

eCee NXP LPC 2138

ARM Development Board

User Manual



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CHAPTER-1: OVERVIEW



We bring the world to you..



The eCee LPC2138 Development and Evaluation Board from RhydoLabz can be used to evaluate and demonstrate the capabilities of NXP LPC2138 microcontrollers. The board (with a base board and header board) is designed for general purpose applications and includes a variety of hardware to exercise microcontroller peripherals. The LPC2138 Board contains all hardware components that are required in a single-chip LPC2138 system plus 2 COM ports for serial RS232 output and interfaces like Lcd, Buzzer, Keyboard, Temperature Sensor, Potentiometer, Led's, EEPROM etc.

FEATURES

- ➢ Includes LPC2138 Header Board
- No Separate power adapter required (USB power source)
- Two RS-232 Interfaces (For direct connection to PC's Serial port)
- > On Board Two Line LCD Display (2x16) (with jumper select option)
- > On Board 8 LED Interface to test Port pin (with jumper select option)
- On Board Pot interface to ADC
- On Board Buzzer Interface
- > On Board 4x4 (16 Keys) Matrix Keyboard
- $\blacktriangleright \qquad \text{On Board I}^2\text{C EEPROM}$
- > On Board External Interrupt Button
- > On Board Connector for PWM Output
- PWM controlled LCD backlight
- On Board Connector for Analog Output
- On Board Speaker Output
- LF Amplifier LM 386
- On Board Power LED Indicator
- On Board Reset button
- All Port Pins available at Berge Strip





- > On Board JTAG Connector for Debugging/Programming
- > Three On Board DB9 Connectors (Two for UART and One for CAN)
- On Board USB Connector
- > On Board 1 Amp Voltage Regulator
- > On Board Connector for regulated 3V3 output
- > On Board Connector for regulated 5V output





CHAPTER-2: HARDWARE INTRODUCTION







FUNCTION MODULE







INTERFACE OVERVIEW







PERIPHERALS	DESCRIPTION
CON1	USB Jack
CON2	Power Jack
JTAG (JP1)	JTAG Connector
СОМО	UARTO Interface via Female DB9 Connector
COM1	UART1 Interface via Female DB9 Connector
LCD CONT.	LCD Contrast Adjust through Pot
CAN PORT	CAN Interfacing through Male DB9
LCD1	LCD Display Module, HD44780U
D1- D8	Light Emitting Diodes
S1- S16	Matrix Keypad Switches
EXT.INT (S17)	External Interrupt Key
RESET (S18)	Reset Key
A2DIN (R18)	Potentiometer as ADC input
U1	HDP1206 X (Buzzer)
U2	LM35 (Temperature Sensor)
U3	74LV244 (LED Driver IC)
U4	External EEPROM 24C04
U5	LM7805 (Regulator IC- 5V)
U6	LD1117S33 (Regulator IC- 3.3V)
U7	74LV244 (LCD Driver IC)
U8	MAX3232 (Level Converter)
U9	LM386 (Audio Amplifier)
U10	TJA1040 (CAN interfacing IC)



JUMPER LIST

Jumper no:	Description	Set option	Set description
J1	Microcontroller Pin-outs for	Already Set in	Already Set in Package
	External Access	Package	
J2	Header Board Connector Pins	Already Set	Already Set in Package
J3	Header Board Connector Pins	Already Set	Already Set in Package
J4	Microcontroller Pin-outs for External Access	Already Set	Already Set in Package
J5	BUZ	Short to access	Buzzer function activate
J6	TEMP	Short to access	LM35 Access via AD0.0
J7	LED PWM	1-2	LCD Brightness vary on PWM
		2-3	LCD works normally
J8	LED	Short to access	LED enable (P1.16-P1.23)
J9	A2DIN	Short to access	Potentiometer as AD0.1 input
J11	CON2	Short to access	Choose DC Power Plug In
J12	+3V3-GND	As Required	Provide a 3.3V to an External Module
J13	LCD	Short to access	LCD Module Functions
J15	JTAG	Short to access	JTAG Access
J16	EXT.INT	Short to access	External Interrupt Input Access
J17	ISP	Short to access	On Program Download
J19	AOUT	Short to access	Analog Out
J20	ISP*	Short to access	Board is RESET Externally
J21	JRST	Short to access	Short while Program Downloading
J22	USBD -	Short to access	USB Device Access
J21	JRST	Short to access	Short while Program Downloading





