

# USING USB ISP BOOTLOADER

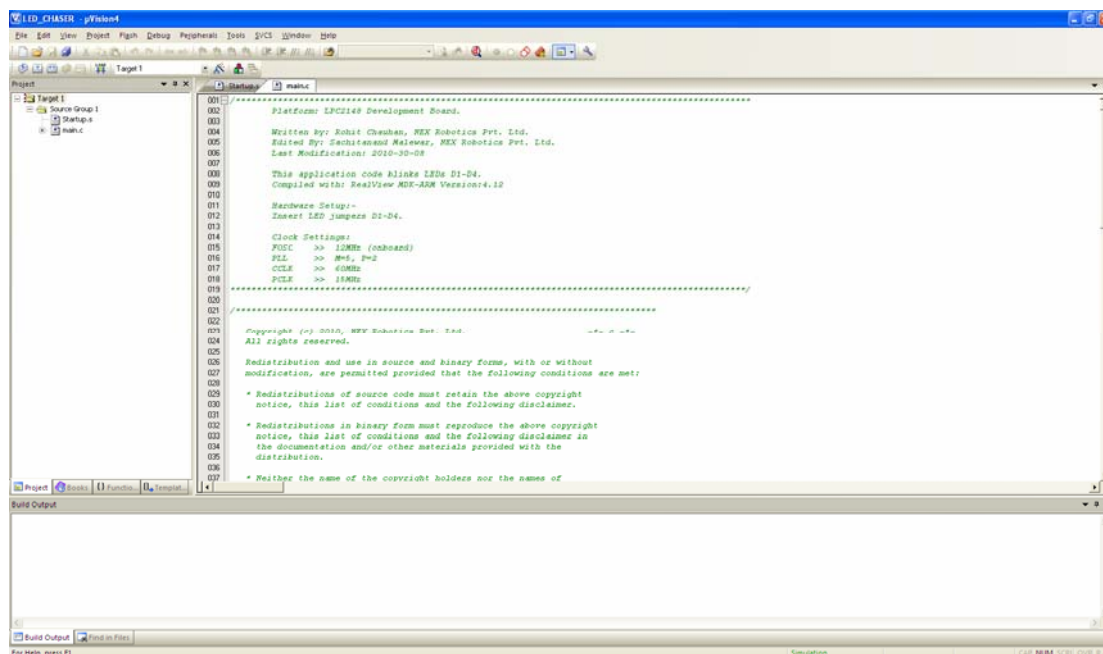
A USB bootloader is a piece of code which allows user's application code to be downloaded using USB channel apart from the standard UART0 used by the primary bootloader (on-chip). The secondary bootloader i.e. USB bootloader utilizes IAP as a method to update the user's application code.

This application note demonstrates the usage of secondary bootloader. The following sections will present a guideline for modifying the user code to make it compatible with the secondary bootloader. The firmware of the secondary bootloader is made available with this application note. The USB bootloader firmware is first loaded in to the microcontroller using Flash Magic and Uart0 ISP. The USB secondary bootloader has entry mechanism which enforces the microcontroller to enter in to bootloader mode on reset. SW1 (P0.15) on LPC2148 development board is configured as entry point for USB bootloader. The following sections assume that you have installed Keil uVision4 IDE and Flash Magic software on your PC.

