# **TiniARM Development with Eclipse**

By: James P. Lynch

## Introduction

When I was a boy in the 1950's, I developed my interest in engineering and science through Heathkits. I built a shortwave radio first and listened to Radio Moscow during the Cold War. I then built Ham Radio gear, a couple televisions, the H8 computer and the Hero Jr. Robot over the years. Heathkit's devotion to customer support and clear and readable construction manuals made it possible for the little guy to build a fairly complex piece of electronics.

Unfortunately, the cost advantage of "building it yourself" faded away with automatic surface mount "pick and place" machines and Heathkit withdrew from the business. You can still see their current products (motion detector floodlights) for sale at Home Depot.

For a person today who wants to dabble in computer electronics, the stumbling block in the past has been the cost of the parts and the outlandish cost of the software development tools such as the compilers, linkers and editors. It's not unusual for a technology company to plunk down \$20,000 for a software development system for a modern microcomputer.

Things are finally changing for the better. Serious embedded processors (the 32-bit machines with on chip RAM and FLASH) are suddenly affordable. There's no better example than the **TiniARM** computer offered by New Micros Inc. in Dallas, Texas.

This little postage stamp sized computer has the following specifications, as listed on the New Micros Inc. web site:

#### **TiniARM Specifications**

- Board Size: 1.0"(W) x 1.3"(L) x 0.4"(H)
- Weight: 0.2 Ounces
- Programming Language:
  - C/C++ Eclipse/GNU Integrated Development Package (this tutorial)
  - In-System Programming Flash Utility (free download)
- ARM7TDMI-S CPU, 32-bit microprocessor
- CPU operating range up to 60Mhz
- Real Time Clock
- On-chip Memory
  - o 128KByte Program Flash
    - 10,000 erase and write cycles
    - 1ms programming time for up to a 512 byte line
    - Single sector erase (8KB), or the whole chip erase is done in 400ms

- o 64KByte Static Ram
- ٠
- 16 General Purpose Digital I/O lines share functions with,
  - 4-wire SPI Interface
  - $\circ~$  4 PWM channels(3 on 24-pin connector, 1 shared with Jtag signal on other connector )
  - o 7 Timers
  - $\circ$   $\,$  1 SCI (TTL) channel with the addition of a modem interface
  - 3 external Interrupts
- Two Serial Communication Interface (SCI)
  - UARTO is dedicate for RS-232 serial channel
  - UART1 is TTL signals and shared function with GPIO's
- I2C Serial Interface
- JTAG connection for flash programming/debugging
- Two low power modes, Idle and Power down
- WatchDog Timer
- Onboard three user's leds
- Onboard 5.0V, 3.3V, & 1.8V linear regulators
- 2x12 header pin connector for Power, Serial, and I/O's connection

The price of this little gem is \$69.00. A development board with the TiniARM module, a power supply and RS-232 cable is just \$95.00.

If the hardware can be made so affordable, can the same be so for the software required to develop applications? No layman is going to buy a \$95.00 microcomputer and then spend \$1500 and upwards on a software development system.

Can a good editor, compiler and linker for the TiniARM be acquired for nothing?

The answer is "Yes it can!"

In this tutorial, I will demonstrate in detail how to build the Eclipse open-source Integrated Development Environment (IDE) and then upgrade it for C/C++ development by installing the CDT plug-ins. I'll then show how to download Cygwin on your computer to pave the way for the open-source (free) GNU software compiler suites. We'll download a complete GNU software development package for Windows computers and then augment that with a GNU compiler suite specifically built for the ARM processors.

We'll then download the Philips LPC2000 Flash Utility and install it into Eclipse so you can run it after building your application. Finally, I'll show how to download the New Micros TiniARM test program and create it as an Eclipse project.

We'll build the project, download it into the TiniARM's flash memory and execute it. When completed, you will have a complete and modern IDE to develop code for the TiniARM in C and C++.

The only feature I didn't address is debugging. This will take some more work since a resident monitor called RedBoot must be installed to support Eclipse/GNU's GDB debugger. I hope to update this tutorial with that information soon.

Who knows, we may be able to bring back Heathkit or a version thereof some day!

## 1. Why Develop with Eclipse

The simple answer is that Eclipse is a **free** open-source equivalent of Microsoft's Visual C++ development system. Eclipse was developed by IBM and released to the open-source community (namely hackers and professionals who know a good deal when they see it) and since then, it has been maintained and upgraded by IBM and a host of collaborators. While Eclipse was originally developed to create Java software, it can be extended to develop C/C++ software by adding the **CDT** (C++ Development Toolkit) plug-in.

The Eclipse/CDT together forms a professional IDE (Integrated Development Environment) to develop C and C++ software for the **TiniARM** computer. When you command Eclipse/CDT to build your software, it invokes a MAKE file. If you have the open-source **GNU** compiler tools installed on your computer, the GNU toolkit will run the MAKE utility and the compilers, linkers, etc. needed to build your downloadable hex file.

To be completely honest, setting all this up is a bit tedious and time consuming. So take a deep breath and let's get started.

## 2. Downloading Eclipse

Using your internet browser, such as Internet Explorer, go to the Eclipse web site: www.eclipse.org You should see the following screen. Click on downloads.



First Eclipse will ask you to choose a download mirror. Now here's a real crap shoot. I picked the "**National Center for High Performance Computing**" because they must have some mucho teraflops computers there.

#### Eclipse 3.0 Mirrors

Due to the overwhelming interest in the Eclipse 3.0 release, we strongly recommend that you do

Academia Sinica	http://eclipse.cis.sinica.edu.tw/downloads/in	dex.php
duvin.org	http://eclipse-mirror.duvin.org/eclipse	
eStation	http://eclipse.estation.com.au/downloads/	
FORTHnet S.A	ftp//ftp.forthnet.gr/pub/eclipse/downloads/dro	ps/
GUL de la Universidad Carlos III de Madrid	http://gul.uc3m.es/eclipse/	
GUL de la Universidad Carlos III de Madrid	ftp://gul.uc3m.es/mirrors/eclipse/eclipse/dov	vnloads/i
ibiblio	http://www.ibiblio.org/pub/packages/develop	ment/ecl
ibiblio	ftp://ftp.ibiblio.org/pub/packages/developmer	it/eclipse
Instituto Superior Técnico - Rede das Novas Licen	ftp://ftp.rnl.ist.utl.pt/eclipse/eclipse/downloa	Click on
Jab	http://eclipse-mirror.jab.fi/	this one
Jab	http://eclipse-mirror.jab.fi:6969/	this one.
Linux-Online LLC	http://oss.linux-online.ru/eclipse/	
Linux Online LLC	Ap://linux_online_ru/pub/mirroro/oolipeo_org	<b>-</b>
National Center for High Performance Computing	http://opensource.nchc.org.tw/Eclipse/	
National Center for High Performance Computing	ftp://opensource.nchc.org.tw/packages/Eclip	se/eclip

Now you may select which version of Eclipse to download. Stick to the "**most recent release**" as this is a version that has been thoroughly debugged. The nightly builds and stream builds are for Eclipse developers. In July of 2004, Eclipse **3.0** is the one to choose.

## eclipse project downloads

latest downloads from the eclipse project

#### Latest Downloads

On this page you can find the latest <u>builds</u> produced by the <u>Eclipse Project</u>. To get started run the program and go through the user and develo system. If you have problems downloading the drops, contact the <u>webmaster</u>. If you have problems installing or getting the workbench to run, <u>c</u> posting a question to the <u>newsgroup</u>. All downloads are provided under the terms and conditions of the <u>Eclipse.org Software User Agreement</u> u

Looking for Tools PMC downloads page then look here. Looking for the Technology PMC downloads page then look here.

Looking for the build schedule or build stats then look here. For information about different kinds of builds look here.

#### Build Type

Latest Release

3.0 Stream Stable Build

3.1 Stream Integration Build

3.1 Stream Nightly Build

Language Pack



#### Build Date

Fri, 25 Jun 2004 -- 12:08 (+0800) Sat, 19 Jun 2004 -- 20:00 (+0800)

Fri, 9 Jul 2004 -- 00:10 (+0800) Mon, 15 Dec 2003 -- 13:00 (+0800) Since my computer is a Windows XP machine, I clicked on "Windows 98/ME/2000/XP (http)" to start the download.

#### Eclipse SDK

The Eclipse SDK includes the Eclipse Platform, Java development tools, and Plug-in Development Environment, including source and both user and prograr sure which download you want... then you probably want this one.

Eclipse does not include a Java runtime environment (JRE). You will need a 1.4.1 level or higher Java runtime or Java development kit (JDK) installed Eclipse. <u>Click here</u> if you need help finding a Java runtime.

