MINI-MAX/ARM-C and -E

Single Board Computers

Quick Start Guide

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BiPOM Electronics

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.
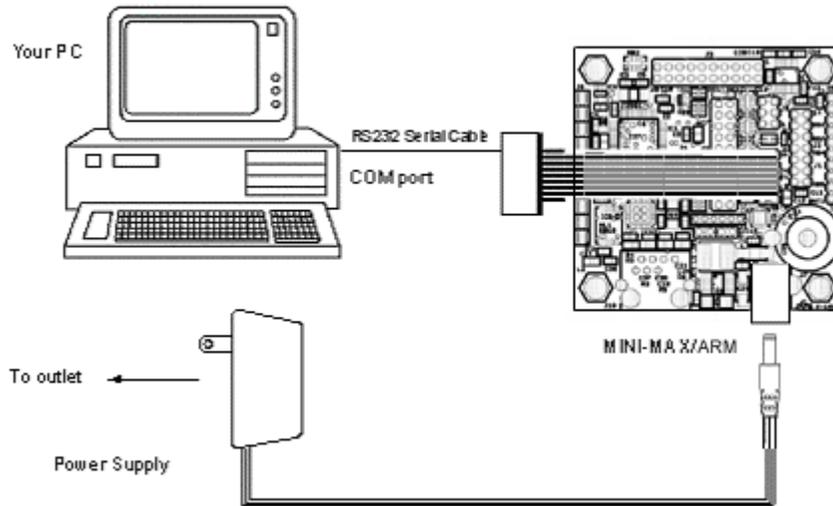
3   Software Installation

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

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

3.1   ARM Development System

3.1.1   Installing ARM Development System

Download ARM Development System from:
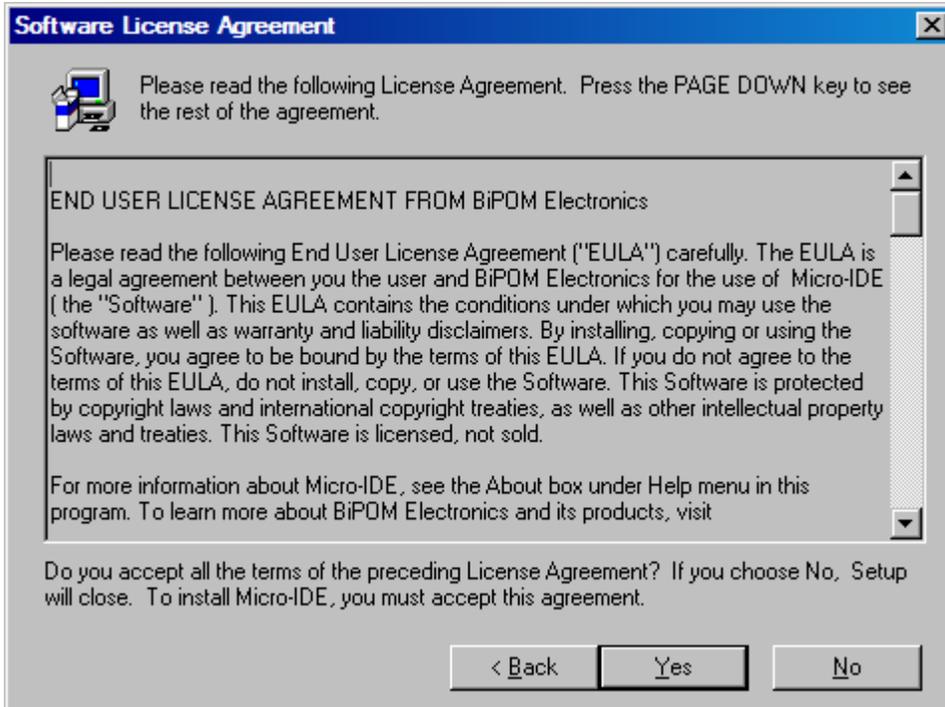
http://www.bipom.com/armdev.php

Open the zip file arm7dev.zip and install by running setup.exe.
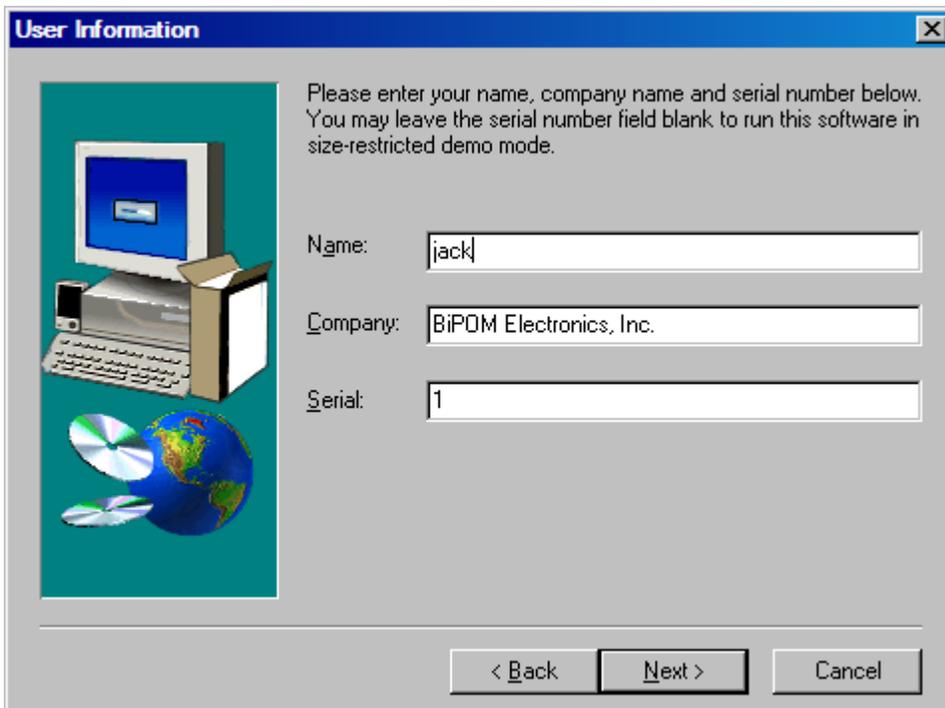
A Welcome screen will appear:

Click on Next. End User Agreement will appear:

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

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

You can enter any Serial Number here in the Serial field. Click Next to continue.
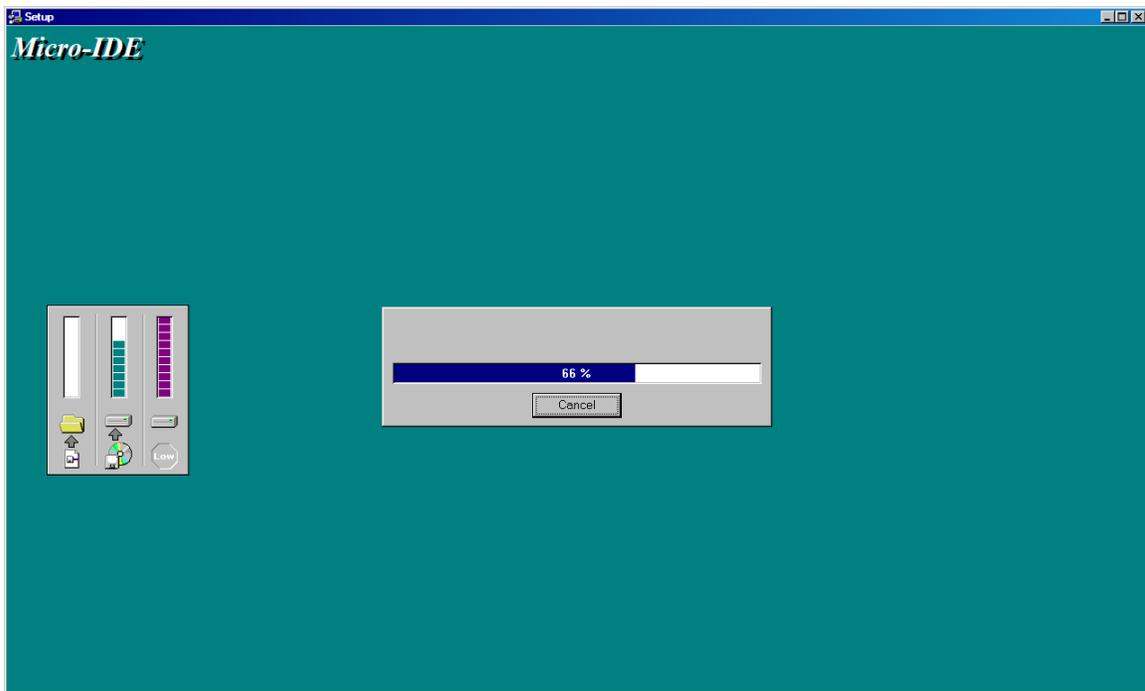
Select the disk location where the software will be installed. Using the default
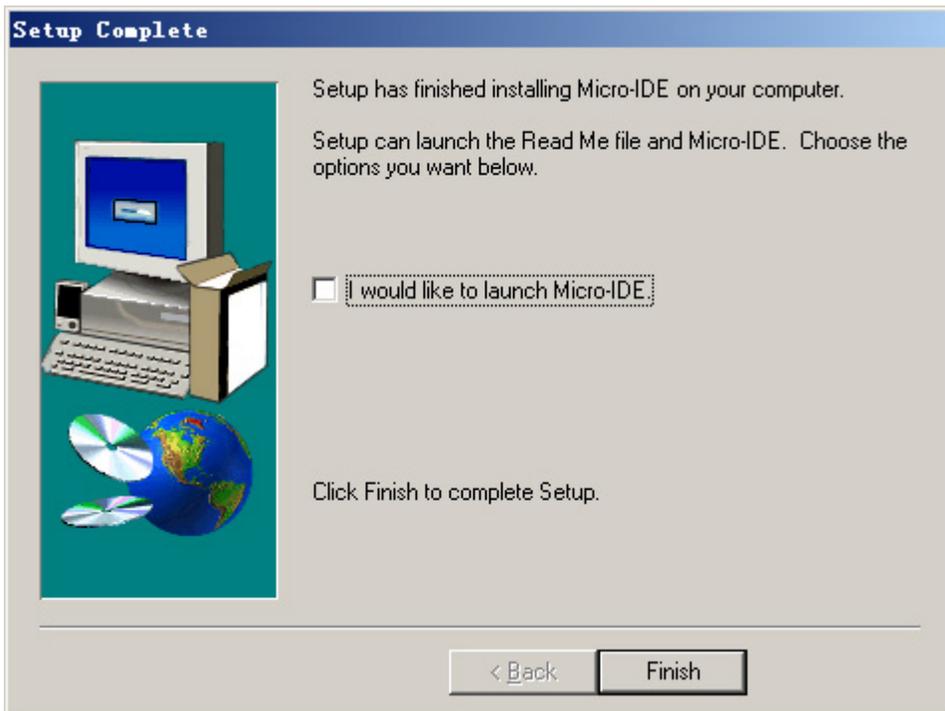location of c:\bipom\devtools is recommended:

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

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:

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
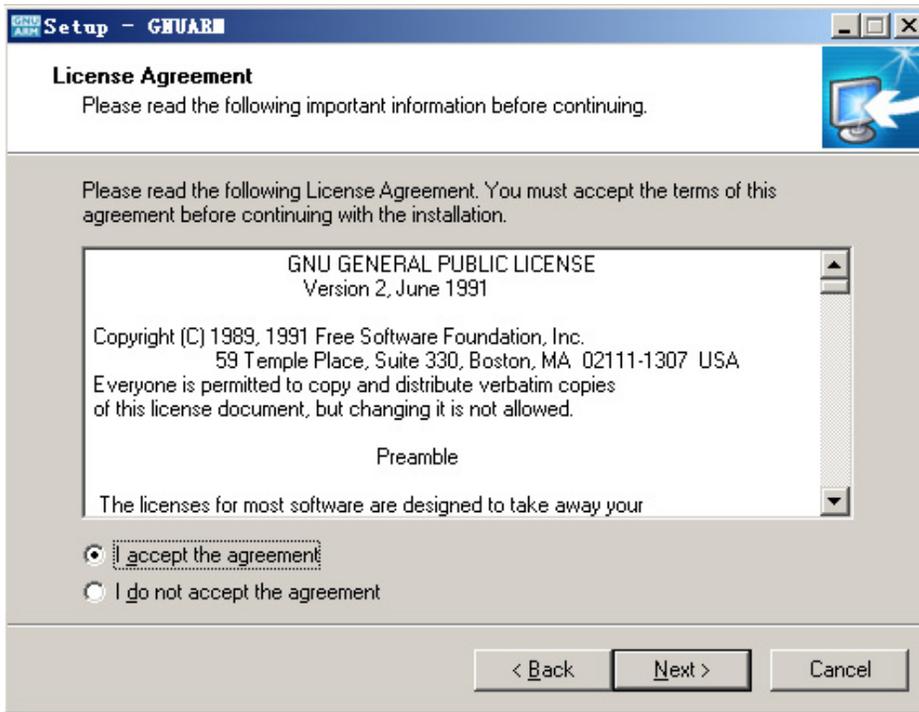
GNU ARM C Compiler <version> Free Download

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

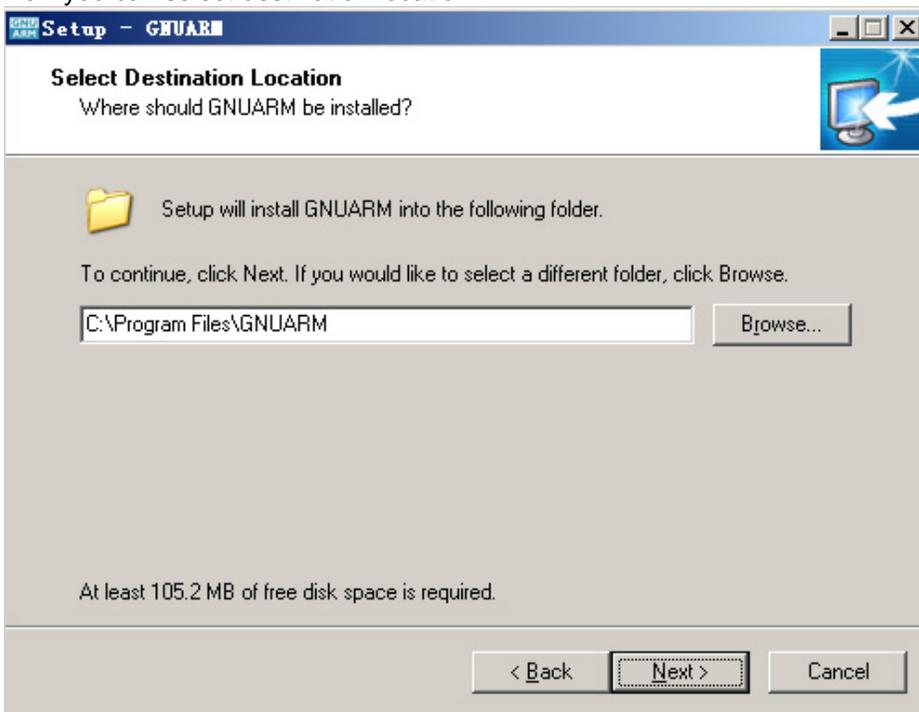Download and run this file and a Welcome screen will appear:

Click on Next. License Agreement will appear:

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:

Using the default location of C:\Program Files\GNUARM is recommended. Click on Next to continue.
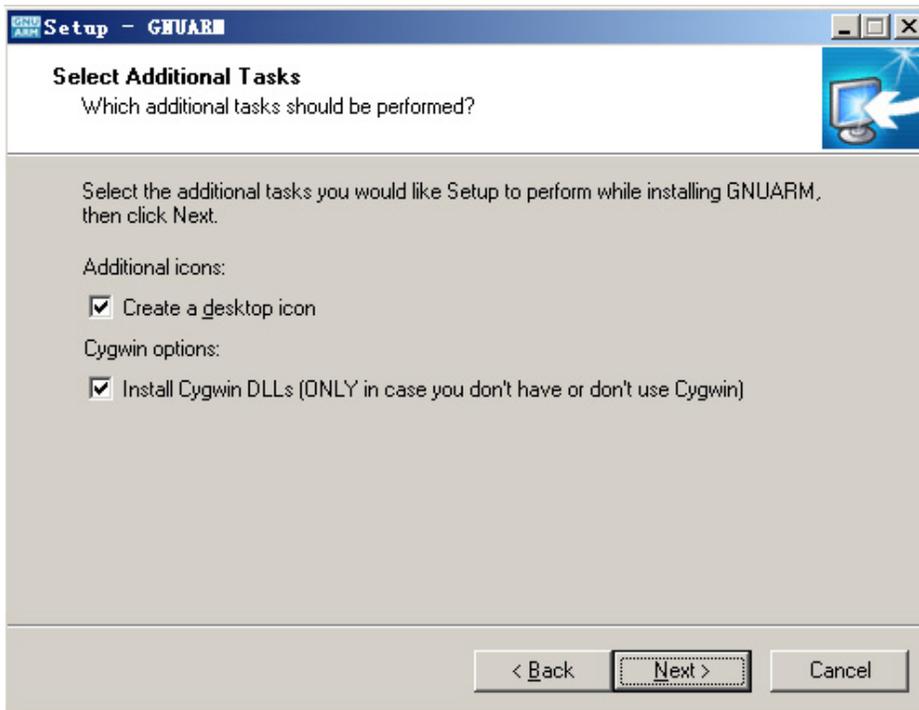
On the next page, you can select components to install. Just keep the default settings if you don't know which to select:
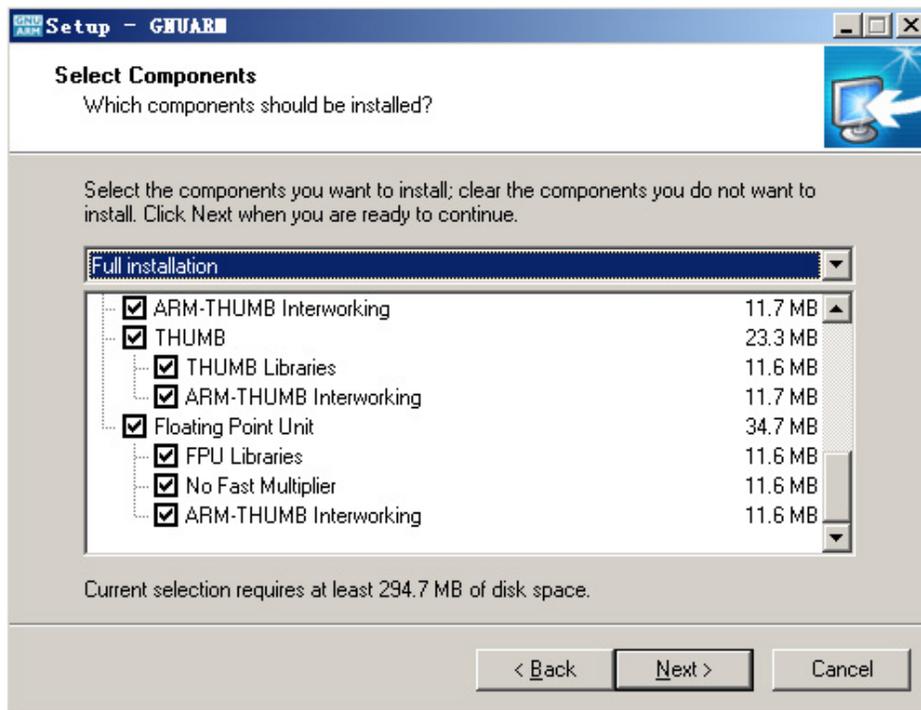
Click on Next to select the Start Menu Folder where the shortcuts for GNUARM will be installed. Default selection is **GNUARM**:

Click on Next to select Additional Tasks:
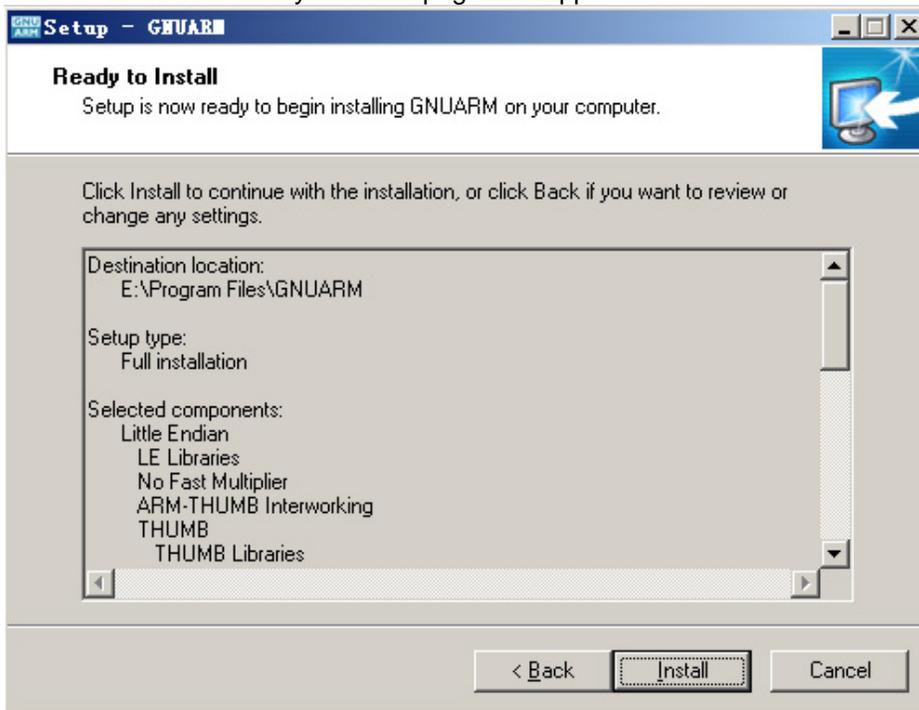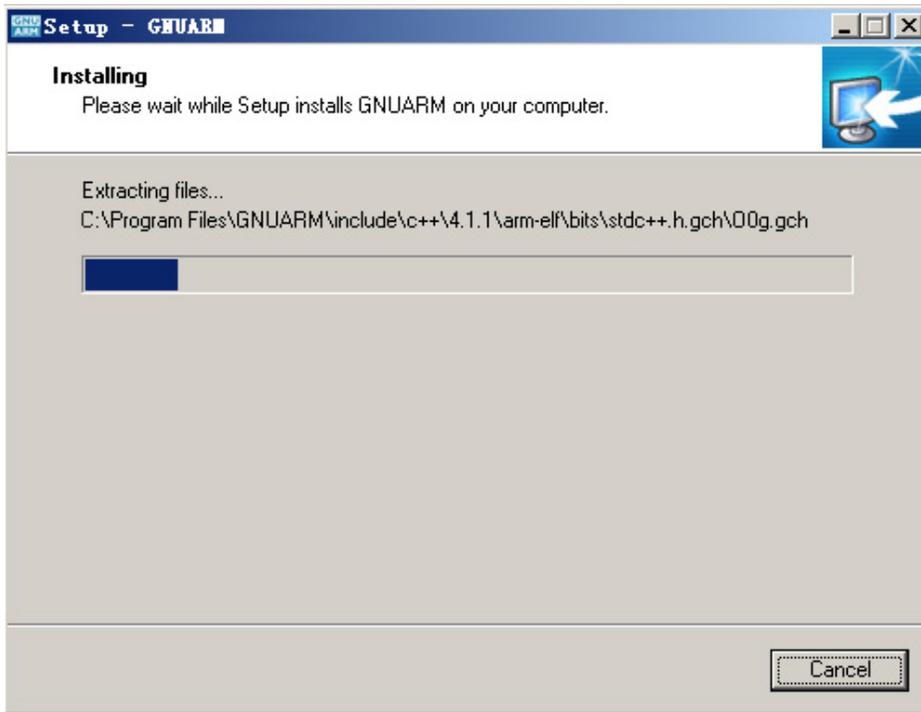
The option "Install Cygwin DLLs" should be checked. Uncheck this only if you are sure that you had installed Cygwin previously on your computer.
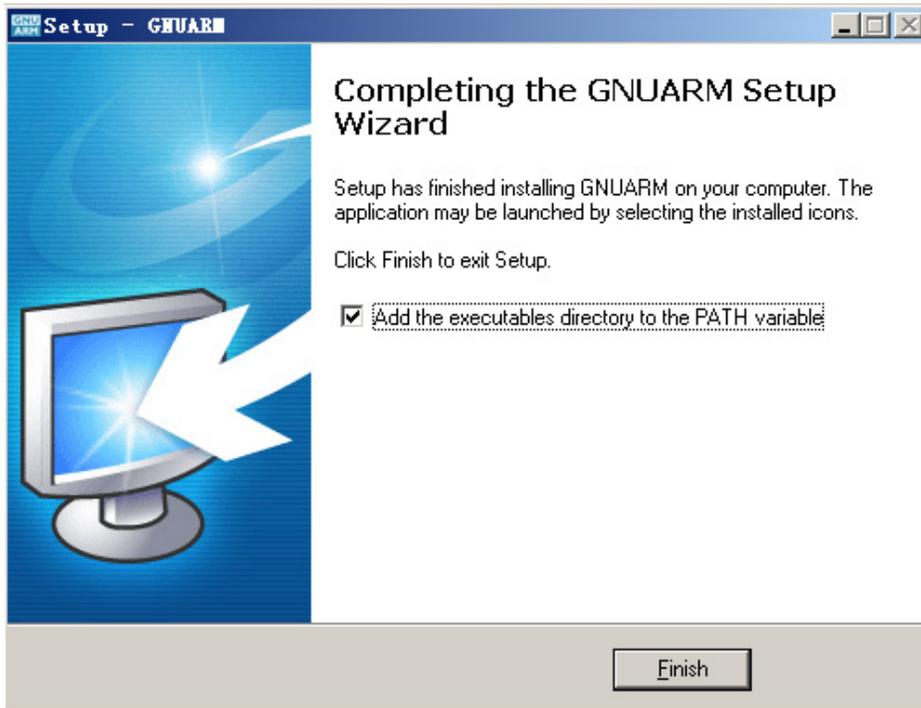
Click on Next. The Ready to Install page now appears.

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:
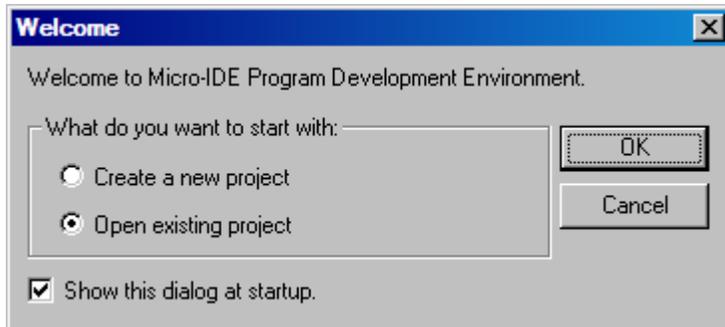
Click OK to select an existing example project.