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J23	USBD+	Short to access	USB Device Access
J24	CANRXD	Short to access	CAN Data Reception (LPC2129 Only)
J26	CAN TXD	Short to access	CAN Transmission (LPC2129 Only)
J27	Supply Select	1-2	DC Power is selected, short J11
		2-3	USB Power is selected
J28	V_BUS	Short to access	USB Device Access
J29	USB LNK	Short to access	USB Led Functioning





POWER SUPPLY

eCee NXP LPC 2138 Board has two power supplies; you can choose one of the following ways to supply power

- (1) Through an Adaptor (any standard 9-12V power supply)
- (2) Through the motherboard USB port

The external Power Supply circuit is given below:



CLOCK SOURCE

eCee NXP LPC 2138 evaluation board has two clock sources:

- > 32.768 KHz Crystal as the RTC clock source
- > 10 MHz Crystal as the MCU clock source



LED INTERFACING

LED's are the simplest devices to test port functioning. The board contains 8 LED's connected to PORT1 pins 16 to 23 (P1.16 to P1.23).

Note: For the LEDs to work, the LED jumper (J8) must be in position.







PORT PINS - BERGE STRIP & ROUND MACHINE CUT CONNECTOR

The board has all port pins available at Berge strip and at round machine cut female connector. The connection is as given below.





BUZZER INTERFACE & LED-PWM

Buzzer is connected to P0.7

Solution Note: For the Buzzer to work, the jumper (J5-BUZ) must be in position.







LCD - LIQUID CRYSTAL DISPLAY

The display is a standard 2x16 LCD which displays 2 lines of 16 characters. Each character is 40 pixels, making it 1280 pixels overall. The display receives ASCII codes for each character at the data inputs (D0–D7).



Connection Diagram

The LCD module can be used in 4-bit or 8-bit mode. The module uses HD44780U (from Hitachi) as the controller IC. The eCee LPC 2138 development board **uses 4-bit interface**. PORT1 pins (P1.17 – P1.23) are used for data/command control pins. An On-Board potentiometer enables to adjust the LCD contrast to a better view in every angle.









The Lcd module has16 pins for interfacing out of which 8 are data pins (DB0-DB7) and 3 (RS,RW,EN) are control pins.

Pin No:	Functional Description	I/O Port
1	VSS	GND
2	VCC	+5V
3	VEE	CONTRAST
4	RS	P1.17
5	R/W	P1.18
6	Е	P1.19
7	DB0	NC
8	DB1	NC
9	DB2	NC
10	DB3	NC
11	DB4	P1.20
12	DB5	P1.21
13	DB6	P1.22
14	DB7	P1.23
15	LED+	+5V
16	LED-	GND







UNIVERSAL ASYNCHRONOUS RECEIVER TRANSMITTER (UART)

The LPC 2138 microcontrollers come with two UART modules - UART0 and UART1. It has only asynchronous (no clock connection) mode of operation. The UART0 operates through **P0.0** (**TXD**) and **P0.1** (**RXD**) pins while the UART1 uses **P0.8** (**TXD**) and **P0.9** (**RXD**) pins. The LPC 2138 UART output itself operates at CMOS voltages, and needs an external serial line driver to convert its output into a higher symmetrical line voltage. The MAX3232 serial driver serves this purpose.

■Note: For the UART module to work, the ISP(J17) and RST(J21) jumpers must be removed.







CREATING HYPERTERMINAL IN PC

The serial data transmitted through UART can be viewed on a PC using a Windows tool for Serial Port Communication called HyperTerminal.



Steps To Create Hyper Terminal





Co	onnection Descript	ion	? 🔀	
U	New Connection			
F	Enter a name and choos	e an icon for the corne	ction	
1	Name:			
	hyp9600			
	lcon: 🍣 🌏 🔇	s 🌆 🍪	🐼 🎗	
		ОК	Cancel	

	COM1 Properties	? 🔀
	Port Settings	
onnect To	Bits per second: 9600	~
🜏 hyp9600	Data bits: 8	M
Enter details for the phone number that you want to diat	Parity: None	~
Country/region: United States (1)	Stop bits: 1	~
Area code: 688	Flow control: None	~
Connect using: COM1		Restore Defaults
OK Cancel	ОК Са	ncel Apply

Now Disconnect the Hyper Terminal. Then open the Property from 'File'.