Status	Platform			Down	oad	File	
V	Windows 98/ME/2000/XP		-	( <u>http</u> )	(ftp)	eclipse-SDK-3.0-win32.zip ( <u>md5</u> )	
V	Linux (x86/Motif) (Supported Versions)			(http	( <u>http</u> )	( <u>ftp</u> )	eclipse-SDK-3.0-linux-motif.zip ( <u>md5</u> )
V	Linux (x86/GTK 2) (Supported Versions)	Click on		( <u>http</u> )	( <u>ftp</u> )	eclipse-SDK-3.0-linux-gtk.zip ( <u>md5</u> )	
V	Linux (AMD 64/GTK 2) (Supported Versions)	this one.		( <u>http</u> )	( <u>ftp</u> )	eclipse-SDK-3.0-linux-gtk-amd64.zip ( <u>md5</u> )	
V	Solaris 8 (SPARC/Motif)			( <u>http</u> )	( <u>ftp</u> )	eclipse-SDK-3.0-solaris-motif.zip ( <u>md5</u> )	
V	AIX (PPC/Motif)				( <u>ftp</u> )	eclipse-SDK-3.0-aix-motif.zip ( <u>md5</u> )	
V	HP-UX (HP9000/Motif)				( <u>ftp</u> )	eclipse-SDK-3.0-hpux-motif.zip ( <u>md5</u> )	
V	Mac OSX (Mac/Carbon) (Supported Versions)				( <u>ftp</u> )	eclipse-SDK-3.0-macosx-carbon.tar.gz ( <u>md5</u> )	
V	Source Build (Source in .zip) (instructions)				( <u>ftp</u> )	eclipse-sourceBuild-srcIncluded-3.0.zip ( <u>md5</u> )	
V	Source Build (Source fetched via CVS) (instruc	ctions)		( <u>http</u> )	( <u>ftp</u> )	eclipse-sourceBuild-srcFetch-3.0.zip ( <u>md5</u> )	

Be forewarned that Eclipse is an 85.1 megabyte download, so even on a cable modem it will take 10 minutes. I directed it to download to an empty "download" directory on my hard drive (in my case, **d:\download**).

6% of eclipse-SDK-3.0-win32 📃 🗆 🗙
ê 🔒
Saving: eclipse-SDK-3.0-win32.zip from opensource.nchc.org.tw
Estimated time left 8 min 43 sec (5.46 MB of 85.1 MB copied) Download to: D:\downl\eclipse-SDK-3.0-win32.zip Transfer rate: 156 KB/Sec
Close this dialog box when download completes
Open Open Folder Cancel

Eclipse is downloaded as a ZIP file, so you can use **WinZip** to extract it to your drive. In my case, I extracted it to the D: drive root and it created a **d:\eclipse** folder on that drive.

If you don't have WinZip, you can search for it using **Google** and the free evaluation version will suffice here.

🕲 WinZip (Evalua	tion Vers	ion) - eclips	e-SDK-3.0	-win32.:	zip	
New Options	Favorites	Add Extrac	t Encrypt	Solution View	CheckOut	Wizard
Name Pragment.xml Update.dll Doub.html	Extract - D	XML Documer	nt 6/25/2004 1 eclipse-SDK-	2:36 PM 3.0-win32	322 322 2.zip	44%
Scheduler.jar Plugin.xml plugin.properties about.html plugin.properties plugin.xml	Extract to Desktop	x D:\ D:\ D:\ D:\ D:\ D:\ D:\ D:\	uter oppy (A:)   Disk (C:)   Disk (D:) ed Documents Lynch's Documents			
Selected 0 files, 0 bytes	My Documents My Computer	Files	beth Delano's Documer ocuments Stiller's Documents /CD-RW Drive (E:)	Dpen Explorer	window	Extract
	My Network Places	Selected files/fol     All files/folders in     Files:	archive	Overwrite existi Skip older files Use folder name	ng files es	Cancel Help

Since I extracted **Eclipse** to my **D**: drive, here is where it put it.

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<ul> <li>Local Disk (D:)</li> <li>AOL Instant Messenger</li> <li>aolextras</li> <li>arm</li> <li>C_DILLA</li> <li>captura</li> <li>catalogs</li> <li>catalogs</li> <li>configuration</li> <li>configuration</li> <li>features</li> <li>plugins</li> <li>readme</li> <li>foobar1</li> </ul>		Configuration features plugins readme .cclipseproduct cpl-v10 eclipse inotice startup	1 KB 15 KB 88 KB 6 KB 18 KB	File Folder File Folder File Folder ECLIPSEPRODUCT File HTML Document Application HTML Document Executable Jar File	7/10/2004 1:41 PM 7/10/2004 1:41 PM 7/10/2004 1:41 PM 6/25/2004 1:41 PM 6/25/2004 12:40 PM 6/25/2004 12:40 PM 6/25/2004 12:40 PM 6/25/2004 12:40 PM

If you double-click on the eclipse application (**eclipse.exe**) in the directory above, this will start up the eclipse application. Note that Eclipse is just an .exe file that runs, there are no entries in the Windows Registry made for it (what could be simpler).



If the following screens appear, we have successfully installed Eclipse!

(c) Copyright B	The ecutive project of sup Merosystems into	
in the U.S., ot	Workspace Launcher	×
	<b>Select a workspace</b> Eclipse Platform stores your projects in a directory called a workspace. Select the workspace directory to use for this session.	
	Workspace: D:\eclipse\workspace	Browse
	Use this as the default and do not ask again	Cancel

Take the default on the above dialog and all your projects will go into the **d:\eclipse\workspace** directory.

Normally at this point, Eclipse users will log onto the Sun Microsystems web site and download the latest and greatest JAVA development kit (which is free to play with but if you develop a commercial product with it, they want their cut).

Instead, we will download the **Eclipse CDT** plug-ins which will allow development of C/C++ programs.

## 3. Downloading CDT

Using your internet browser, such as Internet Explorer, return to the **Eclipse** web site: <u>www.eclipse.org</u> You should see the following screen. Click on **projects**.



Now click on The Eclipse Tools Project.



Now click on **CDT** to bring up the CDT Project.

eclipse	
home	
about us	
projects	eclinse tools
downloads	echpse tools
articles	project
newsgroups	the eclipse tools project home page
mailing lists	About the Follows Table Designst
community	About the Eclipse Tools Project
search	The Eclipse Tools Project is an open sou
bugs	for the project. A list of project docs desi
eclipse tools	Newsubpreieste
Downloads	New subprojects
CDT	→ <u>VE</u> ØØØ
GEF	The Eclipse Visual Editor pro intends to be useful for creat
COBOL	about this project <u>here</u>
Hyades	→ UML2 2000
EMF	The UML2 project is an EMF
VE	implementation of the metam

This is the CDT project screen.

eclipse	
home	
about us	
projects	CDT
downloads	
articles	C/C++ Development Tools
newsgroups	Al - when CDT
mailing lists	About the CDT
community	The CDT (C/C++ Development Tools) Project is working towards providing a fully functional C and C++ Integra
search	
bugs	There are a number of groups contributing to the CDT; We strongly encourage interested parties to extend ou
eclipse tools	available resources. We are looking for contributions from the open source community in the areas of test, de the C/C++ tools work well on all the Eclinse platforms.
Downloads	
CDT	Our current release function includes:
GEF	O/O + - Editor (topic functionality, control bioblichtics, control completion etc.)
COBOL	<ul> <li>C/C++ Editor (basic functionality, syntax nighting, code completion etc.)</li> <li>C/C++ Dehugger (APIs &amp; Default implementation using GDB)</li> </ul>
Hyades	<ul> <li>C/C++ Launcher (APIs &amp; Default implementation, launches and external application)</li> </ul>
EMF	Parser     Social Engine
VE	Content Assist Provider
UML2	Makefile generator
	The CDT is licensed under the Common Public License and is implemented in java as a set of plugins to the
	What's New
	New

CDT 2.0 NOW AVAILABLE! -- for this and other builds, follow the links on the Download Site.

If you scroll down a bit, you'll see a link to the CDT Download site.

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	1030
1	

eclipse		eclipse project universal tool platform
home		
about us	Resources	
projects		
downloads	Ganaral Resources	
articles	General Resources.	Answers to the meet common questions about the CDT. This should be the first place you go for any Question that you
newsgroups	FAQ	may have.
mailing lists	<u>Downloads</u>	Get the latest CDT builds
community	CDT Tutorials	Tutorials that take you through the various features of the CDT
search	CDT newsgroup	Place to ask questions on how to use the CDT (simple web interface also available)
bugs	Buqzilla	Place to open bugs or enhancements for the CDT
eclipse tools	Eclinse Charter	Folinse Charter describes Lenal and Convright issues etc.
Downloads		
CDT	Blanning and Activities:	
GEF		
COBOL	CDT Project Management/Plans	Planning and project management resources, such as CDT plans and project status.
Hyades	<u>CDT Monthly Conference calls</u>	CDT conference call schedule, agenda, and minutes.
EMF	System Tests	CDT verification (system level) activities & information
VE		
UML2	Community Resources:	
	Eclipse Wiki Wiki Web	A site full of useful information, created and maintained by our users.
	CDT Community Webpage	This site showcases plugins and tools developed by and for the CDT Community. If you have tools or plugins that you would like to submit to the CDT Community Page please contact us through the CDT Development Mailing List or the Eclipse Tools CDT newsgroup.

You should now see the CDT download screen, as shown directly below.

eclipse	
home	
about us	
projects	CDT project downloads
downloads	latest downloads from the CDT team
articles	
newsgroups	
mailing lists	X
community	New
search	
bugs	lune 30, 2004
eclipse tools	CDT 2.0 has been released.
Downloads	
CDT	May 31, 2004 CDT 2 0 MD (final milliontane minute C (1) has been released
GEF	CDT 2.0 M9 (final milestone pror to GA) has been released
COBOL	April 2, 2004
Hyades	CDT 2.0 M8 has been released.
EMF	March 2, 2004
VE	CDT 1.2.1 has been released.
UML2	
	February 16, 2004 CDT 2.0 M7 has been released.

#### We must use CDT 2.0 with Eclipse 3.0

If you scroll down a bit on the page, there will be a spot to select the CDT 2.0 Zip Distributions. There is an update manager technique that can install CDT hands off, but I've had problems with it.

Note that this tutorial was prepared in July 2004. Eclipse and CDT are always in flux. Be sure to browse around the Eclipse web site and be sure that the CDT version that you choose is compatible with the Eclipse version you previously selected.

