# EGX-TBT-A500

Pocket AI Portable GPU

**User's Manual**




| | |
|---|---|
| **Manual Rev.:** | 1.0 |
| **Revision Date:** | July 13, 2023 |
| **Part No:** | 50M-7C007-1000 |

LEADING EDGE COMPUTING

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# Revision History

| Revision | Release Date | Description of Change(s) |
|---|---|---|
| 1.0 | 2023-07-13 | Initial Release |


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# Preface

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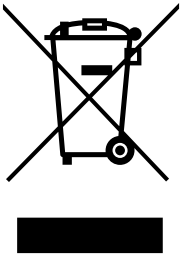
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**Battery Labels** (for products with battery)






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## Conventions

Take note of the following conventions used throughout this manual to make sure that users perform certain tasks and instructions properly.




Additional information, aids, and tips that help users perform tasks.




Information to prevent ***minor*** physical injury, component damage, data loss, and/or program corruption when trying to complete a task.




Information to prevent ***serious*** physical injury, component damage, data loss, and/or program corruption when trying to complete a specific task.


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# 1 About your Pocket AI

## 1.1 Overview

Pocket AI is an external graphic processing unit (eGPU) with a Thunderbolt 3 interface and powered by an external USB-PD adapter. The device is designed to enhance the processing capability of existing computers, allowing users to develop AI applications or use graphics-intensive rendering without having to replace their hardware.

The EGX-TBT-A500 is equipped with the latest Ampere GPU architecture using the 7 nanometer (nm) chip process, third generation Tensor Cores with structural sparsity to improve AI performance. With its 2048 CUDA core Ampere GPU and Thunderbolt Interface, the EGX-TBT-A500 supports numerous existing computers, delivering the latest leading-edge GPU performance for your system and enabling AI capabilities.

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## 1.2 Features

- External Thunderbolt™ 3 GPU
- 2048 CUDA cores
- 9.3 TFLOPS SP peak performance
- 4 GB GDDR6 memory
- Thunderbolt™ 3
- 1 year standard warranty, extendable to 1.5 years with optional registration
- NVIDIA RTX A500 GPU
  - Base Clock @435 MHz
  - Boost Clock @1335 MHz

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## 1.3 Specifications

### 1.3.1 Graphics Module

| | |
|---|---|
| **Graphics Core** | |
| Architecture | NVIDIA® Ampere GA107 |
| GPU | RTX A500 |
| Signal Interface | Thunderbolt™ 3 (PCI Express 3.0 x 4) |
| **GPGPU Computing** | |
| CUDA Support | 2048 CUDA cores, 9.3 TFLOPS FP32 Performance<br>CUDA Toolkit 8.6, OpenCL™ 3.0, DirectX® 12.2<br>OpenGL 4.6, Vulkan 1.3 and above |
| **Memory** | |
| GDDR6 Memory | 4GB |
| Bandwidth | 64-bit<br>96 GB/s data rate |
| **Status LED** | |
| Color | Green: Normal<br>Red: Abnormal |
| **Physical** | |
| Dimensions w/case | 110 mm x 76 mm x 32 mm |
| Dimensions w/o case | 106 mm x 72 mm x 25 mm |
| **Environmental** | |
| Operating Temp. | 0 to 40˚C |
| Storage Temp. | -40˚C to 85˚C |
| **Operating Systems** | |
| Supported OS | Windows 10, Windows 11 & Linux Drivers, 64-bit |

### 1.3.2 Software Support

- CUDA Toolkit 8.6 and higher
- OpenCL™ 3.0
- DirectX® 12.2
- OpenGL 4.6
- Vulkan 1.3

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## 1.4 Mechanical Layout

NOTE:

All dimensions shown are in mm

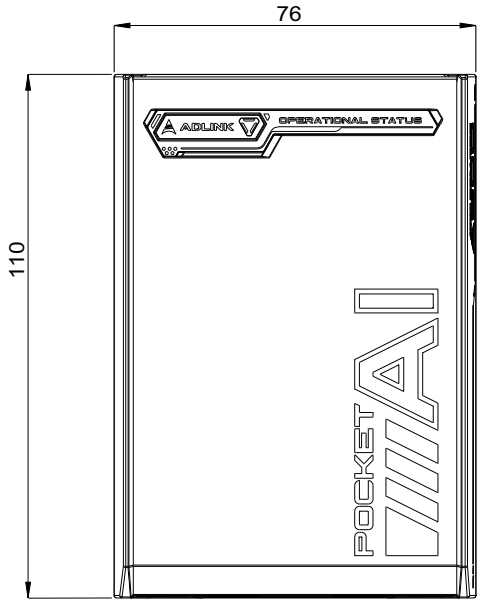



**Figure 1-1: EGX-TBT-A500 Top View**

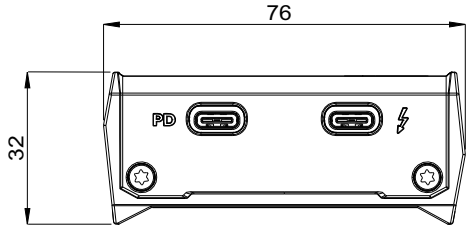



**Figure 1-2: EGX-TBT-A500 Front View**

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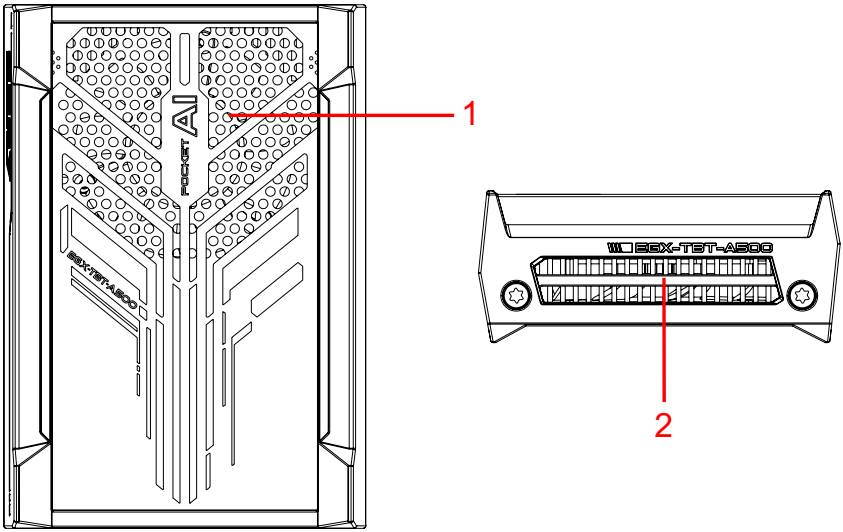



**Figure 1-3: EGX-TBT-A500 Bottom and Back Views**

| Item | Description |
|---|---|
| 1 | Ventilation intake |
| 2 | Ventilation outlet |

**Table 1-1: Pocket AI Ventilation**

NOTE:

Make sure that Pocket AI is placed on a hard, flat surface to allow airflow, and that the vents are not blocked. Avoid placement on soft surfaces like bedding or clothing.



**BURN HAZARD**

Touching this surface could result in bodily injury. To reduce risk, allow the surface to cool before touching.

***RISQUE DE BRÛLURES***

*Ne touchez pas cette surface, cela pourrait entraîner des blessures. Pour éviter tout danger, laissez la surface refroidir avant de la toucher.*



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## 1.5 Pocket AI Ports

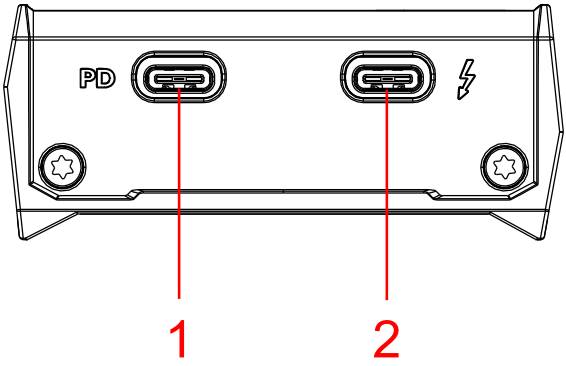



**Figure 1-4: Pocket AI ports**

| Item | Description |
|---|---|
| 1 | USB Type C Power Delivery (Input 15V DC/3A or 20V DC/2.25A) |
| 2 | Thunderbolt 3 Port |

**Table 1-2: Pocket AI IO**

NOTE:

- Some multi-mode power supplies may support 45 watts at voltages lower than 15 volts, which may not be suitable for Pocket AI. Use a USB Power Delivery (USB-PD) power supply with a minimum output of at least 45W and a voltage of at least 15V to ensure compatibility.

