MINI-MAX/ARM-C and -E

Single Board Computers

Quick Start Guide

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1 Package Contents

MINI-MAX/ARM-C or -E Micro-controller Board NULL Modem Serial cable 6VDC Power Supply

2 Hardware Setup

1. Place the MINI-MAX/ARM Microcontroller board on a clean, non-conductive surface.

2. Connect the provided 6VDC power supply plug to the power jack on the MINI-MAX/ARM. Do not connect the power supply to the outlet yet.

CAUTION: Do not use a power supply other than one that is supplied or approved by BiPOM Electronics. Use of another power supply voids the warranty and may permanently DAMAGE the board or the computer to which the board is connected !!!

4. Connect the MINI-MAX/ARM to an available serial port on the PC using the supplied serial cable as shown below.

5. Connect the 6VDC power supply to a suitable wall outlet.



3 Software Installation

MINI-MAX/ARM supports various programming languages such as Assembly, C or BASIC.

Virtually any programming package that supports the ARM microcontroller can be used. Additionally, BiPOM offers the popular ARM Development System that consists of

- I Micro-IDE A Windows IDE for microcontroller development
- I GCC (GNUARM) C Compiler, Linker
- I Downloader for MINI-MAX/ARM
- I Project examples for MINI-MAX/ARM

3.1 ARM Development System

3.1.1 Installing ARM Development System

Download ARM Development System from:

http://www.bipom.com/armdev.php

Open the zip file <u>arm7dev.zip</u> and install by running setup.exe.

A Welcome screen will appear:



Click on Next. End User Agreement will appear:

Software	License Agreement X		
æ	Please read the following License Agreement. Press the PAGE DOWN key to see the rest of the agreement.		
END US			
Please r a legal a (the "So software Software terms of by copy laws and	Please read the following End User License Agreement ("EULA") carefully. The EULA is a legal agreement between you the user and BiPOM Electronics for the use of Micro-IDE (the "Software"). This EULA contains the conditions under which you may use the software as well as warranty and liability disclaimers. By installing, copying or using the Software, you agree to be bound by the terms of this EULA. If you do not agree to the terms of this EULA, do not install, copy, or use the Software. This Software is protected by copyright laws and international copyright treaties, as well as other intellectual property laws and treaties. This Software is licensed, not sold.		
For more program	e information about Micro-IDE, see the About box under Help menu in this n. To learn more about BiPOM Electronics and its products, visit		
Do you a will close	accept all the terms of the preceding License Agreement? If you choose No, Setup e. To install Micro-IDE, you must accept this agreement.		
	< <u>B</u> ack <u>Y</u> es <u>N</u> o		

Please read the agreement and click Yes if you wish to continue with installation.

User Information		×
	Please entr You may le size-restrict	er your name, company name and serial number below. ave the serial number field blank to run this software in ed demo mode.
	N <u>a</u> me:	jack
	<u>C</u> ompany:	BIPOM Electronics, Inc.
	<u>S</u> erial:	1
~		
		< <u>B</u> ack <u>N</u> ext > Cancel

Enter your name, company (if applicable) and serial number:

You can enter any Serial Number here in the Serial field. Click Next to continue.

Select the disk location where the software will be installed. Using the default location of c:\bipom\devtools is recommended:

Choose Destination Loc	ation
	Setup will install Micro-IDE in the following folder. To install to this folder, click Next. To install to a different folder, click Browse and select another folder. You can choose not to install Micro-IDE by clicking Cancel to exit Setup.
	Destination Folder C:\bipom\devtools\ <u>Br</u> owse
	< <u>B</u> ack <u>Next</u> Cancel

Click Next. Select the Program Folder where the icons for Micro-IDE will be installed. Default selection is **Micro-IDE** folder.

Select Program Folder		×
Select Program Folder	Setup will add program icons to the Program Folder listed below. You may type a new folder name, or select one from the existing Folders list. Click Next to continue. Program Folders: Micro-IDE Existing Folders: Games GNUARM Google Desktop Google Earth Google Updater Intel(R) Matrix Storage Manager	×
	Maintenance Matrix Multimedia	
		1
	< <u>B</u> ack <u>N</u> ext > Cancel	

Click Next. Micro-IDE will be installed and you will see the progress:



When the installation is complete, you will be given an option to start Micro-IDE now:

Setup Complete	
	Setup has finished installing Micro-IDE on your computer.
	Setup can launch the Read Me file and Micro-IDE. Choose the options you want below.
	U would like to launch Micro-IDE
	Click Finish to complete Setup.
	< <u>B</u> ack Finish

Uncheck the option and click Finish button to finish the installation.