## Zip Distributions

#### CDT 2.0

As an alternative to using the release update site, users can download the 2.0 release as zip files by following the link below:



We finally select **win32.win32.x86** from the **CDT Runtime**. Selecting the **CDT SDK** brings in the source files which are little interest here.

- CDT Runtime
  - o <u>aix.motif.ppc</u>
  - o hpux.motif.PA\_RISC
  - o linux.gtk.x86
  - o <u>linux motif x86</u>
  - o qnx.photon.x86
  - o solaris motif spare
  - o win32.win32.x86

Click on win32.win32.x86 to start the download Once again, I downloaded to the empty scratch download directory.

Save As								? 🗙	
Save in:	🚞 download		*	G	1	Þ	•		2
My Recent Documents									
Desktop									
My Documents									
My Computer									
	File name:	org.eclipse.cdt-2.0-win32.win3	32.x86			*		Save	
My Network	Save as type:	WinZip File				*		Cancel	:

The **CDT** is an 8 Megabyte download; it takes about 20 seconds on a cable modem.



If you extract the CDT zip file to the same download directory, you will get the following result.



All we have to do to update **Eclipse** with the **CDT** plug-in is to copy the contents of the downloaded "**features**" folder to the same "**features**" folder in the Eclipse directory and do likewise for the "**plugins**" folders.



You can obviously do this with Windows Explorer and drag-and-drop techniques.

Likewise, copy all the folders in the download blugins directory to the eclipse plugins directory.



>>

→ Go

7 Folders

Now we can test if the Eclipse has been successfully updated with the CDT Plug-in. Before testing this, it behooves us to create a desktop icon that will run the Eclipse IDE.

The easy way to do this is to use Windows Explorer to find the Eclipse executable (application) in the Eclipse directory; right-click on it and select "Send to Desktop." When finished, your desktop should have the follow icon placed. Clicking on it will start the Eclipse IDE.



Once Eclipse has started, select **File – New – Project** and you should see the following dialog. If the C and C++ project options are shown, then CDT has been successfully installed. Now exit from Eclipse and we'll install the CYGWIN utilities.

🖾 New Project	×
Select a wizard Create a Java project	
Wizards:	
Java Project	
C C++ Managed Make C++ Project Standard Make C++ Project CVS CVS Java	Success! We have C and C++ capabilities in Eclipse.
⊕- ⁄ Plug-in Development ⊕- ⁄ Esimple	
	3
< Back Next > Finish	Cancel

## 4. Downloading CYGWIN

To use the GNU compiler suite, we must first install the CYGWIN environment. Cygwin is a DLL which provides a UNIX emulation environment for Windows. The Cygwin environment also provides a complete port of such development utilities as gcc, binutils, gdb, make, etc., as well as a vast number of useful utilities. The CYGWIN download includes a GNU compiler suite for Windows/Intel Pentium targets. We will download later a GNU compiler suite specifically targeted for the ARM processor family and use that instead.

The Cygwin environment can be downloaded and installed from the internet. Click on the following link to proceed:

## www.cygwin.com

This link leads to the CYGWIN home page, as shown below. Click on "**Install or Update New!**" to proceed.



What Is Cygwin?

Cygwin is a Linux-like environment for Windows. It consists of two parts:

• A DLL (cygwin 1. dll) which acts as a Linux emulation layer providing substantial Linux API functionality.

• A collection of tools, which provide Linux look and feel.

The Cygwin DLL works with all non-beta, non "release candidate", ix86 32 bit versions of Windows since Windows 95, with the exception of Windows CE.

#### What Isn't Cygwin?

• Cygwin is **not** a way to run native linux apps on Windows. You have to rebuild your application from source if you want to get it running on Windows.

Cygwin is not a way to magically make native Windows apps aware of UNIX functionality, like signals, ptys, etc. Again, you need to build your
apps from source if you want to take advantage of Cygwin functionality.



Now we will take the defaults on most of the following setup screens. In the screen below, select "**Open**" to allow the Cygwin web site to download and then install your Cygwin environment.

File [	Download	×
?	You are downloading the file: setup.exe from www.cygwin.com	1
(	Would you like to open the file or save it to your computer? Open Save Cancel More Info Anways ask before opening this type of file	

Now the Cygwin wizard will start up. Select "Next" to continue.



Choose "Install from Internet" and then click "Next."

Cygwin Setup - Choose Installation Type 🛛 🗖 🔀
Choose A Download Source Choose whether to install or download from the internet, or install from files in a local directory.
<ul> <li>Install from Internet</li> </ul>
C Download from Internet
Install from Local Directory
< Back Next > Cancel

Now we specify the root directory where Cygwin will be installed (**d:\cygwin**). Click "**next**" to continue.

D	
D:\cygwin	Browse
C All Users	Default Text File Type     Ons
<ul> <li>Just Me</li> </ul>	C Unix

We can accept the default here since this specifies a temporary directory for downloading operations (actually on the desktop, you'll need to remove these from your desktop later). Click "**Next**" to continue.

🖻 Cygwin Setup - Select Local Package Dir 📘 🗖 🔀
Select Local Package Directory Select a directory where you want Setup to store the installation files it downloads. The directory will be created if it does not already exist.
Local Package Directory           D:\Documents and Settings\Jim Lynch\Desktop         Browse
< Back Next > Cancel

Here I selected "**Direct Connection**" since I have a cable modem. If you have a dialup, then "**Use IE5 Settings**" would be the proper choice. Click "**Next**" to proceed.

🖻 Cygwin Setup - Select Connection Type 💦 🗖 🔀
Select Your Internet Connection Setup needs to know how you want it to connect to the internet. Choose the appropriate settings below.
Direct Connection
C Use IE5 Settings
C Use HTTP/FTP Proxy:
Proxy Host
Port 80
< Back Next > Cancel

Here we are asked to select a download mirror site. As always, this is a bit of a gamble. Pick one, pray and click "**Next**" to proceed.

Choose A Down	etup - Choose Do nload Site	wnload	Site(s)	
	Available Download Sites: [ftp://planetmirror.com	ites to the list	~	
	ftp://ring.aist.go.jp ftp://ring.asahi-net.or.jp ftp://ring.astem.or.jp ftp://ring.crl.go.jp ftp://ring.exp.fujixerox.co.jp ftp://ring.jp-kyoto.ad.jp ftp://ring.jah.ne.jp ftp://ring.so-net.ne.jp ftp://sigunix.cwru.edu			
User URL:	ftp://sources-redhat.mirror.red ftp://sunsite.cnlab-switch.ch ftp://sunsite.dk	lwire.net	~	Add
·		< Back	Next >	Cancel

The next screen allows you to specify what GNU packages you wish to install.

Basically, we want the default installation that will allow us to compile for the Windows XP / Intel platform. This will allow us to use Eclipse to build Windows applications (not covered in this document).

If you look at the Cygwin "Select Packages" screen below, you'll see the following line.



You must click on the little circle with the two arrowheads until the line changes to this:



This will force installation of the default GNU compiler suite for Windows/Intel targets. Here's the "**Select Packages**" screen before clicking on the circle with arrowheads.

C	Cygwin Setup -	Sele	ct Pack	ages			
	Select Packages Select packages to insta	all					2
		C Ke	ep 🔿 Prev	Curr	C Exp V	liew Categor	y
	Category	Curr	New		Bi Sr	. Package	^
	<ul> <li>+ All   Default</li> <li>+ Admin   Default</li> <li>+ Archive   Default</li> <li>+ Base   Default</li> <li>+ Database   Default</li> <li>+ Devel   Default</li> <li>+ Doc   Default</li> <li>+ Editors   Default</li> <li>+ Grambics   Default</li> </ul>					>	
				< Back	Next >	Can	cel

Here's the "Select Packages" screen after changing from **Devel – Default** to **Devel – Install.** 

Cygwin Setup -	Sele	ct Pack	ages			
Select Packages Select packages to insta	all				(	>
	C Ke	ep 🔿 Prev	Curr	C Exp	View Categor	у
Category	Curr	New		Bi Sr	Package	^
+ All 🚯 Default						
+ Admin 🚯 Default						
+ Archive 🚱 Default						
+ Base 🚯 Default						_
+ Database 🚯 Default						
+ Devel 🚱 Install						
+ Doc 🚯 Default						
+ Editors 🚯 Default						
+ Games 🚯 Default						-
+ Graphics 📭 Default						×
					>	
			< Back	Nevts	Can	
		_	( DOOK	HOAC /		

Now the Cygwin will start downloading. This creates a huge 700 Megabyte directory on your hard drive and takes 30 minutes to download and install using a cable modem.

🖻 99% - Cygwin Setup		_ 🗆 🗙
<b>Progress</b> This page displays the progress of the dov	vnload or installation.	E
Downloading		
Package: Total:		
Disk:		
	< Back Next >	Cancel

When the installation completes, Cygwin will ask you if you want any desktop icons and start menu entries made. Say "**No**" to both. These icons allow you to bring up the BASH shell emulator (like the command prompt window in Windows XP). This would allow you do some Linux operations, but this capability is not necessary for our purposes here.

🛎 Cygwin Setup - Create Icons	
Create Icons Tell setup if you want it to create a few icons for convenient access to the Cygwin environment.	E
🗖 Create icon on Desktop	
Add icon to Start Menu	
< Back Finish	Cancel

Now the Cygwin installation manager completes and shows the following result.



The directory **d:\cygwin\bin** must be added to the **Windows XP** path environment variable. This allows Eclipse to easily find the Make utility, etc.

Using the Start Menu, go to the Control Panel and click on the "System" icon.

