



QUICK START GUIDE

VIA ARTiGO A5000

Android 13.0 EVK



Copyright

Copyright © 2024 VIA Technologies Incorporated. All rights reserved.

No part of this document may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any language, in any form or by any means, electronic, mechanical, magnetic, optical, chemical, manual or otherwise without the prior written permission of VIA Technologies, Incorporated.

Trademarks

All brands, product names, company names, trademarks and service marks are the property of their respective holders.

Disclaimer

VIA Technologies makes no warranties, implied or otherwise, in regard to this document and to the products described in this document. The information provided in this document is believed to be accurate and reliable as of the publication date of this document. However, VIA Technologies assumes no responsibility for the use or misuse of the information (including use or connection of extra device/ equipment/add-on card) in this document and for any patent infringements that may arise from the use of this document. The information and product specifications within this document are subject to change at any time, without notice and without obligation to notify any person of such change.

VIA Technologies, Inc. reserves the right to make changes to the products described in this manual at any time without prior notice.



Revision History

Version	Date	Remarks
1.00	23/12/2024	Initial release

Table of Contents

1.	Introduction.....	1
1.1	EVK Package Contents.....	1
1.1.1	Firmware Folder Contents	1
1.1.2	Document Folder Contents	1
1.1.3	Tool Folder Contents.....	1
1.2	Version Information and Supported Features.....	2
2.	Image Installation	3
2.1	Installing with the Genio Tool	3
3.	Hardware Functions	9
3.1	Enabling ADB Debugging	9
3.2	Changing the Kernel Debug Level	10
3.3	Checking the BSP Version.....	11
3.4	DVFS	11
3.5	Display.....	12
3.6	Camera.....	12
3.7	MTK NeuroPilot AI APU Hardware Acceleration	13

1. Introduction

This Quick Start Guide provides an overview of how to boot the Android image for the VIA ARTiGO A5000 system and configure the supported hardware functions in the build.

The VIA ARTiGO A5000 Android 13.0 EVK is developed based on the MediaTek Android 13.0 BSP, and it enables the hardware features of the VIA ARTiGO A5000 system.

1.1 EVK Package Contents

There are three folders in the package listed as below.

Firmware folder	Description
VIA_ARTiGO_A5000_Android_13.0_EVK.zip	Android evaluation image
Document folder	Description
VIA_ARTiGO_A5000_Android_13.0_EVK_Quick_Start_Guide.pdf	Quick Start Guide
Tool folder	Description
VIA_Android_USB_Driver.zip	VIA USB driver
PoseDetector_Image.apk	Sample test program
android.py	A python script to install the EVK image

1.1.1 Firmware Folder Contents

VIA_ARTiGO_A5000_Android_13.0_EVK.zip: Contains the precompiled Android image for evaluating the VIA ARTiGO A5000 system.

1.1.2 Document Folder Contents

VIA_ARTiGO_A5000_Android_13.0_EVK_Quick_Start_Guide.pdf: This Quick Start Guide provides an overview on how to boot the Android image for the VIA ARTiGO A5000 system and configure the supported hardware functions in the build.

1.1.3 Tool Folder Contents

VIA_Android_USB_Driver.zip: The VIA driver for ADB-over-USB.

PoseDetector_Image.apk: A sample program to test MTK NeuroPilot AI APU hardware acceleration.

android.py: A python script to install the Android evaluation image.

1.2 Version Information and Supported Features

- Kernel version: 5.15.94
- Evaluation image: Android 13.0
- Development based on MediaTek Android 13.0 BSP
- Supports eMMC boot
- Supports HDMI 4K display and audio outputs
- Supports the optional LVDS display panel
 - Innolux 15.6" G156HCE-L01 (1920 x 1080)
- Supports RGMII Gigabit Ethernet
- Supports MediaTek MT6365 Headphone-out and MIC-in
- Supports the optional GSD WXT2PM2003 (MT7921) dual-band Wi-Fi 6 and Bluetooth 5.2
- Supports the optional 4G and 5G mobile broadband M.2 modules
 - Telit LN920A6 4G module
 - Telit FN990A28 5G module
 - Quectel EM05-G 4G module
 - Quectel EM060K-GL 4G module
 - Quectel RM520N-GL 5G module
- Supports the optional AHD OSA-SCA1906 camera module
- Supports MediaTek NeuroPilot AI APU hardware acceleration

2. Image Installation

This section explains the setup requirements for installing the Android evaluation image on the VIA ARTiGO A5000 system.

