

MQP Packet-Master USB12

User Manual



MQP Electronics Ltd
Unit 2, Park Road Centre
Malmesbury
Wiltshire SN16 0BX
United Kingdom

e-mail: sales@mqp.com

Website: www.mqp.com

Contents

1	GETTING STARTED	5
1.1	<i>Introduction</i>	5
1.2	<i>Installing the Software and Driver</i>	5
1.2.1	Install the Software from CD	5
1.2.2	Installing the Driver	5
1.2.3	Update the Software	6
1.3	<i>Sample Capture Files.....</i>	6
1.4	<i>Front and Back Panels.....</i>	7
1.5	<i>Test Set Up</i>	9
1.6	<i>Data Capture.....</i>	11
1.7	<i>Saving the Capture.....</i>	11
2	TECHNICAL DATA	12
2.1	<i>Requirements</i>	12
2.2	<i>Specifications.....</i>	12
2.3	<i>Maximum Capture File Size.....</i>	13
2.4	<i>Safety</i>	13
2.5	<i>Feature Connector</i>	13
2.6	<i>External Power Supply</i>	14
3	GRAPHICUSB SOFTWARE	15
3.1	<i>Overview</i>	15
3.2	<i>Panes.....</i>	16

3.2.1	Event Pane.....	16
3.2.2	Analysis and Data Panes	17
3.3	<i>Toolbars</i>	18
3.3.1	File Functions Toolbar.....	18
3.3.2	View Filter Toolbar	19
3.4	<i>Capturing</i>	20
3.5	<i>Display Filters</i>	21
3.6	<i>Search</i>	26
3.6.1	Event Search.....	26
3.6.2	Transaction Search	27
3.6.3	Data Search	28
3.6.4	Setup Search	29
3.6.5	Error Search.....	30
3.7	<i>Multiple Event Headers</i>	31
4	OPTION SETTINGS	32
4.1	<i>File Locations</i>	32
4.2	<i>Miscellaneous Settings</i>	33
4.3	<i>Capture</i>	34
5	CLASS ANALYSIS OPTIONS	35
5.1	<i>Registration</i>	35
5.2	<i>Analysis Overview</i>	35

6	TROUBLESHOOTING	38
7	WARRANTY	40
7.1	<i>Warranty.....</i>	40
7.2	<i>Limitations</i>	40
7.3	<i>Warranty Period.....</i>	40
7.4	<i>Obtaining Service.....</i>	40
8	ERRORS	41
8.1	<i>Invalid PID.....</i>	41
8.2	<i>Invalid CRC</i>	41
8.3	<i>Invalid SOF</i>	41
8.4	<i>Invalid Control Transfer.....</i>	41
8.5	<i>Invalid Transaction.....</i>	42
8.6	<i>Bit Stuffing Error</i>	42
8.7	<i>Byte Error.....</i>	42
8.8	<i>Spurious Data.....</i>	42
8.9	<i>Both Lines High.....</i>	42
8.10	<i>Spurious End of Packet.....</i>	42

1 GETTING STARTED

1.1 Introduction

The Packet-Master USB12 is a non-intrusive Hardware USB Bus Analyser, intended for development of Low and Full Speed USB devices and hubs etc. It comes complete with our Windows application Graphic USB for capturing and displaying every detail of the data interactions on a USB link.

1.2 Installing the Software and Driver

1.2.1 Install the Software from CD

- Insert the Installation disk into the CD drive.
- The disk should auto-start.
- Follow the on screen instructions.
- If the disk doesn't start then run the file Setup.exe in the root directory of the CD.
- If you should have problems with the install disk, you can run the installation file directly from its location on the CD. If the CD drive is drive "D:" the file is located in: "D:\website\" and is called "usb12_setup.exe".

1.2.2 Installing the Driver

- The first time you plug in the USB cable from your Packet-Master USB12, Windows will start the "Found new Hardware" wizard. If it asks to search "Windows Update", select "No, not this time".
- Ensure that you have the Installation CD in a CD drive. *(if the CD auto-runs and starts the GraphicUSB installation screen, then click "Exit" to leave it before continuing with the driver installation.)*
- For your information: If the CD drive is drive "D:", the driver files are located in "D:\Drivers\" and the installation file is called "mqpuba.inf".

1.2.3 Updating the Driver

- If there is a requirement to update the USB Driver for the Packet-Master USB12, you will be informed when you run a new version of GraphicUSB.
- Should you need to update the USB Driver at any time, full instructions are given in the file:
“C:\Program Files\MQP Electronics\GraphicUSB\usb drivers\updating.txt”
(Assuming a default location for the GraphicUSB installation)
- The driver itself is located in:
“C:\Program Files\MQP Electronics\GraphicUSB\usb drivers\
(Assuming a default location for the GraphicUSB installation)

1.2.4 Update the Software

If at a later date you wish to make use of an update from our website. Please follow the instructions below:

- Download the file.
- Run the down-loaded .exe file straight from your hard disk and follow the on screen instructions.
- The latest version of the software is available at <http://www.mqp.com/>

1.3 Sample Capture Files

During installation of the software a number of sample capture files will be placed in the folder “Samples” in the application’s installation directory. If you have accepted the defaults during installation, this will be called:

C:\Program Files\MQP Electronics\GraphicUSB\Samples

The sample files have the extension *.mqu

You may find it helpful to open one of these sample files to become familiar with the capabilities of GraphicUSB.

1.4 Front and Back Panels



- The Power Indicator illuminates when the Packet-Master is powered and connected to the Host computer.
- The Activity indicator shows the presence of data exchanges. The indicator flashes once for each DATA0, DATA1 or SETUP packet.
- Capture Start and Capture Stop buttons control the capturing of USB data, and the Capture Indicator shows when capturing is in progress.
- The USB through-connectors are used for connection to the Host and device under test.