Then click on the "**Advanced**" tab and select the "**Environment Variables**" icon. Highlight the "**Path**" line and hit the "**Edit**" button. Add the addition to the path as shown in the dialog box shown below (don't forget the semicolon separator). The Cygwin FAQ advises putting this path specification before all the others, but it worked for me sitting at the end of the list.

Edit System	Variable <b>?</b> 🗙
Variable name:	Path
Variable value:	iles\Adaptec Shared\System;D:\cygwin\bin
	OK Cancel

We are now finished with the CYGWIN installation. It runs silently in the background and you should never have to think about it again.

## 5. Downloading the GNUARM Compiler Suite

At this point, we have all the GNU tools needed to compile and link software for Windows/Intel computers. It is possible to use all this to build a custom GNU compiler suite for the ARM processor family. The very informative book "**Embedded System Design on a Shoestring**" by Lewin A.R.W. Edwards ©2003 describes how to do this and it is rather involved.

Fortunately, Pablo Bleyer Kocik and the people at **gnuarm.com** have come to the rescue with pre-built GNU compiler suite for the ARM processors. Just download it with the included installer and you're ready to go.

Click on the following link to download the GNUARM package.

#### www.gnuarm.com

The GNUARM web site will display and you should click on the "Files" tab.



Just like all the other downloads we've done, we direct this one to our empty download directory on the hard drive. Here we click "**Save**" and then specify the download destination.

File [	Download	×
?	You are downloading the file: java_nl-1.12.0_gi-6.0.exe from www.ariusdsp.com Would you like to open the file or save it to your computer?	
	Open     Save     Cancel     More Info       ✓ Always ask before opening this type of file	

Save As				? 🗙
Save in:	🚞 download	💌 G 🌶	• 🖽 🥙	
My Recent Documents				
Desktop				
My Documents				
My Computer				
	File name:	bu-2.15_gcc-3.4.1-c-c++-java_nl-1.12.0_gi-6.0		Save
My Network	Save as type:	Application	<b>v</b> (	Cancel

As you can see, this download has a very long name.

This download is a 18 megabyte file and takes 30 seconds on a cable modem.

83% of bu	-2.15_gcc-3.4.1-c 📃 🗖 🗙
8	*
Saving:	
java_ni-1.12.	U_gI-6.U.exe from www.ariusdsp.com
Estimated time le Download to: Transfer rate:	ft 8 sec (14.7 MB of 17.8 MB copied) \bu-2.15_gcc-3.4.1-c-c++-java_nl-1.12.0_gi-6.0. 362 KB/Sec
🗹 Close this dial	og box when download completes
	Open Open Folder Cancel

The download directory now has the following setup application with the following unintelligible filename: **bu-2.15\_gcc-3.4.1-c-c++-java\_nl-1.12.0\_gi-6.0.exe** 

Click on that filename to start the installer.

😂 download	
File Edit View Favorites Tools Help	
G Back 🔹 🕥 🕤 🏂 🔎 Search 🔊 Folders 💷 🖌 📋 🖺 🗙	
Address 🛅 D:\download	🐱 🄁 Go
Folders × Name Size Ty	ype
<ul> <li>Local Disk (D:)</li> <li>AOL Instant Messenger</li> <li>aolextras</li> <li>arm</li> <li>C_DILLA</li> <li>catalogs</li> <li>cygwin</li> <li>Documents and Settings</li> <li>download</li> <li>eclipse</li> <li>fro</li> </ul>	plication
	>

The GNUARM installer will now start. Click "Next" to continue.



Accept the GNU license agreement – don't worry, it's still free. Click "**Next**" to continue.

🕼 Setup - GNUARM	
License Agreement Please read the following important information before continuing.	
Please read the following License Agreement. You must accept the terms of agreement before continuing with the installation.	f this
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	<b>~</b>
⊙ I accept the agreement	
I do not accept the agreement	
< Back Next >	Cancel

We'll take the default and let it install into the "**Program Files**" directory. Click "**Next**" to continue.

😼 Setup - GNUARM 📃 🗆 🗙
Select Destination Location Where should GNUARM be installed?
Setup will install GNUARM into the following folder.
To continue, click Next. If you would like to select a different folder, click Browse.
D:\Program Files\GNUARM Browse
At least 62.9 MB of free disk space is required.
K K K K K K K K K K K K K K K K K K K

We'll also take the defaults on the "Select Components" window. Click "**Next**" to continue.

	i₿Setup - GNUARM	
	Select Components Which components should be installed?	
	Select the components you want to install; clear the components y install. Click Next when you are ready to continue.	you do not want to
I	Full installation	×
	<ul> <li>Little Endian</li> <li>LE Libraries</li> <li>No Fast Multiplier</li> <li>ARM-THUMB Interworking</li> <li>THUMB</li> </ul>	77.0 MB
	ARM-THUMB Interworking	9.5 MB 9.5 MB
I	Floating Point Unit	29.0 MB
	Current selection requires at least 218.9 MB of disk space.	
	< Back	Next > Cancel

Take the default on this screen. Click "Next" to continue.

🕏 Setup - GNUARM 📃 🗆 🗙
Select Start Menu Folder Where should Setup place the program's shortcuts?
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
<pre></pre>

It's very important that you <u>don't check</u> "**Install Cygwin DLLs**". We already have the Cygwin DLL installed from our Cygwin environment installation. Since all operations are called from within Eclipse, we don't need a "**desktop icon**" either. Click "**Next**" to continue.



Click on "Install" to start the GNUARM installation.

ස් Setup - GNUARM	
Ready to Install Setup is now ready to begin installing GNUARM on your computer.	
Click Install to continue with the installation, or click Back if you want to review o change any settings.	or
Destination location: D:\Program Files\GNUARM Setup type:	<b>^</b>
Full installation Selected components: Little Endian LE Libraries No Fast Multiplier ARM-THUMB Interworking THUMB	~
	>
< Back Install	Cancel

Sit back and watch the GNUARM compiler suite install itself.

When it completes, the following screen is presented. Make sure that "Add the executables directory to the PATH variable" is checked. This is crucial.



This completes the installation of the compiler suites. Since Eclipse will call these components via the make file, you won't have to think about it again.

It's worth mentioning that the GNUARM web site has a nice Yahoo user group with other users posing and answering questions about GNUARM. Pay them a visit. The GNUARM web site also has links to all the ARM documentation you'll ever need.

## 6. Installing the Philips LPC2000 Flash Utility into Eclipse

The Philips LPC2000 Flash Utility allows downloading of hex files from the COM1 port of the desktop computer to the TiniARM board's flash (or RAM) memory.

We need to download the latest version of this program from the Philips web site and unzip and install it into the **program files** directory. Then we will start Eclipse and add the LPC2000 Flash Utility as an external command to be invoked.

Click on the following link to access the Philips LPC2106 web page.

#### www.semiconductors.philips.com/pip/LPC2106.html

The following web page for the LPC2106 should open.

PHILIPS					
YOUR COUNTRY	CONSUMER PROD	истя 🔻	PROFESSIONAL PRODUCTS	SEARCH	•
PHILIPS SEMICONDU	CTORS News Center   Mark	ets   Key Technologie:	s   Products   Jobs   Compa	any Profile	
🥝 🖶 🗐 🕥	Product Inf	formation			
Product Categories	LPC2104/2105/21	06; Single-chip	32-bit Ir	formation as of	2004-07-10
<ul> <li>Analog and mixed- signal devices</li> </ul>	microcontrollers; 128 kB ISP/IAP Flash with 64 🔲 🤌			Download datasbeet	
• Audio				monned	datasheet
• Bus devices	General description	Features	Applications	🔽 Datashe	et
• Clocks & Watches	Block diagram	🖾 Buy online	Support & tools	Email/tra	anslate
• Data Communications	Products & packages	Parametrics	Similar products	🛛 🖾 Disclaim	er
<ul> <li>Discrete modules</li> </ul>	General descripti	on			
<ul> <li>Discretes</li> </ul>					
Display drivers	The LPC2104, 2105 and 3	2106 are based on a 1	6/32 bit ARM7TDMI-S CPU	J with real-time	emulation and
<ul> <li>Identification &amp; Security</li> </ul>	wide memory interface a clock rate. For critical co	embedded trace support, together with 128 kbytes (kB) of embedded high speed flash memory. A 128 bit wide memory interface and a unique accelerator architecture enable 32 bit code execution at maximum clack water. See without end size specifications, the alternative 16 bit Thursh Made actions does be accelerate			
• Logic	than 30pct with minimal performance penalty.			code by more	
<ul> <li>Microcontrollers</li> </ul>					
<ul> <li>Peripherals</li> </ul>	Due to their tiny size and	l low power consumpt	ion, these microcontrollers	are ideal for ap	plications where
•Video	communication is a key r	equirement, such as a es and on-chip SRAM	access control and point-of options up to 64 kilobytes.	-sale, with a wic they are very w	ell suited for
• Wired	communication gateways	communications interfaces and on-chip skew options up to be knowled; any are very wen sated for communication gateways and protocol converters, soft modems, voice recognition and low end imaging,			w end imaging,
Communications	providing both large buff	er size and high proce	ssing power. Various 32 b	it timers, PWM c	hannels and 32 dioal systems
<ul> <li>wireless</li> <li>Communications</li> </ul>	GPIO lines make these microcontrollers particularly suitable for industrial control and medical systems.			uicai systems.	
	Eeatures				
	Key features				
	• 16/32 bit ARM7TDML-	S processor.			
PRODUCT BORTAL	<ul> <li>16/32/64 kB on-chin 5</li> </ul>	Static RAM.			

