USB Analyser user manual

1. Introduction

USB Analyser is a high cost performance USB bus development tool manufactured by Guangzhou ZLG-MCU Development Co., LTD.. The USB Analyser is based on specific USB chip and advanced MCU. It integrates the DPLL, FIFO, automatic synchronization, USB bus disturbance detection and USB1.1/USB 2.0 compatible technologies. We also provide USB development boards and publications about USB. See our web site http://www.zlgmcu.com for more information about us.

2. System Requirements

(1) Monitor PC

- Pentium IV 1.0G or above, or compatible CPU
- USB 2.0 port
- 256MB RAM or above
- Minimum 500MB hard disk space
- CD-ROM or DVD-ROM driver
- Windows 98, Windows 2000, Windows XP or above. Windows XP is recommended.

(2) Debug Host

- A Device conforms to the Universal Host Controller (UHC) or Open Host Controller (OHC) specification (E.g. PC, industry PC, notebook PC, PDA, etc.).
  Note:Not support use low speed device in Hub

3. Features

- Small, light and easy to take;
- Two power supply mode, can meet the requirements of different computers;
- USB 2.0 port, can run on Windows 98, Windows 2000, Windows XP;
- Capture and analyze full speed and low speed data of USB1.1;
- PID or multiple manual trigger modes are available;
- Data auto-trace on USB bus, ensuring the integrity and inerrability of data;
- Analyze USB bus error and data transmission error;
- Optional capture capacity, can be defined from 1 to 99MB;
- Powerful search capability, can find any error frame or specified data;
- USB protocol Decoding makes data easy to know;
- Spare time statistics, data transmission is clear at a glance;
- Perfect data statistics, conveniently allocating USB bandwidth.

4. Technical parameters

- USB monitor port: Supports USB 2.0 port and USB 1.1 port;
- USB capture port: Supports USB 1.1 port;
- USB capture port input impedance: >10MΩ
- Data capture capacity: 1~99MB
- Capture speed: USB 1.1 Full-speed and Low-speed
- Capture content include Sync,PID,ADDR,ENDP,CRC5,CRC16,Frame Number,DATA,struff error,idle

time

- Triggering mode:
  PID trigger: All PIDs defined in USB 1.1 specification;
  Manual trigger;
- IDLE time statistics: Min: 3; Max: 14336 bit; (±1 tolerance)
- External power: 6V

5. Hardware

The top view of USB Analyser is shown in figure 1.

Figure 1 USB Analyser's appearance

The control terminals of USB Analyser are shown below (see figure 2).

Figure 2 Control terminals

POWER: Power input

MONITOR: USB 2.0 port. It's used to connect with monitor PC and transmit control command and monitor information.

RUN: Running state indicator

USB: USB connection (between USB Analyser and monitor PC) state indicator

POW: Power supply indicator of USB Analyser.

Table 1 is the mapping of indicator color to the state of RUN and USB respectively.

Table 1 The meanings of indicating LEDs for RUN and USB states

	RUN	USB
Off	Standby state	Disconnected with USB bus or can not detect USB bus

Green	Capture state	Connected with USB
Red	Transmission state	USB 2.0 port is available
Green and Red	Capture and Transmission	Running on USB 2.0 protocol

During power on, RUN and USB indicators will blink once then off. Then only RUN indicator is on and color is red. After device has connected to USB correctly, RUN indicator turns off. USB indicator will be constantly on. Figure 3 is the capture terminal of USB Analyser.

Figure 3 Capture port

RESET Reset button of USB Analyser.

USB-B Capture input/output port of USB Analyser (type B)

USB-A Capture output/input port of USB Analyser (type A).