NOTE:

- Pocket AI's Thunderbolt 3 port also works with Thunderbolt 4 computers and cables, but continues to operate at Thunderbolt 3 speeds.

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## 1.6 Thermal Policy

The GPU core clock throttles at temperatures ($T_J$) past the thresholds shown with the behaviors as listed. Thermal throttling ensures that the highest temperature on the die does not exceed the sense temperature for prolonged periods of time.

| Parameter | Value | Units |
|---|---|---|
| Thermal Resistance (Junction to Case, RJC) | 0.042 | °C/W |
| Thermal Resistance (Junction to PCB Board, RJB) | 2.36 | °C/W |
| GPU Maximum Operating Temperature | 89 | °C |
| GPU Slowdown Temperature (THERM_ALERT) | 98 | °C |
| GPU Shutdown Temperature (OVERT) | 100 | °C |

**Table 1-3: Thermal Policy**

NOTE:

- Max.GPU operating temperature is the maximum at which the GPU is guaranteed to operate at target performance (base clock) under total board power level
- THERM_ALERT generates a 50% (÷2) hardware clock slowdown.
- OVERT generates a 87.5% (÷8) hardware clock slowdown

## 1.7 Unpacking Checklist

Before unpacking, check the shipping carton for any damage. If the shipping carton and/or contents are damaged, inform your dealer immediately. Retain the shipping carton and packing materials for inspection. Obtain authorization from your dealer before returning any product to ADLINK. Ensure that the following items are included in the package.

- EGX-TBT-A500 Pocket AI

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# 2 System Requirements

## 2.1 Connecting your Pocket AI

To set up your pocket AI for the first time:

1. Plug the USB-PD power adapter into the USB-PD port on the Pocket AI. The green LED will illuminate.

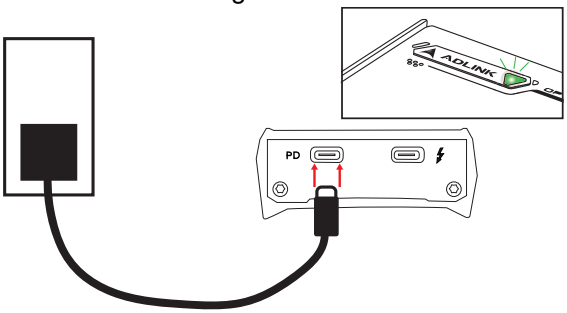



**Figure 2-1: Connecting Pocket AI to power**

2. Power on your computer, and then connect Pocket AI directly to your computer with the Thunderbolt™ cable.

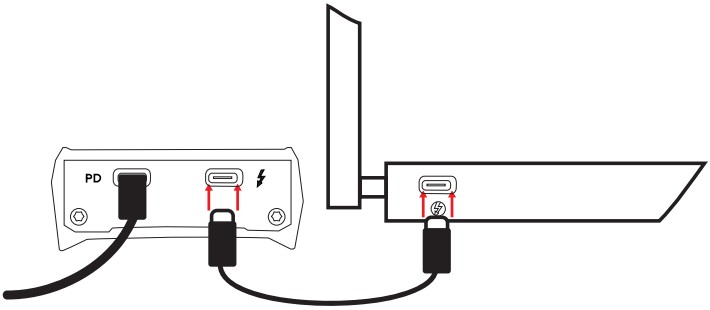



**Figure 2-2: Connecting Pocket AI to your computer**

NOTE:

Pocket AI does not support daisy-chaining or hubs/docks, and should be directly connected to your computer.

3. Follow the instructions in the next section to install the driver.

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## 2.2 Windows Driver Installation

Your Pocket AI needs a driver to function properly.

Before you begin, make sure that you've fully uninstalled any existing NVIDIA drivers from your computer.

To install the driver:

1. Connect the Pocket AI to power as well as the Thunderbolt 3 port on your computer.

NOTE: Always connect power to Pocket AI first before connecting the Thunderbolt cable. If you accidentally connect the Thunderbolt cable first, disconnect it before connecting power.

2. Open your Device Manager. Click **Start** and then type **Device Manager** in the search prompt. Click D**evice Manager** or press the **Enter** key.