Host System Encoding Method ? Select Host System Encoding Method Shift JIS Standard JIS	Connect To Settings Function, arrow, and ctil keys act as Terminal keys Windows keys Backspace key sends Chrl+H Del Chrl+H, Space, Chrl+H Emulation: ANSIW Terminal Setup Telnet terminal ID: 0	ASCII Setup ASCII Sending Send line ends with line feeds Echo typed characters locally Line delay: 0 milliseconds. Character delay: 0 millisecond ASCII Receiving Append line feeds to incoming line
	Backscroll buffer lines: 0	Force incoming data to 7-bit ASCII Wrap lines that exceed terminal w OK C





Select File → Save As → Desktop







MATRIX KEYBOARD

A keypad is simply an array of push buttons connected in rows and columns, so that each can be tested for closure with the minimum number of connections. There are 16 keys on a phone type pad arranged in a 4X4 matrix. Assume the columns are labeled 1, 2, 3, 4 and the rows A, B, C, D. If we assume that all the rows and columns are initially high, a keystroke can be detected by setting each row low in turn and checking each column for a zero. In the KEYPAD circuit the 8 keypad pins are connected to Port0. While coding, **Pins P0.14-P0.17 should be initialized as outputs and pins P0.10-P0.13 as inputs**. These input pins are pulled high to logic 1. The output rows are also initially set to 1. If a 0 is now output on row A, there is no effect on the inputs unless a button in row A is pressed. If these are checked in turn for a 0, a button in this row which is pressed can be identified as a specific combination of output and input bits.







TEMPERATURE SENSOR INTERFACING

LM35 temperature sensor can be used to measure environment temperature, in the range of - 55 Deg C to 150 Deg C. It's connected to Port 0 P0.27 (AD0.0) analog channel.

ZNote: For the temperature sensor to work, the TEMP jumper (J6) must be in position.



EXTERNAL INTERRUPT

This development board uses External Interrupt 1 - EINT1 (Button S17). It is connected to P0.14.

Solution: Place jumper on EXT_INT (J16) pin for the proper functioning of external interrupt.





EXTERNAL EEPROM INTERFACING

The eCee LPC 2138 development board has 4K SERIAL EEPROM interfacing. Internally organized with 256 pages of 2-byte each, the 4K requires an 9-bit data word address for random word addressing with data transfer rate 100 kbits/s. Also it is to be noted that an external EEPROM (AT24C04) is the slave device to be communicated with the microcontroller, via I²C protocol.





ADC POTENTIOMETER

The eCee LPC 2138 development board has a potentiometer connected to its ADC pin P0.28.

■Note: Place jumper on A2DIN (J9) pin .

ADC PORT



AUDIO AMPLIFIER







CHAPTER-3 : SOFTWARE DEVELOPMENT





FAMILIARIZATION OF KEIL PROFESSIONAL DEVELOPMENT SUITE

CREATING A PROJECT

Keil μ Vision3 software is a standard Windows application for project development and can be installed like any standard application. μ Vision3 includes a project manager which makes it easy to design applications for an ARM based microcontroller. You need to perform the following steps to create a new project:

- Open *Kiel uVision3* Software from *start* menu or Desktop shortcut
- Select the Toolset (only required for ARM Projects).
- Create Project File and Select CPU.
- Create New Source Files.
- Add Source Files to the Project.
- Set Tool Options for Target Hardware.
- Configure the CPU Startup Code.
- Create a HEX File.
- Build Project and Generate Application Program Code.





The section provides a step-by-step tutorial that shows you how to create a simple µVision3 project.

		Protel 99 SE		
	•	Set Program Access and Defaults		
	1	Windows Catalog		
	4	Windows Update	_	
Ę	6	Programs	•	
nal	3	Documents	•	Click Keil
Professional	1	Settings	•	JIBM Lotus Symphon UVision3
Prof	P	Search	•	Keil uVision3
	?	Help and Support		MSN <u>Keil uVision3</u> Outlook Express
Windows XP	6	Run	F	Remote Assistance
Wir	0	Shut Down	0	
1	l sta	nrt 🔵 🥥 🕼		

Creating Project File

To create a new project file select from the μ Vision3 menu **File** – **New** – μ Vision **Project...**. This opens a standard Windows dialog that asks you for the new project file name. You should use a separate folder for each project. You can simply use the icon **Create New Folder** in this dialog to get an empty new folder.

Select this folder and enter the file name for the new project, eg. **Project1**. μ Vision3 creates a new project file with the name **PROJECT1.UV2** which contains a default target and file group name. You can see these names in the **Project Workspace – Files**.

Select Microcontroller from Device Database

When you create a new project μ Vision3 asks you to select a CPU for your project. The **Select Device** dialog box shows the μ Vision3 device database. Just select the microcontroller you use. For







the example in this chapter we are using the Philips LPC 2138 controller. This selection sets necessary tool options for the LPC2132 device and simplifies in this way the tool configuration.