If you scroll down this page, you will see a link to the LPC2000 Flash Utility download. Click on the ZIP file LPC2000 Flash Utility (date 2004-03-01)

## Support & tools

PDF LPC2104 Single Chip 32-bit Microcontroller Erratasheet(date 2004-06-01)
PDF LPC2105 Single Chip 32-bit Microcontroller Erratasheet(date 2004-06-01)
PDF LPC2106 Single Chip 32-bit Microcontroller Erratasheet(date 2004-06-01)
PDF LPC2104 Erratasheet(date 2003-12-10)
PDF LPC2105 Erratasheet(date 2003-12-10)
PDF LPC2106 Erratasheet(date 2003-12-10)
PDF Philips Microcontroller Line Card(date 2004-03-05)
PDF LPC2104/2105/2106 Leaflet(date 2004-02-24)
PDF Philips -- The Innovation Leader in Mocrocontrollers(date 2004-06-30)
PDF LPC2106/2105/2104 User Manual(date 2003-09-17)
21P LPC2000 Flash Utility(date 2004-03-01)
WEESITE Development Tools for LPC2100 devices(date 2003-05-21)

As before, we'll save the downloaded zip file in our empty download directory. This is a fairly short download, only about 2 megabytes.

File [	Download 🛛 🗙
2	You are downloading the file: lpc2000_flash_utility.zip from www.semiconductors.philips.com
	Would you like to open the file or save it to your computer?          Open       Save       Cancel       More Info         Image: Always ask before opening this type of file

99% of lpc	2000_flash	_utility	
<b>8</b>			
Saving: lpc2000_flash_util	ity.zip from www.se	miconductors.philip:	s.com
Estimated time left Download to: Transfer rate:	t 1 sec (1.63 MB of ; D:\download\lpc20 416 KB/Sec	2.00 MB copied) 00_flash_utility.zip	I
Close this dialo	g box when downloa	ad completes	

We'll use WinZip to unzip this into the download directory.

🕲 WinZip	(Evalı	uation Vers	sion) - lj	pc2000_	_flash_ut	ility.z	zip		×
File Actions	Options	Help							
1		1	<b>(</b>	<b>1</b>	B	<del></del>	<b>(</b>	I	
New	Open	Favorites	Add	Extract	Encrypt	View	Install	Wizard	
Name		Туре	Modified		Size	Ratio	Packed	Path	
B setup.exe LPC210x_IS Setup.lst	P.CAB	Install Applic WinZip File LST File	7/15/200 5/17/200 5/17/200	0 12:00 AM 4 11:21 AM 4 11:22 AM	139,776 2,041,648 4,001	52% 1% 79%	67,174 2,029, 825		
Selected 0 files	, O bytes			Total 3 files	, 2,135KB			00	) .::

Now you can see that the download directory has a setup utility and another zip file containing the LPC2000 Hex Utility. Click on the **setup.exe** application to start the installer.



The LPC2000 Flash Utility setup now starts. Click on **OK** to proceed.

	PC2000 Flash Utility Setu	p
*	LPC2000 Flash Utility Setup	×
	Welcome to the LPC2000 Flash Utility installation program. Setup cannot install system files or update shared files if they are in use. Before proceeding, we recommend that you close any applications you may be running.	
	OK E <u>x</u> it Setup	

Take the default on this screen and let it install the LPC2000 Flash Utility into the Program Files directory.

🛿 LPC2000 Flash Utility Setup	×
Begin the installation by clicking the button below.	
Click this button to install LPC2000 Flash Utility software to the specified destination directory.	
D:\Program Files\LPC2106 ISP\ Change Directory	
Exit Setup	

Take the default on the screen below. Click on "Continue."

🛿 LPC2000 Flash Utility - Choose 🔀
Setup will add items to the group shown in the Program Group box. You can enter a new group name or select one from the Existing Groups list.
Program Group:
LPC2000 Flash Utility
Existing Groups:
321 Studios Accessories ATI Multimedia Center Cygwin
LPC2000 Flash Utility MSXML 4.0
Startup
<u>C</u> ontinue Cancel

In a very few seconds, the installer will complete and you should see this screen.

LPC2000 Flash	n Utility S	etup	X
LPC2000 Flash Utilit	ty Setup was co	ompleted success	sfully.
	ок	1	
		]	

Here we see the utility residing in the Program Files directory, just as promised.

File Edit View Favorites Tools Help			
File Edit View Favorites Tools Help			
🙆 Back 🔹 🕥 - 🍂 💭 Search 🕞 Er	Iders 🛄 🗸 🕅		
Address 🗁 D:\Program Files\LPC2106 ISP			💙 🄁 Go
Folders × Name	Size	Туре	Date Modified
Program Files 321Studios Adaptec Adobe Almonica Online 7.0 America Online 7.0 America Online 8.0 America Online 8.0a Actional Action	0x_ISP 616 KB	Application Text Document	5/17/2004 10:28 AM 7/11/2004 1:55 AM

Now that the Philips LPC2000 Flash Utility is properly installed on our computer, we'd like to install it into Eclipse so that it can be invoked from the RUN pull-down menu under the "external tools" option. Start Eclipse by clicking on the desktop icon.



The layout of the Eclipse screen is called a "perspective." The default perspective is the "resource" perspective, as shown below.



We need to change it into the C/C++ perspective. In the **Window** pull-down menu, select **Window – Open Perspective – Other – C/C++** and then click **OK**.

Select Perspective
C/C++ C/C++ Browsing CVS Repository Exploring Debug Java Java Browsing Java Type Hierarchy Plug-in Development Resource (default) Team Synchronizing
OK Cancel

Eclipse will now switch to the C/C++ perspective shown below and will remember it when you exit.

	🛛 🗙
Run Window Help	
• 💁 • ] 😰 🖋 ] 🏷 🗇 • 🔿 •	🖹 🗟C/C++ 🛛 🕷
	🗄 Outline 🛛 🐂 🗖 🗖
	An outline is not available.
Problems 🛛 Console Properties	≍ ⇒ - □
0 errors, 0 warnings, 0 infos	1-
Description	Resource
	Image: Second secon

Now we want to add the Philips LPC2000 Flash Utility to the "**External Tools**" part of the **Run** pull-down menu. Select **RUN – External Tools – External Tools**.

🖼 C/C++ - Eclipse Platform			
File Edit Navigate Search Project	Run Window Help		
📬 🗕   💣 🖄 🛉 🛉 🕻	🗞 Run Last Launched	Ctrl+F11	
C/C++ Projects 🔽 Navigator 🗙 🖓	🎭 Debug Last Launched	F11	
	Run History	•	
	Run As	•	
	Run		
	Debug History	•	
	Debug As	•	
	Debug		
	🗞 External Tools	)	Run As
			💁 External Tools
			Organize Favorites

We want to add a new program to the External Tools list, so click on **Program** and then **New**.

External Tools	×
Create, manage, and run configura Create a configuration that will r	tions un an Ant buildfile.
Configurations :	Perspectives These settings associate a perspective with Ant Build launch configurations. A different perspective may be associated with each supported launch mode, and can optionally be activated when a configuration is launched or when a breakpoint is encountered via the Debug preferences. To indicate that a perspective switch should not occur, select "None".   Run: None   Restore Defaults
New Delete	Apply Revert
	Run Close

Note below that there's a new program under the "program" tree with the name **New\_configuration** and there's no specifications as to what it is.

In the Name text box, replace New-configuration with LPC2000 Flash Utility.

In the **Location** text box, use the "**Browse File System**" tool to find the Philips LPC2000 Flash Utility in the Program Files directory. Its name is **LPC210x\_IPC.exe**.

Here's the External Tools window before editing.

External Tools	×
Create, manage, and run configur Please specify the location of th	ations e external tool you would like to configure.
Configurations : Ant Build Program New_configuration	Name: New_configuration
New Delete	Apply Revert
	Run Close

Here's the External Tools window after our modifications. Click on **Apply** to accept.

External Tools	×
Create, manage, and run configure Create a configuration that will I	ations
Configurations:	Name: LPC2000 Flash Utility  Main Refresh R Environment Common  Location:  D:\Program Files\LPC2106 ISP\LPC210x_ISP.exe  Browse Workspace Browse File System Variables  Working Directory:  Browse Workspace Browse File System Variables  Arguments:  Variables  Note: Enclose an argument containing spaces using double-quotes (*).
New Delete	ApplyRevert
	Run Close

Close everything out and return to the **Run** pull-down menu. Select **Run – External Tools – Organize Favorites**.

🖀 C/C++ - Eclipse Platform				
File Edit Navigate Search Project	Run Window Help			
] 📬 ▼ 🔜 🗁 ] 🎯 🏠 序 ] 🏇 ▼ 🖸	🗞 Run Last Launched 🔖 Debug Last Launched	Ctrl+F11 F11		
	Run History Run As Run Debug History Debug As Debug	> > >		
	External Tools		Run As	

We're now going to put the Philips PLC2000 Flash Utility into the "favorites" list. Click on in the window below.

🖾 Organize Ext	ernal 🗙
Favorites:	$\frown$
	Add
	Remove
	Up
	Down
ОК	Cancel

Click the selection box for LPC2000 Flash Utility. This will add it to the favorites list.

Selection Needed 🛛 🗙
Select Launch Configurations:
C2000 Flash Utility
Select All Deselect All
OK Cancel

Now when we click on the Run pull-down menu and select "External Tools," we see the LPC2000 Flash Utility at the top of the list.