The precompiled images are provided in the "Firmware" folder.

2.1 Installing with the Genio Tool

Follow the steps below to install the Android evaluation image:

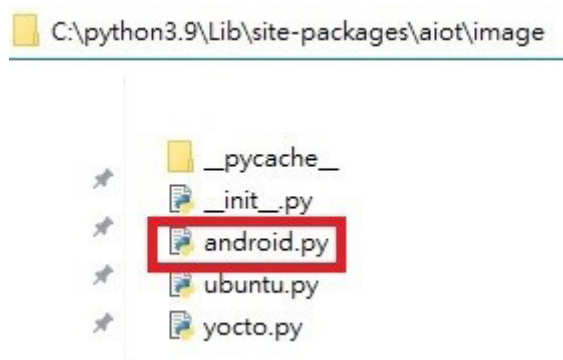
Step 1

Refer to the instructions described in the following sections of the [MediaTek IoT Environment Setup](#) and set up the Genio tool environment on a Windows 10 host machine:

- Setup Git for Windows
- Install Fastboot and ADB Device USB Driver
- Install Fastboot Tool on Windows
- Setup Python 3 on Windows
- Install Genio Tools

Step 2

Copy the "android.py" file to the "C:\python3.9\Lib\site-packages\aiot\image" directory replacing the original file on the Windows 10 host machine.



Step 3

Connect the Windows 10 host machine and the VIA ARTiGO A5000 system through the Micro USB 2.0 port using a Micro USB cable. The Micro USB 2.0 port is located on the back panel of the VIA ARTiGO A5000 system.



Micro USB 2.0 port diagram

Step 4

Extract the Android 13.0 evaluation image package "VIA_ARTiGO_A5000_Android_13.0_EVK.zip" on the Windows 10 host machine.

Step 5

The VIA ARTiGO A5000 system's storage must first be formatted completely to allow clean installation of the Android evaluation image later. Set the path to the "platform tools" folder, and run the "genio-flash" command. When prompted, select option 1 "Format All".

```
D:\VIA_ARTiGO_A5000_Android_13.0_EVK>set PATH=D:\platform-tools;%PATH%
D:\VIA_ARTiGO_A5000_Android_13.0_EVK>genio-flash
1: Format All
2: Flash Image
choice: 1
```

Step 6

Next, press and hold the Download button located on the right panel of the VIA ARTiGO A5000 system, and plug in the AC-to-DC power adapter. The VIA ARTiGO A5000 system will automatically power on and start formatting its storage.



Location of the Download button

**Note:**

After powering on the VIA ARTiGO A5000 system, make sure the Windows 10 host machine detects it as an ADB device.

Step 7

When the formatting process is complete, release the Download button. Confirmation messages will be printed as shown below.

```
D:\VIA_ARTiGO_A5000_Android_13.0_EVK>set PATH=D:\platform-tools;%PATH%
D:\VIA_ARTiGO_A5000_Android_13.0_EVK>genio-flash
1: Format All
2: Flash Image
choice: 1

Android Image:
  system:  Android

Looking for MediaTek SoC matching USB device 0e8d:0003
Opening COM5 using baudrate=115200
Connected to MediaTek SoC: hw_code[0x8188]
Sending bootstrap to address: 0x201000
Jumping to bootstrap at address 0x201000 in AArch64 mode
erasing mmc0boot0
< waiting for any device >
Erasing 'mmc0boot0' (bootloader) request sz: 0x1fe0000, real
erase len: 0x1fe0000
```

```

OKAY [ 0.007s]
Finished. Total time: 0.012s
erasing mmc0boot1
Erasing 'mmc0boot1' (bootloader) request sz: 0x1fe0000, real
erase len: 0x1fe0000
OKAY [ 0.002s]
Finished. Total time: 0.075s
erasing mmc0
Erasing 'mmc0' (bootloader) request sz: 0x3a3e00000,
real erase len: 0x0
OKAY [ 1.126s]
Finished. Total time: 1.130s
flashing mmc0boot0=preloader.img
Warning: skip copying mmc0boot0 image avb footer (mmc0boot0 partition size: 0, mmc0boot0
image size: 382528).
Sending 'mmc0boot0' (373 KB) OKAY [ 0.109s]
Writing 'mmc0boot0' OKAY [ 0.016s]
Finished. Total time: 0.420s
flashing mmc0boot1=preloader.img
Warning: skip copying mmc0boot1 image avb footer (mmc0boot1 partition size: 0, mmc0boot1
image size: 382528).
Sending 'mmc0boot1' (373 KB) OKAY [ 0.016s]
Writing 'mmc0boot1' OKAY [ 0.016s]
Finished. Total time: 0.078s
flashing mmc0=via.gpt
Warning: skip copying mmc0 image avb footer (mmc0 partition size: 0, mmc0 image size:
32768).
Sending 'mmc0' (32 KB) OKAY [ 0.000s]
Writing 'mmc0' OKAY [ 0.062s]
Finished. Total time: 0.109s
Rebooting OKAY [ 0.000s]
Finished. Total time: 0.000s

D:\VIA_ARTiGO_A5000_Android_13.0_EVK>