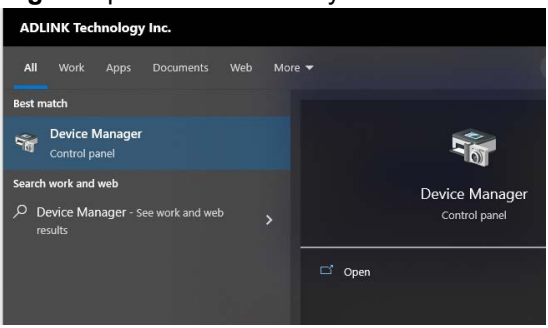



**Figure 2-3: Opening Device Manager**

3. In Device Manager, verify that **3D Video Controller** is listed under **Other Devices**.




**Figure 2-4: Checking Device Manager**



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4. Download the driver and double-click to start the installer.

   Download drivers from:
   adlinktech.com/en/pocket-ai-with-nvidia-rtx-a500-egpu

5. When prompted, read and accept the license agreement.




**Figure 2-5: Agreeing to the license**

6. Choose your installation type, and then click **Next**.




**Figure 2-6: Choosing Installation type**

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7. When the installation is complete, click **Close** to exit the installer

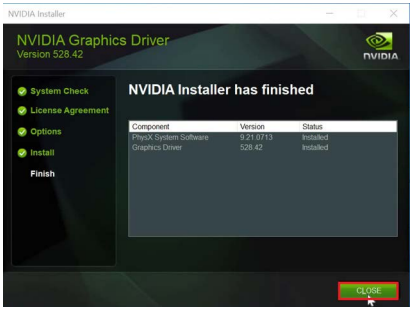



**Figure 2-7: Closing the installer**

8. The driver is now installed. Restart your computer and verify that Pocket AI is working.

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## 2.3 Verifying Windows Driver Installation

To verify that the Windows driver is installed correctly and that your Pocket AI is working properly:

1. Open your Device Manager. Click **Start** and then type **Device Manager** in the search prompt. Click **Device Manager** or press the **Enter** key.

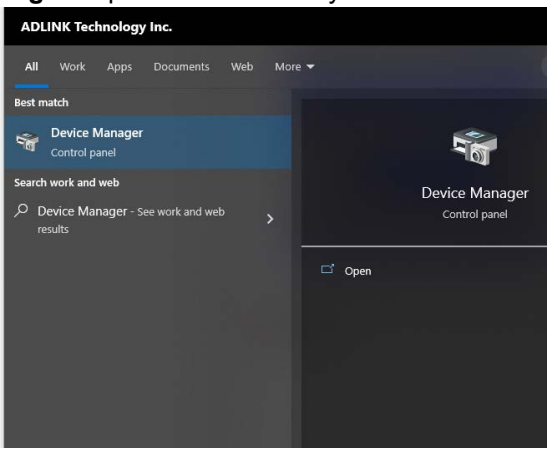



**Figure 2-8: Opening Device Manager**

2. Under Display adapters, verify that **NVIDIA RTX A500 Embedded GPU** appears..

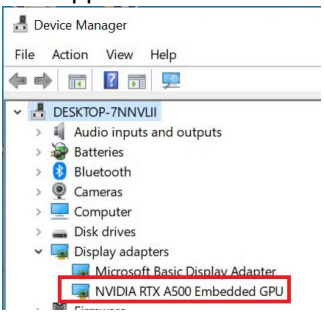



**Figure 2-9: Locating Pocket AI in Device Manager**

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3. To run the NVIDIA System Monitor, click Start, type **command**, and then click **Run as administrator.**