The connection of USB Analyser shows in the following figure.(Figure 4)

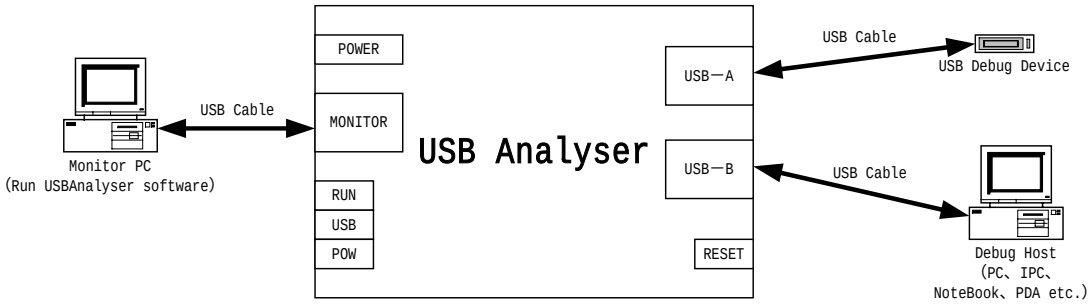

Figure 4 Connection of USB Analyser

6. USB Analyser software installation and using

Double click setup.exe in the Software directory of attaching CD, install USB Analyser software and driver. You can connect and use the USB Analyser after software installation.

Note: Please install the USB Analyser software first, and then connect and use the Analyser, because the driver of Analyser is packed in the installation program.

When connected with the Monitor PC, the computer will show a prompt like Figure 5.

Figure 5 Found New Hardware

Double click the icon, open the Found New Hardware Wizard.(Figure 6)

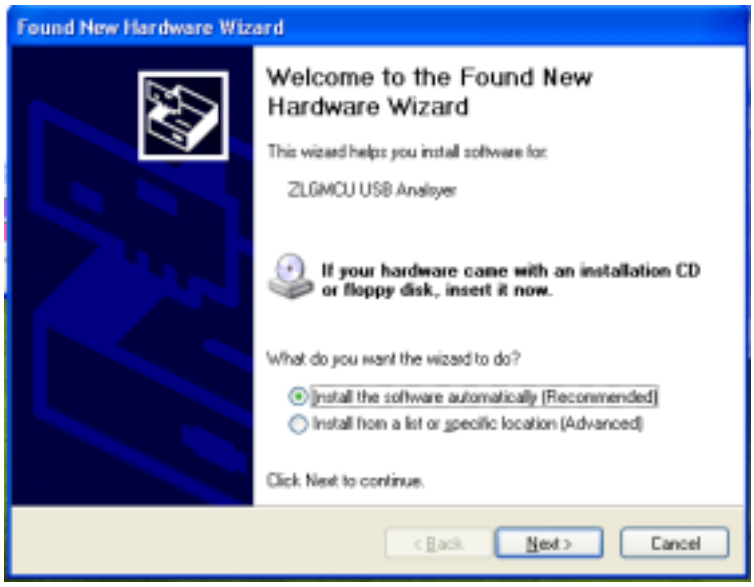

Figure 6 Open Found New Hardware Wizard

Select Install the software automatically, then press Next button. The computer will search the driver auomatically.(Figure 7)

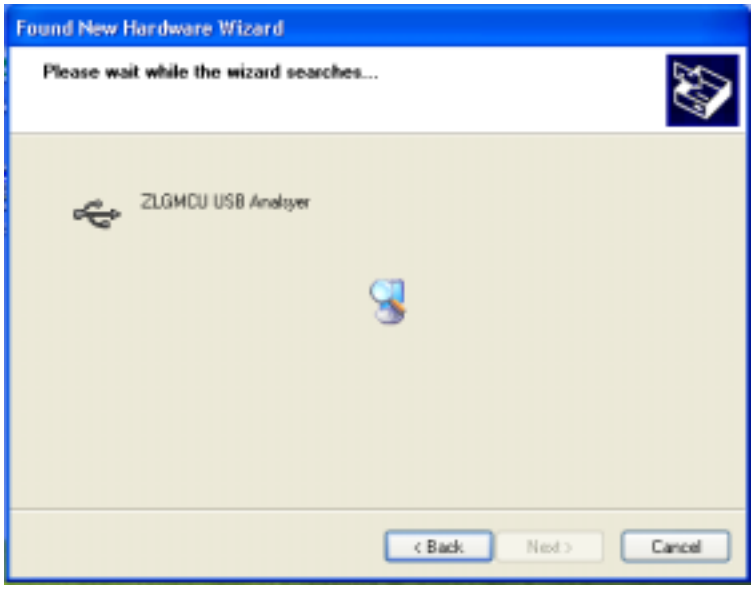

Figure 7 Search the driver

If you using Windows XP or Windows 2000, it will popup a dialog like Figure 8.

