



Quick Start Guide

Beta AI/ML AppKit

Version 1.2

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Introduction

This user guide will take you through the steps of initial setup to power up the Ensemble Beta AI/ML AppKit and observe the factory facial detection model results on the display.

We will then go through the possible options for setting up options for things such as access to one of the user UART ports of the device, where to connect a JTAG debugger, and how to use the optional camera position connector.

The beta AI/ML AppKit contains an Ensemble E7 device with a Cortex M55_HE high efficiency processor and a M55_HP high performance processor, both of which contain an Ethos U55 micro-NPU, or Neural Processor Unit, and two Cortex-A32 application processors. The M55_HE has a 128 MAC wide U55 NPU and the M55_HP has a 256 MAC wide U55 NPU associated with it.

The E7 Family MCU device also contains large on-chip RAM and non-volatile memory, as well as analog and digital peripherals supporting wired connectivity. The range of computational performance, power efficiency, and their rich peripheral set make them suitable for a wide range of embedded IoT applications.

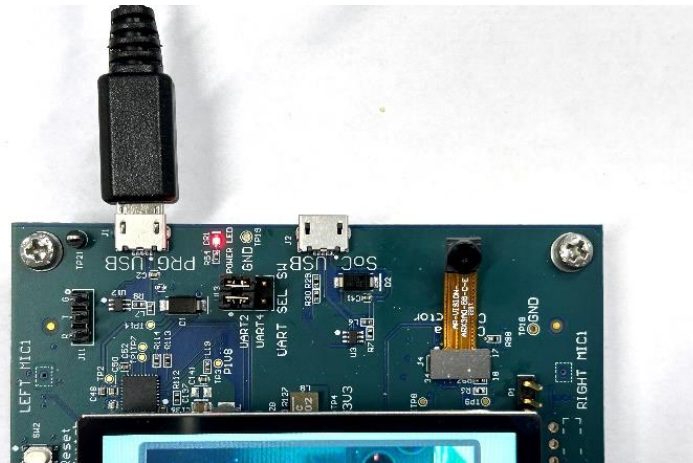
Details of the E3 MCU architecture are discussed in the white paper [“Fusion Processors System Architecture Introduction”](#).

Target Setup Requirements

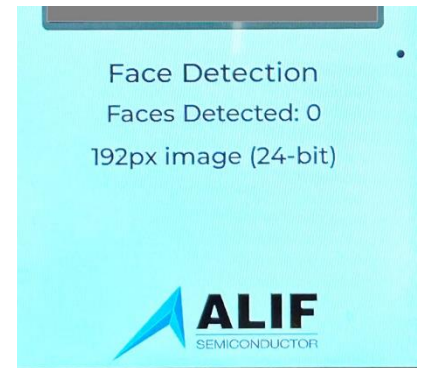
- Beta AI/ML AppKit
- Micro-USB Cable (included in the kit)
- Windows PC with terminal emulation software
- JTAG debugger such as Segger J-Link or Arm ULINKpro (optional for program debugging)

Booting the AppKit

To power your AppKit, connect a USB cable from your computer to the “PRG USB” micro-USB socket on the board.