Select Device for Target 'Target 1'	
CPU Vendor: NXP (founded by Philips) Device: LPC2138 Toolset: ARM	
Data base	Description:
Nordic Semiconductor NXP (founded by Philips) C LPC2119 C LPC2124 C LPC21 C LPC21 C LPC21 C LPC21 C LPC21 C LPC21 C LPC213 C LPC213 C LPC213 C LPC2141 C LPC2142 C LPC2144	ARM7TDMI-S based high-performance 32-bit RISC Microcontroller with Th 512KB on-chip Flash ROM with In-System Programming (ISP) and In-Applic 32KB RAM, Vectored Interrupt Controller, Two UARTs, one with full modem interface. Two I2C serial interfaces, Two SPI serial interfaces Three 32-bit timers, Watchdog Timer, Real Time Clock with optional battery backup, Brown out detect circuit General purpose I/O pins. CPU clock up to 60 MHz, On-chip crystal oscillator and On-chip PLL Click OK
	Cancel Help

Copy and Add the CPU Startup Code

An embedded program requires CPU initialization code that needs to match the configuration of your hardware design. This Startup Code depends also on the tool chain that you are using. Since you might need to modify that file to match your target hardware, the file should be copied to your project folder.





For most devices, μ Vision3 asks you to copy the CPU specific Startup Code to your project. This is **required on almost all projects** (exceptions are library projects and add-on projects). The Startup Code performs configuration of the microcontroller device and initialization of the compiler run-time system. Answer with **YES** to this question.



Note: The CPU Startup Code typically requires some configuration; however the default configuration gives you a good starting point for single chip applications.

Create New Source Files

You may create a new source file with the menu option **File** – **New**. This opens an empty editor window where you can enter your source code. μ Vision3 enables the C color syntax highlighting when you save your file with the dialog **File** – **Save As...** under a filename with the extension *.C. Here we save our example file under the name led.C.

#include <lpc21xx.h></lpc21xx.h>	/* LPC 2138 definitions	*/	
void delay(void) {	/* Delay function	*/	
int i;			
for(i=0;i<1000;i++);	/* Delay for LED blink	*/	
}			
int main (void) {			
IO1DIR = 0x00FF0000;	/* P1.1623 defined as Out	puts */	
while (1) {	/* infinite Loop	*/	
IO1SET = 0X00FF0000;	/* P1.1623 pins high	*/	
delay();			
IO1CLR = 0x00FF0000;	/* P1.1623 pins low	*/	
delay(); } }			





Add Source Files to Project

Once you have created your source file you can add this file to your project. μ Vision3 offers several ways to add source files to a project. For example, you can select the file group in the **Project Workspace** – **Files** page and click with the right mouse key to open a local menu. The option Add Files opens the standard files dialog. Select the file **led.c** you have just created.



Set Tool Options for Target

 μ Vision3 lets you set options for your target hardware. The dialog **Options for Target** opens via the toolbar icon or via the **Project - Options for Target** menu item. In the **Target** tab you specify all relevant parameters of your target hardware and the on-chip components of the device you have selected. The following dialog shows the settings for our example.





cions i	or Target '	Target 1'						
Device	Target	Output Listin	ng User	C/C++ As	m Linker Di	ebug Utilities		
VXP (fou	unded by Ph	ilips) LPC2132			- Code Generat			
			<u>X</u> tal (MHz):	12.0	ARM-Mode	N6654	1	
							1	
Opera	iting system:	None		-	Use Cros	s-Module Optim	nization	
Read	/Only Memo				Read/Write Mem	100		
- Read,	/Only Memo off-chip:	ry Areas Start:	Size:	Startup	Read/Write Memory off-chip:	ory Areas Start:	Size:	Nolnit
Read,			Size:	Startup		100	Size:	Nolnit
	off-chip:		Size:	_	off-chip:	100	Size:	
	off-chip: ROM1:		Size:		off-chip:	100	Size:	
	off-chip: ROM1: ROM2:		Size:		off-chip:	100	Size:	
	off-chip: ROM1: ROM2: ROM3:		Size:		off-chip:	100	Size:	
	off-chip: ROM1: ROM2: ROM3: on-chip:	Start:		с с с	off-chip: RAM1: RAM2: RAM3: on-chip:	Start:		

The following table describes the options of the **Target** dialog:

Dialog Item	Description
Xtal	Specifies the external clock frequency of your device. Several microcontrollers use an on-chip PLL to generate the CPU clock. In this case the value is not identical with the XTAL frequency. Check your hardware design carefully to determine the correct value.
Operating System	Allows you to select a Real-Time Operating System for your project.
Use On-chip ROM / RAM	Defines the address spaces for the on-chip memory components for the linker/locater. Note that on some devices you need to reflect this configuration in the Startup Code.