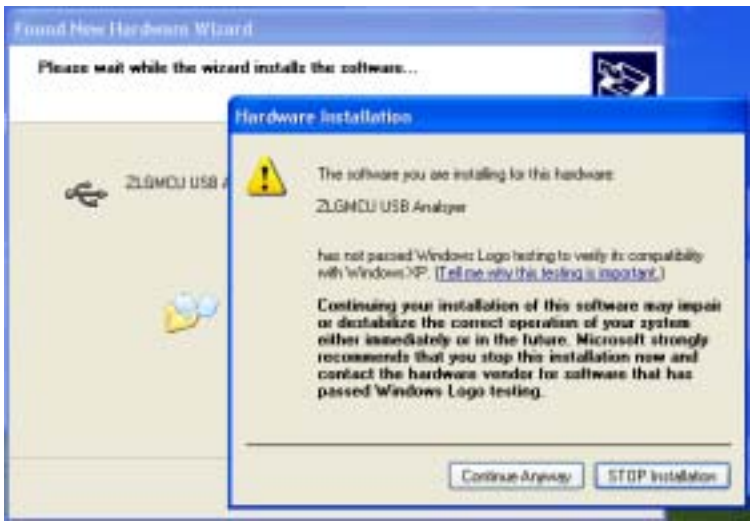

Figure 8 Windows logo testing

Press Continue Anyway, the computer start to copy the driver. When finish installation, it will show a dialog link Figure 9.

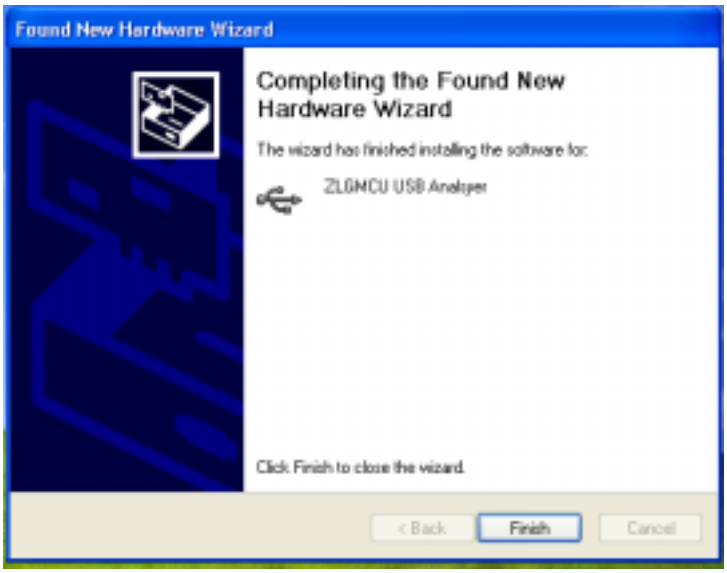

Figure 9 Completing the Found New Hardware Wizard

Click Finish. The right bottom corner of status bar will show a finish installation prompt.(Figure 10)

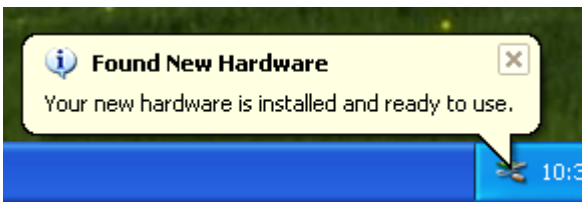

Figure 10 finish installation prompt

You can look into the Device manager to see whether install the driver succefully.(the red rectangle in Figure11)