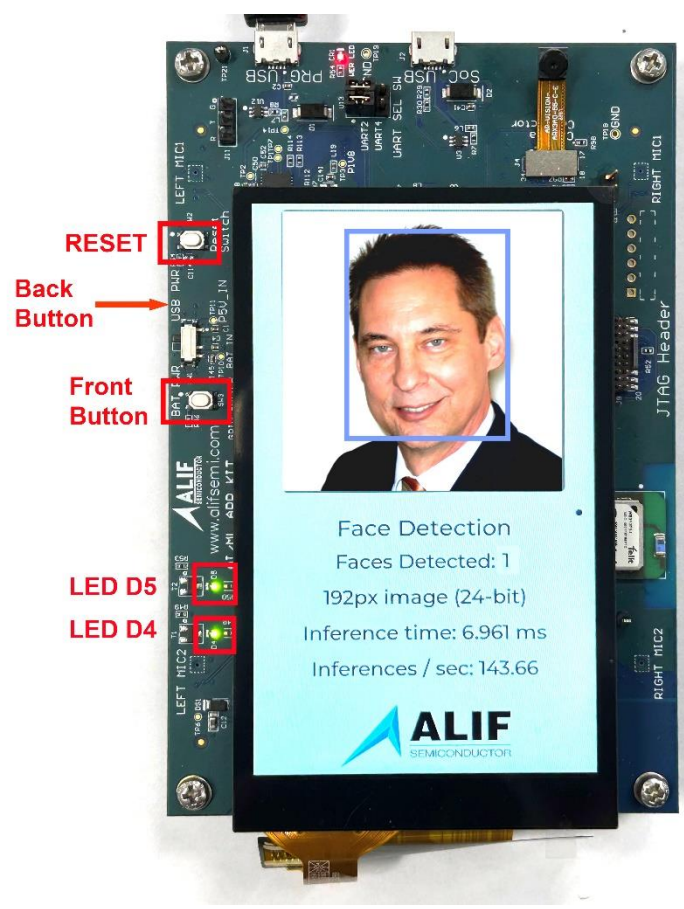
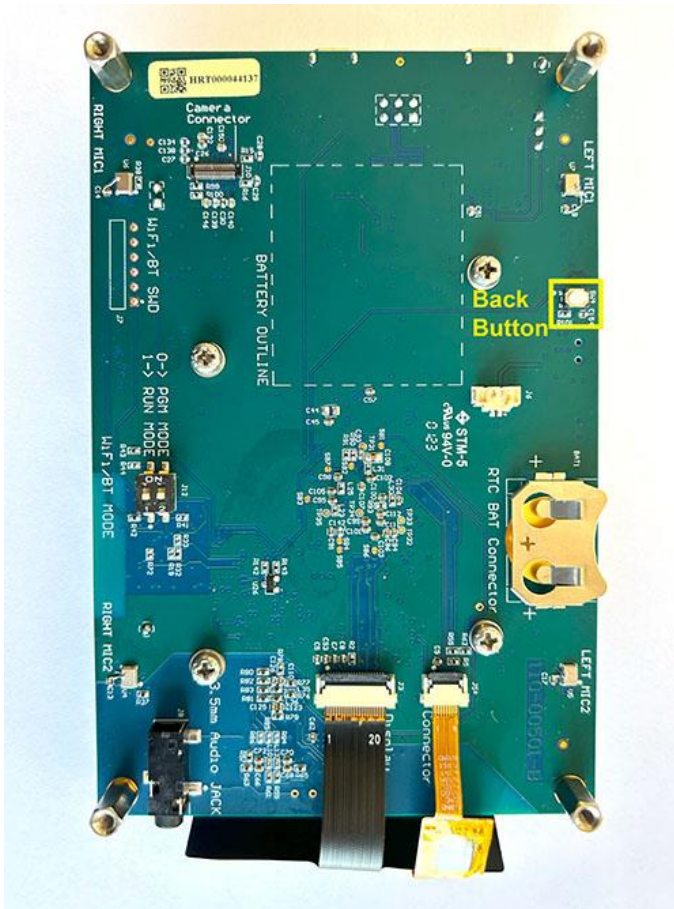


Upon powering the board, a boot message will be displayed and then the default face detection application will start with the message shown to the right.



To perform a single detection inference, press the front button.

To start a continuous inference process, press the back button. Pressing it again will stop inferencing.



Install Alif Security Toolkit

The next step is to install the version 65 release of the Alif Security Toolkit (SETOOLS). Refer to the Alif Security Toolkit Quick Start Guide [\[click here\]](#) for installation instructions.

The Alif Security Toolkit Version 0.65.0 is available from the Alif Semiconductor web site at:

Windows ZIP format: <https://alifsemi.com/download/ALFTK006>

Linux tar format: <https://alifsemi.com/download/ALFTK005>

Your Beta AI/ML AppKit has been provisioned at the factory with Version 0.65.0 firmware, so it is not necessary to update the device firmware before proceeding.

Determining UART Port Assignments

The Beta AI/ML AppKit has a 2-channel USB UART adapter on the board. It is connected to the SEUART that is used by the SETOOLS applications to query device status and program images into the MRAM. The other channel can be connected to either the UART2 or the UART4 general-purpose UART ports of the E3 device.

SETOOLS Port Discovery

The first time you execute one of the SETOOLS scripts you will be prompted for the required serial port. When the ports are presented, just enter the port name and press [ENTER].

