# TUSBEP2140 USB Monitor Demo-Code Instructions

**The enclosed firmware, applet and host driver are written for the TUSB2140 and TUSBEP2140 EVM (Evaluation Module Board). The enclosed software is only meant to demonstrate basic functionality of our TUSB2140 device and is not for production because there will be some changes to the software in support of the TUSB2140A device.**

**PLEASE NOTE:**
The modified firmware, applet and host driver for the TUSB2140A and the TUSBHEP214X EVM will be available 4/9/98 or sooner. The TUSB2140A supports customizable Product ID (PID) and Vendor ID (VID) for both the hub and embedded function. The TUSBHEP214X EVM is a 2-layer PCB board layout.

| *Release Type* | *Version* | *Date* |
|---|---|---|
| Beta | 0.90 | February 27, 1998 |

## 1. Files Included in Release

### *1.1 Binaries*

| *Filename* | *Description* |
|---|---|
| EP2140VB.PDF | This Acrobat Reader document you are reading. |
| TARG8051.HEX | Firmware for 8051 micro-controller in Intel hex format (5 kilobytes approximate size) |
| CONMON.CPL | Monitor control panel applet for USB monitor commands |
| CONMON.INF | Installation file for the USB monitor device |

### TARG8051.HEX

Contains the firmware in Intel hex format for the 87C524 (8051 family) micro-controller. The Atmel 27C512 OTP ROM on the TUSBEP2140 Evaluation Board (EVM) is already programmed. The size of the firmware is around 5 kilobytes.

### USB Monitor Control Applet (CONMON.CPL)

This Windows control panel application is the user interface that is used to configure the USB monitor. It contains the software virtual controls for the USB monitor which are provided as buttons in a dialog box. The monitor control applet contains some of the most common controls supported by DDC2AB monitors. The monitor control applet is easily customized to contain only those controls actually supported by the monitor. Similarly, additional custom controls are easily added due to the modular format of the software code.

### USB Monitor Install File (CONMON.INF)

Upon first connecting the EVM board, windows will ask for a driver. When windows is referred to this driver, Windows will automatically copy this file into the **C:\Windows\Inf\Other** directory. This file will then prompt Windows to copy the CONMON.CPL file into the **C:\Windows\System** directory and the HID class drivers into the **C:\Windows\System32** directory. This file also enables the customer to display their own name in the device manager box and to display their name during enumeration.

### *1.2 Source Code*

Will be made available for the TUSB2140A device, but will NOT be made available for this release.

## 2. Supported Monitor Features

### *2.1 VCP Op-Codes*

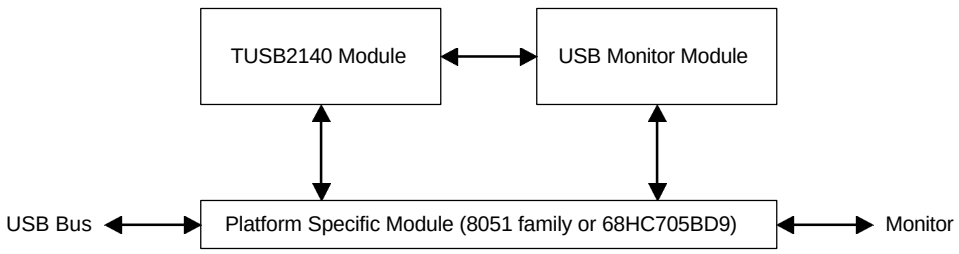
The monitor controller firmware currently supports a subset of the VCP op-codes (monitor commands) specified by the USB Monitor Control specification. The supported VCP op-codes (see table below) were chosen to implement the commands supported by LG Electonics 17" Studio Works 7D Model monitor in order to demonstrate the TUSB2140 and our software solution. Even though your VESA DDC2AB compliant monitor may not implement these exact commands, the TUSB2140 demo software should still function when connected to your monitor. However, if your monitor does not support the exact commands listed below, some controls in the Monitor Control Applet for may have no effect on the monitor. Support for additional op-codes is extremely easy to add to the monitor controller firmware by modifying data tables within the firmware.