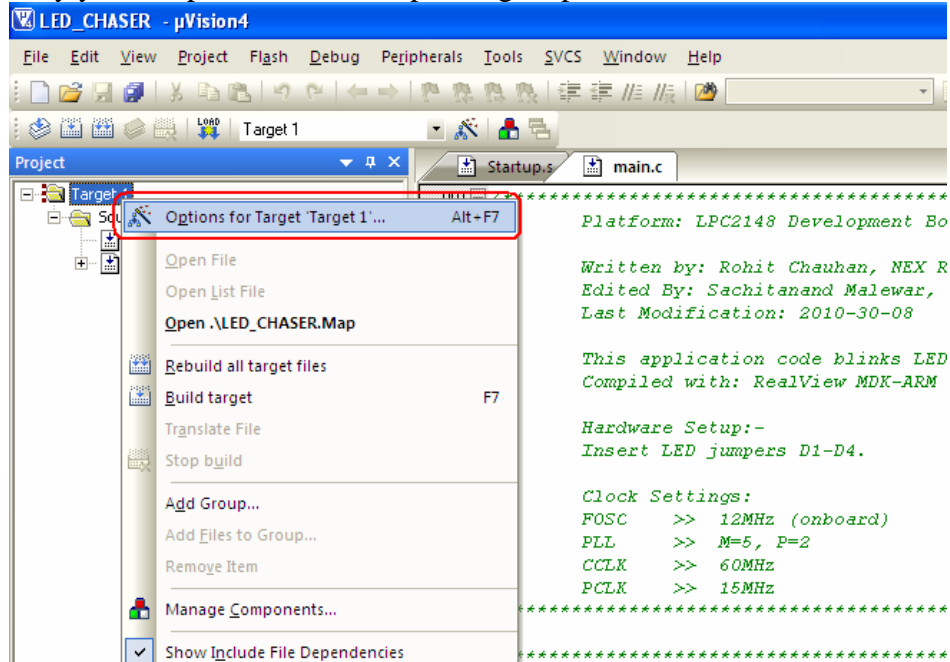
The following steps explain the modification required in user code to make it compatible with the USB Bootloader.

For demonstration purpose we will modify the **LED CHASER** firmware that comes as a sample code with the documentation CD. It is recommended to make a copy of this project before making any changes to the firmware.

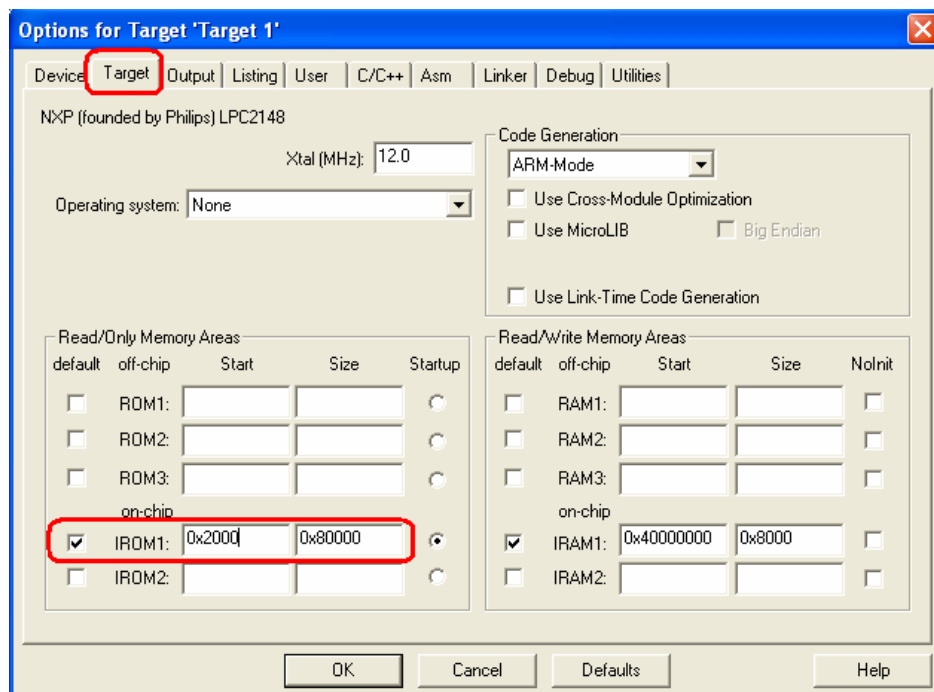
1. Start uVision4 Keil IDE and open the **LED CHASER** project.



2. In the project explorer window right click on Target 1 to open option for target 1. Alternatively you can press Alt+F7 to open target options.



