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