ARM HOW-TO GUIDE

Interfacing Zigbee with LPC2148 ARM
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ARM7 LPC2148 Primer Board

The ARM7 LPC2148 Primer board is specifically designed to help students to master the required skills in the area of embedded systems. The kit is designed in such way that all the possible features of the microcontroller will be easily used by the students. The kit supports in system programming (ISP) which is done through serial port.

NXP’s ARM7 (LPC2148), ARM Primer Kit is proposed to smooth the progress of developing and debugging of various designs encompassing of High speed 32-bit Microcontrollers.

ZigBee

ZigBee is a specification for a suite of high level communication protocols using small, low-power digital radios based on an IEEE 802 standard for personal area networks.
Digi ZigBee

The Digi Xbee 802.15.4 modules are the easiest to use, most reliable and cost-effective RF devices we've experienced. The 802.15.4 Xbee modules provide two friendly modes of communication - a simple serial method of transmit/receive or a framed mode providing advanced features. These modules can communicate point to point, from one point to a PC, or in a mesh network.

![Fig. 1 Block diagram of Zigbee](image)

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Interfacing Zigbee

Fig. 1 shows how to interface the Zigbee with microcontroller. The Xbee modules work at the 2.4 GHz frequency which means smaller board and antenna size. Xbee modules have the ability to transmit Digital, PWM, Analog or Serial RS232 signals wirelessly. To communicate over UART or USART, we just need three basic signals which are namely, RXD (receive), TXD (transmit), GND (common ground). So to interface UART with LPC2148, we just need the basic signals.

![Fig. 1 Interfacing Zigbee to Microcontroller](image)

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Interfacing Zigbee with LPC2148

We now want to interface the ZigBee module with LPC2148 Primer Board for accessing the mobiles without wires through UART0. The data communication is done in internet by using the ZigBee module through MAX232 into the SBUF register of LPC2148 microcontroller (refer serial interfacing with LPC2148). The serial data from the Zigbee receiver is taken by using the Serial Interrupt of the controller. +5V and ground is connected to provide power to the module. While TX and RX pin is connected for communication.

Pin Assignment with LPC2148

<table>
<thead>
<tr>
<th>UART DB-9 Connector</th>
<th>LPC2148 Processor Lines</th>
<th>Serial Port Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>UART0(P1) ISP PGM</td>
<td>TXD-0 P0.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RXD-0 P0.1</td>
<td></td>
</tr>
<tr>
<td>UART1 (P2)</td>
<td>TXD-1 P0.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RXD-1 P0.9</td>
<td></td>
</tr>
</tbody>
</table>
Circuit Diagram to Interface Zigbee with LPC2148

Source Code

The Interfacing ZigBee module with LPC2148 program is very simple and straight forward, which communicate a mobile or any other devices with LPC2148 Primer Board through Zigbee module by using UART0. Some delay is occurring when a single data is sent to mobile through UART. C programs are written in Keil software. The baud rate of microcontroller is 9600.
# C Program to interface ZigBee with LPC2148

Title: Program to send or receive data in LPC2148 through UART0 using ZigBee module

```c
#define CR     0x0D
#include <LPC21xx.H>

void init_serial (void);
int putchar (int ch);
int getchar (void);
unsigned char test;

int main(void)
{
    char *Ptr = "*** UART0 Demo ***\n\n\n\rType Characters to be echoed!!\n\n\r";
    VPBDIV = 0x02;       // Divide Pclk by two
    init_serial();
    while(1)
    {
        while (*Ptr)
        {
            putchar(*Ptr++);
        }

        putchar(getchar());  // Echo terminal
    }
}
```

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void init_serial (void)
{
    PINSEL0    = 0x00000005; // Enable RxDO and TxDO
    U0LCR     = 0x00000083;   // 8 bits, no Parity, 1 Stop bit
    U0DLL     = 0x000000C3; // 9600 Baud Rate @ 30MHz VPB Clock
    U0LCR     = 0x00000003;
}

int putchar (int ch)
{
    if (ch == '\n')
    {
        while (!(U0LSR & 0x20));
        U0THR = CR;
    }

    while (!(U0LSR & 0x20));
    return (U0THR = ch);
}

int getchar (void)
{
    while (!(U0LSR & 0x01));
    return (U0RBR);
}
To compile the above C code you need the KEIL software. They must be properly set up and a project with correct settings must be created in order to compile the code. To compile the above code, the C file must be added to the project.

In Keil, you want to develop or debug the project without any hardware setup. You must compile the code for generating HEX file. In debugging Mode, you want to check the port output without LPC2148 Primer Board.

The Flash Magic software is used to download the hex file into your microcontroller IC LPC2148 through UART0.

**Testing the ZigBee with LPC2148**

Give +3.3V power supply to LPC2148 Primer Board; connect the +5V adapter with ZigBee module which is connected with the LPC2148 Primer Board. There are two ZigBee modules are used. One is connected with LPC2148 Primer Board UART0; other one is connected with PC.
First connect the serial cable between LPC2148 Primer board & PC. Then open the Hyper Terminal screen, select which port you are using and set the default settings. Now the screen should show some text messages. If the messages are correctly displayed in Hyper Terminal, then only connect the ZigBee modules in LPC2148 Primer Board UART0 & PC.

If you are not reading any data from UART0, then you just check the jumper connections & just check the serial cable is working. Otherwise you just check the code with debugging mode in Keil. If you want to see more details about debugging just see the videos in below link.

➢ How to Create & Debug a Project in Keil.

General Information

• For proper working use the components of exact values as shown in Circuit file. Wherever possible use new components.
• Solder everything in a clean way. A major problem arises due to improper soldering, solder jumps and loose joints.
• Use the exact value crystal shown in schematic.
• More instructions are available in following articles,
  - User Manual of LPC2148 Primer Board.
  - Tutorial of how to create & Debug a project in KEIL.
  - Interfacing UART with LPC2148.
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