```

Step 8

Unplug the AC-to-DC power adapter to power off the VIA ARTiGO A5000 system.

Step 9

The VIA ARTiGO A5000 system is now ready to be flashed with the provided Android evaluation image. Set the path to the "platform tools" folder, and run the "genio-flash" command. When prompted, select option 2 "Flash Image".

```

:\VIA_ARTiGO_A5000_Android_13.0_EVK>set PATH=D:\platform-tools;%PATH%
D:\VIA_ARTiGO_A5000_Android_13.0_EVK>genio-flash
1: Format All
2: Flash Image
choice: 2

```

Step 10

Next, press and hold the Download button, and plug in the AC-to-DC power adapter. The VIA ARTiGO A5000 system will automatically power on.



Note:

After powering on the VIA ARTiGO A5000 system, make sure the Windows 10 host machine detects it as an ADB device.

Step 11

Messages will start printing to show that the flashing process is loading, and will then pause to find the VIA ARTiGO A5000 system in bootloader mode. When the VIA ARTiGO A5000 system is found, the flashing process will begin and messages will start printing to show its progress. When the first message is printed, release the Download button.

```
D:\VIA_ARTiGO_A5000_Android_13.0_EVK>set PATH=D:\platform-tools;%PATH%
D:\VIA_ARTiGO_A5000_Android_13.0_EVK>genio-flash
1: Format All
2: Flash Image
choice: 2

Android Image:
    system:  Android

Looking for MediaTek SoC matching USB device 0e8d:0003
Opening COM5 using baudrate=115200
Connected to MediaTek SoC: hw_code[0x8188]
Sending bootstrap to address: 0x201000
Jumping to bootstrap at address 0x201000 in AArch64 mode
flashing vbmeta_a=vbmeta.img
< waiting for any device >
Sending 'vbmeta_a' (8 KB)                OKAY [  0.005s]
Writing 'vbmeta_a'                      OKAY [  0.040s]
Finished. Total time: 0.074s
```