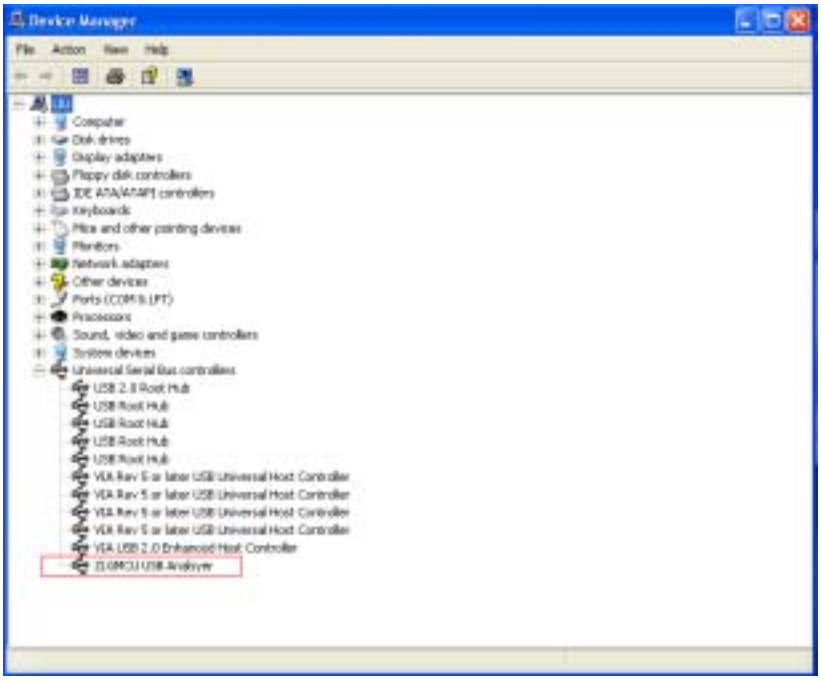

Figure 11 Device Manager

When finish installation , open the USB Analyser software , it looks like Figure 12.

Figure 12 The menu of USB Analyser

The following sections describe the menus on the USB Analyser menu bar:

File menu

The File menu includes commands you use to work with USB Analyser file. There are 8 available options (Figure 13).

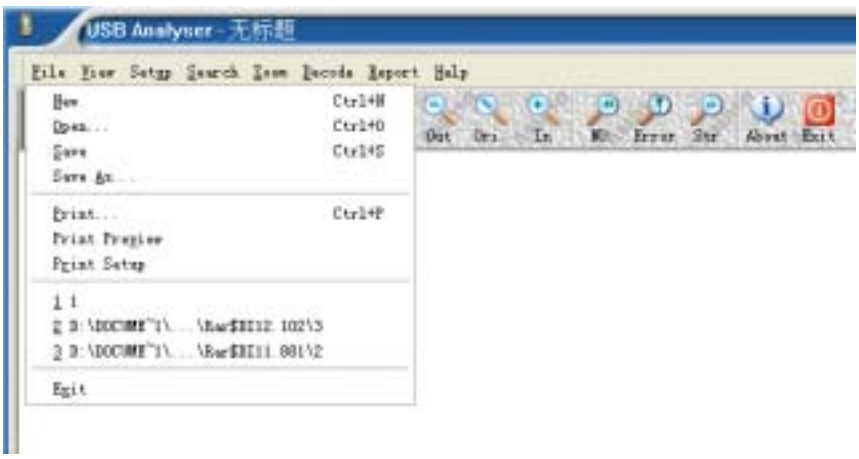

Figure 13 File menu

New: Clear current displayed record and build a new blank record file.

Open: Open a previous USB Analyser record file.

Save and Save As…: Save current recorded data with specified name.

Print: Print the current displayed data.

Print Preview: Preview the print effect on PC.

Printer Setup: Configure the printer.

Exit: Quit USB Analyser software.

View menu

You can choose whether to display the tool bar or status bar on View menu (Figure 14).

Figure 14 View menu

Setup menu

You can use Setup menu to configure the working mode of USB Analyser.(Figure 15)

Figure 15 Setup menu

Field color

Configures the colors of data record, you can customize the color (Figure 16).

Figure 16 Color setting panel

Hidden Elements…

Choose which kinds of data that do not display in main window.