Configure Startup Code

The CPU Startup Code (on most ARM targets the file name is **Startup.S**) may be open from the **Project Workspace - Files Tab**. Most startup files have embedded comments for the μ Vision3 <u>Configuration Wizard</u> which provides menu driven selections.





Option	Value
E Stack Configuration (Stack Sizes in Bytes)	
🕀 Heap Configuration	
- VPBDIV Setup	
VPBDIV: VPB Clock	VPB Clock = CPU Clock / 2
XCLKDIV: XCLK Pin	XCLK Pin = CPU Clock / 4
- PLL Setup	
MSEL: PLL Multiplier Selection	5
PSEL: PLL Divider Selection	2
🕀 MAM Setup	
⊕- External Memory Controller (EMC)	\checkmark

The default settings of the Startup Code give a good starting point on most single chip applications. However you need to adapt the configuration for your target hardware. CPU/PLL clock and BUS system are target specific and cannot be automatically configured. **You need to ensure** that the settings in the startup file match the other settings in your project.

The button **Edit as Text** opens the Startup Code in a standard editor window and allows you to review the source code of this file.

Create HEX File

Once you have successfully generated your application you can start debugging. After you have tested your application, it is required to create an Intel HEX file to download the software into an EPROM programmer or simulator. μ Vision3 creates HEX files with each build process when **Create HEX file** under **Options for Target – Output** is enabled.





ons for Target 'Target 1' vice Target Output Listing U	ser C/C++ Asm Linker Debug Utilities	
Select Folder for <u>O</u> bjects	Name of Executable: test	
Create Executable: \test Create HEX File Big Endian Create Library: \testLIB	ureate Batch File	2
	OK Cancel Defaults H	lelp

Build Project

Typical, the tool settings under **Options – Target** are all you need to start a new application. You may translate all source files and link the application with a click on the **Build Target** toolbar icon. When you build an application with syntax errors, μ Vision3 will display errors and warning messages in the **Output Window – Build** page. A double click on a message line opens the source file on the correct location in a μ Vision3 editor window.

x	uild target 'Target 1'	
	ssembling Startup.s	
	compiling led.c	
wo	inking	
Vind	romELF: creating hex file	
A ID	led.axf" - O Error(s), O Warning(s).	Ţ
Outpi	inking 'romELF: creating hex file 'led.axf" - O Error(s), O Warning(s). Imply Build & Command & Find in Files /	





CONNECTING THE DEVELOPMENT BOARD



The eCee LPC 2138 requires a +9-12V DC adapter or USB connection for power and either a serial connection for In-system programming, or the JTAG connector.

Use LPC2000 Flash Utility Software at the PC side for programming through Serial port. Connect eCee LPC 2138 Development board to your PC using USB cable (for powering it) and serial cable (for In-serial programming) as shown in the figure.

Note: Serial cable should be **connected to COM0** Port of the development board for downloading. **Corresponding jumpers** has to be inserted (see circuit diagram) for the functioning of each peripheral.






PROGRAMMING STEPS

eCee NXP LPC 2138 development board supports two modes of programming

I. AUTOMATIC MODE

1. Configure LPC Flash Utility software at the PC side

- a. Browse your hex file here.
- b. Select Crystal frequency here.
- c. Enable DTR/RTS for Reset and boot loader selection.
- *d. Select your COM port and Set baud rate (9600) here.*
- 2. Connect system serial port to COM port of eCee LPC 2138.

3. Put jumper on RST(J21), ISP(J17) and Reset the board

4. Click "Read Device ID" and wait till Device Id is shown5. Click "Upload to Flash" button in the flash utility software

and wait till the programming is over.

6. Remove jumper on ISP and RST

7. Now Reset the development board



II. MANUAL MODE

- 1. Configure LPC Flash Utility software at the PC side
 - a. Browse your hex file here.
 - b. Select your COM port and Set baud rate (9600) here.
 - c. Disable DTR/RTS for Reset and boot loader selection.
- 2. Connect system serial port to COM port of eCee LPC 2138.
- 3. Put jumper on ISP(J17),*ISP(J20)
- 4. Click "Read Device ID"
- 5. The software prompts you to reset the development board.
- 6. Press Reset button (S18) and press OK
- 7. Wait till Device Id is shown

5. Click "Upload to Flash" button in the flash utility software

and wait till the programming is over.