Step 12

When the flashing process is complete, confirmation messages will be printed as shown below.

```
D:\VIA_ARTiGO_A5000_Android_13.0_EVK>set PATH=D:\platform-tools;%PATH%
D:\VIA_ARTiGO_A5000_Android_13.0_EVK>genio-flash
1: Format All
2: Flash Image
choice: 2

Android Image:
    system:  Android

Looking for MediaTek SoC matching USB device 0e8d:0003
Opening COM5 using baudrate=115200
Connected to MediaTek SoC: hw_code[0x8188]
Sending bootstrap to address: 0x201000
Jumping to bootstrap at address 0x201000 in AArch64 mode
flashing vbmeta_a=vbmeta.img
< waiting for any device >
Sending 'vbmeta_a' (8 KB)                OKAY [  0.005s]
Writing 'vbmeta_a'                      OKAY [  0.040s]
Finished. Total time: 0.074s
flashing vbmeta_system_a=vbmeta_system.img
Sending 'vbmeta_system_a' (4 KB)        OKAY [  0.000s]
Writing 'vbmeta_system_a'              OKAY [  0.000s]
Finished. Total time: 0.025s
flashing vbmeta_vendor_a=vbmeta_vendor.img
Sending 'vbmeta_vendor_a' (4 KB)        OKAY [  0.007s]
Writing 'vbmeta_vendor_a'              OKAY [  0.000s]
Finished. Total time: 0.511s
flashing spmfw_a=spmfw.img
Sending 'spmfw_a' (14 KB)               OKAY [  0.000s]
Writing 'spmfw_a'                      OKAY [  0.016s]
Finished. Total time: 0.083s
flashing pi_img_a=pi_img.img
Sending 'pi_img_a' (6 KB)               OKAY [  0.000s]
Writing 'pi_img_a'                     OKAY [  0.016s]
Finished. Total time: 0.109s
flashing dpm_a=dpm.img
Sending 'dpm_a' (200 KB)                OKAY [  0.016s]
Writing 'dpm_a'                        OKAY [  0.016s]
Finished. Total time: 0.156s
```

```

flashing scp_a=scp.img
Sending 'scp_a' (305 KB)                                OKAY [ 0.000s]
Writing 'scp_a'                                          OKAY [ 0.018s]
Finished. Total time: 0.098s
flashing ccu_a=ccu.img
Sending 'ccu_a' (146 KB)                                OKAY [ 0.016s]
Writing 'ccu_a'                                          OKAY [ 0.016s]
Finished. Total time: 0.101s
flashing sspm_a=sspm.img
Sending 'sspm_a' (541 KB)                                OKAY [ 0.012s]
Writing 'sspm_a'                                         OKAY [ 0.031s]
Finished. Total time: 0.268s
flashing mcupm_a=mcupm.img
Sending 'mcupm_a' (436 KB)                                OKAY [ 0.012s]
Writing 'mcupm_a'                                         OKAY [ 0.022s]
Finished. Total time: 1.143s
flashing cam_vpu1_a=cam_vpu1.img
Sending 'cam_vpu1_a' (1963 KB)                            OKAY [ 0.050s]
Writing 'cam_vpu1_a'                                     OKAY [ 0.078s]
Finished. Total time: 1.810s
flashing cam_vpu2_a=cam_vpu2.img
Sending 'cam_vpu2_a' (4114 KB)                            OKAY [ 0.094s]
Writing 'cam_vpu2_a'                                     OKAY [ 0.172s]
Finished. Total time: 0.516s
flashing cam_vpu3_a=cam_vpu3.img
Sending 'cam_vpu3_a' (237 KB)                            OKAY [ 0.000s]
Writing 'cam_vpu3_a'                                     OKAY [ 0.016s]
Finished. Total time: 0.110s
flashing apusys_a=apusys.img
Sending 'apusys_a' (1824 KB)                            OKAY [ 0.047s]
Writing 'apusys_a'                                       OKAY [ 0.078s]
Finished. Total time: 0.310s
flashing lk_a=lk.img
Sending 'lk_a' (1381 KB)                                OKAY [ 0.031s]
Writing 'lk_a'                                           OKAY [ 0.062s]
Finished. Total time: 0.188s
flashing boot_a=boot.img
Sending 'boot_a' (65536 KB)                            OKAY [ 5.351s]
Writing 'boot_a'                                         OKAY [ 2.572s]
Finished. Total time: 7.986s
flashing vendor_boot_a=vendor_boot.img
Sending 'vendor_boot_a' (65536 KB)                      OKAY [ 1.470s]
Writing 'vendor_boot_a'                                  OKAY [ 2.556s]
Finished. Total time: 4.057s
flashing init_boot_a=init_boot.img
Sending 'init_boot_a' (8192 KB)                        OKAY [ 0.943s]
Writing 'init_boot_a'                                   OKAY [ 0.328s]
Finished. Total time: 2.124s
flashing dtbo_a=dtbo.img
Sending 'dtbo_a' (8192 KB)                              OKAY [ 0.779s]
Writing 'dtbo_a'                                         OKAY [ 0.328s]
Finished. Total time: 1.169s
flashing tee_a=tee.img
Sending 'tee_a' (2241 KB)                                OKAY [ 0.052s]
Writing 'tee_a'                                          OKAY [ 0.094s]
Finished. Total time: 0.177s
flashing logo_a=logo.img
Sending 'logo_a' (3026 KB)                              OKAY [ 0.078s]
Writing 'logo_a'                                         OKAY [ 0.125s]
Finished. Total time: 0.312s
flashing super=super.img
Sending sparse 'super' 1/7 (262140 KB)                  OKAY [ 19.748s]
Writing 'super'                                          OKAY [ 10.241s]
Sending sparse 'super' 2/7 (244500 KB)                  OKAY [ 5.703s]
Writing 'super'                                          OKAY [ 9.579s]
Sending sparse 'super' 3/7 (262140 KB)                  OKAY [ 5.866s]
Writing 'super'                                          OKAY [ 10.262s]
Sending sparse 'super' 4/7 (246448 KB)                  OKAY [ 5.494s]
Writing 'super'                                          OKAY [ 9.649s]
Sending sparse 'super' 5/7 (262140 KB)                  OKAY [ 5.857s]
Writing 'super'                                          OKAY [ 10.242s]

