OVERVIEW

This Application Note shows you how to:

- Connect the Cypress EZ-USB Development Board to the PC and start the Keil Monitor-51.
- Verify that the Cypress EZ-USB Development Board works and download a sample test application.
- configure Keil μ Vision2 to download user code to the Cypress EZ-USB Development Board.

PREPARE YOUR PC FOR THE EZ-USB BOARD

The following section describes the steps that need to be performed for debugging with μ Vision2 debugger.

The EZ-USB board comes with complete USB drivers for the PC. If you want to debug your application code with the Keil Monitor-51 you should copy the following files to a floppy disk and locate this in to drive A:

- Cypress\USB\Drivers\EZMON\Lib\I386\Checked\EZMON.SYS
- Cypress\USB\Drivers\EZUSBDRV\Lib\I386\Checked\EZUSB.SYS
- Cypress\USB\Drivers\EZUSBW2K.INF

When you conn0ect the EZ-USB board to the PC via the supplied standard USB cable, your computer should display the following message:



Since there is no existing driver for the EZ-USB board on your computer, Windows starts the Found New Hardware Wizard.

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Found New Hardware Wizard	
	Welcome to the Found New Hardware Wizard This wizard helps you install a device driver for a hardware device.
	< <u>B</u> ack

Then you select the floppy disk drive A: as source for the driver files.

Found New Hardware Wizard			
Locate Driver Files Where do you want Windows to search for driver files?			
Search for driver files for the following hardware device:			
The wizard searches for suitable drivers in its driver database on your computer and in any of the following optional search locations that you specify.			
To start the search, click Next. If you are searching on a floppy disk or CD-ROM drive, insert the floppy disk or CD before clicking Next.			
Optional search locations:			
Floppy disk drives			
CD-ROM drives			
Specify a location			
Microsoft Windows Update			
(But Nuts Court			

EXAMPLE CYPRESS PROJECT

After you have connected the EZ-USB board to the PC, you may check if the sample application that is provided with this Application Note works correct. Therefore perform the following steps:

• From the Windows Start menu run Programs – Cypress – USB – EZ-USB Control panel. This should open the EZ-USB Control Panel with **Ezusb-0** as device name. When you send the command **Get Pipe Info** to the board you should get **Interface Size 16** as return message. This is shown in the following picture:

😂 EZ-USB Control Panel - Ezusb-0	
File Edit View Options Tools Window Help	
Ezusb-0	
Get Pipe Info v Send Device Ezusb-0 v Clear LoadMon	
Get Dev Get Conf GetPipes GetString Download. EEPROM URB Stat HOLD RUN	
Vend Req Req 0xA2 Value 0x0000 Index 0xBEEF Length 16 Dir 1 IN V Hex Bytes B0 47 05 80 00 01 00 V	
Iso Trans Pipe Packets 128 Size 16 Buffers 2 Frames / Buffer 8	
BulkTrans Pipe Length 64 Hex Bytes 5 BulkLoop	
ResetPipe AbortPipe FileTrans Pipe	
SetIFace Interface AltSetting 1	
EZ-USB Control Panel - built 11:31:35 Jul 28 2000 Get PipeInfo	
Interface Size 16	

- Connect the SIO-1 connect on the EZ-USB Development Board with a standard 9-pin serial cable to the PC COM1 port.
- Then start Keil µVision2 and open the project **TARGET\CIUSBTST.UV2** that comes with this application note. This sample project allows you to display a single digit on the EZ-USB Development Board.
- With **Project Rebuild all Target Files** (µVision2 menu) you may check that all development software packages are installed correctly. This generates the example project, but may generate two Warning 16 messages, since some library functions are not used.
- With Debug Start/Stop Debug Session (μVision2 menu) you can start the μVision2 debugger. (Make sure that you have connected the EZ-USB port via a serial cable as described above!). μVision2 should connect to Monitor-51 and start with the debug screen as shown in the following picture:

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SOFTWARE Programming the Cypress EZ-USB Board