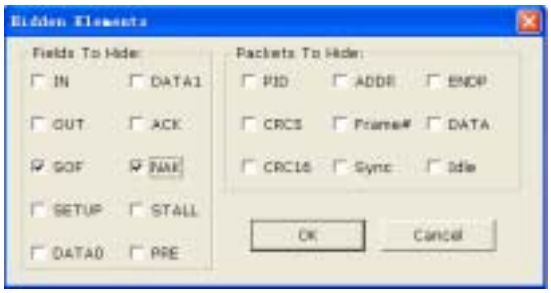

Figure 17 Hidden Elements panel

When you select a Field or a PID, the corresponding field and PID will hide. When select IN,OUT or SETUP, you need to config the following dialog:

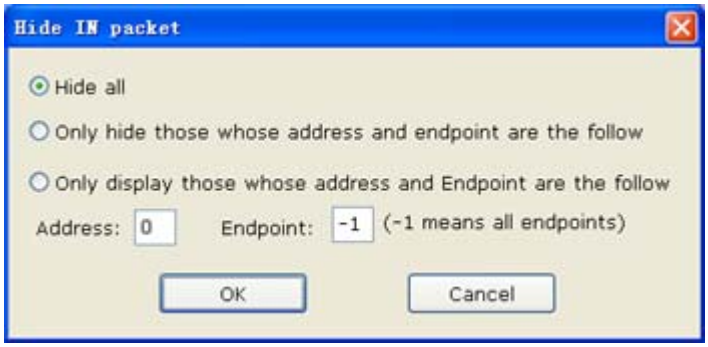

Figure 18 Hide packet dialog

You can hidden or display data packet of specified address and endpoint. If endpoint is –1, it means all endpoints.

Note:

1.When NAK is selected, all NAKs and respond data packets of NAK will be hidden.

2.when select IN,OUT or SETUP, it will hide all the subsequent data packets(DATA0 or DATA1) and respond packets(NAKs or ACKs).

Display formats

Set up the display format of recorded data. You can choose to display in Binary or HEX, MSB locate in left or right (Figure 19).

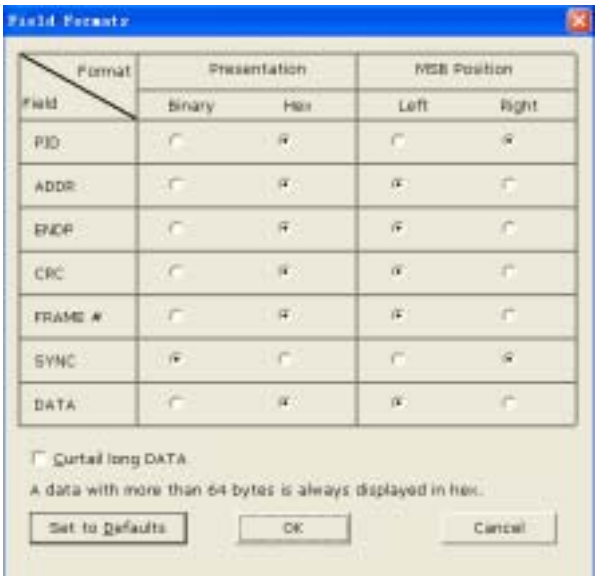

Figure 19 Display formats

Recording options…

Configure Trigging mode, connection speed and buffer size (Figure 20).

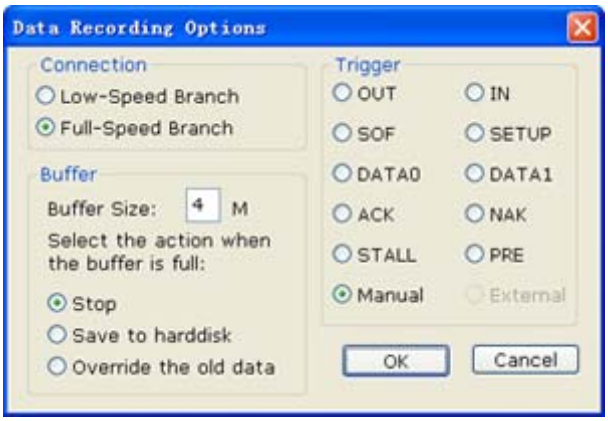

Figure 20 Recording options

You can select PID trigger or manual trigger to toggle data capture. Available PID trigger modes include: OUT, IN, SOF, SETUP, DATA0, DATA1, ACK, NAK, STALL, and PRE.

It's recommended to use manual trigger, because buffer size of the Analyser is large, you can record all data first and then analyze the data.

You can choose connection speed in Connection box. Please select a correct speed of your device. Generally, USB keyboard and USB mouse is low-speed devices. If you select a wrong speed, the data recorded will be wrong, because the sampling speed of full-speed device and low-speed device is different.