3.1.2 Installing GNU ARM C Compiler

Download GNU ARM C Compiler from:

http://www.bipom.com/armdev_down.php

by clicking on the

GNU ARM C Compiler <version> Free Download

link (where <version> is the latest version number)

Download and run this file and a Welcome screen will appear:



Click on Next. License Agreement will appear:

🚟 Setup - GHUAR		
License Agreement Please read the following important information before continuing.	R	
Please read the following License Agreement. You must accept the terms of this agreement before continuing with the installation.		
GNU GENERAL PUBLIC LICENSE Version 2, June 1991	_	
Copyright (C) 1989, 1991 Free Software Foundation, Inc. 59 Temple Place, Suite 330, Boston, MA 02111-1307 USA Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.		
Preamble		
The licenses for most software are designed to take away your	-	
accept the agreement		
○ I do not accept the agreement		
< <u>B</u> ack <u>N</u> ext >	Cancel	

Please read the agreement. If you wish to continue with installation, select "I accept the agreement" and click on Next.

Now you can select destination location:

Setup - GHUAR	_ 🗆 X
Select Destination Location Where should GNUARM be installed?	R
Setup will install GNUARM into the following folder.	
To continue, click Next. If you would like to select a different folder, click I	Browse.
C:\Program Files\GNUARM	B <u>r</u> owse
At least 105.2 MB of free disk space is required.	
< <u>B</u> ack	Cancel

Using the default location of C:\Program Files\GNUARM is recommended. Click on Next to continue.

On the next page, you can select components to install. Just keep the default settings if you don't know which to select:

ANN Setup - GHUARN	
Select Components Which components should be installed?	
Select the components you want to install; clear the components install. Click Next when you are ready to continue.	s you do not want to
Full installation	
ARM-THUMB Interworking THUMB ARM-THUMB Libraries ARM-THUMB Interworking Floating Point Unit FPU Libraries No Fast Multiplier ARM-THUMB Interworking	11.7 MB A 23.3 MB 11.6 MB 11.7 MB 34.7 MB 11.6 MB 11.6 MB 11.6 MB
J Current selection requires at least 294.7 MB of disk space.	
< <u>B</u> ack	Next > Cancel

Click on Next to select the Start Menu Folder where the shortcuts for GNUARM will be installed. Default selection is **GNUARM**:

Mam Setup - GHUAR	_ 🗆 🗙
Select Start Menu Folder Where should Setup place the program's shortcuts?	R
Setup will create the program's shortcuts in the following Start Menu folder.	
To continue, click Next. If you would like to select a different folder, click Browse.	
GNUARM Browse.	
Don't create a Start Menu folder	
< <u>B</u> ack <u>Next</u> >	Cancel

Click on Next to select Additional Tasks:

🚟 Setup - GHUAR		
Select Additional Tasks Which additional tasks should be performed?		
Select the additional tasks you would like Setup to perform while installing GNUARM, then click Next.		
Additional icons:		
Create a desktop icon		
Cygwin options:		
Install Cygwin DLLs (ONLY in case you don't have or don't use Cygwin)		
< <u>B</u> ack <u>Next</u> > Cancel		

The option "Install Cygwin DLLs" should be checked. Uncheck this only if you are sure that you had installed Cygwin previously on your computer.

Click on Next. The Ready to Install page now appears.

Setup - GHUAR	_ 🗆 🗵
Ready to Install Setup is now ready to begin installing GNUARM on your computer.	R
Click Install to continue with the installation, or click Back if you want to review or change any settings.	
Destination location: E:\Program Files\GNUARM Setup type:	-
Full installation Selected components: Little Endian LE Libraries No Fast Multiplier ARM-THUMB Interworking THUMB THUMB	_
✓ K [Install]	Cancel

Click Install. GNUARM will be installed and you will see the progress:



When the installation is complete, following page will appear:



Click Finish button to finish the installation.

3.1.3 Downloading Example Programs

After installing the software, you can build programs and download programs to the MINI-MAX/ARM board. Follow the steps below:

1. Make sure the board is powered and connected to the PC as described in the section **Installing the Hardware**.

2. Run Micro-IDE from Windows Start menu. When Micro-IDE starts, the Project Selection window appears:

Welcome	×	
Welcome to Micro-IDE Program Development Environm	ent.	
What do you want to start with:		
C Create a new project		
Open existing project	Cancel	
Show this dialog at startup.		

Click OK to select an existing example project.