C/C++ - Eclipse Platform		
File Edit Navigate Search Project	Run Window Help	
📬 🗕   🖉 🖄 🛉 🗸 🕻	🗞 Run Last Launched Ctrl+F11	☆ C/C++ **
C/C++ Projects 🕾 Navigator 😂 🧧	🍇 Debug Last Launched 🛛 F11	Cutline 🛛 🐂 🗖 🗖
	Run History	An outline is not available.
	Run As 🕨 🕨	
	Run	
	Debug History	
	Debug As	
	Debug	
	🍇 External Tools 🔹 🔸	🗞 1 LPC2000 Flash Utility
		Run As
		Q. External Tools
		Organize Favorites
	Problems × Console Properties	; ☆▼□□
	0 errors, 0 warnings, 0 infos	
	Description	Resource
	<	>
I I		

Click on LPC2000 Flash Utility to verify that it runs.

C/C++ - Eclipse Platform	
File Edit Navigate Search Project Run Window Help   Image: Search Image: Search Image: Search Image: Search Image: Search Image: Search   Image: Search Image: Search Image: Search Image: Search Image: Search Image: Search   Image: Search Image: Search Image: Search Image: Search Image: Search Image: Search   Image: Search Image: Search Image: Search Image: Search Image: Search Image: Search   Image: Search Image: Search Image: Search Image: Search Image: Search Image: Search   Image: Search Image: Search Image: Search Image: Search Image: Search Image: Search   Image: Search Image: Search Image: Search Image: Search Image: Search Image: Search   Image: Search Image: Search Image: Search Image: Search Image: Search Image: Search   Image: Search Image: Search Image: Search Image: Search Image: Search Image: Search   Image: Search Image: Search Image: Search Image: Search Image: Search Image: Search   Image: Search Image: Search Image: Search Image: Search Image: Search Image: Search   Image: Search Image: Search Image: Search Image: Search Image: Search Image: Search   Image: Search Image: Search Image: Search Image: Search Image: Search <td< th=""><th>E C/C++ » tline ≈ *1 = 1 tline is not available /2.2.0</th></td<>	E C/C++ » tline ≈ *1 = 1 tline is not available /2.2.0
Flash Programming       Filename:         D:\eclipse\workspace\test\main.hex          Upload to Flash       Execute Code         Compare Flash       Manual Reset         Device       End Sector:         Device       Part ID:         XTAL Freq. [kHz]:       14746	Communication Connected To Port: CDM1: • Use Baud Rate: 19200 • Time-Out [sec]: 2 Use DTR/RTS for Reset and Boot Loader Selection

Now cancel the LPC2000 Flash Utility and quit Eclipse.

## 7. Downloading the New Micros TiniARM Example Program

The example provided by New Micros for their **TiniARM** development system is a good place to start to check out our Eclipse system.

Click on the following link to go to the New Micros web site.

www.newmicros.com

When the New Micros web site appears, click on **TiniARM** to continue.



#### When the page for the **TiniARM** loads, scroll down towards the middle of the page.

Prod Guide	FORUM	Sales Dept.	Tech Support	NIMA	Contact Us	Press Release
		N	Wiene	Inc		
PlugaPod™		NG		9, <b>ШС</b> .		TiniARM
TiniPod™		<mark>⊠ E</mark> mai	il this page	Sales Questions		TechQuestions
ServoPod™		Cate	gory: - Select Category -	v Go	Search:	Go
IsoPodX™						
IsoPod ™						
MiniPod ™		TiniARM				
IsoMax <sup>™</sup>		//				
DSP56800		PDF Schemati	•	lini		IM
MCORE		Manual				
68HC11		/		120 M		
68HC12				100		
68HC16			2 54			
68332			150			100
8051			1		11111, ( mil, ( m)	
INEC V25						
Handbeld				-h		
Perinherals						
H-Bridge			TT.			MISTO
Psyscope			(A)			CONV.
Time Machine						
Accessories						
SPECIALS						

In the "Features" section, click on the link "GNU, download info and examples now available."

APPLICATIONS:	
TiniARM <sup>™</sup> is suitable for dedicated control of RC Servo motors, DC motors, Brushless DC Motors, stepper motors, solenoids, and other bipolar power outputs, such as general converter/inverter applications, data collection and many networked control applications.	
FEATURES:	
Board Size: 1.0"(W) x 1.3"(L) x 0.4"(H)     Weight: 0.2 Ounces     Programming Longuage.     GNU,download info and examples now available     O FORTH, Third Darty     O In-System Programming Flash Utility (free download)     ARM7TDMI-S CPU, 32-bit microprocessor	
CPU oprerating range up to 60Mhz     Real Time Clock	

As usual, we will download into our empty "download" scratch directory on the hard drive.

File [	Download 🛛 🗙
?	You are downloading the file: GNUfiles.zip from www.newmicros.com
	Would you like to open the file or save it to your computer?          Open       Save       Cancel       More Info         Image: Always ask before opening this type of file



downloading the documentation and examples, we see that the download directory has a zip file named **GNUfiles.zip**.

WinZip	(Evalu	iation Ve	rsion) -	GNUfil	es.zip						×
File Actions	Options	Help									
1		1	<b>(</b>	<u>ت</u>	B	9	<b>6</b>	6	ð		
New	Open	Favorites	Add	Extract	Encrypt	View	CheckOut	Wiz	ard		
Name			Туре	•	Modified		Size	Ratio	Packed	Path	
📩 AN10254_1	1.pdf		Adob	e Acrob	12/16/2003	7:30 AM	53,023	26%	39,143	PDFs\	
🗖 AN10255_1	1.pdf		Adob	e Acrob	1/9/2004 6:	11 AM	40,222	28%	28,954	PDFs\	
🔁 AN10256_1	1.pdf		Adob	e Acrob	12/16/2003	7:42 AM	37,544	26%	27,702	PDFs\	
🔁 ARMDebug	v10.pdf		Adob	e Acrob	1/6/2004 8:	26 AM	550,176	9%	498,282	PDFs\	
📩 gcc-whitep	aper.pdf		Adob	e Acrob	3/23/2004 6	51 PM	65,448	29%	46,389	PDFs\	
🔁 TiniARMdki	um.pdf		Adob	e Acrob	4/2/2004 4:	45 AM	143,613	16%	120,027	PDFs\	
🔁 UM_LPC21(	06_2105_2	2104_2.pdf	Adob	e Acrob	11/12/2003	7:30 AM	2,383,927	55%	1,081,	PDFs\	
🖻 a.lst			LST F	File	4/2/2004 3:	41 AM	12,561	70%	3,783	Example	
📼 ivt.o			O File	Э	4/2/2004 3:	41 AM	1,072	62%	406	Example\	
💌 ivt.s			S File	e	4/2/2004 3:	41 AM	2,270	66%	775	Example\	
國 libc.a			A File	e	4/2/2004 3:	41 AM	512,590	74%	135,808	Example\	
🗒 lpc210x.h			H File	э	4/2/2004 3:	41 AM	13,501	86%	1,904	Example\	
🗒 main.c			C File	9	4/2/2004 3:	41 AM	4,212	61%	1,627	Example	
👅 main.cmd			Wind	ows NT	3/31/2004 4	:16 AM	7,903	70%	2,337	Example\	
國 main.hex			HEX I	File	4/2/2004 3:	41 AM	2,719	60%	1,080	Example\	
🖻 main. map			MAP	File	4/2/2004 3:	41 AM	1,620	69%	497	Example\	
🖻 main.o			O File	Э	4/2/2004 3:	41 AM	1,772	43%	1,007	Example\	
🖻 main.out			OUT	File	4/2/2004 3:	41 AM	2,414	48%	1,267	Example\	
🖻 makefile			File		4/2/2004 2:	13 AM	741	51%	360	Example\	
🐻 simple.cm	t i		Wind	ows NT	4/2/2004 2:	12 AM	474	46%	254	Example\	
🖻 start.o			O File	Э	4/2/2004 3:	41 AM	660	61%	258	Example	1
🖻 start.s			S File	e	4/2/2004 3:	41 AM	1,501	69%	470	Example\	
<					Ш						>
Selected 0 file:	s, O bytes				Total 22 files,	3,750KB				00	.:

Using WinZip, we extract this file into the **download** directory.

When unzipping is finished, we see the following files in the **download**\example directory.

😂 Example				
File Edit View Favorites Tools	Help			
🕒 Back 🔹 🕥 🕤 🏂 🔎 Sear	rch 😥 Folders	∭ <b>-</b>	🗈 <u>ĩ</u> 🗙	
Address 🛅 D:\download\Example				💌 🄁 Go
Folders	Name	Size	Туре 🔺	Date Modified
🗆 👄 Local Diek (Dr)	🖬 libc.a	501 KB	A File	4/2/2004 3:41 AM
	🗐 main	5 KB	C File	4/2/2004 3:41 AM
AUL Instant Messenger	🖻 makefile	1 KB	File	4/2/2004 2:13 AM
🗄 🧰 aolextras	🗐 lpc210x	14 KB	H File	4/2/2004 3:41 AM
🗀 arm 📃	📷 main.hex	3 KB	HEX File	4/2/2004 3:41 AM
C_DILLA	🗖 a.lst	13 KB	LST File	4/2/2004 3:41 AM
🚞 captura	💽 main	2 KB	MAP File	4/2/2004 3:41 AM
🛅 catalogs	🔟 ivt.o	2 KB	O File	4/2/2004 3:41 AM
🕀 🗀 cyawin	📷 main.o	2 KB	O File	4/2/2004 3:41 AM
Concurrents and Settings	📼 start.o	1 KB	O File	4/2/2004 3:41 AM
	🔟 main.out	3 KB	OUT File	4/2/2004 3:41 AM
	🖻 ivt	3 KB	S File	4/2/2004 3:41 AM
	🖻 start	2 KB	S File	4/2/2004 3:41 AM
DFS	💿 main	8 KB	Windows NT Command Script	3/31/2004 4:16 AM
QNUfiles	simple	1 KB	Windows NT Command Script	4/2/2004 2:12 AM
🗉 🗀 eclipse 🛛 🗸 🗸				
<				

When we create a **CDT** project to build the New Micros example, the following files from the **download**\**example** directory will be needed.

main.c	Test program in C (performs echo over serial port)
lpc210x.h	Standard Philips header file with all registers defined
ivt.s	Interrupt vector table in assembler language
start.s	Startup code in assembler language to set up TiniARM micro and jump to the main program
libc.a	Pre-compiled C library
simple.cmd	Simple Linker script
makefile	The script on how to compile and build the test application

The other files are the results on New Micros themselves building this application. We want to build it ourselves using the Eclipse system.