Buffer size is the sample buffer capacity, you can choose 1 to 99 MB, and default is 4MB. Note: The larger buffer size you select, the longer time is needed to handle data after capture finished. Please select the appropriate value according to your requirements.

When the buffer is full, you can use one of the following three ways to handle this situation:

STOP: When the buffer is full, stop capture and display the data that have been captured.

Override the old data: When the buffer is full, do not stop capture. The new data will override the old data in the buffer. And the data in buffer are the newest data.

Save to disk: When the buffer is full, it will save the data in buffer to files and then continue capture. When you

select this option, it will display a select directory dialog. Please ensure the harddisk which your files save in have enough space. The data will save as files in the directory you selected, and the size of each file is the buffer size you selected above. The file extension name is .usb. you can use this software open the file and analyze.

Figure 21 Select directory

Search menu

You can use it to search the packet and PID that you specify (Figure 22).

Figure 22 Search menu

Go to packet

Enter the packet number in following dialog box (Figure 23) and click OK. It will goto and display the specified packets.

Figure 23 Enter Packet number dialog

Find PID

Find specific PID. When you select this menu item, following dialog appears (Figure 24).

Figure 24 Find PID dialog

The avalible PID including:

Token: IN, OUT, SOF, SETUP;

Data: DATA0, DATA1, Both (both DATA0 and DATA1);

Special: PRE;

Handshake: ACK, NAK, STALL;

Other: Invalid;

Note: Invalid means to find invalid data.

Find Errors:

This menu item is to find error data. When you select this menu item, following dialog appears (Figure 25).

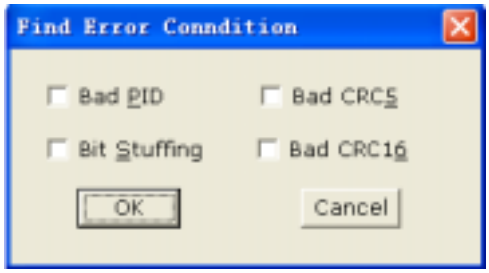

Figure 25 Find errors dialog

Following are selectable error conditions:

Bad PID: Indicates PIDs that do not exist in USB 1.1 specification.

Bit Stuffing: There are disturbances on USB bus or transmission errors due to the violation of USB Specification.

Bad CRC5: The Token CRC5 transmitted in USB bus is different from the CRC5 calculated at the end of packet reception.

Bad CRC16: The Data CRC16 transmitted in USB bus is different from the CRC5 calculated at the end of packet reception.

Find String

Find the packets that include specific data in DATA0 or DATA1 (Figure 26).

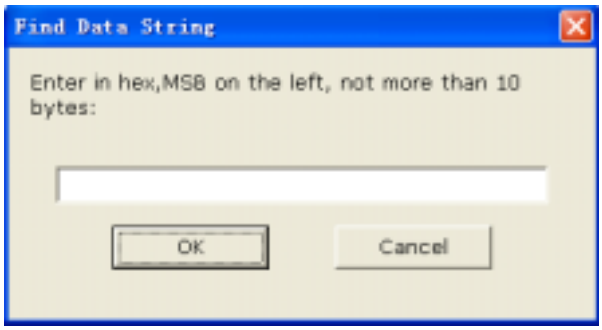

Figure 26 Find String dialog

The data you find is in DATA field. For example, in Figure 27, you can find 00 01 00 in Packet #1.

Figure 27 Find String example

Zoom menu

Zoom menu items control zoom in and zoom out of the display of recorded data (Figure 28).

Figure 28 Zoom menu

Decode menu

Decode menu items explain the contents of standard protocol (Figure 29).

Figure 29 Decode menu

Select device class

Available device class includes: Standard request only, HUB class and HID class. After selected the device class, you can use Decode device request item to decode (Figure 30).

Figure 30 select device class dialog

Decode device request

Decode device request decoded data according to above device class. You can specified to decode the latest SETUP packet or specific packet(Figure 29). Note: Decode device request can only decode the contents of SETUP packet.