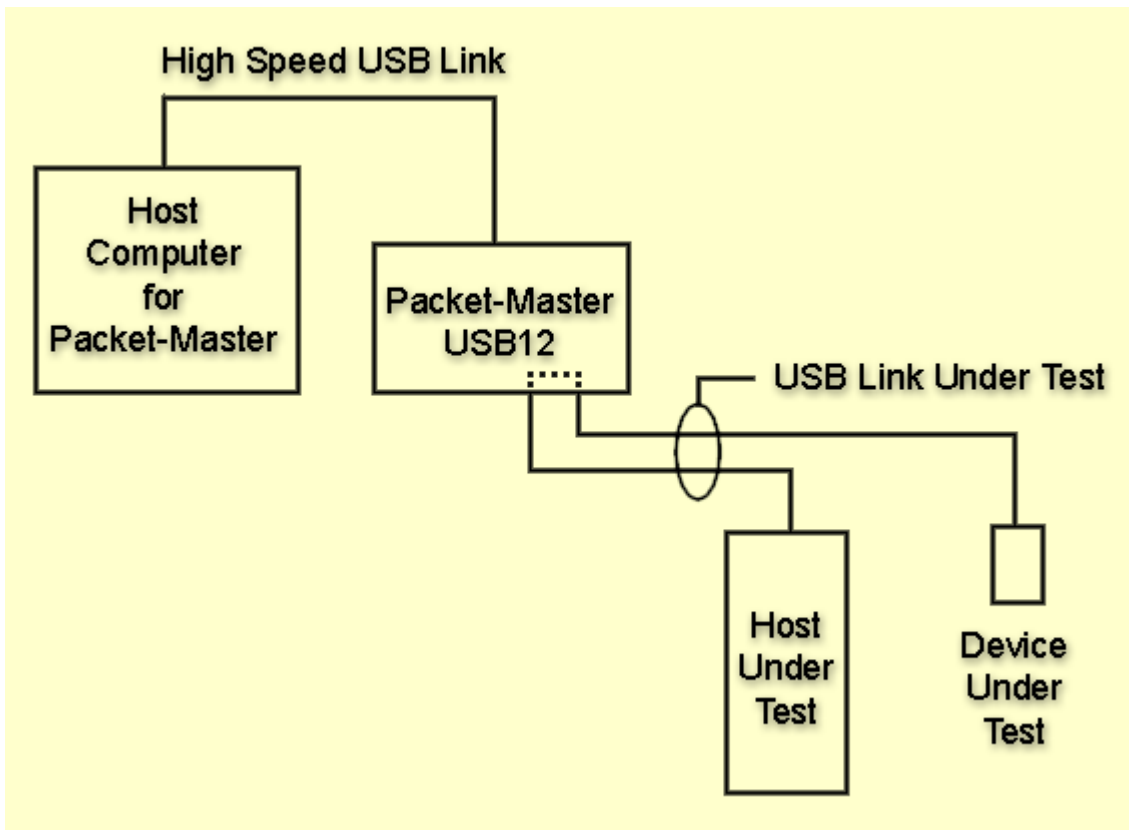
- The Packet-Master is normally USB Bus Powered for convenience of use.
- An optional external power input is provided (this is not normally required, but useful if the host won't configure a high-power device)
- A High Speed USB (480 Mbit/s) provides the connection to the Host PC.
- A 10 pin Feature connector provides signals for an oscilloscope or logic analyser.

1.5 Test Set Up

To achieve a good capture rate it is important to provide a suitable test environment. The Packet-Master USB12 should preferably be hosted by a good performance PC with a high speed USB connection. The USB host controller should not be shared by any other USB device while doing the testing.

The Packet-Master USB12 will function correctly when connected to a Full Speed link but the capacity will be severely reduced and only low rates of USB traffic may be captured from the device under test.

In a similar fashion it is theoretically possible to use the same host computer for the Packet-Master USB12 and for the Host under Test. We do not recommend this, but if it is absolutely unavoidable, then you must at least use a separate USB host controller for the device under test. If your computer does not have two host controllers then you will need to buy a plug-in USB host controller card.



It is possible to have more than one device under test. In this case the devices must first be connected to a Hub and the Hub plugged into the Packet-Master. Both devices and the Hub are downstream of the Packet-Master.

It is not recommended that a Hub is connected upstream of the analyser as traffic from the Host to Hub may be recorded but not the traffic from the Hub to the Host.

This test equipment, by its very nature, has to connect to a junction of two USB cables in order to probe the data on the link. It is important to keep the cables between the 'device under test' and the 'host under test' as short as possible (for example 1m), and to use good quality cables.

1.6 Data Capture

- Connect the Packet-Master to the Host computer as shown in the Test Set Up section. You must first have installed the Graphic USB software and Driver.
- Connect the Device under Test and the Host under Test as shown in the Test Set UP section. It may be preferable to use a simple working commercial device such as a low speed mouse for your first data capture.
- Run the Graphic USB software.
- Start capturing by either momentarily pressing the Start button on the Packet-Master front panel or clicking Capture on the tool bar.
- A capture window will open and you should see the capture statistics incrementing.
- After a few moments stop capturing by either momentarily pressing the Stop Button on the Packet-Master front panel or clicking the Save button in the Capture window.
- A full analysis of the data captured will be displayed.
- Each new capture will create a new capture window. To select the capture you wish to view click on “Window” on the menu bar.

1.7 Saving the Capture

If you wish to keep the capture for future reference, click on “File...Save” on the menu bar or on the “Save” icon on the Tool Bar. By default, files will be saved in the folder specified in the Options Settings Window. GraphicUSB files have the extension .mqu

2 TECHNICAL DATA

2.1 Requirements

The minimum requirements for the Packet-Master Host are as follows:

- Pentium 3 - 600MHz
- PC with High Speed USB port should be dedicated to the capturing. (Actual target device should be connected to a different Host Computer to ensure reliable capture bandwidth)
- Windows XP (Service Pack 1 or better) preferred. Also Windows 2000 / ME / 98SE.
- CD ROM / DVD Drive
- 128MB RAM
- 100MB space on Hard Disk

Note: A good performance machine is recommended for good capture rate.

2.2 Specifications

Weight:	165 g
Dimensions:	129 x 100 x 31 mm
Temperature:	0°C - 40°C
Humidity:	20% - 80% non condensing
Power:	150mA from USB host Optionally zero mA from USB if powered externally

2.3 Maximum Capture File Size

The maximum size of the Capture file is limited by the available RAM in the Host computer.

2.4 Safety

CE compliant.

2.5 Feature Connector

The signals available on the back panel connector are:

Pin	Signal	Notes
1	D+	De-glitched and synchronised with the 48 or 6MHz clock
2	GND	
3	D-	De-glitched and synchronised with the 48 or 6MHz clock
4	GND	
5	DECODED DATA	Decoded NRZI data
6	GND	
7	DATA CLOCK ENABLE	Data sampling signal phase-locked to the incoming signal transitions
8	GND	
9	PACKET SYNC PULSE	A pulse one clock period wide indicating that the sync pattern has been detected
10	GND	

2.6 External Power Supply

The Packet-Master USB12 normally derives its power from the Host computer's USB connection, but may be powered externally. This is not normally required, but useful if the host won't configure a high-power device. The external supply must meet the following requirements:

Output Voltage	9V Regulated
Output Current	300mA
Polarity	Centre Pin Positive

-

A suitable Power Supply is available from MQP Electronics Ltd. The use of any other supply is not recommended and is at the users own risk.

3 GraphicUSB SOFTWARE

3.1 Overview

The Packet-Master USB12 owes a large part of its functionality to the Graphic USB application, which is supplied with the Analyser. A simple, yet information-rich display allows you to view every detail of a capture.

This shows the organization of the screen after a typical capture:

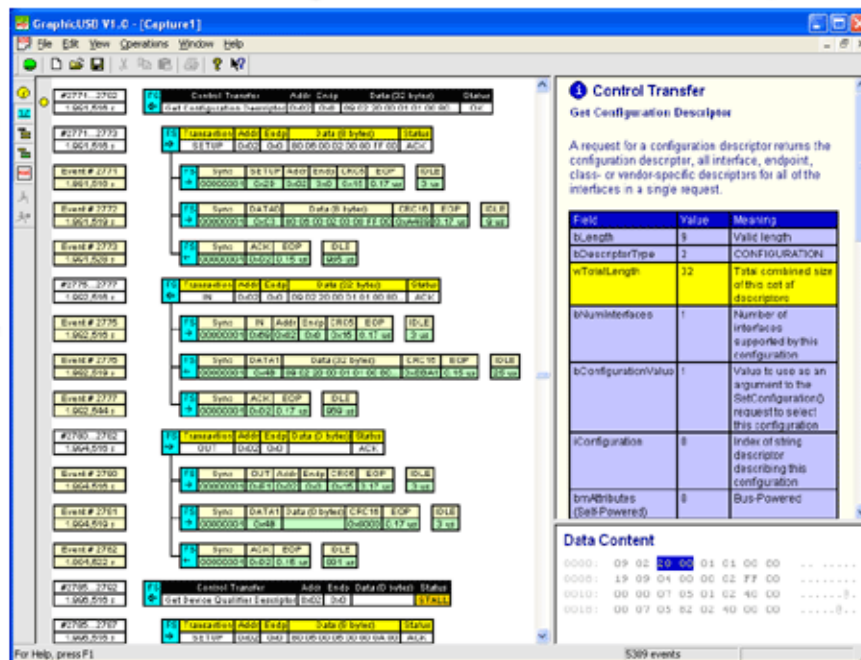
The event pane reveals every detail of data and timing which occurs on the bus. You see exactly what happened in graphic detail.