This port data is saved in a local configuration file (isp_config_data.cfg). The next time a command is invoked and this configuration file is present, it will use the parameters from this file.

To override this option simply use the -d option:
This will force a re-discovery of the Serial ports.

```
c:\app-release-exec-65>maintenance -d
COM ports detected = 2
-> COM6
-> COM8
Enter port name:COM6
[INFO] COM6 open Serial port success
[INFO] baud rate 100000

Available options:

1 - Device Control
2 - Device Information
3 - MRAM
4 - Utilities
5 - Setting capabilities

Select an option (Enter to exit):
```

UART Errors

There is only one SE-UART on the device. When running the SETOOLS, please ensure you have no other Tera term or putty sessions using the same SE-UART. The following shows the output if the SE-UART is already being used by another program:

```
c:\app-release-exec-65>maintenance -d
COM ports detected = 2
-> COM6
-> COM8
Enter port name:COM6
[ERROR] openSerial could not open port 'COM6': PermissionError(13, 'Access is denied.', None, 5)
[ERROR] isp openSerial failed for COM6

c:\app-release-exec-65>
```

Determining SEUART Port Assignment



The SEUART port will usually appear as the lowest numbered port available from the USB UART adapter chip on the board but depending on other USB port assignments in the system, it sometimes is the higher numbered port.

With the SEUART connected to your PC, open a Windows command prompt and navigate to the SETOOLS Version 0.65.0 release directory.

Run “maintenance -d” and select the lower numbered COM port.

Then, from the available options in the maintenance program menu:

1. select “4 – Utilities”
2. select “1 – Terminal Mode”
3. press the RESET button

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```
c:\app-release-exec-65>maintenance -d
COM ports detected = 2
-> COM6
-> COM8
Enter port name:COM6
[INFO] COM6 open Serial port success
[INFO] baud rate 100000

Available options:

1 - Device Control
2 - Device Information
3 - MRAM
4 - Utilities
5 - Setting capabilities

Select an option (Enter to exit): 4

Available options:

1 - Terminal mode
2 - Get SERAM metrics

Select an option (Enter to return): 1
[TERMINAL] Ctrl-C to exit
|
```

If you are connected to the SEUART port, you will see a log file as shown below.

```
[TERMINAL] Ctrl-C to exit
/

SEROM A1 FUSION RELEASE v0.24.3
SEPCTL

SES A1 EVALUATION_BOARD SE_FW_0.65.000_DEV v0.65.0 Jan 27 2023 00:48:13
[SES] Device ID = 0x0000A100
[SES] PLL code version 0.0.7
[SES] LCS=1
[SES] Device key pair generation returned 0
[SES] CM0+ frequency is 100 MHz
[SES] System partition address 0x80580000
[DEV] Wounding Data: 0x00C0FFFB
[SES] System device configuration processed (0x00000000) BL_STATUS_OK
[SES] Application device configuration processed (0x00000000) BL_STATUS_OK
[SES] System partition processed (0x00000000) BL_STATUS_OK
[SES] Application partition processed (0x00000000) BL_STATUS_OK
[SES] CPU cores are booted

[SES] FC:Rgn - 7:1 7:2 7:3 7:4 7:5 8:1 8:2 8:3 8:4 8:5 13:0 13:1 13:2
[SES] Protected areas:
      0x80580000 - 0x805FFFFF

+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| Name | CPU | Store Addr | Obj Addr | Dest Addr | Boot Addr | Size | Version | Flags | Time (ms)|
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| DEVICE | CM0+ | 0x805C1EE0 | 0x805C14E0 | ----- | ----- | 672 | 0.5.0 | u V | 10.60 |
| SERAM0 | CM0+ | ----- | 0x000000E0 | ----- | ----- | 70080 | 1.0.0 | ----- | 0.00 |
| SERAM1 | CM0+ | ----- | 0x00020AE0 | ----- | ----- | 70080 | 1.0.0 | ----- | 0.00 |
| HE_DBG | M55-HE | 0x805C2B80 | 0x805C2180 | 0x60000000 | 0x60000000 | 2256 | 1.0.0 | uLVB | 9.99 |
| OD_E43GB | M55-HP | 0x80001000 | 0x8057F5C0 | ----- | 0x80001000 | 1018272 | 1.0.0 | u VB | 529.75 |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
Legend: (u)(C)ompressed, (L)oaded, (V)erified, (s)kipped verification, (B)ooted, (E)ncrypted, (D)eferral