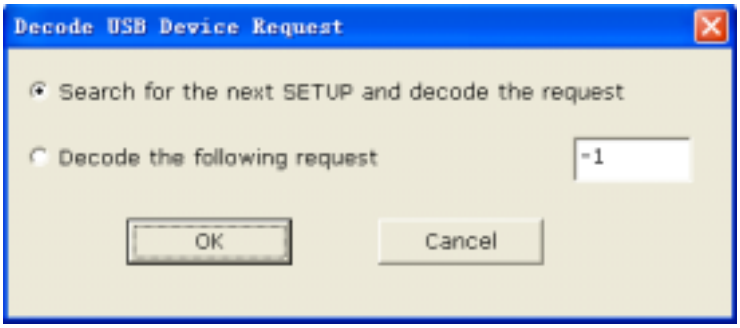

Figure 31 Decode device request dialog

The following figure is an example result of decoding Packet #1.

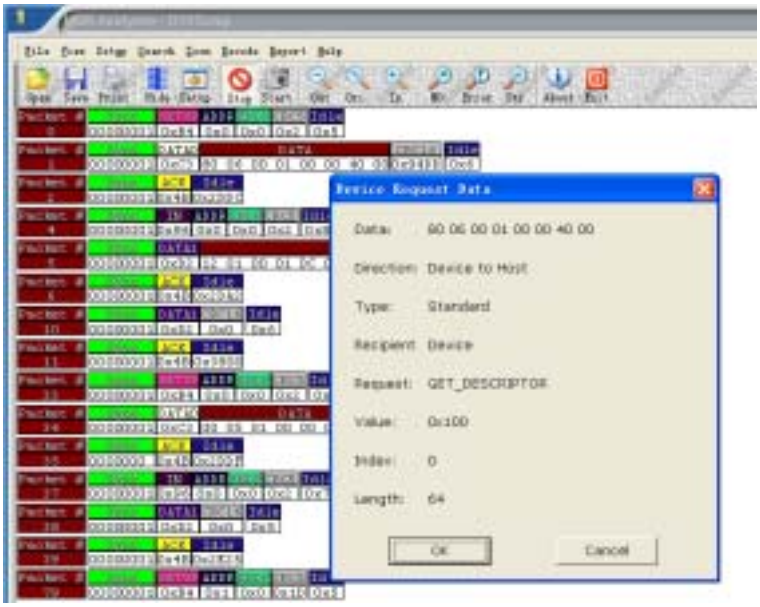

Figure 32 Example decoding

Report menu

The menu items in Report menu are used to summarize transmission errors and packet errors (Figure 33).

Figure 33 Report menu

Packet error summary

This menu item statistics Data packet errors(Figure 34). The contents of summary include Bad PID, Bad CRC5, Bad CRC16 and Bit stuffing error. Bit stuffing error is detected by hardware.

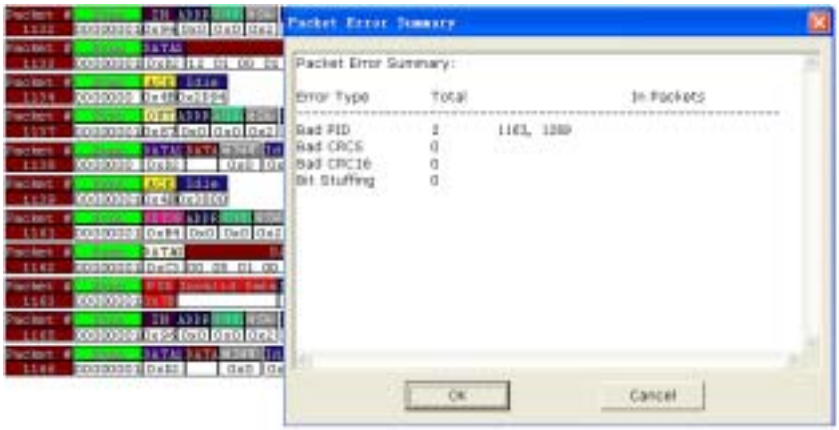

Figure 34 Packet error summary dialog

Note: if your USB cable not conformed to the requirements of USB specification, the transmission error will increase. It's recommended to use the specific USB cable attached to the USB Analyser.