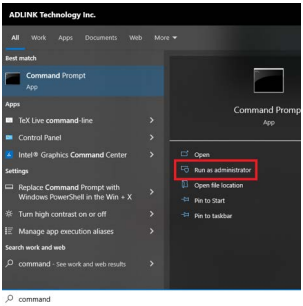



**Figure 2-10: Opening command prompt as an administrator**

4. In the command prompt, type **nvidia-smi** and then press the **Enter** key. If Pocket AI is installed correctly, you will see **NVIDIA RTX A500** in the listing.

```
C:\Windows\system32>nvidia-smi
Fri Mar 17 11:33:18 2023
+-----------------------------------------------------------------------------+
| NVIDIA-SMI 528.42       Driver Version: 528.42       CUDA Version: 12.0     |
|-------------------------------+----------------------+----------------------+
| GPU  Name            TCC/WDDM | Bus-Id        Disp.A | Volatile Uncorr. ECC |
| Fan  Temp  Perf  Pwr:Usage/Cap|         Memory-Usage | GPU-Util  Compute M. |
|                               |                      |               MIG M. |
|===============================+======================+======================|
|   0  NVIDIA RTX A500 .. WDDM  | 00000000:03:00.0 Off |                  N/A |
| N/A   45C    P8     3W /  25W |     17MiB /  4096MiB |      0%      Default |
|                               |                      |                  N/A |
+-------------------------------+----------------------+----------------------+

+-----------------------------------------------------------------------------+
| Processes:                                                                  |
|  GPU   GI   CI        PID   Type   Process name                  GPU Memory |
|        ID   ID                                                   Usage      |
|=============================================================================|
|    0   N/A  N/A       488    C+G   ...b3d8bbwe\WinStore.App.exe    N/A      |
|    0   N/A  N/A      6960    C+G   ...5n1h2txyewy\SearchApp.exe    N/A      |
+-----------------------------------------------------------------------------+
```

**Figure 2-11: Running NVIDIA Software Management Interface**

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## 2.4 Linux Driver Installation

Your Pocket AI needs the Linux driver from NVIDIA to function correctly, as well as a small update to your bootloader to support multiple cards.

Before you begin, make sure that you've fully uninstalled an existing NVIDIA drivers from your computer. This tutorial will guide you through updating your bootloader and installing the driver.

NOTE:

This guide was written for Ubuntu 20.04. Different distributions or versions may require different steps. Consult your support provider or distribution community for additional information.

To install the Linux driver:

1. Sign in to Ubuntu using an account with sudo access.
2. Open a terminal window and type:
   **`sudo gedit /etc/default/grub`**
   and then press the **Enter** key. A text editor will appear, allowing you to edit bootloader settings.

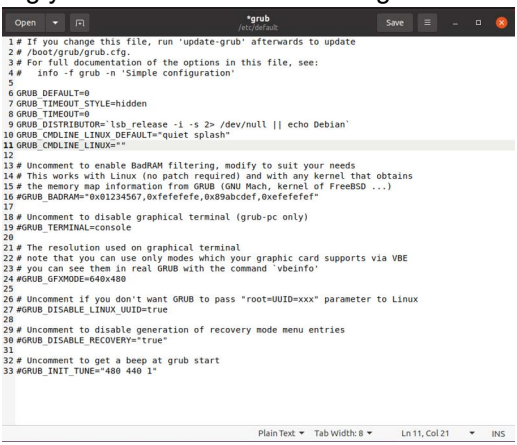



**Figure 2-12: GRUB Bootloader Configuration File**

3. In the text editor window, add the following text to **`GRUB_CMDLINE_LINUX=""`** between the quotation marks:
   **`pci=realloc=off`**

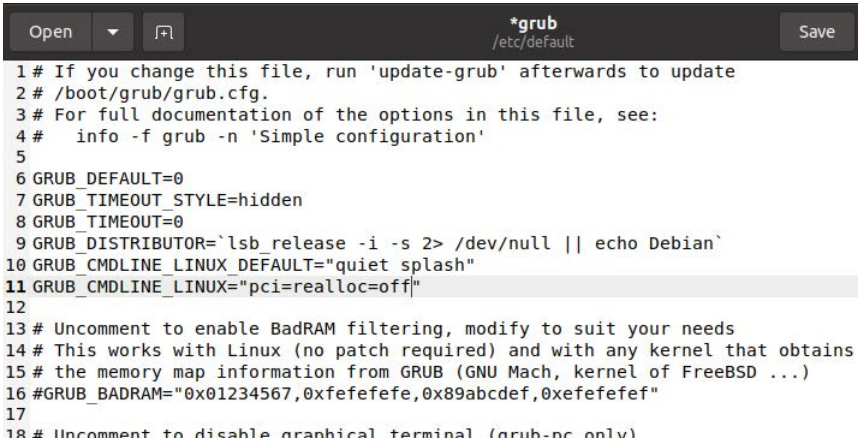



**Figure 2-13: Modifying the GRUB Bootloader Configuration**

NOTE: If there are multiple items between the quotation marks, add a space and then add **`pci=realloc=off`** to the end before closing the parentheses.

Save the file and close the text editor.