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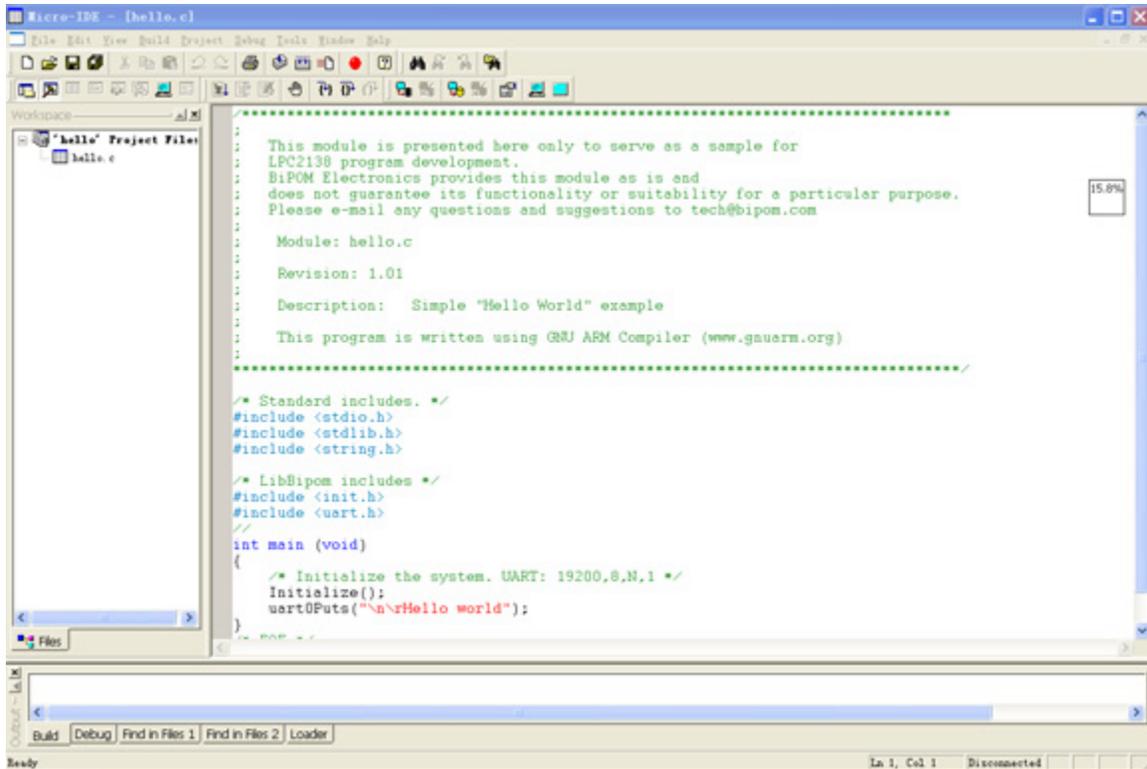
4. Click the Build button on the main toolbar. This will build the Hello project:

Build button

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:

Download button

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

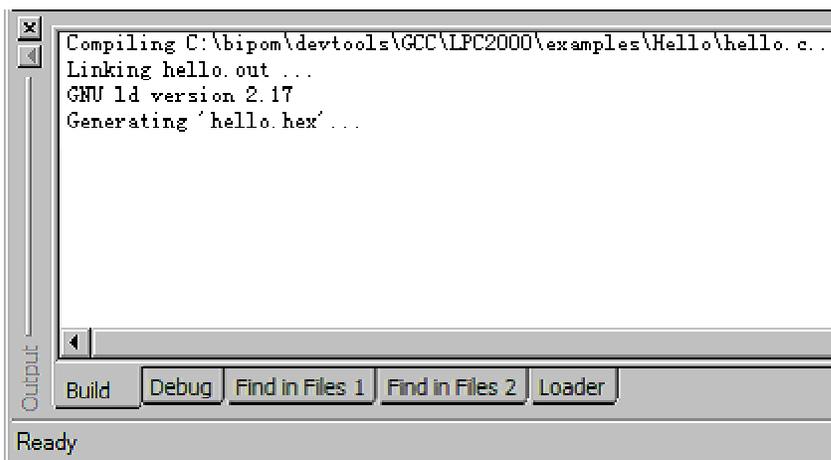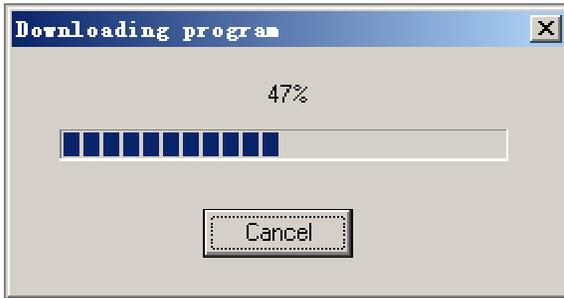The progress dialog will disappear following a successful download. Details of the download are shown on the Output Window:


```
Mini-Max/ARM 1.04 Loader
The reserved ARM interrupt vector location (0x0000 0014) = B4C04FA4
Waiting for board to initialize...
Synchronization...
Success synchronization
Specify 14.746MHz frequency...
Success frequency
Disable Echo...
Echo is disabled
Get Loader Version...
Loader version: 2.11
Get Part ID...
PartID: 196389
Unlocking..
Unlock OK
Downloading 'hello.hex'...
Success writing 4096 bytes, 00000000-00000FFF
Download is completed
```