ARM Development System is distributed with several example programs that illustrate how to program the ARM micro-controller. Example projects are located under the Examples folder under following folders:

"bipom\devtools\ GCC \AT91SAM7", "bipom\devtools\ GCC \LPC23xx" "bipom\devtools\ GCC \LPC2000"

3. Open the example project Hello.prj from

C:\bipom\devtools\GCC\LPC2000\examples\Hello

III Micro-IDE - [hello.c]		
Eile Edit Yiew Build Droject	Bebug Looks Hindow Halp	. 6 ×
0	2 🚳 🕸 😇 🕒 🌒 🛤 🛱 🦮	
	1 🗵 🛎 🔁 🔁 🖓 🖏 😼 🐭 😭 🗮 🧮	
Workspace A	/**************************************	<u>^</u>
S Talls' Fraject Files	This module is presented here only to serve as a sample for LPC2138 program development. BIPOM Electronics provides this module as is and does not guarantee its functionality or suitability for a particular purpose. Please e-mail any questions and suggestions to tech@bipom.com	15.8%
	1 Notare Berro.c	
	Revision: 1.01	
	Description: Simple "Hello World" example	
	This program is written using GRU AFM Compiler (www.gnuarm.org)	
	/	
	<pre>/* Standard includes. */ finclude (stdio.h) finclude (stdib.h) finclude (string.h) /* LibBipom includes */ finclude (init.h) finclude (uart.h) // int main (void) { /* Initialize the system. UART: 19200.8.N.1 */ Initialize (1)</pre>	
c	uartOPuts("\n\rHello world");	_
Ties <	is not as	2
×.		
Build Debug Find in Files 1 Find	d in Files 2 Loader	2
Lendy	La 1, Col 1 Disconne	etel

4. Click the Build button on the main toolbar. This will build the Hello project:

🗅 🖻 🖬 🕼	X 🖻 🖬	$ \Omega \Omega $	s 🕸 👔	🖞 💷 🗋 🔴	2 🖌 🖓	: 🏦 🎙
			l Build b	utton	·	

If the project builds successfully, you should see a message indicating no errors on the Output Window:



5. Download the executable (hello.hex) file to the board by selecting Download under Build menu:



If the MINI-MAX/ARM board is powered and connected properly to the PC, a progress dialog will appear:

Downloading program	×
47%	
Cancel	

The progress dialog will disappear following a successful download. Details of the download are shown on the Output Window:

xI.		
-	Mini-Max/ARM 1.04 Loader	
	The reserved ARM interrupt vector location $(0 \times 0000 \ 0014) = B4C04FA4$	
	Waiting for board to initialize	
	Speciry 14,746Minz frequency	
	Success frequency	
	Disable Echo	
	Echo is disabled	
	Get Loader Version	
	Loader version: 2.11	
	Get Part ID	
	PartID: 196389	
	Uplocking.	
	Downloading 'bello bey'	
	Success withing 4006 bytes, 0000000-00000EEE	
	Jaccess withing to bytes, doubledoub-doublent	
	Download is completed	
1	2	101
j j		
Outr	Build Debug Find in Files 1 Find in Files 2 Loader	
Read	iy	

When the download is finished, the progress indicator disappears. This means that the board has received the program successfully. After the program has been successful downloaded, it can be started using the Mode button on the main Toolbar:



Mode button puts the board into **Run** or **Program** mode. In Run mode, the microcontroller is executing the program in its memory. In Program mode, the microcontroller is in Reset state so no programs are running. In Program mode, microcontroller's flash memory can be changed and a new program can be downloaded.

6. Open the Terminal window and set the correct baud rate.

Before you can run the program you are suggested to open the Terminal window first, else you cannot see the result of the example program. Following are the related buttons on Terminal Toolbar:



Connect Terminal

Connect Terminal - When you click this button, the terminal opens and connects to the selected COM port. So if the MINI-MAX/ARM board sends data to its serial port, we will see messages in Terminal window.

If you type any characters in Terminal window, this data will be sent to the MINI-MAX/ARM board through COM port to which Terminal is connected.

Disconnect Terminal - Disconnects from and closes the COM port.

Open Terminal - Open Terminal window or Hide it.

Clear Terminal – Erases the contents of Terminal window.

To specify the options for Terminal, select Tools menu and select Options to open the Options dialog. Switch to **Terminal** page:

Baud Rate 115200 Data Bits C 7 © 8 Parity © None C Odd C Even	Com Port COM1 COM2 COM3 COM4	C COM5 C COM6 C COM7 C COM8
Echo C Off C On Logging Log to file Log file name:	2	Browse
Font Selection Sample		1

Select the correct PC COM port that you have connected the MINI-MAX/ARM. Other settings should be set as below:

Baudrate: 19200 Parity: None Data Bits: 8 Stop bits: 1 Echo: On – Micro IDE prints in terminal window what user types; Off - Micro IDE does not print in terminal window what the user types.