## 8. Creating a Eclipse Project

At this point, we have a fully functional Eclipse IDE capable of building C/C++ programs for the ARM microcomputer (specifically the TiniARM hardware).

We will now create an Eclipse C++ project called "test" and import the New Micros TiniARM example test program into the project. It will work without change save for three simple lines added to the makefile to satisfy Eclipse.

Click on our Eclipse desktop icon to start Eclipse.



Eclipse should come up with the C/C++ perspective as shown below. If not, select **"Window – Open Perspective – Other – C/C++**" to change to the C++ perspective.

🖾 C/C++ - makefile - E	clipse Plat	form			
File Edit Navigate Search Ri	un Project W	'indow Help			
<mark>11 - 12   10   10 / 11 / 11 / 11 / 11 / 11 / 11</mark>	⅀⅃ৡ⋆Ο	• 🤷 • ] 🚇 🦂	ፆ ] ♥⇒ ⇔ → ⊂	> - ] ∦ ₿	. ∰ ℡@C/C++ >> \$€C/C++ Bro
C/C++ Projects CNavigator X	- □ 🕅 m	akefile 🛛 📄 m	ain.map	1	∃ BEOutline ∞ <sup>*</sup> 1 <sup>□</sup> □ J <sup>a</sup> z
	Reso	urce /test/makefil	e does not exist.		-
	Probl	ems 🗉 Console S	3 Properties		
	Conse	ble			
l l test	?	?	?		

To create a C project, select **File – New - Project** from the **File** pull-down menu as shown below.

🖻 C/C++ - makefile - Eclipse Platform 📃 🗆 🔀									
File Edit Navigate	Search R	un Proje	ect Iali	den tek					
New	Alt+Shift-		竹 Projec	:t		• ⇔ • ] ∦	8	🖹 🔤C/C++	*
Close	Ctrl+F4	Ó	💕 Class					C/C++ Bro	
Close All	Ctrl+Shift	+F4 [	🕈 File		n.map			BOutline 🛛 🔭	- 8
📳 Save	Ctrl+S	0	՝ Folder	-					Jª₂
🔙 Save As			😚 Other	Ctrl+N					
🕅 Save All	Ctrl+Shift	+5							
Revert									
Move			Resou	rce /test/makefil	e does not e	exist.			
Rename	F2								
Refresh	F5								
🖹 Print	Ctrl+P								
Switch Workspace		20							
Open External File									
🔤 Import									
🛃 Export									
Properties	Alt+Enter		Proble	ms 📮 Console Σ	3 Proper	ties		2	
1 main.c [test]			Consol	3					
2 main.map [test]									
3 makefile [test]									
Exit									
l I test		?		?	?				

Select "C – Standard Make C Project" and then click "Next."

🖾 New Project	×
Select a wizard Create a new C Project which uses a simple makefile.	
Wizards: Java Project Plug-in Project C Managed Make C Project Standard Make C Project C++ C++ CVS Plug-in Development Simple	
	<u>(?)</u>
< Back Next > Finish	Cancel

In the New Project window, we give the project the name "**test**." Click on "**Next**" to continue.

🖨 New Project	×
C/Make Project	
Create a New C Project using 'make' to build it	
Project name: test	
Project contents	
I✓ Use default Directory: D:\eclinee\workspace\test	Browse
< Deck Next > Thick	Cancel _
< Back Next > Finish	

If you click on the "**Make Builder**" tab, you'll see that Eclipse invokes the command **Make All** for an incremental build, **Make Clean All** for a full build and **Make Clean** for the clean operation. The New Micros example makefile doesn't have the **All** and **Clean** targets, so we will have to modify the example makefile to bring it into compliance with Eclipse/CDT. Click "**Finish**" to complete the project specification.

🖬 New Project	×				
C/Make Project Settings					
Define the project and 'make' builder setti	ings				
Make builder settings.					
🗁 Projects Make Builder   Error Parser	s   Binary Parser   Discovery Options   C/C++ Indexer				
Build command					
I✓ Use default					
Build command: make					
-Build Setting					
🗆 Stop on first build error.					
Workbench Build Behavior					
Workbench build type:	Make build target:				
E Build on resource save (Auto Build)	all				
Note: See Workbench automatic build p	reference.				
🔽 Build (Incremental Build)	all				
🔽 Rebuild (Full Build)	clean all				
🔽 Clean	clean				
< Boo					



As the next screen shows, we have a legal C project named **test**, albeit with no files.

Remember from Section 7 above, we downloaded and unzipped the New Micros example test program into the directory **d:\download\example**.

We can use the **Import** facility under the File pull-down menu to fetch and insert these files into our Eclipse project.

Click on **File – New – Import** to open the import facility, as shown below.

File Edit Navigat	e Search Run Pro	iect Wind	low Help			
New	Alt+Shift+N	0 - 0	• 0 4	、 ↔ → →	🖹 🔤 C/C++	
Close	Ctrl+F4					
Close All	Ctrl+Shift+F4				 An outline is not availabl	e.
📳 Save	Ctrl+S					
🗟 Save As						
🕞 Save All	Ctrl+Shift+S					
Revert						
Move		_				
Rename	F2					
Refresh	F5					
📤 Print	Ctrl+P					
Switch Workspa	ie	-				
Open External Fi	le					
🔄 Import,		$\mathbf{D}$				
🛆 Export						
Properties	Alt+Enter	Problem	s 🖳 Console 🛛	Properties	2	
1 main.c [test]		Console			 	
2 makefile [test	1					
3 makefile [test,	- /arm]					
4 main.c [test/a	rm]					
Exit		-				

In this case, we'll want to import from the **File system**, as shown below.

🖾 Import				×
Select Import resources fr	om the local file	e system		Ľ
Select an import sou Checkout Project Existing Ant Build Existing Project i External Feature External Plug-ins File system Team Project Se Zip file	Irce : Its from CVS Iffile nto Workspace s and Fragment	3		
	< Back	Next >	Finish	Cancel

Now we browse to the desired directory: **d:\download\Example**. Click **OK** to continue.

Import from directory	?×
Select a directory to import from.	
🗉 🚞 cygwin	~
🗉 🗀 Documents and Settings	
🖃 🧰 download	
🗀 Example	
🚞 PDFs	
🗉 🗀 eclipse	
🗀 foo	
🗀 foobar1	
🗀 fubar	
install CompuServe7.0	×
Folder: Example	
Make New Folder OK Ca	ancel:

There are 15 files in the Example directory. As mentioned before, we only need the following seven files to make up the complete project.

main.c	Test program in C (performs echo over serial port)
lpc210x.h	Standard Philips header file with all registers defined
ivt.s	Interrupt vector table in assembler language
start.s	Startup code in assembler language to set up TiniARM micro and jump to the main program
libc.a	Pre-compiled C library
simple.cmd	Simple Linker script
makefile	The script on how to compile and build the test application

Now we check only those files listed above for importation.

🖾 Import	×
File system Import resources from the local file system.	
From directory:       D:\download\Example         D::::::::::::::::::::::::::::::::::::	Browse
Into folder: test Options: Overwrite existing resources without warning C Create complete folder structure C Create selected folders only	Browse
< Back Next > Finish	Cancel

Now click **Finish** and these files will appear in our project.

Notice that the Navigator pane shows the imported files.

File Edit Navigate Search Run Project Window Help     C/C++ Projects     C/C++ Projects     C/C++ Projects     C/C++ Projects     C/C++ Projects     Composition     C/C++ Projects     Console     C/C++ Projects     Console     C/C++ Projects     Console     C/C++ Projects     C/C++ Projects     Console     C/C++ Projects     Console     C/C++ Projects     C/C++ Projects     C/C++ Projects     Console     C/C++ Projects	C/C++ - Eclipse Platform		
C/C++ Projects     Comparing     C/C++ Projects     C/C++ Projects </td <td>File Edit Navigate Search Run Proje</td> <td>ect Window Help</td> <td></td>	File Edit Navigate Search Run Proje	ect Window Help	
C/C++ Projects CNavigator X C C/C++ Projects CNavigator X C C/C++ Projects CNavigator X C C/C++ Project C	] 📬 🗕 📄 📄 🖉 🌋 👘 🛛 🎄 🔻	<b>○ -  ○ -</b> ] <b>●</b> <i>A</i> ] <b>*</b> ⇒ <b>-</b> ⇒ -	🖹 🖬 C/C++ 🛛 ×
Problems Console & Properties Console	C/C++ Projects CNavigator X C C/C++ Projects CNavigator X C C/C++ Project C C/C++ Projec		An outline is not available.
		Problems Console Properties	

Double-click on the makefile; it will pop up as an editor window.

Eclipse requires that the makefile have the targets ALL and CLEAN. We will add three lines to satisfy this requirement.