**Currently Supported VCP Op-codes**

| *VCP Op-Code* | *Description* |
|---|---|
| 10h | Brightness |
| 12h | Contrast |
| 16h | Red video gain |
| 18h | Green video gain |
| 1Ah | Blue video gain |
| 20h | Horizontal position |
| 22h | Horizontal size |
| 24h | Horizontal pincushion |
| 30h | Vertical position |
| 32h | Vertical size |
| 42h | Trapezoidal distortion |
| 44h | Tilt |
| 02h | Degauss |
| 01h | Save / Restore |

### *2.2 Monitor Control Firmware Format*

The overall architecture of the monitor controller firmware is modular and easy to modify. The firmware consists of three modules as shown in the diagram below. The USB monitor firmware supports all of the standard USB device requests defined by chapter 9 of the USB specification as well as the SetReport and GetReport requests defined by the monitor class and HID class specifications. The USB firmware is also responsible for managing the flow of data between the USB bus and the monitor hardware. The monitor firmware, which is written in 'C', runs on both 8051 and 68705 families of micro-controllers, but can easily be modified to reside on any micro-controller. Because the firmware is structured as a single interrupt service routine, it is also extremely easy to integrate into existing monitor control code bases.



# 3. TUSBEP2140 EVM Configuration and Instructions

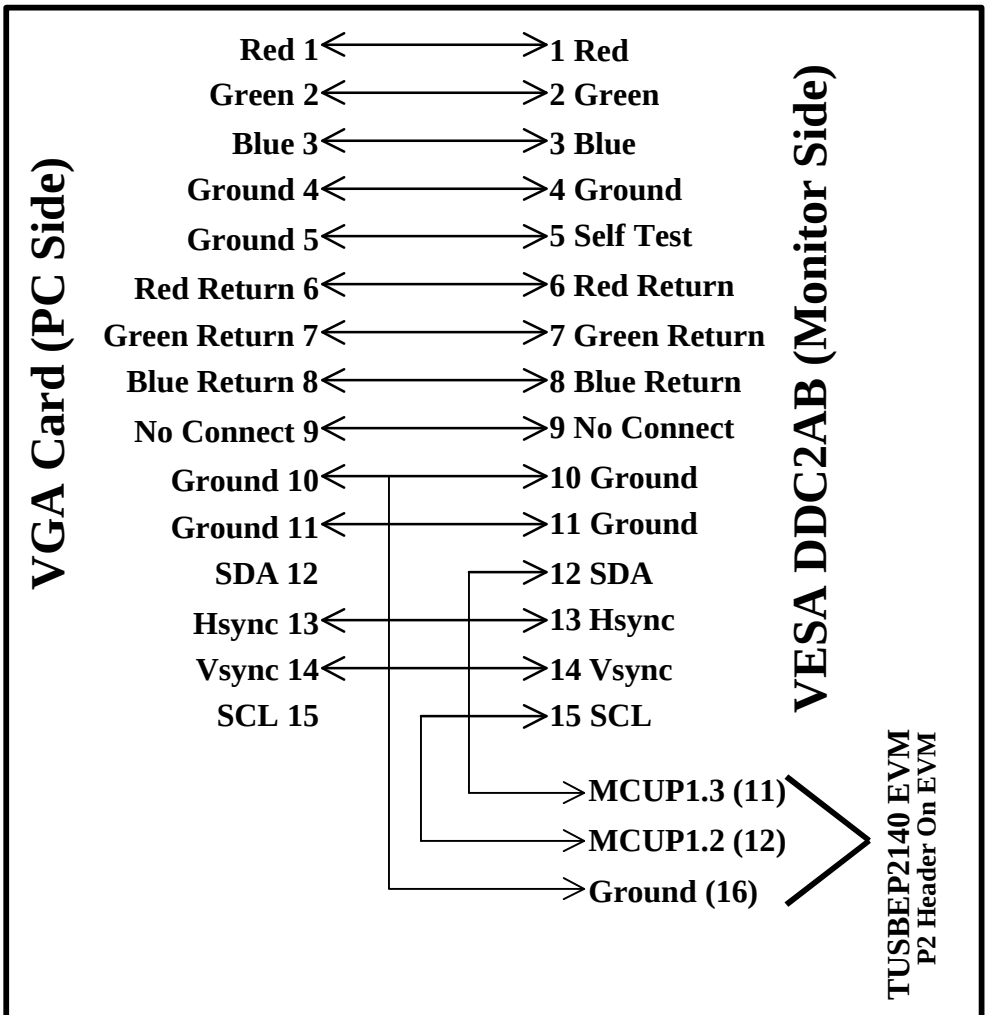
## *3.1 Jumper Settings*

| *Jumper* | *Set To* | *Effect* |
|---|---|---|
| P4 | On | Enable 2140's 3.3v power |
| P5 | 3-5, 4-6 | 87C524's clock derived from 12MHz crystal (not from TUSB2140A) |
| P6 | 1-2, 3-4, 5-6, 7-8 | MPUP1.2, MPUP1.3, MPUP1.4, and MCUP1.5 drive LEDs |
| P7 | 0 | Set 2140 CLKOUT to 12MHz |
| P8 | 0 | Set 2140 CLKOUT to 12MHz |
| P9 | 0 | 2140 Oscillator enabled |
| P10 | 0 | 87C524 uses external program memory |

## *3.2 Cable Connections*

| *Port* | *Connection* |
|---|---|
| J1 or J7 | Connect to 5VDC power supply |
| J2 | Connect to host system's USB port |
| J8, J9, J10, J11 | May be connected to other USB peripherals (hub function) |
| P2 | Connect to VESA DDC2AB compliant monitor using a VGA cable modified as the below diagram illustrates. |