Any selected event is thoroughly analysed in the details pane. Highlighting an item locates its data in the data pane below.

These toolbar buttons allow less significant events to be filtered out from the display.

Precise timing is shown for every event.

Careful use of colour draws instant attention to protocol anomalies



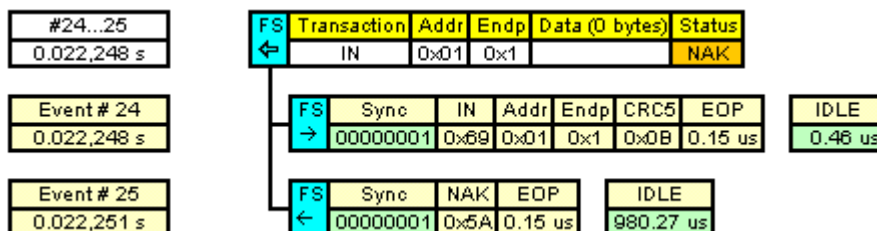
The data pane shows every data byte contained in the selected event.

3.2 Panes

3.2.1 Event Pane

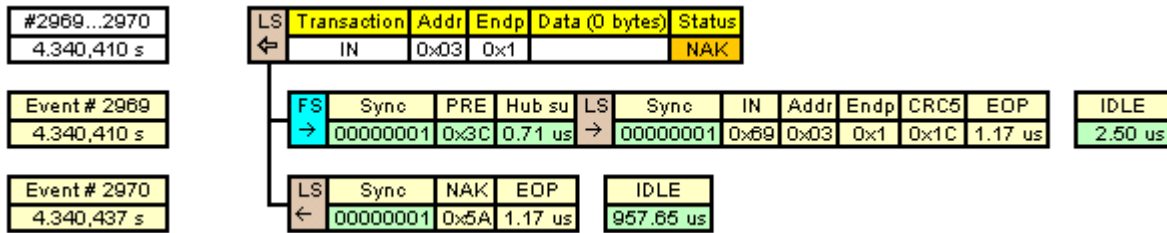
The Event Pane graphically shows every detail of data and timing on the bus. The example shown below is an IN transaction made up of two packets. The left hand column contains an event number and a time stamp. The time stamp has a resolution of 20.83ns. A vertical line associates the packets within the transaction. Looking in detail at the display for event #24 below, the following information is displayed:

- The speed of the transmission. FS is full speed, 12MHz and LS is low speed, 1.5MHz.
- The direction of the packet. A right pointing arrow is for host to device and a left pointing arrow for device to host.
- The Synchronisation field. The bit pattern received is shown.
- The Packet ID (PID). In this case it is an IN token.
- The Address field.
- The Endpoint field.
- The CRC field. Token packets have a five bit CRC while data packets have a sixteen bit CRC.
- End of Packet (EOP). An EOP is made up of a single ended zero for approximately two bit times followed by a J state. The time shown is the length of the single ended zero.
- Finally the idle time before the next event.



An error e.g. an incorrect CRC is indicated by the appropriate field being highlighted in red. A field highlighted in orange indicates a potential problem or warning.

This view of a Graphic USB capture shows data being transferred at two different speeds on the same link. Each packet is preceded by a coloured marker indicating Full Speed or Low Speed. This makes the function of the PREAMBLE packet very clear. Notice also the detailed timing information for Hub Setup time, End of Packet duration, and IDLE state time.



3.2.2 Analysis and Data Panes

By clicking on an event row in the event pane, a complete analysis of the event is displayed in the analysis pane, and the data content is shown in its entirety in the data pane. Where appropriate, any information selected in the analysis pane is highlighted in the data pane for easy identification. All standard requests and descriptors are analysed in detail. Any discrepancies are described.

i Control Transfer
Get String Descriptor 1

String descriptors use UNICODE encodings.

Field	Value	Meaning
bLength	16	Valid Length
bDescriptorType	3	String Descriptor
bString	"USB Hub"	

Data Content

```
0000: 10 03 55 00 53 00    ..U.S.
0006: 42 00 20 00 48 00    B. .H.
000C: 75 00 62 00          u.b.
```

3.3 Toolbars

3.3.1 File Functions Toolbar



Start Capture



Open an existing Capture file



Save the currently active Capture document



Print the current Events Pane (If icon is grayed out, click in the Events Pane)



About GraphicUSB



Help on GraphicUSB



Search Settings



Find First



Find Previous





Find Next



Find Last

3.3.2 View Filter Toolbar

 Show Start of Frame events

 Show bus events

 Show Transactions in Control Transfer

 Show Packets

 Show NAKed Transactions

 Go to Event number

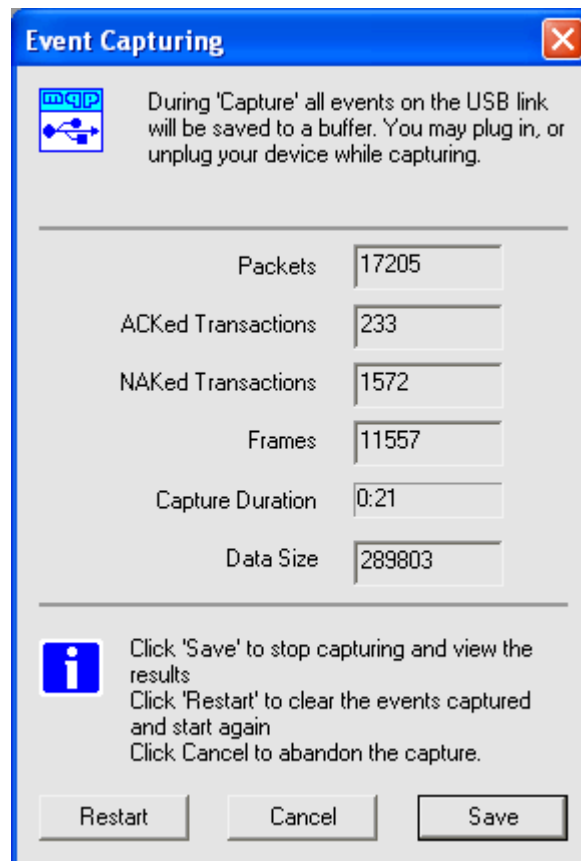
 Go to selected Event

3.4 Capturing

Capturing may be started by either clicking on the Capture button situated on the tool bar of GraphicUSB or by momentarily pressing the Start button on the front panel. During capturing an Event Capturing Window opens. This window contains the following information:

- The number of packets received
- The number of ACKed transactions
- The number of NAKed transactions
- The number of frames received
- The duration of the current capture
- The size of the captured data in bytes

At any time during the capture, devices may be plugged in or out.



To end capturing and display the data, either click on SAVE in the Capture window or momentarily press the STOP button on the front panel. Clicking RESTART will clear all the events so far and start again. Clicking CANCEL will abandon the capture.