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Elle Edit View Project Debug Peripherals Iools SVCS Window Help
1 🖆 😹 🛃 🖇 ங 🖻 으 오 痒 疟 ゅ % % % % 🦄 🦰 SSION 🔍 🛤 🕲 🗶 💽 🗩 🗶 約 🖄 😫 🖉 🕩 🖓 (* 1) 🔶 註 註 ③
Regite Vake Pegge (unsigned char reply_length; //unsigned long xdata i; UORD offset; DUORD filescriddr; UORD filescriddr; UCRD filesc
E Files 🖓 Regs 🛄 B E ciuablet.c
Connected to Monitor-51 V3.0 Load "D:\EXAMPLE\target\ciusbtst" Kinger Connected to Monitor-51 V3.0 Load "D:\EXAMPLE\target\ciusbtst" Korreget Connected to Monitor-51 V3.0 Korreget

- Start the USB application via the µVision2 menu: **Debug Go**.
- Microsoft Windows will start again the **Found New Hardware Wizard**. You should perform the same steps and use the same floppy disk as described under PREPARE YOUR PC FOR THE EZ-USB BOARD described above.
- The renumeration process described in the file DSCR.A51 that is part of the project, the board connects again to the PC. In the EZ-USB Control Panel you can send again the command **Get Pipe Info**. The board should react as in the following picture with the message Interface Size 56...

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🗲 EZ-USB Control Panel - Ezusb-0	
Eile Edit View Options Iools Window Help	
Ezusb-0	
Get Pipe Info v Verice Ezusb-0 v Clear LoadMon	
Get Dev Get Conf Get Pipes Get String Download. EEPROM. URB Stat HOLD RUN	
Vend Req Req 0xA2 Value 0x0000 Index 0xBEEF Length 16 Dir 1 IN • Hex Bytes B0 47 05 80 00 01 00 •	
Iso Trans Pipe Packets 128 Size 16 Buffers 2 Frames / Buffer 8	
BulkTrans Pipe 1: Endpoint 2 OUT V Length 64 Hex Bytes 5	
ResetPipe AbortPipe FileTrans. Pipe 1:Endpoint 2 OUT 💌	
SetIFace Interface 0 AltSetting 1	
EZ-USB Control Panel - built 11:31:35 Jul 28 2000 Get PipeInfo Interface Size 56 Pipe: 0 Type: BLK Endpoint: 2 IN MaxPktSize: 0x40 Pipe: 1 Type: BLK Endpoint: 2 OUT MaxPktSize: 0x40	
pr For Helo, press F1	

• Then use the button **BulkTrans** with Pipe 1: Endpoint 2 OUT, Hex Bytes: 41 0 1 5 as shown in the following picture. The EZ-USB board shows on the LED display the digit **'5'**.

🗲 EZ-USB Control Panel - Ezusb-0	
Elle Edit View Options Tools Window Help	
Ezusb-0	
Get Pipe Info	
Get Dev Get Conf Get Pipes Get String Download. EEPROM URB Stat HOLD BUN	
Vend Beq Reg 0xA2 Value 0x0000 Index 0xBEEF Length 16 Dir 1 IN Hex Bytes B0 47 05 80 00 01 00 Image: Comparison of the compariso	
Iso Trans Pipe Packets 128 Size 16 Buffers 2 Frames / Buffer 8	
BulkTrans Pipe 1: Endpoint 2 OUT V Length 4 Hex Bytes 41 0 1 5 BulkLoop	
ResetPipe AbortPipe FileTrans Pipe 1: Endpoint 2 OUT	
Set IFace Interface 0 AltSetting 1	
EZ-USB Control Panel - built 11:31:35 Jul 28 2000 Get PipeInfo	
Interface Size 56 Bine: 0 Tune: BLV Endpoint: 2 IN MayPhtSize: 0x40	
Pipe: 1 Type: BLK Endpoint: 2 OUT MaxPktSize: 0x40 Write IOCTL passed	
For Help, press F1	

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• With the button **BulkTrans** Pipe 1: Endpoint 2 IN the Read IOCTL should display the value 61. This ensures that the command is process correct on the EZ-USB board.