[SES] os Kernel V10.4.2 (Tickless)
[SES] Main Task - looping forever...
```

If you see no output, you should exit the maintenance program terminal mode by pressing Ctrl-C, then press RETURN twice to exit maintenance mode.

Then rerun the process while selecting the higher numbered COM port and you should see the SEUART boot screen shown above. The tools will remember the last port selection used, so once you have the correct port for the SEUART you will not have to go back through port discovery.

Optional Connections

UART Connections:

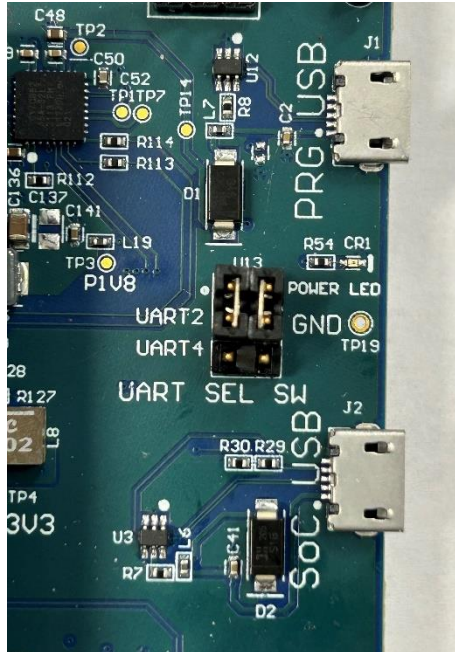
If an example application you are going to use specifies the need for additional UART connections, the instructions below will show you how to connect to UART2 or UART4.

When a micro-USB cable is plugged into the “PRG USB” port (the port closest to the corner of the board), power is applied to the board and there is access to 2 UART ports. One of these will be the SEUART that is used to access the Secure Enclave to get device status and to program application images into the non-volatile MRAM of the device. You determined how to select the SEUART port in a previous section.

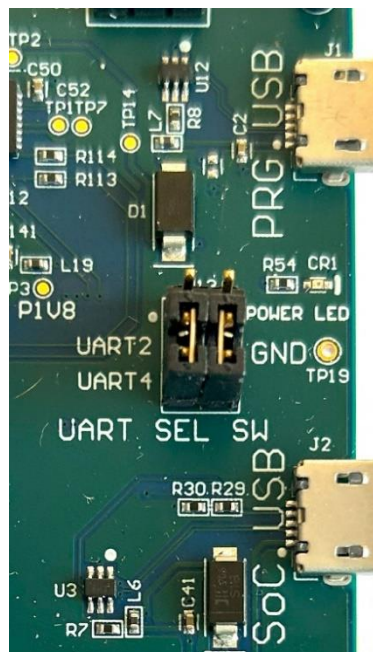
The other port is either the UART2 or UART4 general purpose peripheral port depending on jumper settings for header pins labeled “UART SEL SW” in between the 2 micro-USB sockets.

Putting jumpers on the two pairs of pins closer to the PRG USB socket selects UART2, while putting jumpers on the two pairs of pins closer to the SoC USB socket selects UART4.

UART2 Selection



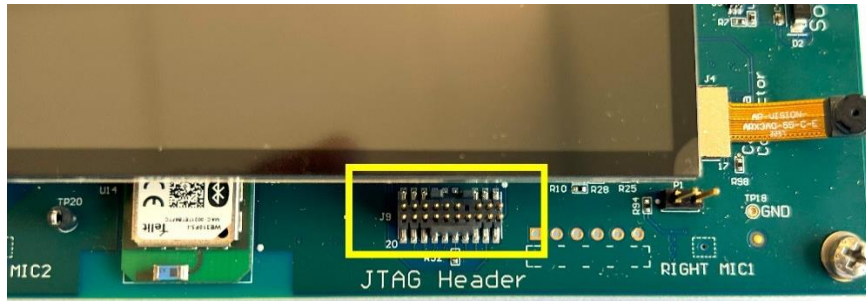
UART4 Selection



The SoC USB connector is connected directly to the USB peripheral output pins of the E3 SoC device and can be used in program development.

JTAG Debugger Connection:

If you are doing program development and need to do interactive debugging, you can connect a debugger such as the Segger J-Link or Arm ULINKpro to the 19-pin JTAG connector. That connector is on the right side of the board as viewed with the camera at the top. The keyway for the tab on the JTAG connector is on the side of the connector closest to the display.

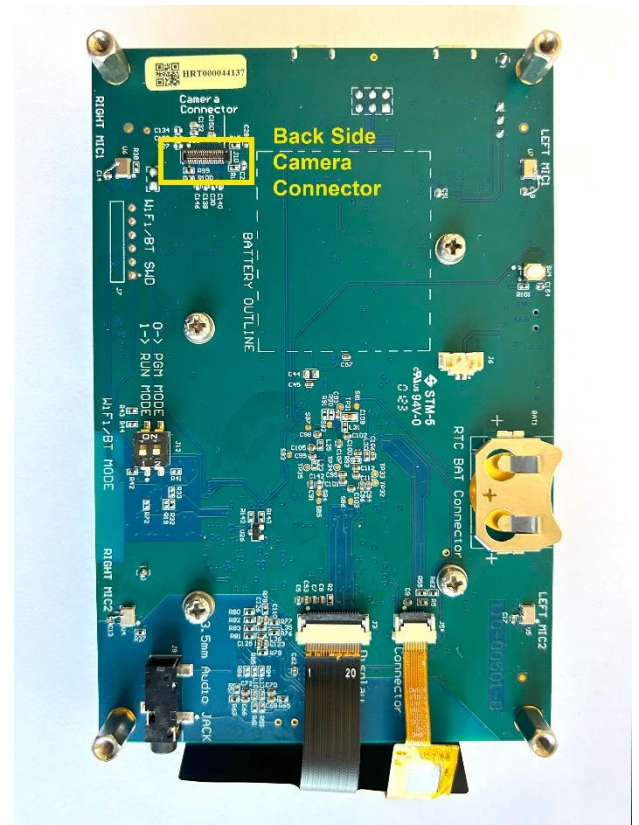


Back Side Camera Connection:

For applications requiring a back-side camera that views in the direction away from the person holding the board, there is an alternate camera connector on the back side of the board.

You can remove the camera from the front-side “selfie mode” connector and plug it into the back side connector.

The two connectors are wired in parallel and only one camera can be connected to the board at one time.



You have now updated your internal system image and can proceed with design and debug.

A complete step-by-step tutorial on doing bare metal design is available in the documents
 “Getting Started with GNU/VSCODE/J-Link User Guide” [\[click here\]](#) or
 “Getting Started With Bare Metal Design Using Arm DS User Guide” [\[click here\]](#)

Pre-Built Demos

There is an archive of pre-built demo images and the files necessary to create a loadable image for the Beta AppKit. With these files, you can easily other demos for your Beta AppKit.

The archive is available at <https://alifsemi.com/download/AAPK0001>

Download and open the archive and install the files according to the directions below.

First, note where you installed your Alif Security Toolkit (SETOOLS). The recommended directory is C:\app-release-exec but it can be in another location. We will refer to that directory at <SETOOLS_root>.

Open a file explorer window in <SETOOLS_root>

Open the archive into another file explorer window.

Copy all the files ending in “.bat” plus the file “maintenance_fast_erase.txt” to <SETOOLS_root>

Navigate to <SETOOLS_root>/build/config and copy all files from the archive ending in “.json” to that directory.

Navigate to <SETOOLS_root>/build/images and copy all files from the archive ending in “.bin” to that directory.

To load a demo, open a command prompt window and go to the <SETOOLS>_root directory

Execute the batch file for the desired demo according to the following table:

Batch File	Demo
demo_obj_detect.bat	Object detection (default factory app)
demo_ic_kws.bat	Object classification controlled by keyword spotting
demo_LVGL_Helium.bat	LVGL graphics benchmarks with Helium acceleration
demo_music_player.bat	Music player display demo (no music output)
demo_printer.bat	Printer interface demo

Document History

Version	Change Log
1.0	Initial public release
1.1	Revised list of pre-built demos
1.2	Minor edits to introduction