Transmission error summary

The contents of transmission error summary including no acknowledge for IN token (ACK or NAK), no acknowledge for OUT token(ACK or NAK), no acknowledge for SETUP token(ACK or NAK) and no cross error for DATA0 和 DATA1 (Figure 35).

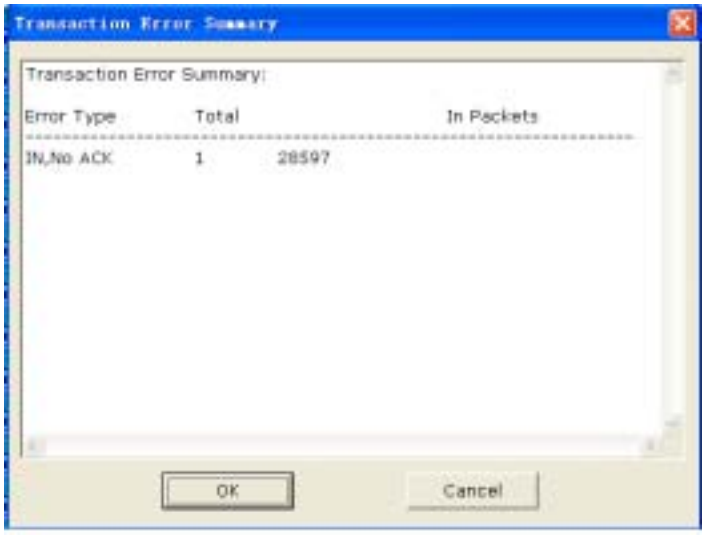

Figure 35 Transmission error summary dialog

Help menu

You can use it to display the software version and copyright information (Figure 36).

Figure 36 About dialog

7. Notes

Computer requirements

It's recommended that the monitor pc has a USB 2.0 port and a Pentium IV 1G or above CPU.

Verify the USB version of the monitor USB port

The following section explains how to verify the version of monitor USB port. Open Control Panel and double click System icon. Then a Device Manager dialog show(Figure 37), expand the Universal Serial Bus Controller tree and see whether have the Enhanced Host Controller and USB 2.0 Root Hub(red rectangle in Figure 37). If the PC has these items, it means the USB 2.0 driver has been installed successfully. If it has not installed, that means the PC do not support USB 2.0 or the USB 2.0 driver not install successfully. Please make sure the PC has a USB 2.0 controller or reinstall the USB 2.0 driver.

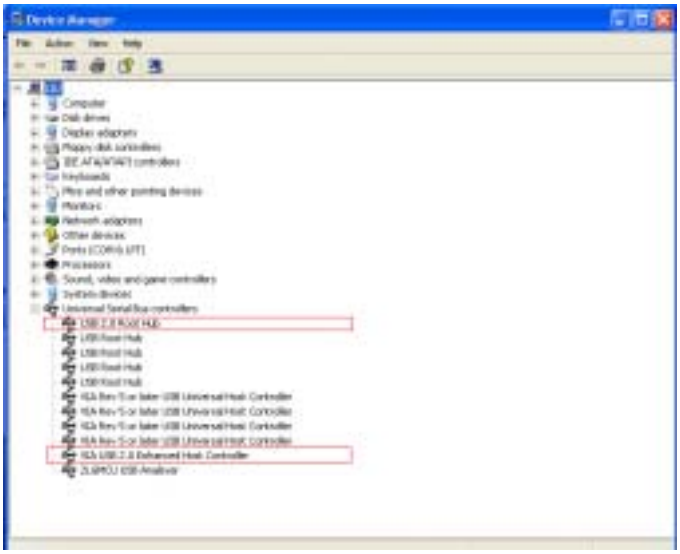

Figure 37 Device Manager

Use PC to monitor and capture

If you use a PC to monitor and capture USB traffic, pay attention not to use the same USB controller to monitor and capture. In other words, it must have two USB Root Hub or above in Universal Serial Bus Controller tree of Device Manager, otherwise it will capture all data of the Hub instead of the data of single USB device.

Use extension cable for capture

When use the extension cable to capture, if the extension cable does not comply with the USB specification, there will be errors in data capture. The extension cable will increase the parasitic capacitance due to the extension cable. It's recommended to use the specific USB cable attached to the USB Analyser instead of extension cable.

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