Click the OK button to save the setting and close the Options dialog.

7. Run the example program.

The Mode button is Red in Program mode and Green in Run mode. Following a download, the Mode button will be Red. Click the Mode button to change the mode to Run mode. The program **hello.c** that you just downloaded starts executing.

You should now see the message "Hello World" being displayed on the Terminal window.

Congratulations!!! You have built and executed your first program on the MINI-MAX/ARM.

Click the Mode button once again so it turns Red. The board is in Program mode

3.1.4 Writing Your Own Programs

3.1.4.1 Creating Projects

To create your own project, select Project menu and select New Project. This will display the New Project dialog:

New project	×
Project	test It is recommended NOT to put spaces in project name as some toolkits may
Location	C:\test Browse
Toolkit	GRUARMT LPC2000
Debugger:	[no debugger]
Manufacturer	
Chip ID	_
	OK Cancel

Enter the name of the new project and its location (this example uses *test* as the project name and c:\test as the project location). Select GNUARM7 LPC2000 as the Toolkit. Click OK; the new project with the name of test under c:\test will be created.

Create a new C file for the project. Select File menu and click New File. The New File dialog displays:

C Source File C Header File Asm File Listing File	✓ Add to proj. Filename [test] Location	-
	C:\test	Browse

Check Add to project option and enter the Filename "test". blank C file (test.c) will be created and added to the test project:

Type the C Language sentences into test.c as shown below. The program should now look like this:

```
test.c#
#include (stdio.h)
#include (stdlib.h)
#include (hipomtypes.h)
#include (tbl.h)
int main (void)
{
   TB1_LedON(TB1_GREEN_LED_BIT);
}
```

This program will turn on the Green LED on TB-1 Training board, if TB-1 is installed. Build the program by clicking the Build button. If the program builds successfully, you will see the following messages on the Output Window:

Compiling c:\test\test.c... Linking test.out ... GNU Id version 2.17 Generating 'test.hex' ...

3.1.4.2 Downloading the program

Download the program to the board by clicking the Download button on the main toolbar. Run the program by clicking the Mode button on the main toolbar (The Mode button should be green now). You will see the Green LED on TB-1 turning on if TB-1 is connected.

Congratulations!!! You have built and executed your first GNU ARM C program on the MINI-MAX/ARM.

4 Expanding Your System

4.1 Connecting Peripheral Boards

MINI-MAX/ARM can be connected to a wide variety of low-cost peripheral boards to enhance its functionality. Some possibilities are:

- I Prototyping board (PROTO-1)
- I Training Board (TB-1)
- I Digital Input/Output Expander Board (DIO-1)
- Analog (ADC and DAC) Input/Output Boards (DAQ-2543, DAQ-2543-DA1)
- Relay peripheral boards (RELAY-1, RELAY-2, RELAY-4REED)
- I Real Time Clock boards with a Multi Media Card socket (RTC board, MMC/RTC board)
- A peripheral board with four 7-segment LED displays with decimal point (LED-1).

Peripheral boards can either be stacked on top of MINI-MAX/ARM using stand-offs or connected in a chain configuration using flat ribbon cable.

The following Figure shows how MINI-MAX/ARM can be connected to a peripheral board in a stacked fashion.



The following Figure shows chain connection.



4.2 <u>LCD</u>

LCD connector on MINI-MAX/ARM serves various types of character and graphic LCD modules. Please look at the "LCD connector" section of *Technical Manual* for reference.

4.3 Keypad

MINI-MAX/ARM provides a Keypad Connector that contains 5 Volt power and ground lines and the 8 port lines of the micro-controller. It can be used to scan various types of keypads, such as 3 by 5 or 4 by 4. The lines can also be used as general-purpose inputs/outputs.

4.4 <u>MicroTRAK</u>

Please see <u>http://www.bipom.com/arm7tk.php</u> for training and project kits based on the MINI-MAX platform.

4.5 <u>Wireless</u>

<u>MaxStream</u>, Inc. sells some wireless RS232 modules that you can use to interface our microcontroller boards to each other through the wireless with rates up to 38,400 bps and up to 300 feet (90meters) indoor, 1000 feet (300 meters) outdoor/line-of-sight range. We have tested these modules with our microcontroller boards. Please <u>contact us</u> for more information.

5 Accessories

Please see <u>http://www.bipom.com/peripherals.php</u> for a full range of accessories.