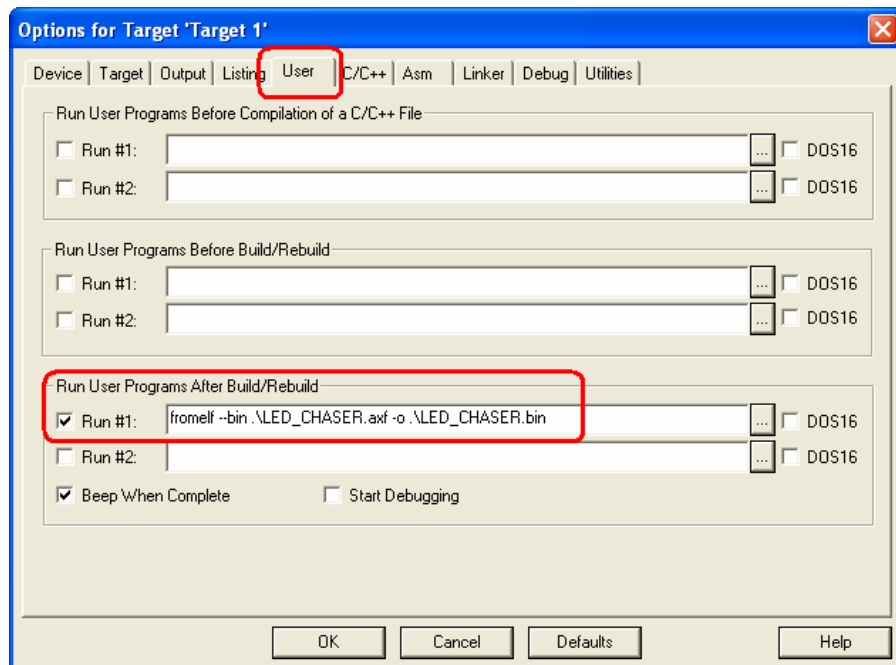
3. In the Target options window go to Target tab and change the starting address of IROM1 as shown in fig. below.



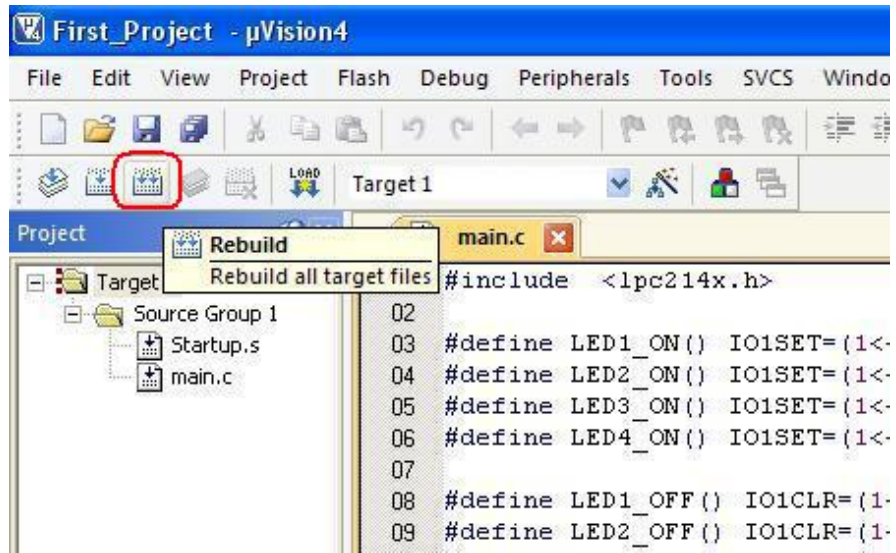
4. Go to User tab and add following user command to execute after successful build.  
`fromelf --bin .\LED_CHASER.axf -o .\LED_CHASER.bin`

This command will create a binary (.bin) file from .axf file as USB bootloader recognizes only raw binary files. Do not forget to check the Run#1 checkbox next to the command. You may copy and paste this command from the following line.