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

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:
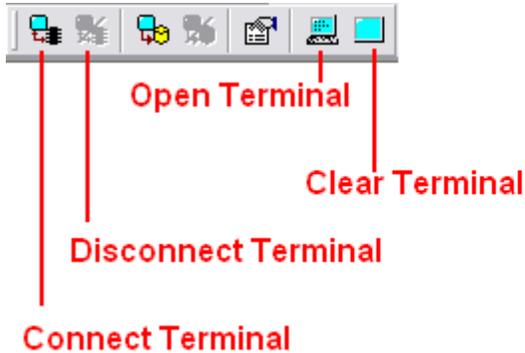
Connect Terminal - When you click this button, the terminal opens and connects to the selected COM port. So if the MINI-MAX/ARM board sends data to its serial port, we will see messages in Terminal window.
If you type any characters in Terminal window, this data will be sent to the MINI-MAX/ARM board 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:
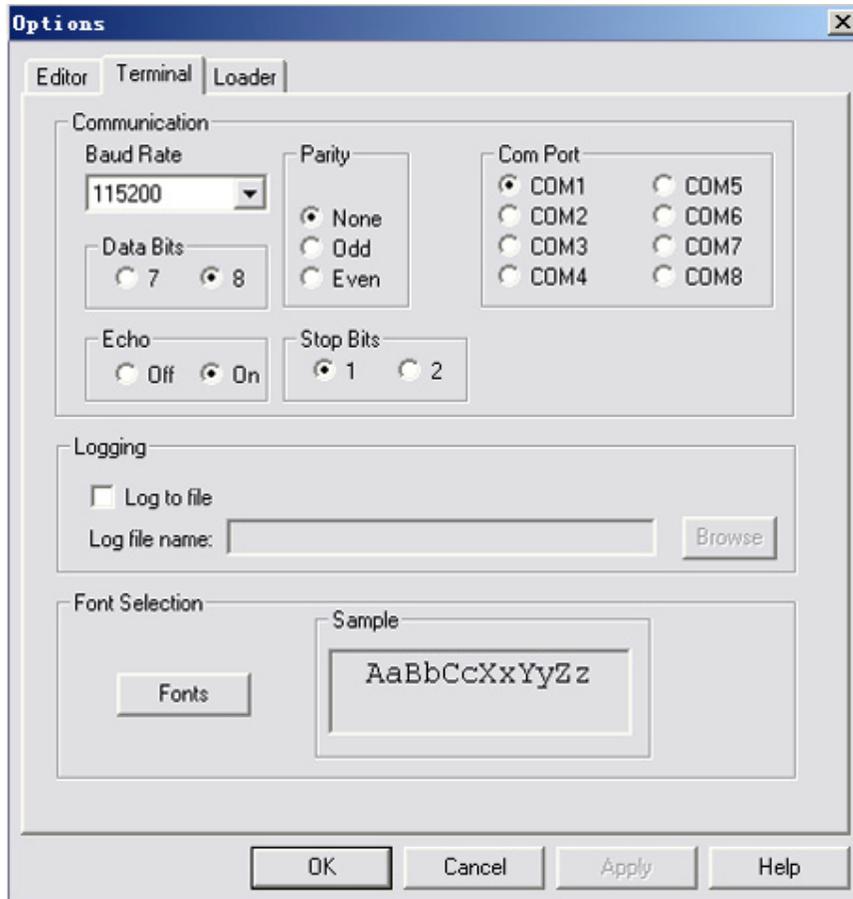
Select the correct PC COM port that you have connected the MINI-MAX/ARM. Other settings should be set as below:

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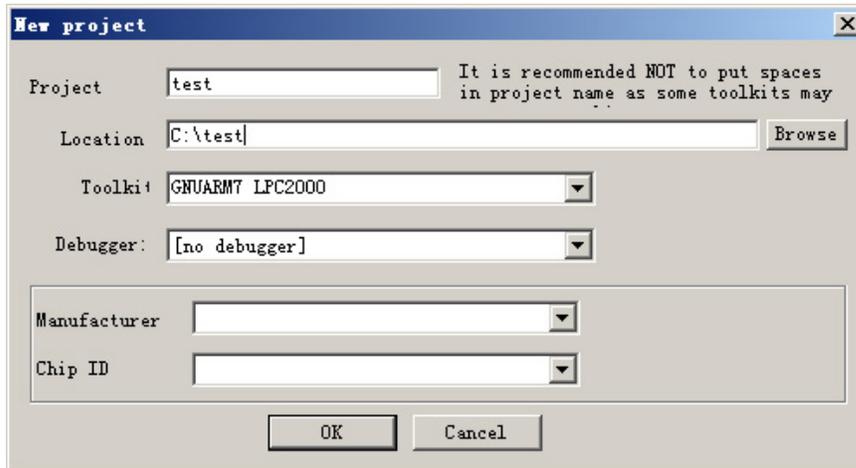
Enter the name of the new project and its location (this example uses **test** as the project name and c:\test as the project location). Select GNUARM7 LPC2000 as the Toolkit. Click OK; the new project with the name of test under c:\test will be created.