🗲 EZ-USB Control Panel - Ezusb-0	
Elle Edit View Options Iools Window Help	
Ezusb-0	
Get Pipe Info	
Get Dev Get Conf Get Pipes Get String Download. EEPROM. URB Stat HOLD RUN	
Vend Req Req 0xA2 Value 0x0000 Index 0xBEEF Length 16 Dir 1 IN • Hex Bytes B0 47 05 80 00 01 00 •	
Iso Trans Pipe Packets 128 Size 16 Buffers 2 Frames / Buffer 8	
BulkTrans Pipe 0: Endpoint 2 IN V Length 4 Hex Bytes 41 0 1 5	
ResetPipe AbortPipe FileTrans Pipe 1: Endpoint 2 OUT	
Set Face Interface O AltSetting 1	
EZ-USB Control Panel - built 11:31:35 Jul 28 2000 Get PipeInfo	
Interface Size 56 Pipe: 0 Ture: BLK Endpoint: 2 IN MayPhtSize: 0x40	
Pipe: 1 Type: BLK Endpoint: 2 OUT MaxPktSize: 0x40	
0000 41 00 01 05	
Read IOCTL passed	
For Help, press F1	

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CREATE OWN µVISION2 PROJECTS

The Cypress EZ-USB board comes with a complete firmware example that can be found in the folder Cypress\USB\Examples\EZ-USB\Bulktest\Target. The project file **Bulktest.UV2** might be use as starting point for own USB application programs. You should copy all the files to a new folder.



With **Project – Create New Project** you may create a new firmware project for the Cypress EZ-USB board. Enter your project name and select as device **Cypress Semiconductor**, **EZ-USB (AN21XX)**. Then you should add all the source files of the original EZ-USB example. We have renamed the original file Bulktest.C to **CIUSBTST.C**. This is the file where you add your application code. The other files need not to be modified.

REQUIRED TOOL CONFIGURATION

The following section shows you the tool configuration that is required to generate proper firmware code for the Cypress EZ-USB part.

Dialog: Project – Options for Target – Target

The Cypress **EZUSB.LIB** uses the SMALL memory model. Therefore you need to select as the memory model: **Small: variables in DATA**.

When you debug your application with Monitor-51, you need to configure the Memory Map *Configuration 11* as described in the *Cypress Technical Reference Manual, Chapter 5.8 Memory Maps*.

Under **Off-chip memory**, the memory layout of the target system needs to be defined. With *Configuration 11* the Cypress EZ-USB contains gaps in the code/xdata memory at addresses 0x1B40 - 0x1FFF and 0x7B40 - 0x7FFF due to the EZ-USB registers. Therefore you need to exclude this memory areas. The xdata area 0xFF00 ... 0xFFFF is used by the Keil Monitor-51 as data area. Also it is very important to configure the off chip Code memory and the off chip Xdata memory as non-overlapping areas. Below is an example for code memory til address 0x5EFF:

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ions for Target 'Target 1'		?
arget Output Listing C51 A51	BL51 Locate BL51 Misc Debug	
ypress Semiconductor EZ-USB (AN21XX	1	
∐tal (M Memory Model: Small: variables in DA Code Rom Size: Large: 64K program Operating system: None	Hz): 48.0 TA Use multiple DPTR registers Use On-chip XRAM (0x0-0x3FF)	
Off-chip Code memory S Eprom 0x20 Eprom 0x20 Eprom 1	tart: Size: 000 0x1840 000 0x3F00 Ram 0: Ram 0: Ram 0:	Start: Size: x5F00 0x1C40 x8000 0x7F00
Code Banking St	art: End: Tar' memory type support	

Dialog: Project – Options for Target – C51

The EZ-USB firmware uses the include files **ezusb.h** and **ezregs.h** that are located in the folder **c:\cypress\usb\target\inc**. You may specify this folder under **Include Paths** as shown below:

Options for Target 'Target 1'	<u>? ×</u>	
Target Output Listing C51 A51 BL51 Locate BL51 Misc Debug		
Preprocessor Symbols Define: Undefine:		
Code Optimization Wan Level: 8: Common tail merging Emphasis: Favor execution speed Global Register Coloring K Don't use absolute register accesses K	ings: Warninglevel 2 ▼ to round for float compare: 3 ▼ terrupt vectors at address: 0x0000 eep variables in order nable ANSI integer promotion rules	
Include Paths Controls		
Compiler control string		
OK Cancel Defaults		

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Dialog: Project – Options for Target – BL51 Locate

The file **DSCR.A51** that comes with the Cypress firmware code contains a segment **DSCR** that needs to be located in the on-chip memory of the EZ-USB part. This is required for correct operation of the enumeration. When you enter this segment under **CODE** the linker locates this segment before other segments. In this way it is ensured that this segment is located in on-chip code memory.