**VGA cable modification needed to connect the $I^2C$ bus to the TUSBEP2140 EVM, VGA card in the PC and VESA DDC2AB monitor.**



# 4. EVM LED Usage

The TUSBEP2140 EVM board contains several LEDs that indicate the current state of the firmware and the EVM board. These LEDs may aid in troubleshooting any problem encountered during installation or operation.

| *LED Name* | *Description* |
|---|---|
| 3.3VDC | Indicates 3.3V power is working |
| 5VDC | Indicates 5.0V power is working |
| PWRON | Shine when the downstream port power has been enabled by the host system. This LED should turn on when the host computer finds and enables the TUSB2140 hub. If this LED is not on, the monitor controller will not function. |
| OVERCUR1 | Indicates an over current condition on hub port 1 or 2. LED should be off during normal operation. |
| OVERCUR2 | Indicates an over current condition on hub port 3 or 4. LED should be off during normal operation. |
| MCUP1.2 | Indicates traffic on the monitor's SDA line. LED should flicker when monitor adjustments are being made. |
| MCUP1.3 | Indicates traffic on the monitor's SDA line. LED should flicker when monitor adjustments are being made. |
| MCUP1.4 | Indicates that the microcontroller is busy executing a command issued to it from the USB bus. LED should flicker when any USB commands or data are sent to the monitor controller. |
| MCUP1.5 | Should blink indicating that the monitor controller's firmware is running. A slow blink rate indicates that the EVM board is powered up and running, but has not yet been enable by the host system. A fast blink rate indicates that the monitor controller firmware is running, and the host system has found and enabled the monitor controller. This LED is also used to indicate a communications error between the microcontroller and the TUSB2140 and/or the monitor over $I^2C$. If the LED is in a steady on state, then an $I^2C$ communications error has occurred with the TUSB2140. If the LED is in a steady off state, then an $I^2C$ communications error has occurred with the monitor. |

# 4. Software Installation and Operation

## *4.1 Host Software*

Power up your host PC system and make sure that Windows 98 (Beta 3 or later) is loaded.