- 6. Remove jumper on ISP (J17), *ISP (J20)
- 7. Now Reset the development board







JTAG INTERFACE FOR PROGRAMMING/DEBUGGING

(The JTAG explained in this section is the ARM-JTAG Debugger/Programmer from Rhydolabz.com) <u>Note :</u> Connect the JTAG debugger to the development board and make sure that the JTAG Jumper in the development board (Marked JTAG – J15) is inserted.



This section explains how to interface **ARM-JTAG**, a wiggler compatible module, with **ARM evaluation board**. This is a stable and easy to use device which provides a low cost alternative for programming/debugging a target board. It supports Remote Debug Interfacing (RDI).

This **ARM-JTAG** module is compatible with **H-JTAG** software which is free software available for H-JTAG debugging process.

Install the H-JTAG software in your PC.

The example screens showed here uses **uvision 3V3.50 from Keil** Software.

Before you start downloading and debugging process, certain settings have to be configured in Kiel uV Project. First, create a new **Kiel uV project** or open an already existing one, add the needed program in source group and build it. Make sure that the **.hex** file is created. Now select **Flash** menu and click **Configure Flash Tools** in it.





🕎 LED_BLINK - µVision3 - [E:\ARM-JTAG\Led_Blink.c] Eile Edit View Project Debug Flash Peripherals Tools SVCS Window Help X 🖻 🛍 12 🖌 🖬 🕼 - M M 🙀 🔊 Targe ۵ 🏝 🖽 🍝 🗎 B 🖷 Project Workspace Configure Flash Tools... x ARM-JTAG\Led Blink.c 🖃 🛅 Target 1 06 Description This is a sample program of 1 🖻 🦳 Source Group 1 07 ********* ********************** 🔝 Startup.s */ 08 🗄 🔝 Led_Blink.c 09 10 #include<1pc213x.h>

Select **RDI** Interface Driver and click on Settings in the Debug option. Check whether Load Application at Startup and Run to main are enabled.

Asm Linke Debug Utilities		
ngs Vise: RDI Interface Driver Settings		
✓ Load Application at Startup		
t Edit		
Restore Debug Session Settings		
I Breakpoints I Toolbox		
Watchpoints		
Memory Display		
Driver DLL: Parameter:		
SARM.DLL		
Dialog DLL: Parameter:		
TARMP.DLL oLPC2138		

Click **Browse** in the **"Browse for RDI Driver DLL"** option and select the **H-JTAG.dll** file from the installed HFlasher location.(Usually found in C:\Program Files\H-JTAG\H-JTAG.dll). Click **"OK"**.

Options for Target 'Target 1'		×
	· · · · · · · · · · · · · · · · · · ·	<u>^</u>
Device Target Output Listing L	Jser C/C++ Asm Linker Debug Utilities	
C Use Simulator	Settings 📀 Use: RDI Interface Driver	✓ Settings
RDI Interface Driver Setup		×
Browse for RDI Driver DLL		
C:\Program Files\H-JTAG\H-JTAG	.dll	
Browse for ToolConf File		
Debug Cache Options		
Cache Code	Configure RDI Driver	
	OK Cancel	Help
DARMP.DLL PLPC2138	TARMP.DLL	
	OK Cancel Defaults	Help





Click Utilities enable Use External Tool for Flash Programming. Click Browse in the Command Option and select the file H-Flasher.exe (Usually found in C:\Program Files\H-JTAG\H-Flasher.exe). Enable Run Independent option. Click OK. This will exit you from the Configuration Menu.

Configure Flash	Dutput Listing User C/C++ Asm Linker Debug (Utilities) Menu Command Driver for Flash Programming
Γ	DIIVer for Flash Frogramming ADI Interface Driver Settings Update Target before Debugging NProgram Files\HJTAG\HJTAG\dll Edit
	I Tool for Flash Programming CNProgram FilesNHJTAGNH-Flasher.exe

Debugging/Programming

Connect your evaluation board to the JTAG debugger. Make sure that the JTAG is connected to the

parallel port of your PC using the cable provided.