3.5 Display Filters

Toolbar buttons allow the filtering out of events that you do not wish to display. The following filters are available:



Show SOF

Start of Frame packets on full speed devices and Keep Alive events on low speed devices come at approximately one millisecond intervals. Clicking this tool bar button removes/shows these events.



Show Bus States

Clicking the Bus States button removes/shows the following events:

- Plugged in
- Unplugged
- Reset
- Suspend
- Resume



Show Transactions

A Control Transfer contains a number of transactions starting with a SETUP. Clicking this button removes/shows the transactions within a Control Transfer. The example below shows the effect of filtering out the transactions.

#81...87 5.126,195 s	FS Control Transfer Addr Endp Data (0 bytes) Status → Set Address (0x01) 0x00 0x0
#81...83 5.126,195 s	FS Transaction Addr Endp Data (8 bytes) Status → SETUP 0x00 0x0 00 05 01 00 00 00 00 00 ACK
#85...87 5.127,195 s	FS Transaction Addr Endp Data (0 bytes) Status ← IN 0x00 0x0 ACK
#127...145 5.166,196 s	FS Control Transfer Addr Endp Data (18 bytes) Status ← Get Device Descriptor 0x01 0x0 12 01 00 02 00 00 00 08...
#127...129 5.166,196 s	FS Transaction Addr Endp Data (8 bytes) Status → SETUP 0x01 0x0 80 06 00 01 00 00 12 00 ACK

Show Transactions

#81...87 5.126,195 s	FS Control Transfer Addr Endp Data (0 bytes) Status → Set Address (0x01) 0x00 0x0
#127...145 5.166,196 s	FS Control Transfer Addr Endp Data (18 bytes) Status ← Get Device Descriptor 0x01 0x0 12 01 00 02 00 00 00 08...

Hide Transactions

If transactions within control transfers have been filtered out, then double clicking on a particular control transfer will reveal the transactions within it, as shown below.

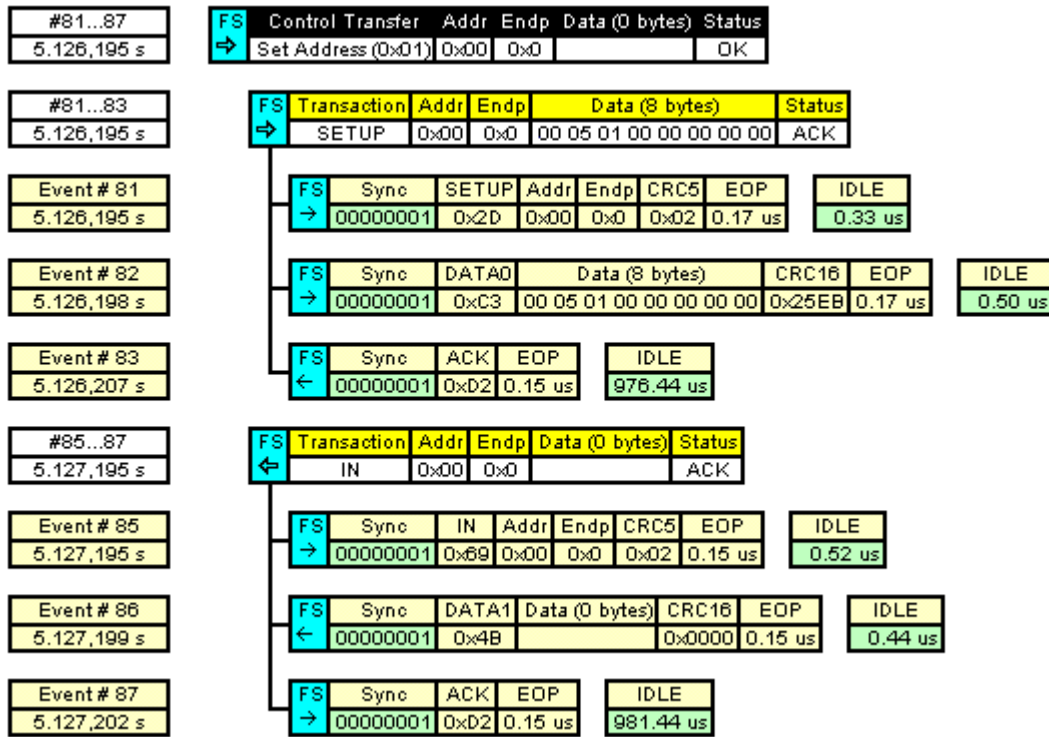
#47...58 5.086,194 s	FS ←	Control Transfer	Addr	Endp	Data (8 bytes)	Status
		Get Device Descriptor	0x00	0x0	12 01 00 02 00 00 00 08	OK
#81...87 5.126,195 s	FS →	Control Transfer	Addr	Endp	Data (0 bytes)	Status
		Set Address (0x01)	0x00	0x0		OK
#81...83 5.126,195 s	FS →	Transaction	Addr	Endp	Data (8 bytes)	Status
		SETUP	0x00	0x0	00 05 01 00 00 00 00 00	ACK
#85...87 5.127,195 s	FS ←	Transaction	Addr	Endp	Data (0 bytes)	Status
		IN	0x00	0x0		ACK
#127...145 5.166,196 s	FS ←	Control Transfer	Addr	Endp	Data (18 bytes)	Status
		Get Device Descriptor	0x01	0x0	12 01 00 02 00 00 00 08...	OK
#148...162 5.172,196 s	FS ←	Control Transfer	Addr	Endp	Data (9 bytes)	Status
		Get Configuration Descriptor	0x01	0x0	09 02 22 00 01 01 00 A0...	OK

Show Selected Transactions

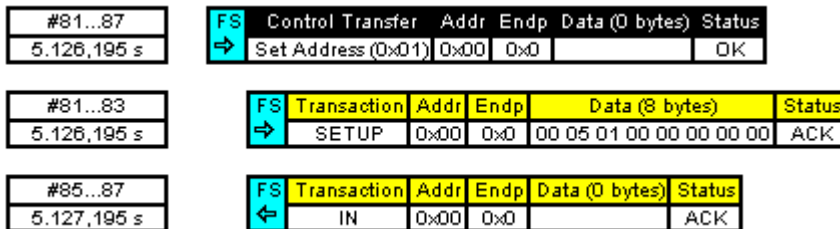


Show Packets

A transaction contains a number of packets. Clicking this button removes/shows the packets within the transactions.



Show Packets



Hide Packets

If packets have been filtered out, then double clicking on a particular transaction will reveal the packets within it, as shown below.