```

```
Sending sparse 'super' 6/7 (262140 KB)          OKAY [  5.895s]
Writing 'super'                                OKAY [ 10.245s]
Sending sparse 'super' 7/7 (54904 KB)          OKAY [  1.235s]
Writing 'super'                                OKAY [  2.141s]
Finished. Total time: 112.298s
Flashing userdata=userdata.img
Sending 'userdata' (16580 KB)                  OKAY [  0.377s]
Writing 'userdata'                            OKAY [  0.675s]
Finished. Total time: 1.114s
Rebooting                                     OKAY [  0.000s]
Finished. Total time: 0.000s

D:\VIA_ARTiGO_A5000_Android_13.0_EVK>
```

Step 13

Unplug the AC-to-DC power adapter to power off the VIA ARTiGO A5000 system.

Step 14

Unplug the Micro USB cable, and plug in the AC-to-DC power adapter. The VIA ARTiGO A5000 system will automatically power on.

When the boot process has completed, you will see the Android 13.0 desktop.

3. Hardware Functions

This section explains how to enable and test the hardware functions precompiled in the VIA ARTiGO A5000 Android 13.0 EVK.

3.1 Enabling ADB Debugging

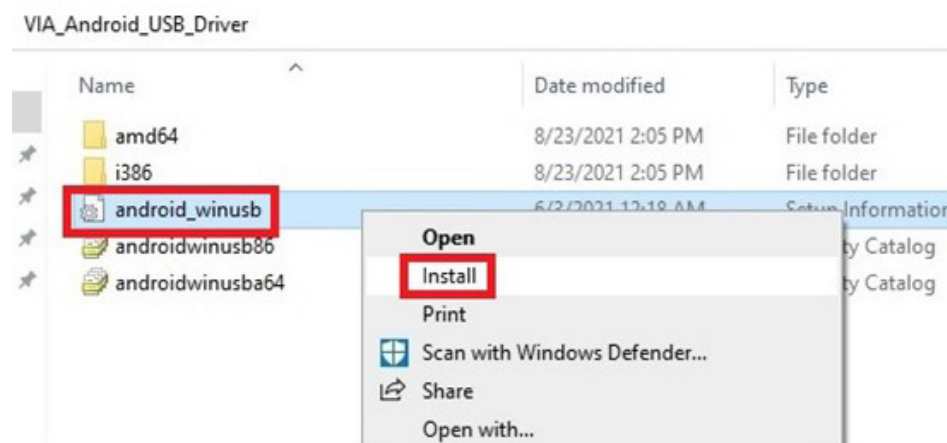
Follow the steps below to enable ADB debugging:

Step 1

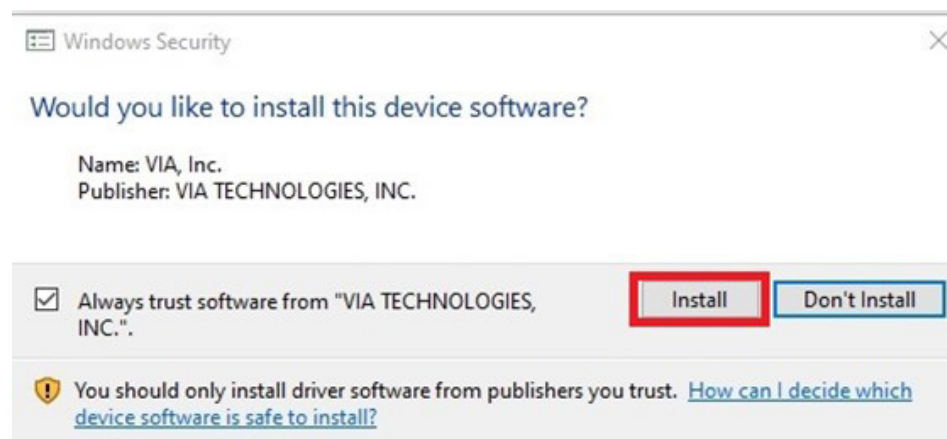
Prepare the "fastboot tool" and install the "VIA USB driver" into your Windows 10 host machine.