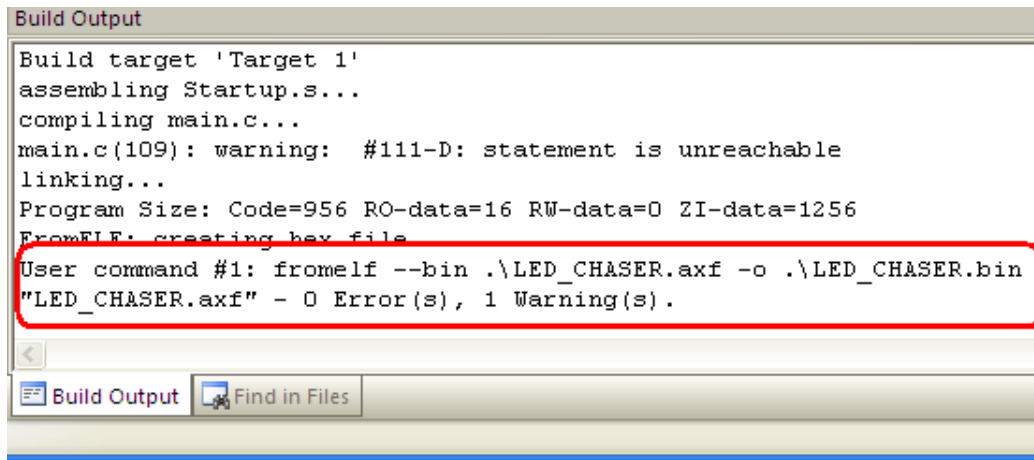
Here LED\_CHASER resembles the project name. So every time a new project is created only the highlighted part in the above command is needed to be changed. After you have entered the command click OK to close target options window.



5. Now build the project by clicking on **Rebuild** button on the main toolbar.



6. Observe the build output window in the bottom. It shows the information about the execution of user command. After successful build LED\_CHASER.bin file will be created in to the project directory.



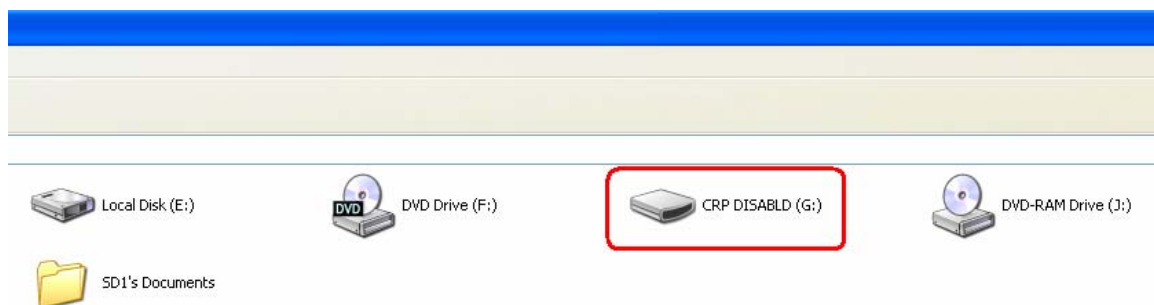
```
Build target 'Target 1'
assembling Startup.s...
compiling main.c...
main.c(109): warning: #111-D: statement is unreachable
linking...
Program Size: Code=956 RO-data=16 RW-data=0 ZI-data=1256
FromELF: creating hex file
User command #1: fromelf --bin .\LED_CHASER.axf -o .\LED_CHASER.bin
"LED_CHASER.axf" - 0 Error(s), 1 Warning(s).
```

7. The next step involves downloading the bootloader firmware on to the microcontroller using Flash Magic software. The bootloader firmware i.e. **Memory.hex** can be found in the Bootloader folder in the CD. For help on Flash Magic refer LPC2148 development Board manual.