#127...145 5.166,196 s	FS ←	Control Transfer	Addr	Endp	Data (18 bytes)	Status		
		Get Device Descriptor	0x01	0x0	12 01 00 02 00 00 00 08...	OK		
#127...129 5.166,196 s	FS ⇒	Transaction	Addr	Endp	Data (8 bytes)	Status		
		SETUP	0x01	0x0	80 06 00 01 00 00 12 00	ACK		
#131...133 5.167,195 s	FS ←	Transaction	Addr	Endp	Data (8 bytes)	Status		
		IN	0x01	0x0	12 01 00 02 00 00 00 08	ACK		
Event # 131 5.167,195 s	FS ⇒	Sync	IN	Addr	Endp	CRC5	EOP	IDLE
		00000001	0x69	0x01	0x0	0x1D	0.15 us	0.54 us
Event # 132 5.167,199 s	FS ←	Sync	DATA1	Data (8 bytes)	CRC16	EOP	IDLE	
		00000001	0x4B	12 01 00 02 00 00 00 08	0xE757	0.15 us	0.42 us	
Event # 133 5.167,207 s	FS ⇒	Sync	ACK	EOP	IDLE			
		00000001	0xD2	0.15 us	980.04 us			
#135...137 5.168,195 s	FS ←	Transaction	Addr	Endp	Data (8 bytes)	Status		
		IN	0x01	0x0	D8 04 00 00 01 00 01 02	ACK		
#139...141 5.169,195 s	FS ←	Transaction	Addr	Endp	Data (2 bytes)	Status		
		IN	0x01	0x0	00 01	ACK		
#143...145 5.170,195 s	FS ⇒	Transaction	Addr	Endp	Data (0 bytes)	Status		
		OUT	0x01	0x0		ACK		



Show Selected Packets



Show NAKs

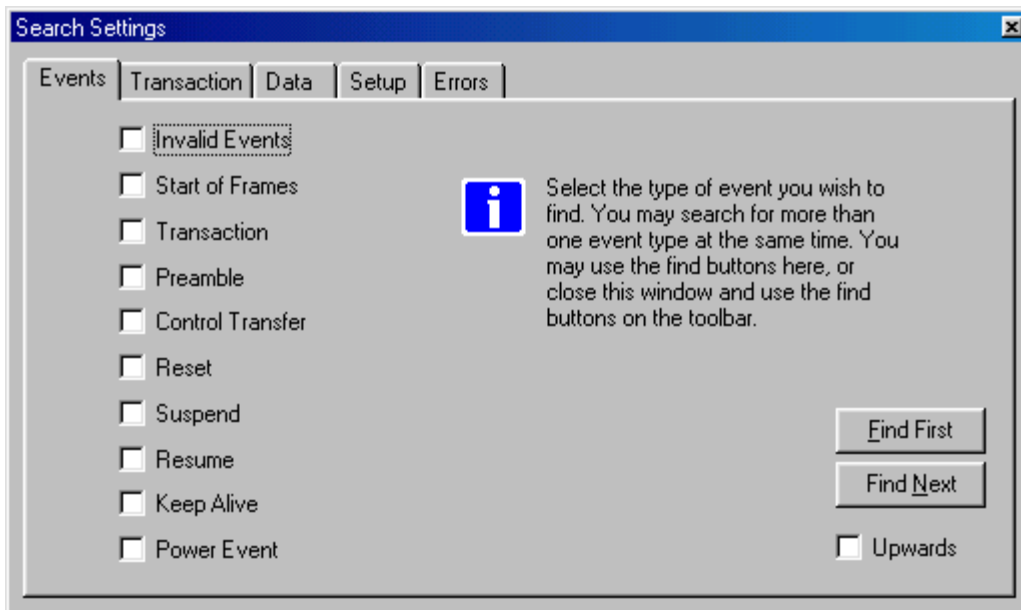
Clicking this button removes/shows any NAKed transactions. This differs from filtering NAKs during capture where NAKed control transactions will always be included.

3.6 Search

The Search function is used to locate particular events within the captured data. Events which are not currently being displayed will still be found by the search function and the display filter settings will be adjusted accordingly. Select the Search Settings by either clicking the Tool Button  or selecting the item on the Edit menu. Items may be searched for by Event, Transaction, Data, Setup or Error. Once a search has been defined the Search Settings Window may be closed and the Toolbar Search buttons  used instead. This provides a clearer view of the data.

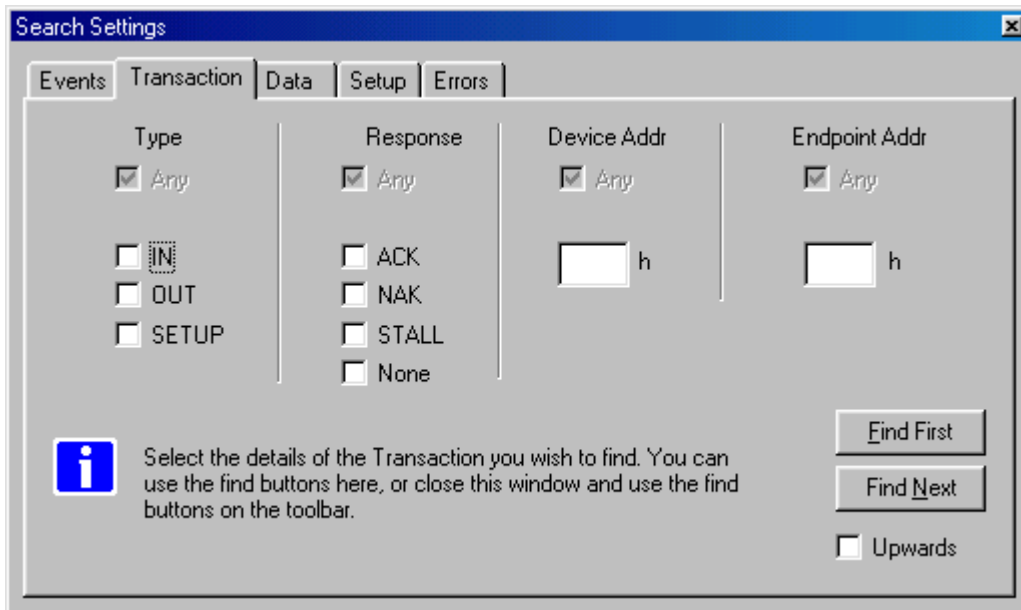
3.6.1 Event Search

The events search allows you to find such items as Reset, Preamble etc.



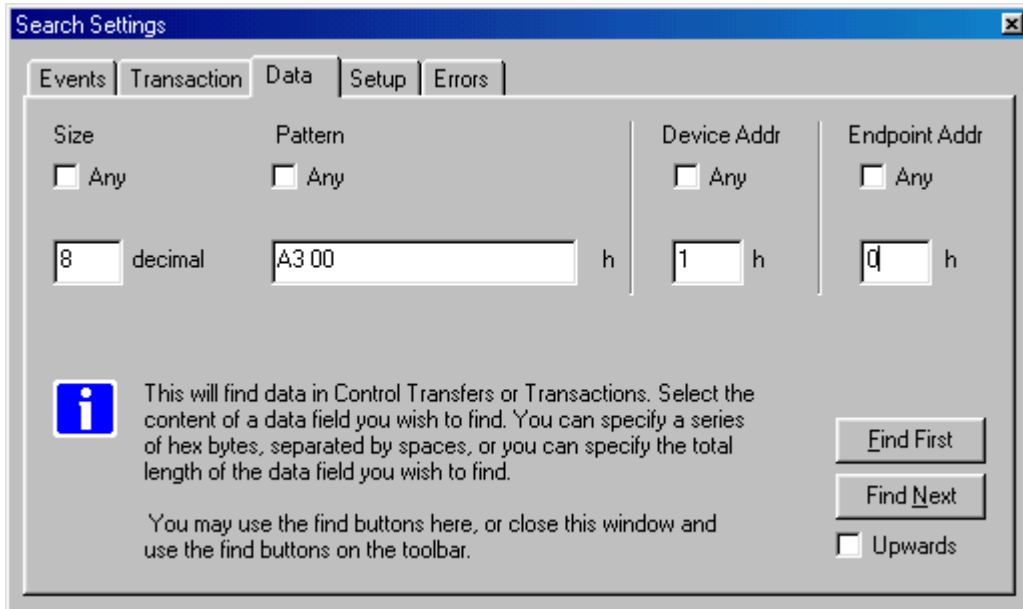
3.6.2 Transaction Search

Transactions may be searched for according to their Type (IN, OUT, or SETUP), the Response (ACK, NAK, STALL or NONE), the Device Address and/or Endpoint. If no selection is made in any particular column then any transaction meeting the requirements of the other columns will be found.