Options for T	arget 'Tar	get 1'	<u>? ×</u>
Target Out	put Listing	C51 A51 BL51 Locate BL51 Misc Debug	
	🔽 🛛 se M	femory Layout from Target Dialog	
		Code Range: 0X0000-0X1B3F,0X2000-0X5EFF	
Space	Base	Segments: Xdata Range: 0X5F00-0X7B3F,0X8000-0XFEFF	
<u>C</u> ode:		DSCR	
⊠data			
<u>P</u> data:			
P <u>r</u> ecede:			
<u>B</u> it:			
<u>D</u> ata:			
<u>I</u> data:			
<u>S</u> tack:			
Linker control string	TO "ciust RAMSIZE	otet" (256)	▲ ▼
		OK Cancel Defaults	

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Dialog: Project – Options for Target – Debug

Select Use: Keil Monitor-51 Driver as shown below to debug your application with the Monitor program. Since the μ Vision2 debugger allows you debugging with different drivers, this driver needs to be selected for each μ Vision2 project target. Under Settings you need to select the PC COM port and the baudrate for the communication to the Cypress EZ-USB board. The Monitor that we have loaded into the Cypress EZ-USB board works with 19200 bps as baudrate.

Dptions for Target 'Target 1'		
Target Output Listing C51 A51 BL51 Locate BL51 Misc Debug		
C Use <u>S</u> imulator	⊡se: Keil Monitor-51 Driver Settings	
Load Application at Startup 🔽 Go till main()	Load Application at Startup 🔽 Go till main()	
Initialization File:	Laterative mail	
Restore Debug Sessi Comm Port Settings Image: Setting Baudrate: Baudrate: Image: Setting Baudrate: 19200 Image: Setting Baudrate: 19200 Image: Setting Baudrate: Stop Program Execution with Image: Setting Baudrate: Stop Program Execution with Image: Setting Baudrate: Stop Program Execution with Image: Setting Baudrate: Image: Setting Baudrate: Image: Setting Baudrate: Stop Program Execution with Image: Setting Baudrate: Image: Setting Baudrate: Image: Setting Baudrate: Image: Setting Baudrate: <tr< th=""><th>Cache Options Cache DATA (SFR) Cache IDATA Cache LOATA Cache LOATA Cache CODE Cancel</th></tr<>	Cache Options Cache DATA (SFR) Cache IDATA Cache LOATA Cache LOATA Cache CODE Cancel	
Dialog DLL: Parameter: DP51.DLL pAN21	Dialog DLL: Parameter: TP51.DLL pAN21	
OK Cancel Defaults		

MONITOR ERROR 22

In case that you receive MONITOR ERROR 22: NO CODE MEMORY AT ADDRESS: 0045H you are using the original file USBJMPTB.A51 or you did not specify under Options for Target – A51 – Set: Monitor. The USB autovector interrupt modifies the code byte location 0x45 by hardware. Therefore Monitor cannot alter this memory location and displays the above error message. If you change the code in the file USBJMPTB.A51 the error message will be no longer displayed:

```
; Interrupt Vectors
; Interrupt Vectors
; CSEG AT 43H
USB_AutoVector equ $ + 2
DB 02H ; LJMP
DB HIGH USB_Jump_Table ; Autovector Jump Table5
DS 1 ; Autovector will replace byte 45
```

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CONCLUSION

When you follow the information in this application notes it is easy to develop programs for the Cypress EZ-USB board with the μ Vision2 and the C51 Compiler. The μ Vision2 debugger allows you to download and test your code on the EZ-USB board. You may single step set breakpoints in your application program.