4. From the terminal window, type
   **`sudo update-grub2`**
   and press the **Enter** key to regenerate your bootloader configuration from the file.
5. Once the bootloader has been updated, reboot your computer by typing
   **`sudo reboot`**
   and press the **Enter** key. Your computer will reboot.
6. Once you have rebooted, sign in to Ubuntu using an account with sudo access.

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7. Open a terminal window, and type:
   **`sudo add-apt-repository ppa:graphics-drivers/ppa -y`**
   and press the **Enter** key. This step adds the NVIDIA drivers repository to apt so you can install the driver.

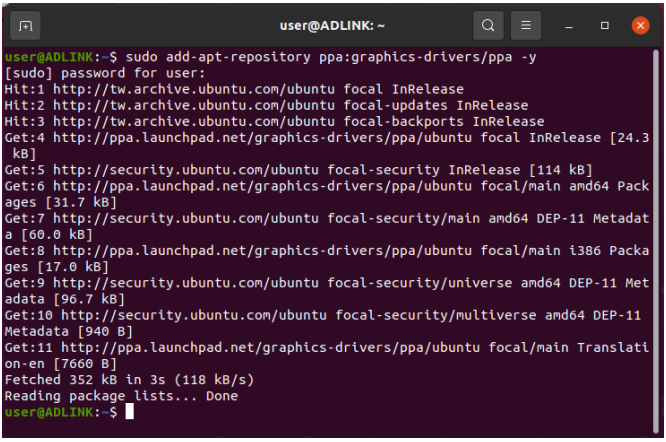



**Figure 2-14: Adding NVIDIA Driver Repository**

8. Once the installation completes, type
   **`sudo apt update`**
   and press the **Enter** key to refresh your repository information.
9. Once the repositories are refreshed, type
   **`sudo apt install nvidia-driver-525 -y`**
   and press the **Enter** key to install version 525 of the NVIDIA driver..

NOTE:

As of this writing, version 525 is the most recent version of the NVIDIA driver tested with Pocket AI. You can check for more recent versions using apt **`search nvidia-driver-`**, and replace 525 with the relevant version for your Linux distribution and version.

10. Once the driver has been installed, reboot your computer by typing
    `sudo reboot`
    and press the **Enter** key. Your computer will reboot.
11. Follow the instructions in the next section to verify that Pocket AI is working.

## 2.5 Verifying Linux Driver Installation

To verify that the Linux driver is installed correctly and that your Pocket AI is working properly:

12. Sign in to Ubuntu.
13. Open the Ubuntu settings app, and then select the **Thunderbolt** menu item. Pocket AI should be listed as **ADLINK EGX-TBT-A500**.

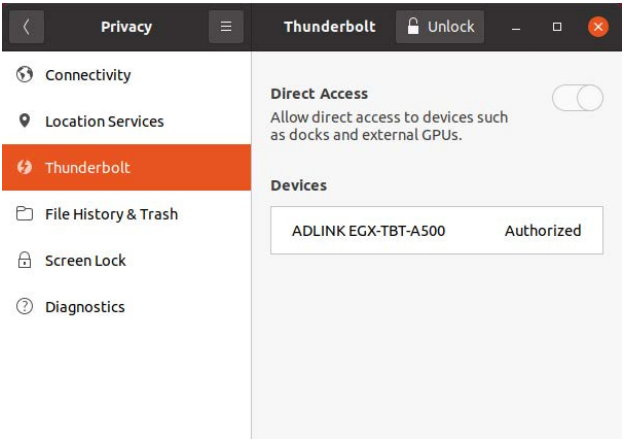



**Figure 2-15: Accessing the Ubuntu Thunderbolt Settings Menu**

NOTE:

If you do not see the Thunderbolt menu, you may need to install Thunderbolt support by running `sudo apt install bolt` in a terminal window. If you still do not see the Thunderbolt options, try starting the Thunderbolt daemon manually by typing `boltctl` in a terminal window.

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14. To verify that the your device is recognized, open a terminal window and type
    **`nvidia-smi`**
    and then press **ENTER**. If the device is installed correctly, you will see **NVIDIA RTX A500 Embedded GPU** listed.