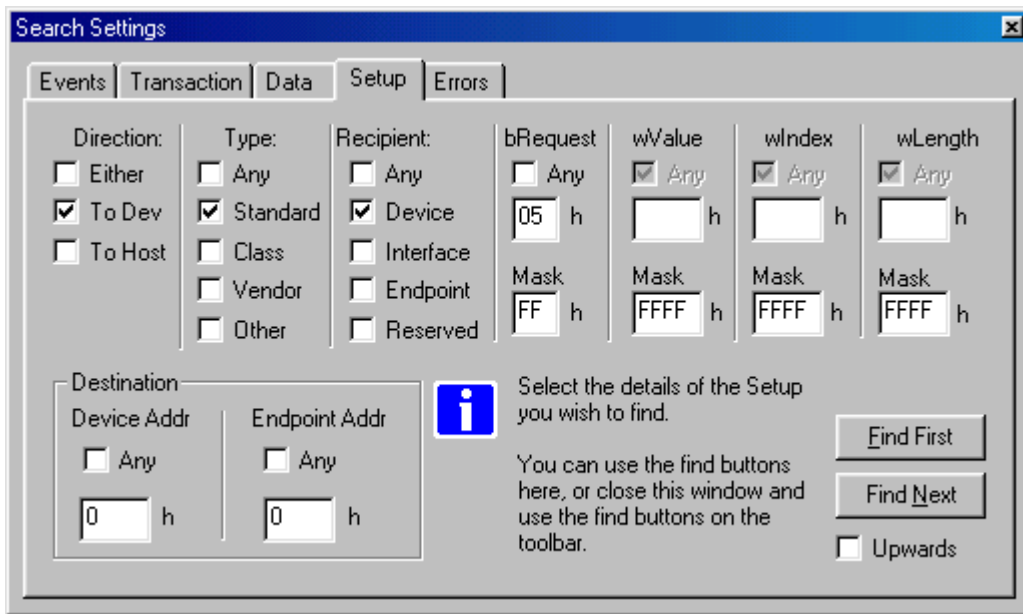
3.6.3 Data Search

The data to be searched for is entered as a sequence of Hex bytes separated by spaces. The size of the data field, the Device Address and Endpoint Address can also be specified. The example below shows a search for Hex bytes 'A3 00' in an 8 byte Data field with Device Address 1 and Endpoint 0. If no selection is made in any particular column then any transaction meeting the requirements of the other columns will be found.



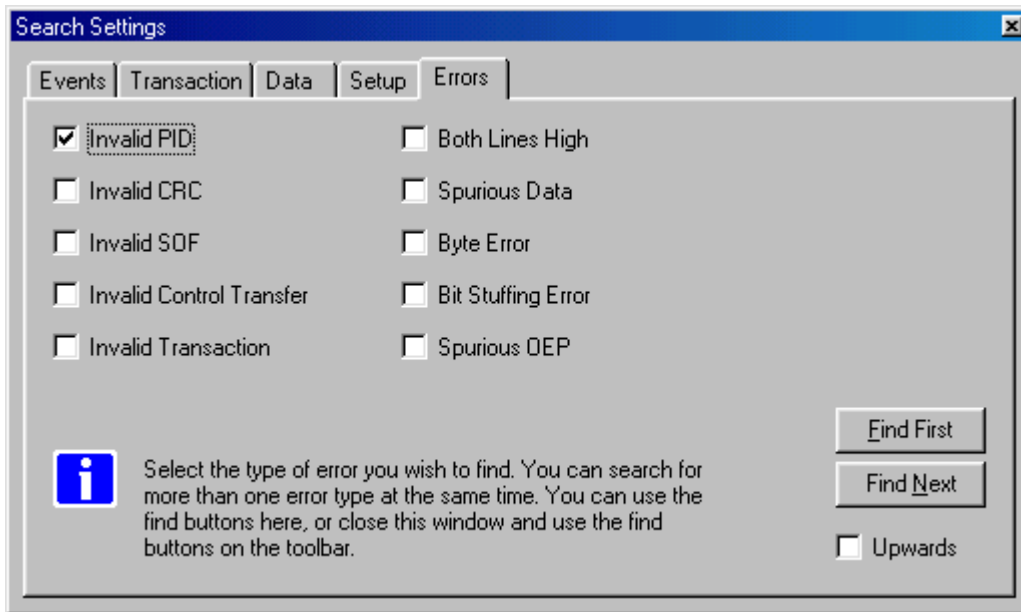
3.6.4 Setup Search

The example below demonstrates a search for a bRequest of 05h in a standard Setup to a device having Address 0 and Endpoint 0. Masks are available if you wish to test for only a part of a field. If no selection is made in any particular column then any transaction meeting the requirements of the other columns will be found.



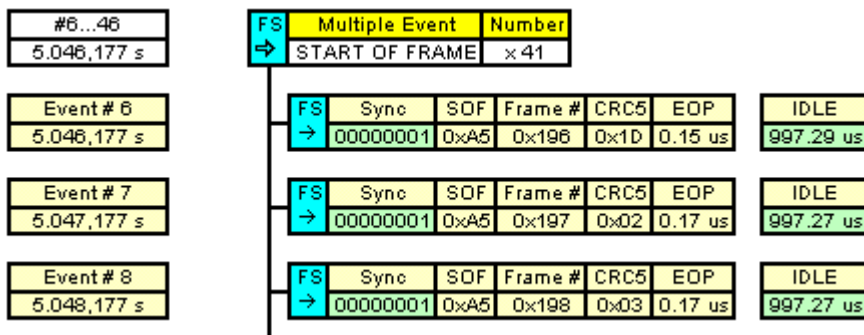
3.6.5 Error Search

Errors such as Invalid PID, Invalid CRC etc may be found by selecting the appropriate boxes. A more detailed explanation of these errors is given in the Errors Chapter.

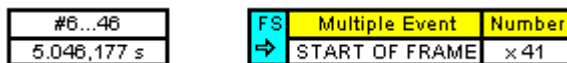


3.7 Multiple Event Headers

Numerous consecutive Start of Frame packets or Keep Alive events make the display difficult to read. GraphicUSB inserts multiple Event Headers before such sequences. The packets can be hidden by clicking on the “Show Packets” button with the multiple Events Header still being visible. The multiple Events Headers can be hidden by clicking on the “Show SOFs” button. The example below shows 41 SOF’s grouped together.