Launch H-JTAG software from *start* menu.

elamato:	😢 Windows Media Player	
MPLAB IDE v7.60	🔏 Windows Messenger	
Keil uVision3	🚳 Windows Movie Maker	
	im WinPic800	•
Microsoft Office Wor	🛅 Network Enabler Administrator	•
	mcAfee	X
H-JTAG	🛅 Atmel AVR Tools	•
N	icrochip Microchip	•
All Programs 👂	🕎 Keil uVision3	H-Converter
	m HI-TECH Software	H-Flasher
	microsoft Office	H-JTAG Location: C:\Program Files\H-JTAG
🛃 start 🚽 🖉 🧶 🕻	🛗 H-JTAG	> 🙀 Uninstall





It detects device id of the controller connected to the evaluation board. If the device is not detected, RESET the evaluation board and Click "Detect Target" (In Operations Menu) again. In the example, we use LPC 2138 microcontroller from NXP with **ARM7TDMI-S** processor.



Minimize the H-JTAG screen and pop-up the Keil window. Click **Download** in the Flash Menu for downloading the program using JTAG. The H-JTAG automatically pop-up.









Select **Flash Selection** under **Program Wizard** to select the microcontroller in the evaluation board. Here we use **NXP's LPC2138** controller.

w Load Save Save / Program Wizard L Flash Selection 2 Configuration	As Options Exit About	Vendor: AMD
Init Scripts Pgm Options Programming H-Flasher Help	LPC2102 LPC2103 LPC2104 LPC2105 LPC2106 LPC2109 LPC2114 LPC2119 LPC2124 LPC2129 LPC2131 LPC2132 LPC2134 LPC2136 LPC2138	PartNo: Type: Sector: Size: ID: Width:

Now select **Configuration** and set external crystal frequency in the **XTAL** (**MHz**) text box. Enter the frequency of the crystal used in the evaluation board.

🖬 H-Flasher 📃 🗖 🔀					
New Load Save Save	As Options Exit Abou	ut			
Program Wizard	>> Configuration - L	PC2138			
1 Flash Selection					
2 Configuration	Flash Width x Chip:	08-Bit x 1-Chip	T		
Init Scripts Pgm Options	Flash Start Address:	0x0	*		
 Programming H-Flasher Help 	RAM Start Address:	0x40000000			
	XTAL (MHz):	10			





Now Select the **Programming** option and set **Type** as **Intel hex Format** and select the **Source File** from your program folder. We can also check the **Flash** and **Target** unit by clicking **Check.** Now click **Program** button to program the Target board.

🖻 H-Flasher		
New Load Save Save	As Options Exit About	
Program Wizard	>> Programming	
Flash Selection Configuration Tail: Conicide	Flash: Unchecked Target: Unchecked	Check
 Init Scripts Pgm Options 	Type: Intel Hex Format	- Program
5 Programming	Dst Addr:	Verify
P H-Flasher Help	Src File: E:\ARMJTAG\LED_BLINK.hex	
	From:	✓ Erase
	To:	- Blank
	Address: Size:	Read

Successful programming is shown as given below, indicating program size.

Program Wizard	>> Programming - LPC2138				
Flash Selection	Flash: LPC2138 0x0002FF25	Check			
Init Scripts	sher				
Pgm Options	Programmed and Verified x1 successfully.	Program			
Programming					
H-Flasher He	00:00:20 100% 7 KB/s Size = 1.2 KB	· · · · · · · · · · · · · · · · · · ·			
	Close	Erase			
	To: Sector-0005 0x00005000 + 4K 💌	Blank			





🕎 LED_BLINK - μVision3 - [E:\ARM-JTAG\Led_Blink.c]					
Eile Edit Yiew Project	<u>D</u> eb	ug Fl <u>a</u> sh Pe <u>r</u> ipherals <u>T</u> ools	<u>S</u> VCS <u>W</u> indow	He	
🎦 😂 🖬 🎒 🕺 🖻	Q	Start/Stop <u>D</u> ebug Session	Ctrl+F5	Ē	
🕸 🕮 📇 🕌 💥 🚿	101	<u>B</u> un	F5		
Project Workspace	{+ }	Step	F11	**	
🖃 🛅 Target 1	1	Step Over	F10		
🖻 📇 Source Group 1	17	Step Out of current Function	Ctrl+F11	21	
I Startup.s I Led_Blink.c		Run to <u>C</u> ursor line	Ctrl+F10	h -J	

Now select **Start/Stop Debug Session** from **Debug** menu in the Keil Software.

