Proprietary Notice

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1 Introduction

This booklet introduces the *ARM Evaluation Board* (AEB-1).

The AEB-1 has been developed as a fast introduction to ARM products. It allows you to quickly familiarize yourself with the tools, environments, and products available from ARM, and to work through the development stages required to build an Embedded System.

To assist you, the AEB-1 package includes several example applications for you to compile, link, download, debug, and extend.

As well as this document, the AEB-1 package contains:

- an ARM *Software Development Toolkit* (SDT) v2.50 CD-ROM (evaluation version)
- an ARM Evaluation Board Tools and Documentation CD-ROM
- a 9-pin null-modem RS232 serial cable
- the ARM Evaluation Board
- a 9V power adapter.

CAUTION:

If you already have a full version of the ARM Software Development Toolkit (SDT) do not install the SDT evaluation CD-ROM supplied with the AEB-1. Please refer to the Documentation section and Development Support section on the ARM website.

1.1 ARM Software Development Toolkit CD-ROM

The CD-ROM contains a free evaluation copy of the latest version of the ARM Evaluation SDT. The ARM Evaluation SDT is fully functional but has a 60-day timeout. It runs on Microsoft Windows NT 4.0 and Microsoft Windows 95/98.

1.2 ARM Evaluation Board Tools and Documentation CD-ROM

This CD-ROM contains an assortment of tools, documentation and example application source code specific to the AEB-1 board. The contents of this CD-ROM include the following PDF documents:

- This document, the *ARM Evaluation Board Welcome Guide* (ARM DGI 0005)
- *ARM AEB User Guide* (ARM DUI 0091)
- Schematics for the AEB-1 (Rev. C) board
- *Sharp LH77790A/B Embedded Microcontroller User's Guide v1.0*.

2 System Requirements

The AEB-1should be connected to a PC running the ARM Evaluation SDT. The minimum host PC requirements are:

- 100MHz or faster Pentium, or similar PC
- Microsoft Windows NT 4.0 or Microsoft Windows 95/98
- 16MB of RAM
- 25MB available hard disk space
- CD-ROM drive
- Serial port.

3 Setting-up the Software and Hardware

3.1 Installing the AEB tools and documentation

To install the AEB tools and documentation:

1. Place the AEB Tools and Documentation CD-ROM into the CD-ROM drive.
2. Bring up a directory view of the AEB Tools and Documentation CD-ROM.
3. Double-click on the setup program (`setup.exe`). The ARM install banner is displayed.
4. Follow the prompts presented to complete the installation procedure.
5. Install the ARM Evaluation SDT as described in *Installing the SDT evaluation software*.

3.2 Installing the SDT evaluation software

To install the ARM Evaluation SDT:

1. Place the SDT CD-ROM into the CD-ROM drive.
2. Bring up a directory view of the SDT CD.
3. Double-click on the setup program (`setup.exe`). The ARM install banner is displayed.
4. Select the drive and directory where the software is to be installed. For example:
   `c:\ARM250.`
5. Follow the prompts presented to complete the installation procedure.

When the installation is complete, you will have a working evaluation version of the ARM SDT.

Note *Make sure that each command has completed before issuing the next one.*

Although the AEB-1 comes with free evaluation copy of the ARM SDT, experienced engineers may like to build a GNU tool chain using their favorite GNU source. For details of where one GNU source can be found please view the Development Support area of the ARM web site. Please see ***10 References*** on page 11.

A free patch is provided on the AEB Tools and Documentation CD-ROM which converts an ARM-compatible GNU tool chain so that it works with the Angel debug monitor.

Note *It is not possible for ARM to test the patch with every available GNU source which is available as, by definition, the code and variants are freely available in the public domain.*

Describing how to set up a GNU tool chain is beyond the scope of this document.

3.3 Installing the AEB-1 hardware

The AEB-1 comes with a 9-pin to 9-pin serial cable. If you have a 25-pin connector on your PC, a 9-pin to 25-pin male to female straight-through adapter is required.

To install the AEB-1 hardware:

1. Connect the null modem cable to the evaluation board.
2. Connect the other end of the cable to the host PC, making a note of the serial port that is used.
3. Connect the power adapter to the power connector on the evaluation board (9V nominal, centre pin positive).
4. Connect the power adapter to the mains power socket. The red LED power indicator D5 lights up.
5. Press the reset button on the evaluation board. The four general purpose LEDs should flicker, while the green LED D1 remains on. This indicates the board has been initialized and is working correctly.

Please refer to the *SDT User Guide*, the *AEB User Guide*, and the *Multi-ICE User Guide* for further information.

Note *The board must be disconnected from the power adapter before connecting any device to the JTAG port.*

3.4 Initialization information

Some code is needed to initialize the board at start time. For boards based on the ARM processor, this task is performed by the Angel debug monitor, which initializes the board and communicates with the host PC.

For the AEB-1, Angel has already been loaded into the flash memory. When the AEB-1 is switched on (or reset) Angel initializes the board. Once the initialization is successful, the green LED on the board remains lit, indicating that the AEB-1 is ready for download.

4 Building the Sample Application

The following procedure describes how to build the sample application, using the *ARM Project Manager* (APM).