Show SOF Packets



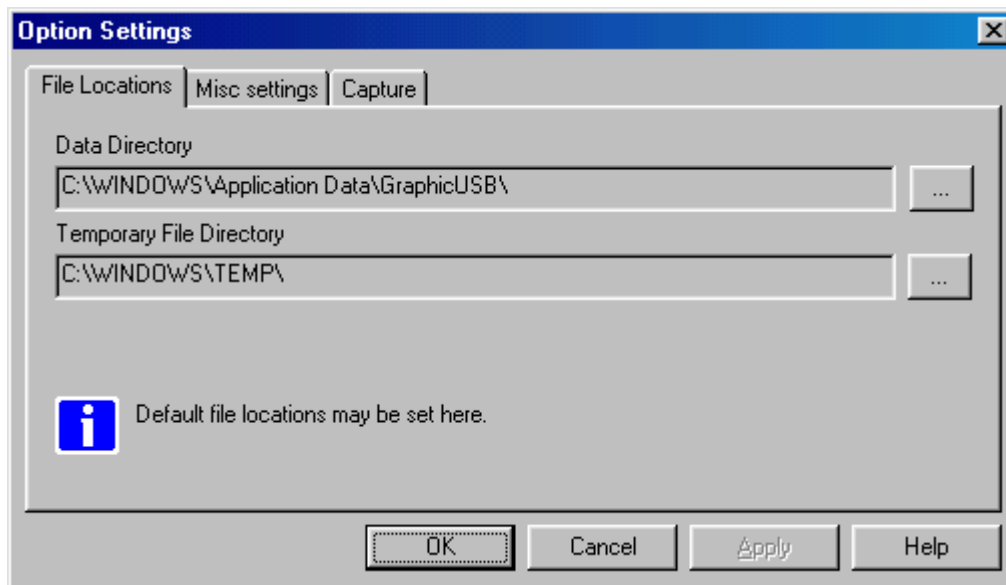
Hide SOF Packets

4 OPTION SETTINGS

Select Options in the Edit menu to open the Option Settings Window.

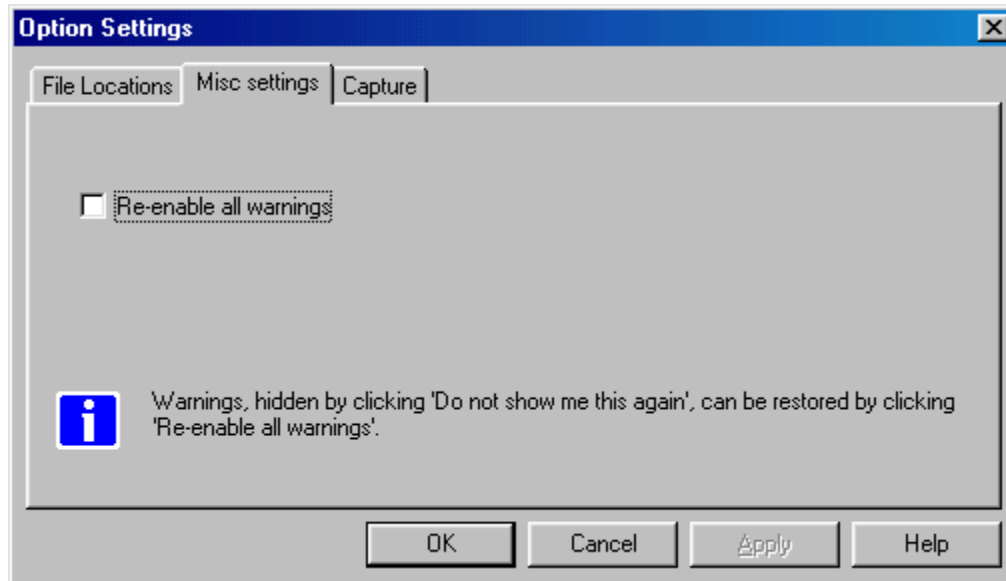
4.1 File Locations

Use this to specify the locations of the Capture and temporary files.



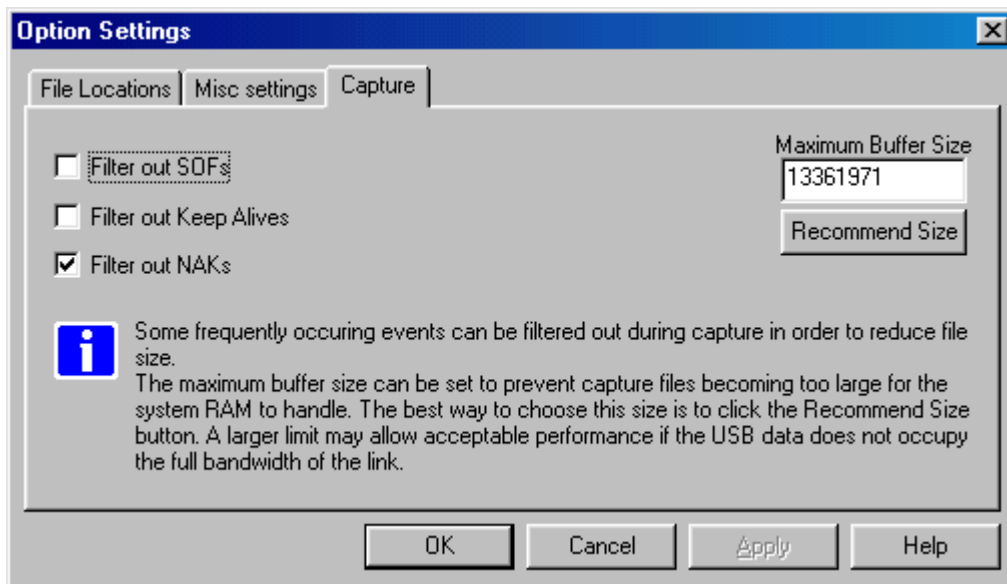
4.2 Miscellaneous Settings

User warnings e.g. concerning the test set-up, may be re-enabled.



4.3 Capture

The size of the Capture file may be minimized by filtering Start of Frame or Keep Alive events or NAKed transactions. Please note that NAKed control transactions will always be included in the capture.



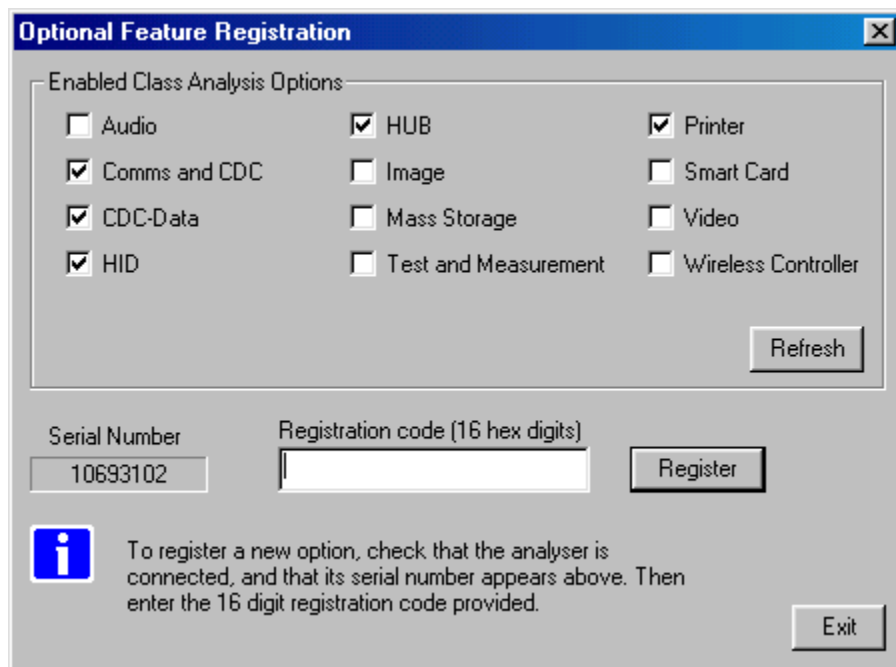
The size of the capture buffer defaults to a safe value which should guarantee a reliable capture under most circumstances. You may increase this size as required, but you should be prepared to decrease it again if you start to have poor response caused by the system using virtual memory to satisfy your requirement. The 'Recommend Size' button returns the buffer size to the default value for your system. An option well worth considering is to increase the size of the RAM in your PC.