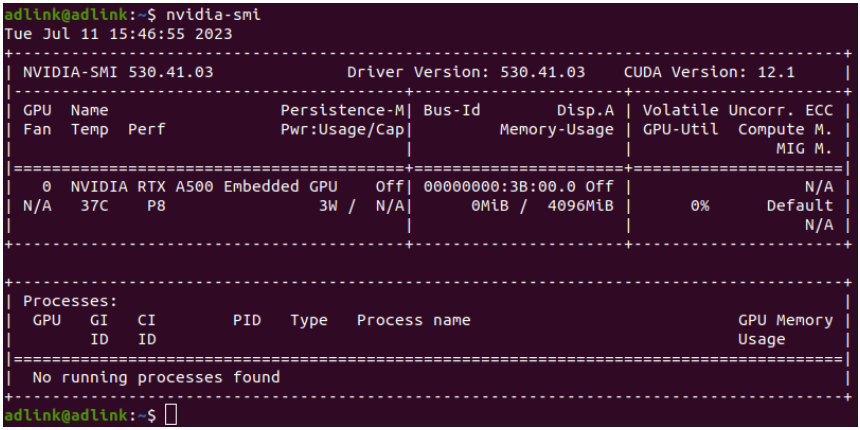



**Figure 2-16: Running NVIDIA Software Management Interface**

15. To verify that your device is using the correct driver, open a terminal window, and then type:
    **`lsmod | grep nv`**
    and then press **ENTER**. If the driver is installed correctly, you will see **nvidia** listed as the module for the device.

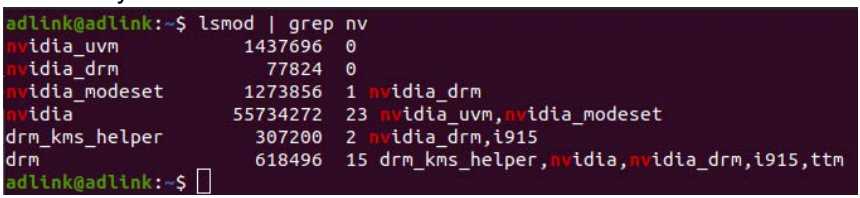



**Figure 2-17: Verifying nvidia Module**

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## 2.6 Certifications & Agencies

- Windows Hardware Quality Lab (WHQL) certified for Windows 10 and Windows 11
- EU Reduction of Hazardous Substances (EU-RoHS)
- Conformité Européenne (CE)
- Federal Communications Commission (FCC)

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# Important Safety Instructions

For user safety, please read and follow all instructions, Warnings, Cautions, and Notes marked in this manual and on the associated device before handling/operating the device, to avoid injury or damage.

*S'il vous plaît prêter attention stricte à tous les avertissements et mises en garde figurant sur l'appareil, pour éviter des blessures ou des dommages.*

- Read these safety instructions carefully
- Keep the User's Manual for future reference
- Read the Specifications section of this manual for detailed information on the recommended operating environment
- The device can be operated at an ambient temperature of 40ºC
- To avoid electrical shock and/or damage to device:
  - Keep device away from water or liquid sources
  - Keep device away from high heat or humidity
  - Keep device properly ventilated (do not block or cover ventilation openings)
  - Always use recommended voltage and power source settings
  - Always install and operate device near an easily accessible electrical outlet
  - Secure the power cord (do not place any object on/over the power cord)
  - Only install/attach and operate device on stable surfaces and/or recommended mountings
- If the device will not be used for long periods of time, turn off and unplug from its power source
- Never attempt to repair the device, which should only be serviced by qualified technical personnel using suitable tools
- The device must be serviced by authorized technicians when:


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- ▷ The power cord or plug is damaged
- ▷ Liquid has entered the device interior
- ▷ The device has been exposed to high humidity and/or moisture
- ▷ The device is not functioning or does not function according to the User's Manual
- ▷ The device has been dropped and/or damaged and/or shows obvious signs of breakage

▶ This product is intended to be supplied by a Listed Power Adapter, with an output that meets LPS(PS2), rated 15VDC or 20VDC, 3A or 2.25A, maximum 45W, TMA = 45ºC, and altitude of operation = 2000m.

- ▷ The equipment power supply cord shall be connected to a socket-outlet with grounded connection, or equivalent.

| | |
|---|---|
|  | **BURN HAZARD**<br>Touching this surface could result in bodily injury. To reduce risk, allow the surface to cool before touching.<br>***RISQUE DE BRÛLURES***<br>*Ne touchez pas cette surface, cela pourrait entraîner des blessures.*<br>*Pour éviter tout danger, laissez la surface refroidir avant de la toucher.* |


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# Getting Service

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