This is the makefile as supplied by New Micros.

🖾 C/C++ - makefi	e - Eclipse Platform	
File Edit Navigate Sea	arch Run Project Window Help	
] 📬 🕶 🔚 🗁 🗍 💣	🖄 👔   🎄 🗸 🔕 🗸   😰 🖋   🏷 🔶 🗸 - 🖓 🗸   📾	😭 🗟c/c++
ଷ-Nav ଅ 🎽 🗖	🖸 makefile 🗙	🗆 🗄 Outline 🛛 🎽 🗖 🗖
-	# for making arm code Rob Chapman Apr 1, 04	la
⊡- 😂 test	NAME = test 10	cc
.cdtproject	CC = arm-elf-gcc	
.project	LD = arm-elf-ld -v	
🚽 🖻 ivt.s	AR = arm-elf-ar	AS
libc.a	AS = arm-elf-as	
🔤 💼 lpc210x.h	CP = arm-elf-objcopy	.SUFFIXES
🔤 main.c		CFLAGS
	.SUFFIXES : .o .c .s	AFLAGS
🛛 💿 simple.cmd		CAFLAGS
🔤 start.s	CFLAGS = -1.7 - c - 03	LFLAGS
	AFLAGS = -anis -mapcs-32	CPFLAGS
	CAFLAGS = S(CFLAGS) - Wa, -anis, -mapcs-32	
	CPFLAGS = -O ibey	
	CITEROSO THER	.c.o
	test: main.out	
	R echo "copving"	
	\$(CP) \$(CPFLAGS) main.out main.hex	
	main.out: start.o ivt.o main.o simple.cmd	
	0 echo "linking"	
	<pre>\$(LD) \$(LFLAGS) -o main.out start.o ivt.o main.o libc.a</pre>	
	9.9.	
	ß echo ".compiling"	
	$\emptyset$ \$(CC) \$(CAFLAGS) \$< > a.1st	
	mainin: start.s ivt.s main.c	
	0 echo ".compiling"	
	<pre>\$(CC) \$(CFLAGS) start.s ivt.s main.c</pre>	
		~
	<	>
	Problems 🖳 Console 🛛 Properties	
	Writable Smart Incert 1 1	

We'll add three lines to provide the missing targets. The updated makefile is shown below.

Notice the three new lines, outlined by a red box.



The first line "all: test" just runs the target test when Eclipse invokes the "all" target.

The second and third lines implement the "**clean**" target. The third line deletes the object files, the .out and .hex files and the map. Remember that the <u>third line is</u> <u>indented by a **tab** character (not spaces)</u>. Forgetting the **tab** indent is the most common of all makefile mistakes.

## 9. Building the Application

We can now build the project (compile, assemble and link all the source files) by selecting "**Project – Build All**".



When you invoke "**Build – All**", Eclipse will run the makefile as "**make clean all**." This means that it will erase the objects and load files and then compile, assemble and link everything. Here is a screen capture as Eclipse is building the ARM target software.



Here is the console display of the build process. Since we started with no object or load files, the **rm** operation indicated no such files to remove.

There was a mild assembler warning, but it did not stop the build process.

Note the last line, where the GNU utility **objcopy** is used to create a hex file suitable for the LPC2000 Flash Utility.

```
Problems 📃 Console 🗙
                    Properties
                                                                        C-Build [test]
make -k clean all
rm start.o ivt.o main.o main.out main.hex main.map
rm: cannot remove `start.o': No such file or directory
rm: cannot remove `ivt.o': No such file or directory
rm: cannot remove `main.o': No such file or directory
rm: cannot remove `main.out': No such file or directory
rm: cannot remove `main.hex': No such file or directory
rm: cannot remove `main.map': No such file or directory
make: [clean] Error 1 (ignored)
arm-elf-as
           -o start.o start.s
            -o ivt.o ivt.s
arm-elf-as
ivt.s: Assembler messages:
ivt.s:5: Warning: setting incorrect section attributes for .interp
.compiling
..linking
arm-elf-ld -v -Map main.map -nostartfiles -T simple.cmd -o main.out start.o ivt.o
main.o libc.a
GNU ld version 2.15
...copying
arm-elf-objcopy -O ihex main.out main.hex
```

### 10. Downloading the Application to the TiniARM Board

Before starting the Philips Ipc2000 Flash Utility, make sure that the hardware is properly hooked up and configured.

![](_page_62_Picture_2.jpeg)

A. TiniARM board plugged into socket J1A with crystal closest to the 9-pin RS-232 socket.

B. Jumper J11 installed for downloading

![](_page_62_Picture_5.jpeg)

**Install** this jumper for download; **remove** this jumper for normal execution of the application.

A. Check all the other jumpers.

![](_page_63_Picture_1.jpeg)

#### B. Attach Serial Cable

Attach the New Micros supplied 9-pin serial cable from COM1 serial port of your computer to the DB9 connector on the TiniARM Development Board.

#### E. Attach the 6-volt Power Supply

Plug in the "wall wart" power supply and observe that all three LEDs on the TiniARM are illuminated.

After double-checking that the "download" jumper J11 is installed, we can now attempt to download our hex file to the TiniARM board.

Select **Run – External Tools – LPC2000 Flash Utility** to start the Philips flash loader.

C/C++ - Eclipse Platform		
File Edit Navigate Search Project	Run Window Help	
📬 ▾ 🖫 🖻   🎸 🌋 🗳   🎄 ▾ 🕻	🔍 Run Last Launched Ctrl+F11	😭 🔤 C/C++ 🛛 »
C/C++ Projects 🕾 Navigator 🛛 🦳	🍬 Debug Last Launched 🛛 F11	
	Run History	An outline is not available.
	Run As 🕨 🕨	
	Run	
	Debug History	
	Debug As	
	Debug	
	🗞 External Tools 🔹 🕨	🗞 1 LPC2000 Flash Utility
		Run ás 🕨
		Q. External Tools
		Organize Favorites
	Rroblems × Console Properties	: ☆ - □
	0 errors, 0 warnings, 0 infos	
	Description	Resource
	<	

The Philips LPC2000 Flash Loader will start and appear on top of the Eclipse Screen, as shown below.

Step LPC2000 Flash Utility			
File         Buffer         Help           DHIDS         LPC2000 Flash Utility         V2.2.0			
Flash Programming Erase / Blank	Communication		
Filename:       D:\eclipse\workspace\test\main.hex       Blank Check       Entire Device         Upload to Flash       Execute Code       Start Sector:       0         Compare Flash       Manual Reset       Erase       End Sector:       14	Connected To Port: COM1:		
Device       Device:       LPC2106 <ul> <li>Read</li> <li>Device ID</li> <li>Boot Loader ID:</li> </ul> Use DTR/RTS for Reset and Boot Loader Selection         File Upload Successfully Completed       File Upload Successfully Completed       Device ID			

In the LPC2000 setup screen above, note that the correct hex file has been selected, thanks to our earlier setup work. Note also that the device is set to LPC2106 (very important) and the baud rate is set to 9600 baud; to match our Windows COM1 setup. You can change the baud rate to a faster one at your convenience.

Push the RESET button SW2 on the TiniARM board.

Click on "Upload to Flash" to start the download operation.

If you didn't press the RESET button SW2 you will get this reminder to do it.

![](_page_65_Picture_5.jpeg)

Now downloading into Flash should commence.

× 🕫 LPC2000 Flash Utility File Buffer Help LPC2000 Flash Utility V2.2.0 Flash Programming Erase / Blank Communication Filename: Connected To Port: Entire Device D:\eclipse\workspace\test\main.hex COM1: ----Blank Check C Selected Sectors Use Baud Rate: Execute Code Upload to Flash 9600 after Upload Start Sector: Erase End Sector: 14 Compare Flash Time-Out [sec]: 2 Device Use DTR/RTS Device: LPC2106 for Reset and Part ID: -Read Boot Loader XTAL Freq. [kHz]: 14746 Device ID Selection Boot Loader ID: Progress: File Upload Successfully Completed

A progress bar will show it downloading into Flash.

## **11. Testing the Sample Application**

The first thing to do is to **REMOVE THE J11 BOOT JUMPER**!

![](_page_66_Picture_4.jpeg)

Now hit the **RESET** button again, just to be sure.

Go to the Windows XP desktop and use the **START** menu to run the accessory program **HyperTerm**.

![](_page_67_Figure_2.jpeg)

Start the HyperTerminal and set it up to operate over COM1 with the settings of 9600 baud, no parity, 8 data bits etc.

If the TiniARM application is running properly, anything you type on HyperTerm will be echoed back from the TiniARM, as shown below.

![](_page_68_Picture_0.jpeg)

Congratulations, you have successfully installed an Eclipse IDE for crossdevelopment of a ARM processor and actually compiled, linked and downloaded an executable to the TiniARM board.

Pat yourself on the back!

## About the Author

Jim Lynch lives in Grand Island, New York and is a Project Manager for Control Techniques, a subsidiary of Emerson Electric. He develops embedded software for the company's industrial drives (high power motor controllers) which are sold all over the world.

![](_page_69_Picture_2.jpeg)

Mr. Lynch has previously worked for Mennen Medical, Calspan Corporation and the Boeing Company. He has a BSEE from Ohio University and a MSEE from State University of New York at Buffalo.

Jim is a single Father and has two children who now live in Florida and Nevada. He has two brothers, one is a Viet Nam veteran in Hollywood, Florida and the other is the Bishop of St. Petersburg, also in Florida.

Jim plays the guitar and is collecting woodworking machines for future projects that will integrate woodworking and embedded computers.

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