1. Start APM.
2. When APM is loaded, select **Open** from the **File** menu option. The Open dialog is displayed.
3. Find the Pascal's triangle example, which is located in the directory in which you installed the AEB Tools and Documentation, for example:

   `c:\Aeb\examples\pascal`
4. Select the project file, `pascal.apj`, from the `pascal` directory.
5. Press the **Open** button. A project window labelled ARM Executable Image is displayed.
6. In the ARM Executable Image project window, double-click on the **ARM Executable Image** project. Two project variants, **Debug** and **Release** are displayed.
7. Double-click on the **Debug** variant.

   The **Sources**, **IncludedFiles**, **Objects**, **SubProjects**, **Libraries**, **Image**, and **Miscellanea** partitions are displayed.
8. Select **Force Build pascal.apj "Debug"** from the **Project** menu. The Pascal's triangle example is rebuilt. You can now download the Pascal's triangle debug image to the AEB-1 board.

For more information about the APM, refer to the online help provided with the software, or to the *ARM SDT User Guide* (ARM DUI 0040).

5 Downloading the Image

When you download an image, you transfer the debug image from your host PC to the AEB-1. The image can then be executed under the control of the *ARM Debugger for Windows* (ADW).

APM should be already up and running after building the image as described in ***4 Building the Sample Application*** on page 5.

From APM:

1. Press the reset button on the AEB-1 before downloading the image.
2. Select **Debug pascal.apj** from the **Project** menu to download the Pascal's triangle example image. This launches ADW.
3. When ADW is loaded, select **Configure Debugger** from the **Options** menu.

   The Configure Debugger dialog is displayed.
4. To use the Angel debug protocol for communication with the AEB-1 board, change the **Target Environment** to **Remote_A**.
5. Press the **Configure** button.The Angel Remote Configuration dialog is displayed.
6. Set the **Serial Line Speed** to 9600 baud.
7. Verify that the Port is set to the correct port (as set in ***3 Setting-up the Software and Hardware*** on page 3).
8. If you are using an EmbeddedICE interface make sure that you configure the debugger for ARM7DI by selecting **Configure EmbeddedICE** from the **Options menu** and then selecting **ARM7DI**. Multi-ICE configures automatically.

You can now run the Pascal's triangle example on the AEB-1.

6 Running the Sample Application

To run an image on the AEB-1 under ADW, you need to have downloaded the image first. You also need to reset the AEB-1 and load an image each time you want to execute an application.

The ADW should already be up and running after downloading the Pascal's triangle example described in ***5 Downloading the Image*** on page 6.

From ADW:

1. Select **Go** from the **Execute** menu. The program stops at the `main()`C function.
2. Select **Go** again. The LEDs on the AEB-1 flash once.
3. The console window will show:

```
1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
```

7 Debugging an Application

When you run the downloaded image from ADW, you have a full range of debug functionality to use in debugging including breakpoints, watchpoints, examination of registers and variables.

To debug the sample application, follow the download procedure again (see ***5 Downloading the Image*** on page 6). Then from ADW:

1. Select **Go** from the **Execute** menu. The program stops at the `main()`C function.
2. Scroll to the `pascal_triangle` function in the **Executing pascal.c** window.
3. Click on the line containing `for (j=1;J<depth;j++){`.
4. Select **Toggle Breakpoint** from the **Execute** menu.
5. The `for (j=1;J<depth;j++){` line is highlighted in red. At this point the AEB-1 board shows two LEDS active.
6. Select **Go** again from the **Execute** menu. The debugger executes all the lines of code between the current point and the breakpoint. Once a breakpoint is encountered, the Debugger halts the program.
7. Select **Local** from the **Variable** submenu on the **View** menu. All the local variables in the `pascal_triangle` function are displayed.
8. Select **Go** from the **Execute** menu. The program continues normally to completion.

For full details about debugging please refer to the *ARM SDT User Guide*.

8 Further Information

An email list server is provided by ARM so that you can share information with other AEB-1 users. To subscribe, send an email to `subscribe-aeb@arm.com`. The list server will reply, welcoming you to the AEB-1 email group. You can query other AEB-1 users by sending email to `aeb@arm.com`.

To unsubscribe, send an email to `unsubscribe-aeb@arm.com`. This will take you off the AEB-1 email list.

Additional information on APM and ADW is available in the online help provided with the ARM SDT.

9 Warranty Information

The AEB-1 has been sold without any warranty, including without limiting the implied warranties of merchantability, non-infringement, and fitness for a particular purpose. The AEB-1 is provided without support.

In the case of a faulty component, ARM will replace that item or the complete unit, depending on the severity, up to 60 days from the date of purchase.

The provision in this section shall constitute ARM’s exclusive liability and sole remedy for any and all damages resulting from the use of the AEB-1.

10 References

10.1 ARM documentation

- *ARM AEB User Guide* (ARM DUI 0091)
- *ARM Software Development Toolkit User Guide* (ARM DUI 0040)
- *ARM Software Development Toolkit Reference Guide* (ARM DUI 0041)
- *ARM Multi-ICE User Guide* (ARMDUI 0048)

10.2 Recommended website

- Documentation section and Development Support section on the ARM website: `http://www.arm.com`

10.3 Recommended books

- *ARM Architecture Reference Manual*, edited by Dave Jaggar, ISBN 0-13-736299-4

10.4 Further reading

- *Sharp LH77790A Embedded Microcontroller User's Guide v2.1*
- *ARM System Architecture*, by Steve Furber, ISBN 2-201-40352-8.