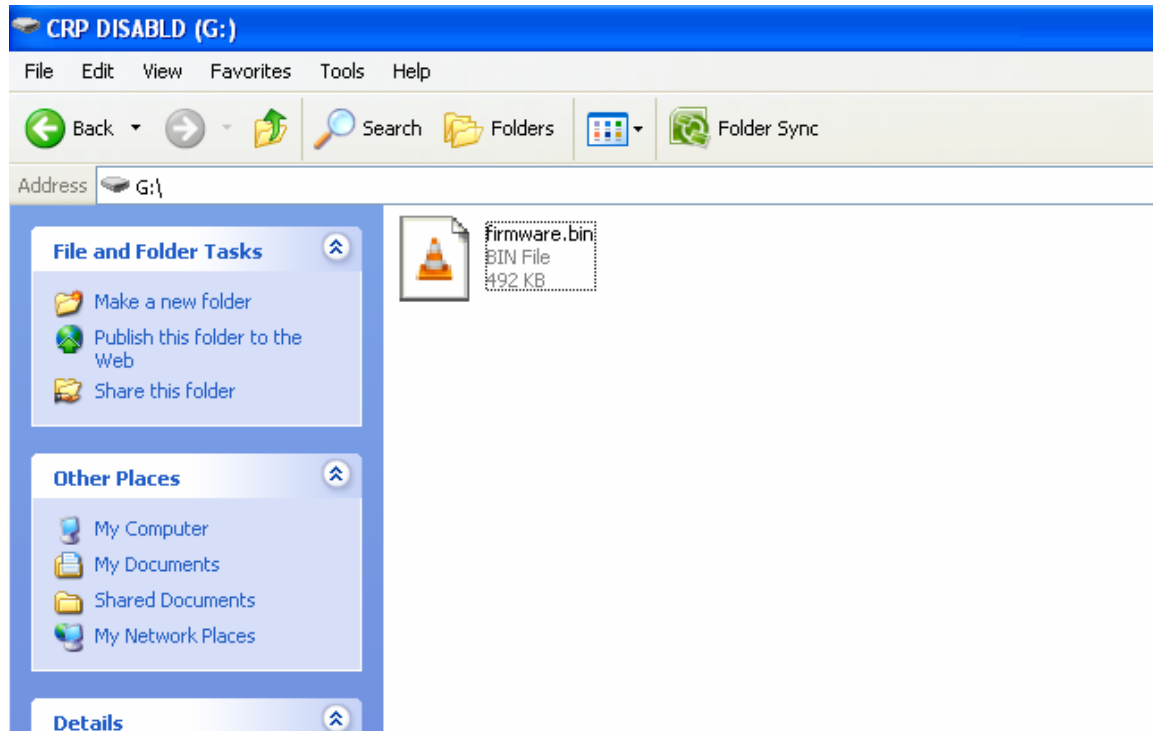
8. Now connect the USB cable between the development board and PC and press reset on the development board.

9. Your PC should detect LPC2148 development board as a mass storage device. Let windows install generic drivers for mass storage device class.

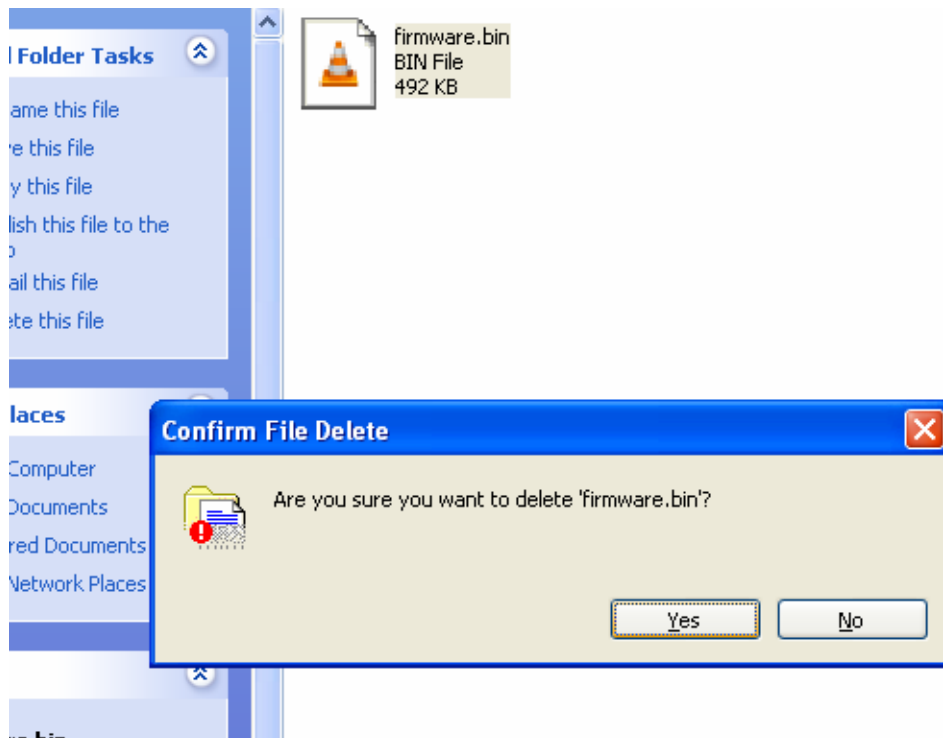
10. After successful installation of drivers a disk drive will be created in the My Computer as shown in fig. below. As there is no user code loaded in to the microcontroller, the bootloader firmware will enter directly in to bootloader mode. Once the user code is loaded in to the microcontroller, pressing reset button will execute user code rather than bootloader code and no disk drive will be created in My Computer.