To get the "fastboot tool" for Windows, please refer to the "SDK Platform Tools release notes" chapter on the Android developer website <https://developer.android.com/studio/releases/platform-tools>.

To install the "VIA USB driver", right-click "android_winusb" and select "Install".



Then click "Install" when the installer opens.



When the installer finishes, it will show a confirmation message "The operation completed successfully".

Step 2

Connect the Windows 10 host machine and the VIA ARTiGO A5000 through the Micro USB 2.0 port using the Micro USB cable.



Micro USB 2.0 port diagram

Step 3

Power on the VIA ARTiGO A5000 system to initiate the boot process.

Step 4

When the VIA ARTiGO A5000 system has completed booting, use the following command to open ADB debugging:

```
D:\platform-tools>adb shell
```

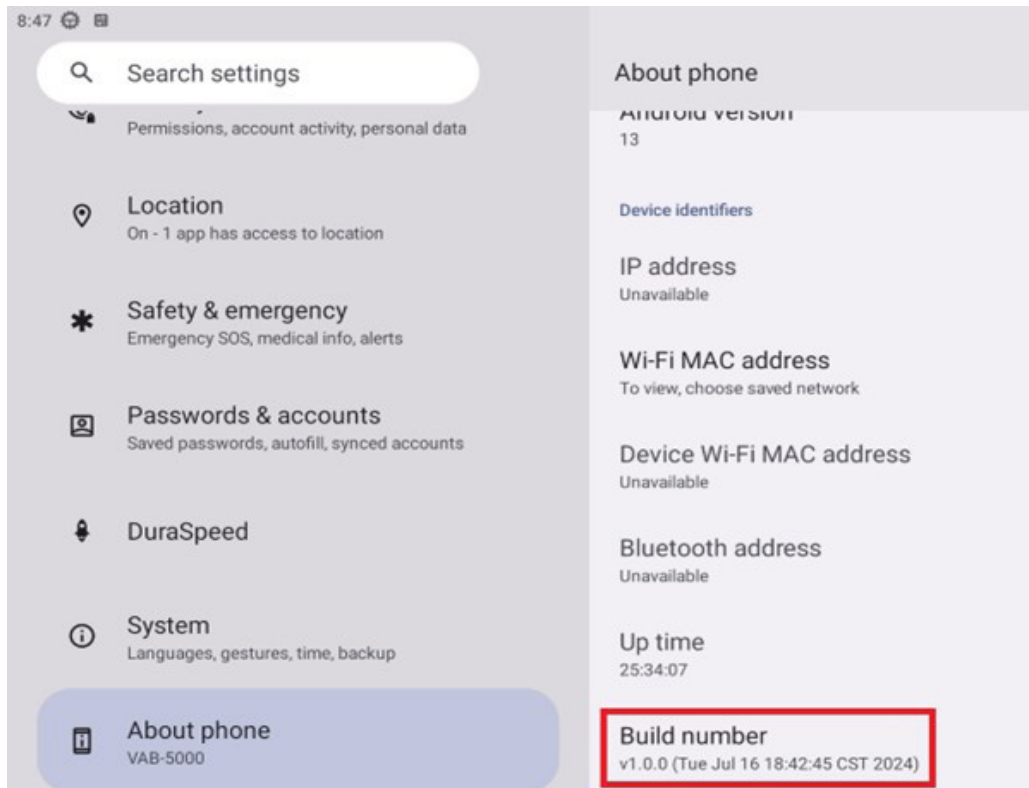
3.2 Changing the Kernel Debug Level

To disable the kernel messages, modify the debug level using the following command:

```
onsole:/ # su
console:/ # echo 3 > /proc/sys/kernel/printk
```

3.3 Checking the BSP Version

To check the BSP version, navigate to "Settings > About phone" and check the "Build number".