## *4.2 Clearing the registry and older versions of software*

In order to eliminate older versions of software drivers, please do the following steps.

**A.) Setting Explorer to view hidden files and file extensions**

1.) Point to the "Start" button and click the right mouse button. Then click "Explore".
2.) Once in the "Exploring" box, click "View".
3.) Click "Folder Options".
4.) Click the "View" tab.
5.) Under "Hidden Files", click "Show all files" to show all files.
6.) Make sure that the square for "Hide file extensions for known file types" is not checked.
7.) Click the "Apply" button
8.) Click the "Like current folder" button.
9.) Click "OK".

**B.) Deleting files using Explorer**

1.) Inside Explorer, Go to the **C:\Windows\Inf\Other** folder and delete the "American Megatrends.Inf" file if there is one.
2.) In the **C:\Windows\System** folder, delete the "CONMON.CPL" file if there is one.
3.) In the **C:\Windows\System32\Drivers** folder, delete the "Hidclass.sys", "Hidparse.sys" and the "HidUSB.sys" files if they are there.
4.) Close Explorer

**C.) Clearing the PC's Registry**

1.) Click the "Start" button using the left mouse button.
2.) Click "Run.."
3.) In the box, type "Regedit" then hit the enter button.
4.) Click "Hkey_local_Machine".
5.) Click "Enum".
6.) Click "USB"
7.) Delete all the entries under the "USB" folder except the "Root Hub" folder.
8.) Close the box by clicking the "X" in the top right corner of the box

**D.) Shut down and Restart Windows**

## *4.3 Connecting the EVM and setting up the software installation*

1.) Make sure the +5Volts and Ground are connected to the EVM.
2.) Connect the modified VGA cable to the P2 header of the EVM.
3.) Insert the Window98 beta3 or later disk into the CD ROM drive.
4.) Insert a 3.5 disk containing the CONMON.CPL and the CONMOM.INF into the floppy disk drive.
5.) Press the reset button on the EVM and make sure that the MCUP1.5 is blinking slowly.

**Note:** In order to avoid grounding issues and instability, make sure that your power supply is connected to the same power strip as your PC and that all the grounds for the PC, EVM and power supply are all connected to the same grounding source.

## *4.4 Installing the Software*

1.) Plug the USB cable to the EVM board.
2.) Windows should automatically recognize the hub and install the Hub Class driver off the Windows CD.
3.) The "Add New Hardware" box should then appear once Windows finds the hub embedded function and it should say "USB Human Interface Device". Click "next".
4.) In the next box, make sure that the "Search for best driver for your device" circle is selected. Click "next".
5.) In the next box, make sure that the "Floppy disk drive" box is the only one selected. Click "next".
6.) If the floppy disk is in the drive, the Conmon.inf file will be selected and copied into the **C:\Windows\Inf\Other** folder.
7.) Once the Conmon.inf is found, the dialog box should come back and say "<Insert monitor name here> USB Monitor".
8.) The Conmon.inf file will then copy the "Conmon.cpl" file into the **C:\Windows\System** folder, and the "Hidclass.sys", "Hidparse.sys" and the "HidUSB.sys" files will then be copied off the Windows CD into the **C:\Windows\System32\Drivers** folder.
9.) Check the MCUP1.5 LED because it should now be blinking fast (about 10 blinks/sec).

**Note:** If the MCUP1.5 is not blinking quickly (about 10 blinks/sec) after the completing step 4.4, the firmware is not in the correct state. In order to reset the software, you must disconnect the USB cable from the root port of the EVM and push the reset button (SW1) on the EVM board. The MCUP1.5 LED should then start blinking slowly (about 5 blinks/sec). Once the USB cable is reconnected to the root port of the EVM, the MCUP1.5 LED should start blinking quickly (about 10 blinks/sec). You are ready to open and use the monitor applet .

## *4.5 Using the monitor control Applet*

1.) Click “Start”, “Settings” and then “Control Panel”.
2.) Click the icon that looks like a monitor and is labeled “Monitor”
3.) The control applet should then appear.