# Project Log 1
**Project Title:** USB MicroSD Card Reader
**EEE G512** Embedded System Design
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# 1   USBMem

The first attempt made was to reproduce a demo USB-based mass storage program for the Keil MCB2140 Board using the Philips LPC2148 Microcontroller. Given that UM10139 was being used and not the MCB2140 board, only the startup file needed to be changed and the main program written for the MCB board would still be compatible with that for UM10139.

## 1.1   Objective

The USB Memory should be automatically recognized by the host PC running Windows which will load a generic Mass Storage driver, such that the microcontroller board acts as a USB Mass Storage Device (MSD) and the PC acts as the USB Host. The on-chip RAM is to function as MSD.

## 1.2   Details

**memory.c** is the main file which starts the Mass Storage Device. It uses the following files:

- Startup.s: CPU startup file for the NXP LPC2148 device.

- usbhw.c: USB hardware layer for NXP LPC2148.

- usbcore.c: USB core module that implements the basic USB communication layer.

- usbdesc.c: USB device description.

- usbuser.c: HID custom module.

- mscuser.c: Mass Storage Class implementation module.

Figure 1.2 shows contents of the main program memory.c. Figure 1.2 shows the list of Source COde files in the Keil workspace window.
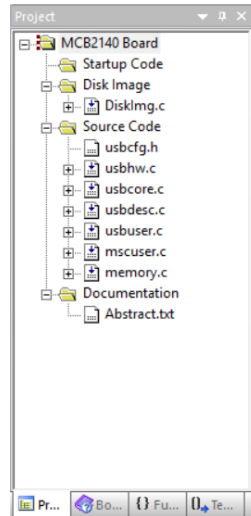
Figure 1: Files in the demo project

LEDs are used to display the following:
- P1.16: LED_RD is on when USB Device is performing Read access
- P1.17: LED_WR is on when USB Device is performing Write access
- P1.22: LED_CFG is on when USB Device is configured
- P1.23: LED_SUSP is on when USB Device is suspended

## 1.3 Circuit Connections

LEDs are connected to pins P1.16, P1.17, P1.22 and P1.23 for evaluating USB device status. Appropriate Jumper positions for J7 and J9 are put in place so that the board is using USB.

# 2 Conclusion

Due to issues of compatibility with the UM10139 board, the code did not successfully compile. Attention was then shifted to the LPC2148 USB Bootloader.

```
01  /*-----------------------------------------------------------------------
02   *      Name:     MEMORY.C
03   *      Purpose: USB Mass Storage Demo
04   *      Version: V1.10
05   *-----------------------------------------------------------------------

07  #include <LPC214X.H>                    /* LPC214x definitions */

09  #include "type.h"
10  #include "usb.h"
11  #include "usbcfg.h"
12  #include "usbhw.h"
13  #include "usbcore.h"
14  #include "mscuser.h"
15  #include "memory.h"

17  extern BYTE Memory[MSC_MemorySize];     /* MSC Memory in RAM */


20  /* Main Program */

22  int main (void) {
23      DWORD n;

25      for (n = 0; n < MSC_ImageSize; n++) {    /* Copy Initial Disk Image */
26          Memory[n] = DiskImage[n];            /*   from Flash to RAM     */
27      }

29      IODIR1 = LED_MSK;                        /* LED's defined as Outputs */

31      USB_Init();                              /* USB Initialization */
32      USB_Connect(TRUE);                       /* USB Connect */

34      while (1);                               /* Loop forever */
35  }
36
```
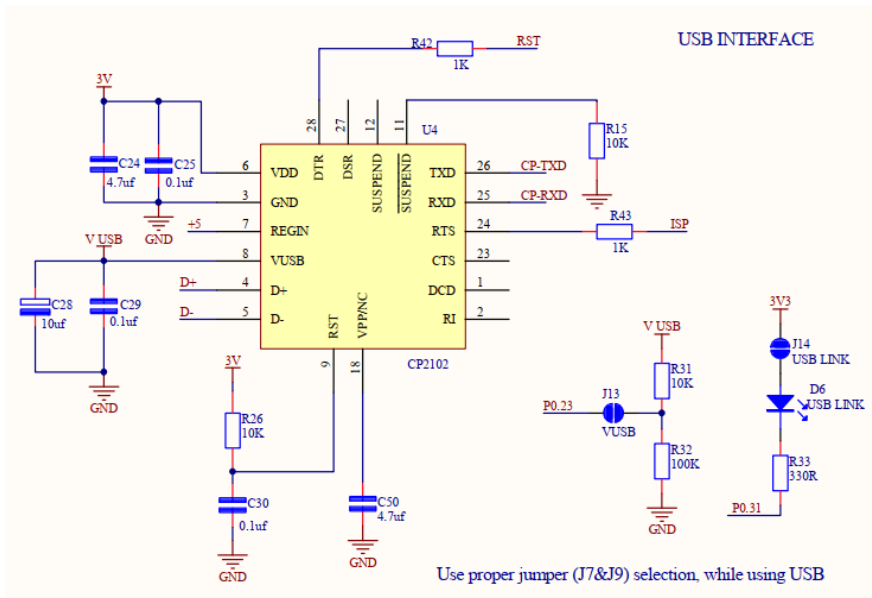
Figure 2: memory.c



Figure 3: Schematic of UM10139 showing internal connections of the USB interface

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# References

[1] ARM Keil Documentation, USBMem- Mass Storage Device,
    Available online: http://www.keil.com/support/man/docs/mcb2140

[2] UM10139 LPC214x Manual, Rev. 4, NXP Semiconductors, 23 April 2012.

[3] SDCard Interfacing with LPC2148 using SPI Module - WikiNote