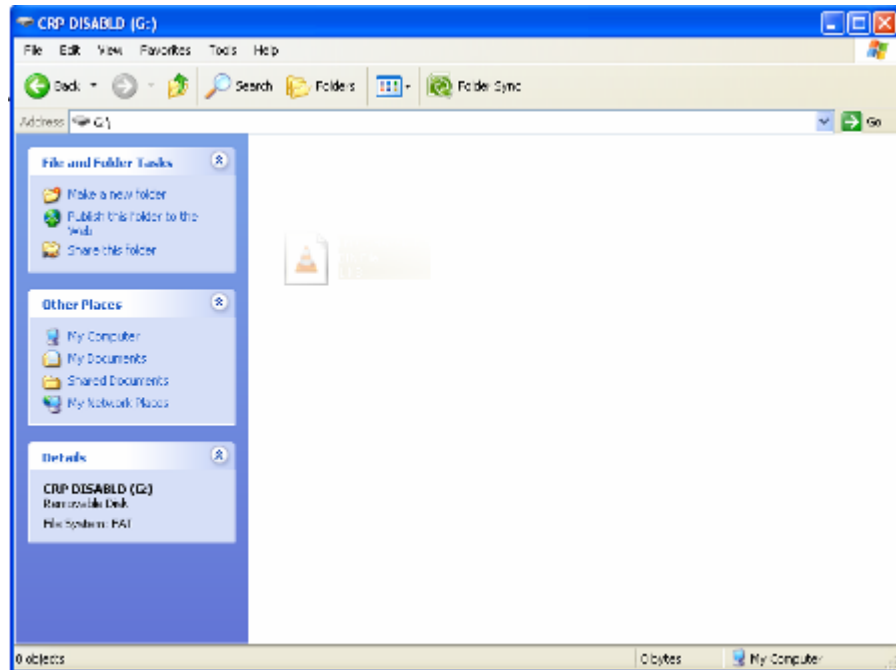
11. Double click on this drive to view its contents. It will contain a single file labeled as “Firmware.bin” which is the image of internal flash of the microcontroller.



12. To load the user application, delete the file “firmware.bin”.



13. Now copy the “LED\_CHASER.bin” file that was created earlier using Keil to this drive using drag and drop with mouse or copy and paste with keyboard..



14. On successfully copying the file press reset button on the development board and observe the LEDs. You should see them blinking.

15. Now if you wish to update the firmware or load another application code, keep SW1 pressed and then press reset button. It will exit application mode and enter back in to bootloader mode and create a disk drive in My Computer. To copy a new firmware file, repeat steps 11 to 15.

### Reference:

AN10711 USB Secondary Bootloader ([www.nxp.com](http://www.nxp.com))