3.4 DVFS

To verify the DVFS (Dynamic Voltage Frequency Scaling) function and list all the supported features, use the following commands:

```
console:/ # ls -l /sys/devices/system/cpu/cpu0/cpufreq/
total 0
-r--r--r-- 1 root root 4096 2023-07-11 13:43 affected_cpus
-r----- 1 root root 4096 2023-07-11 13:43 cpuinfo_cur_freq
-r--r--r-- 1 root root 4096 2023-07-11 13:43 cpuinfo_max_freq
-r--r--r-- 1 root root 4096 2023-07-11 13:43 cpuinfo_min_freq
-r--r--r-- 1 root root 4096 2023-07-11 13:43 cpuinfo_transition_latency
-r--r--r-- 1 root root 4096 2010-01-01 00:00 related_cpus
-r--r--r-- 1 root root 4096 2010-01-01 00:00 scaling_available_frequencies
-r--r--r-- 1 root root 4096 2023-07-11 13:43 scaling_available_governors
-r--r--r-- 1 root root 4096 2023-07-11 13:43 scaling_cur_freq
-r--r--r-- 1 root root 4096 2023-07-11 13:43 scaling_driver
-rw-rw---- 1 system system 4096 2023-07-11 11:20 scaling_governor
-rw-rw---- 1 system system 4096 2010-01-01 00:00 scaling_max_freq
-rw-rw-r-- 1 system system 4096 2010-01-01 00:00 scaling_min_freq
-rw-r--r-- 1 root root 4096 2023-07-11 13:43 scaling_setspeed
drwxr-xr-x 2 root root 0 2023-07-11 13:43 schedutil
drwxr-xr-x 2 root root 0 2010-01-01 00:00 stats
console:/ #
```

To check the supported and current CPU frequency, use the following commands:

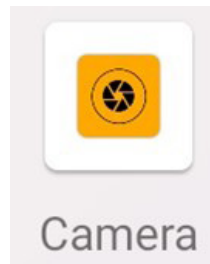
```
:~# cat /sys/devices/system/cpu/cpu0/cpufreq/scaling_available_frequencies
2000000 1903000 1807000 1710000 1614000 1517000 1421000 1325000 1228000 1132000 1035000
939000 842000 746000 650000 500000
:~# cat /sys/devices/system/cpu/cpu0/cpufreq/cpuinfo_cur_freq
1614000
```

3.5 Display

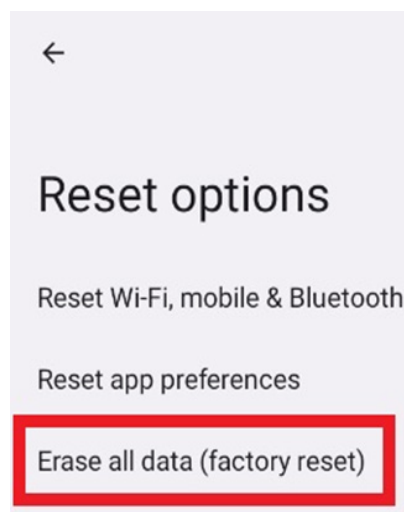
There is no need to set the display device. If an HDMI display or LVDS panel is connected, the corresponding display/panel output will be automatically enabled after booting.

3.6 Camera

If an optional AHD camera module was connected correctly to the VIA ARTiGO A5000 system before booting the VIA ARTiGO A5000 system, a "Camera" APK can be found on the Android desktop. Click to open it and test the camera functions.