Create a new C file for the project. Select File menu and click New File. The New File dialog displays:
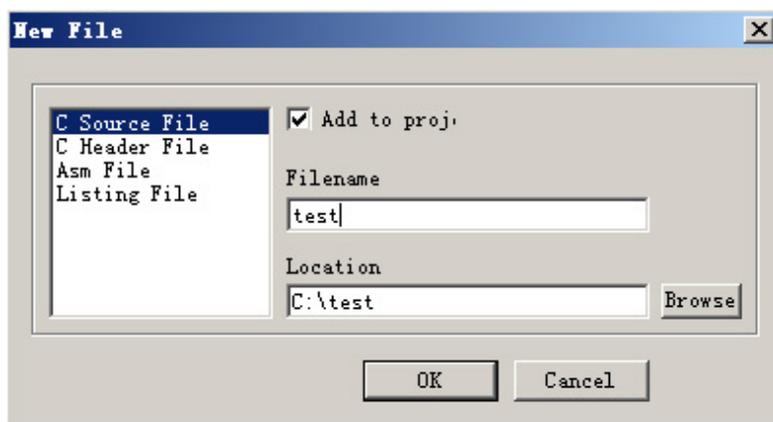
Check Add to project option and enter the Filename "test". blank C file (test.c) will be created and added to the test project:

Type the C Language sentences into test.c as shown below. The program should now look like this:
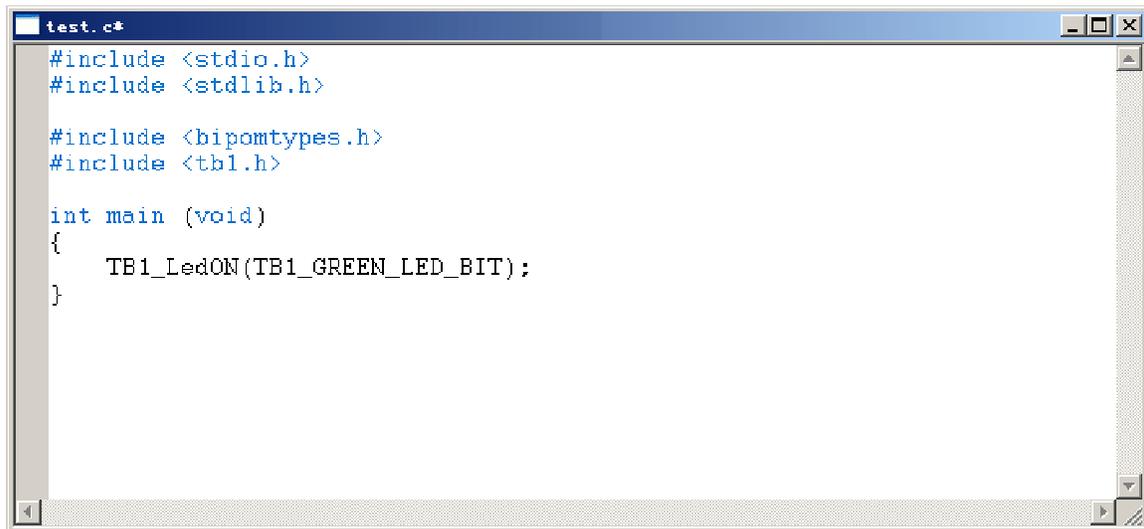
```
test.c*                                                    _ □ ×
#include <stdio.h>
#include <stdlib.h>

#include <bipomtypes.h>
#include <tb1.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 ld 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   <u>Connecting Peripheral Boards</u>

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

l   Prototyping board (PROTO-1)
l   Training Board (TB-1)
l   Digital Input/Output Expander Board (DIO-1)
l   Analog (ADC and DAC) Input/Output Boards (DAQ-2543, DAQ-2543-DA1)
l   Relay peripheral boards (RELAY-1, RELAY-2, RELAY-4REED)
l   Real Time Clock boards with a Multi Media Card socket (RTC board, MMC/RTC board)
l   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.
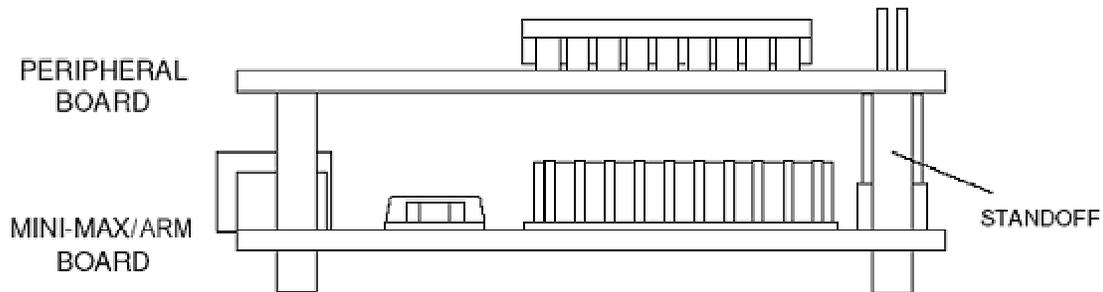
The following Figure shows chain connection.
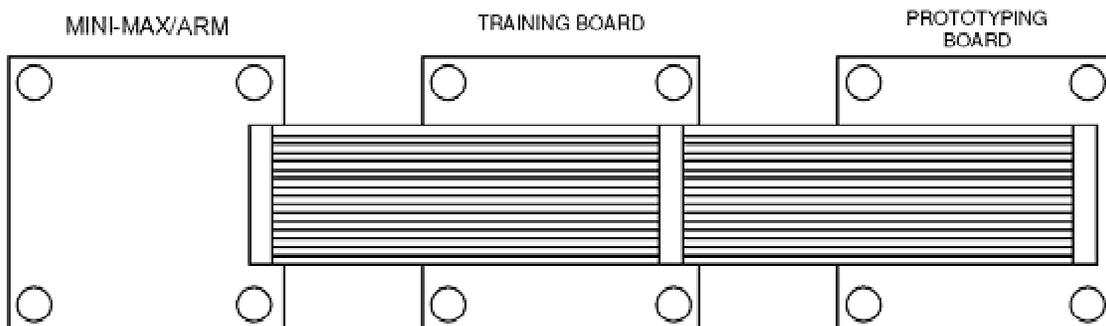
4.2 <u>LCD</u>

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 <u>Keypad</u>

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, Inc.</u> 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.