🕎 LED_BLINK - µVision3 - [E:\ARM-JTAG\Led_Blink.c]					
Elle Edit View Project Debug Flash Peripherals Iools SVCS Window Help					
11111 22 12 12 12 12 12 12 12 12 12 12 1					
許 💷 🚳 🕑 🕑 🕂 🔸 註 (弦) 🔍 题 ザ 😹 🗉 🖻 🏧 🖪 🥕					
Project Workspace	05	File Name : ARM-JTAG\Led Blink.c			
Register Value	06	Description : This is a sample program of LED blink, in which LED is connecte			
E-Current	07	***************************************			
	08	*/			
R1 0xe0028000	09	#include <lpc213x.h></lpc213x.h>			
	10				
R3 0x000004c5	11	#define LED (1<<16) /* LED is connected to PORT1.16 */			
	12	#define LED_ON (IO1SET=IO1SET LED)			
R5 0x40000000	13	#define LED_OFF (IO1CLR=IO1CLR LED)			
R6 0x00000000	14				
B7 0x00000000	15	void Delay(unsigned long Count)			
R8 0x00000000	16				
R9 0x3a93a11c	17	while (Count>0)			
	18	(
	19	Count;			
	20)			
R13 (SP) 0x4000045c	21				
R14 (LR) 0x000002d8	22				
	23	int main()			
E CPSR 0x40000010	24				
	25	IO1DIR = IO1DIR LED; /* To set LED pin as Output */			
🗉 User/Syst	26	LED_OFF; /* To OFF LED */			
Fast Interrupt	27	while (1)			
Interrupt	28	(
Supervisor	29	LED_ON;			
😟 🗹 Abort	30	Delay(1200000); /* A Software Delay Of 100ms */			
🛨 🔤 Undefined	31	LED_OFF;			
🖻 Internal 🦲	32	Delay(1200000);			
PC \$ 0x00000214	33	}			
Mode User 34 >					
	35				
🖹 📑 🕼 💌 🗮	36				
Symbols					
Mark- × Case Sensit	<u>Ξ</u> ι	en ⁻ ouix			





CHAPTER- 4: I/O DISTRIBUTION





The Pin Distribution of LPC2138 Development Board

LPC2138 Pin No:	Name	Туре	The I/O assign of LPC2138 Development Board
1	P0.21	I/O	PWM5
2	P0.22	I/O	N/C
3	RTXC1		
4	P1.19	I/O	Led4/LCD (E/D)
5	RTXC2		
6	VSS		GND
7	VDDA		+3V3
8	P1.18	I/O	Led3/LCD (R/W)
9	P0.25	I/O	AOUT
10	P0.26	I/O	USBD+
11	P0.27	I/O	USBD-
12	P1.17	I/O	Led2/LCD (RS)
13	P0.28	I/O	AD0.1
14	P0.29	I/O	N/C
15	P0.30	I/O	N/C
16	P1.16	I/O	Led1
17	P0.31	I/O	USBLINK
18	VSS		GND
19	P0.0	I/O	TXD0
20	P1.31	I/O	TRST
21	P0.1	I/O	RXD0
22	P0.2	I/O	SCL0
23	VDD		+3V3
24	P1.26	I/O	RTCK



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25	VSS		GND
26	P0.3	I/O	SDA0
27	P0.4	I/O	N/C
28	P1.25	I/O	N/C
29	P0.5	I/O	N/C
30	P0.6	I/O	N/C
31	P0.7	I/O	BUZZER
32	P1.24	I/O	N/C
33	P0.8	I/O	TXD1
34	P0.9	I/O	RXD1
35	P0.10	I/O	Matrix Key
36	P1.23	I/O	Led8/ LCD (D4)
37	P0.11	I/O	Matrix Key
38	P0.12	I/O	Matrix Key
39	P0.13	I/O	Matrix Key
40	P1.22	I/O	Led7/ LCD (D3)
41	P0.14	I/O	Matrix Key/ EINT1
42	VSS		GND
43	VDD		+3V3
44	P1.21	I/O	Led6/ LCD (D2)
45	P0.15	I/O	Matrix Key
46	P0.16	I/O	Matrix Key
47	P0.17	I/O	Matrix Key
48	P1.20	I/O	Led5/ LCD (D1)
49	VBAT	Input	VBAT
50	VSS		GND



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51	VDD		+3V3
52	P1.30	I/O	TMS
53	P0.18	I/O	N/C
54	P0.19	I/O	N/C
55	P0.20	I/O	N/C
56	P1.29	I/O	ТСК
57	RESET		
58	P0.23	I/O	P0.23
59	VSSA		GND
60	P1.28	I/O	TDI
61	XTAL2		
62	XTAL1		
63	VREF		+3V3
64	P1.27	I/O	TDO





TECHNICAL SUPPORT

If you are experiencing a problem that is not described in this manual, please contact us. Our phone lines are open from 9:00 AM - 5.00 PM (*Indian Standard Time*) Monday through Saturday excluding holidays. Email can be sent to *support@rhydolabz.com*

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