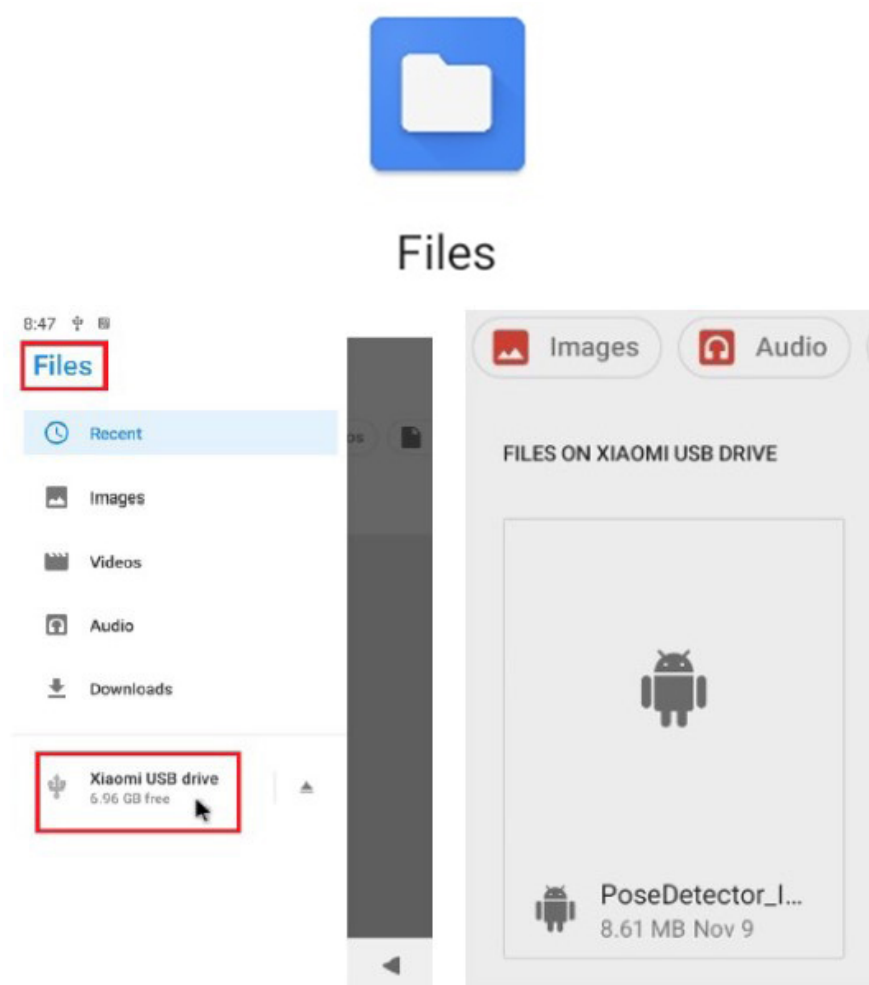
If an optional AHD camera module was connected correctly before booting the VIA ARTiGO A5000 system, but there is no "Camera" APK on the Android desktop, navigate to "Settings > System > Reset options" and click "Erase all data (factory reset)" to reboot. The "Camera" APK will be generated after the system reboots.



3.7 MTK NeuroPilot AI APU Hardware Acceleration

We recommend running the "PoseDetector_Image.apk" sample program for testing MTK NeuroPilot AI APU hardware acceleration. To install the program, follow the steps below:

1. Copy the "PoseDetector_Image.apk" file to a USB drive and connect the USB drive to the VIA ARTiGO A5000 system.
2. Next, navigate to "Files" and click on the USB drive's name to find "PoseDetector_Image.apk" as shown below. Double-click the program.



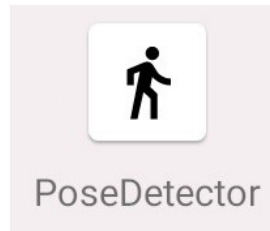
3. When the program opens, it will display a dialog box as shown below. Click "Continue" to confirm.

Your phone and personal data are more vulnerable to attack by unknown apps. By installing this app, you agree that you are responsible for any damage to your phone or loss of data that may result from its use.

CANCEL

CONTINUE

4. After installation, double-click "PoseDetector" to run the program.



5. Check the Pose Detection inference time on the bottom left corner of the program:
 - If the inference time is less than 200ms, MTK NeuroPilot AI APU hardware acceleration is enabled and running correctly.
 - If the inference time is greater than 200ms, MTK NeuroPilot AI APU hardware acceleration is disabled.





Taiwan Headquarters

1F, 531 Zhong-zheng Road,
Xindian Dist., New Taipei City 231
Taiwan

Tel: 886-2-2218-5452
Fax: 886-2-2218-9860
Email: embedded@via.com.tw



USA

940 Mission Court
Fremont, CA 94539,
USA

Tel: 1-510-687-4688
Fax: 1-510-687-4654
Email: embedded@viatech.com



Japan

3-15-7 Ebisu MT Bldg. 6F,
Higashi, Shibuya-ku
Tokyo 150-0011
Japan

Tel: 81-3-5466-1637
Fax: 81-3-5466-1638
Email: embedded@viatech.co.jp



China

Tsinghua Science Park Bldg. 7
No. 1 Zongguancun East Road,
Haidian Dist., Beijing, 100084
China

Tel: 86-10-59852288
Fax: 86-10-59852299
Email: embedded@viatech.com.cn



Europe

Email: embedded@via-tech.eu