5 CLASS ANALYSIS OPTIONS

5.1 Registration

The Class Analysis Options are supplied as software add-ons for Graphic USB. The options are available for individual classes, so you only need to purchase the functionality you actually require. The options are provided in the form of 16 digit hexadecimal registration codes.

To enable a particular option, first ensure the analyser is connected to the host, and then click in the menu bar on Edit...Registration... and the following dialog will appear.



Enter the registration code provided and the corresponding option should become checked. Please store the registration code carefully in case you need to install the option on another host computer.

5.2 Analysis Overview

The Class Analysis option you have enabled will enhance all captures performed on the analyser in question. If you use the

analyser on a different host, remember to register the option on that computer as well.

The option will not allow the analysis of classes on captures performed with the analyser before the option was registered. However the captured files can later be viewed in their analysed form on any computer with or without the analyser present.

A typical class analysis example is shown below.

i Control Transfer
Get HID Report Descriptor

Meaning	Value
Usage Page (Generic Desktop Controls)	05 01
Usage (Mouse)	09 02
Collection (Application)	A1 01
Usage (Pointer)	09 01
Collection (Physical)	A1 00
Usage Page (Button)	05 09
Usage Minimum (1)	19 01
Usage Maximum (5)	29 05
Logical Minimum (0)	15 00
Logical Maximum (1)	25 01
Report Count (5)	95 05
Report Size (1)	75 01
Input (Data, Variable, Absolute, Bit Field)	81 02
Report Count (1)	95 01
Report Size (3)	75 03
Input (Constant, Array, Absolute, Bit Field)	81 01
Usage Page (Generic Desktop Controls)	05 01
Usage (X)	09 30
Usage (Y)	09 31
Usage (Wheel)	09 38
Logical Minimum (-127)	15 81
Logical Maximum (127)	25 7F
Report Size (8)	75 08
Report Count (3)	95 03
Input (Data, Variable, Relative, Bit Field)	81 06
End Collection	C0
End Collection	C0

This shows a HID Report Descriptor, and below is the result of parsing it.

Input Report

Usage	Bits
Button 1	1 Bit
Button 2	1 Bit
Button 3	1 Bit
Button 4	1 Bit
Button 5	1 Bit
Not Used	3 Bits
X	8 Bits
Y	8 Bits
Wheel	8 Bits

Each transfer of a HID report is also analysed, as follows.

i Interrupt Transfer

Device To Host

This is a HID IN report. An analysis of the report contents appears below.

In Report

Usage	Value
Button 1	0
Button 2	0
Button 3	0
Button 4	0
Button 5	0
X	-5
Y	-1
Wheel	0

Data Content

0000: 00 FB FF 00

6 TROUBLESHOOTING

During capture a Data Overrun message appears.

This happens when the device under test generates more traffic than the Host computer can handle. Check that the Host computer has a High Speed USB connection and is sufficiently powerful. A test set up using two computers is preferable.

The data captured contains a large number of CRC or other errors.

Check the cabling between the Packet-Master and the device under test and to the Host under test. The cabling should be kept as short as possible with the total length of cable not exceeding 4 metres.

The data captured just contains a Plugged In message and a Start of Reset message.

This may happen if, after starting capture, a high speed device is plugged into the Packet-Master.

The data captured contains a large number of “Spurious Data” or “Both Lines High” errors.

This may be the result of using excessively long cables in the test setup or perhaps trying to analyse a high speed device.

An alternative possibility, which we have seen on some (non-approved) devices, is that the designer has incorporated reactive elements into the data lines such that on the bus itself the voltage waveform is not readable. A quick check with an oscilloscope will confirm this situation as the data lines will not show a clean square appearance, but rather mostly ringing shapes. One solution to devices of this type is to view their data upstream of a Full Speed Hub

My capture buffer fills up too quickly to collect any useful events.

Some devices can continuously NAK transfers, which leads to a very high bandwidth of not-very-useful data. We suggest that you disable the capture of NAKs in the Edit...Options...Capture dialog, which will reduce the amount of data captured, limiting it to transfers which are not NAKed.

If necessary, a further reduction in captured data can be achieved by disabling the capture of SOFs or Keep Alive events.

You can also increase the buffer size in the same dialog. If doing this causes system slowdown problems (caused by the system using virtual memory), then consider adding RAM to your computer.

7 WARRANTY

7.1 Warranty

MQP Electronics guarantees that its products are free from defects in materials and workmanship for the warranty period, subject to the limitations below. MQP Electronics will at its discretion either repair or replace any part that proves defective because of faulty materials or workmanship.

7.2 Limitations

This warranty does not cover any damage that results from any accident, misuse or unauthorized disassembly or repair. This product is not authorized for use as a critical component in life support equipment or any application where failure would result in any loss, injury or damage to persons or property.

7.3 Warranty Period

The warranty starts on the day of purchase and covers a period of one year.

7.4 Obtaining Service

Defective product may be returned to the authorized distributor from whom you purchased the product. Defective product may be returned direct to MQP Electronics. Please call +44 (0)1666 825 666 and request a Return Material Authorization (RMA) number from customer services.

8 ERRORS

8.1 *Invalid PID*

A Packet Identifier, PID, is a 4 bit code. The 4 bits of the PID are complemented and repeated making an 8 bit PID in total. An error in the transmission of the PID will result in an Invalid PID being reported.

8.2 *Invalid CRC*

A Cyclic Redundancy Check is performed on the data transmitted in a packet. Token packets have a 5 bit CRC while Data packets have a 16 bit CRC. The CRC is checked by the Packet-Master and, if incorrect, an error is reported.

8.3 *Invalid SOF*

A Start of Frame packet contains a frame number. If a frame number is out of sequence then an Invalid SOF error is reported. It's likely that frame numbers will be out of sequence after a Reset or Suspend; in these cases the error can be ignored.

8.4 *Invalid Control Transfer*

A Control transfer consists of a SETUP packet (which defines a from-host or to-host direction), followed by an optional set of 'Data Stage' DATA0/DATA1 packets in that direction, completed by a 'Status Stage' zero-length DATA1 packet, in the other direction. If this sequence is not correct then an Invalid Control Transfer error is reported.

The correct sequence for the data toggle in a Control Transfer is that the SETUP should contain a DATA0 packet, the Data Stage should start with a DATA1 packet and then alternate, and finally the Status Stage should be a zero-length DATA1 packet. If these polarities are not correct then an Invalid Control Transfer error is reported.

8.5 Invalid Transaction

A transaction consists of a token packet (SETUP/IN/OUT), followed by a DATA0 or DATA1 packet (in the appropriate direction), and completed by an ACK, NAK or STALL. Either the last or the last two packets may be missing. If this sequence is not correct then an Invalid Transaction error is reported.

A SETUP transaction must contain a DATA0 packet. If this polarity is not correct then an Invalid Transaction error is reported.

8.6 Bit Stuffing Error

In order to ensure adequate signal transitions, bit stuffing is employed by the transmitting device when sending a USB packet. A zero is inserted after every six consecutive ones in the data stream before the data is NRZI encoded. If more than six consecutive ones are detected a Bit Stuffing Error is reported.

8.7 Byte Error

All packets must have an integral number of bytes. If this is not the case a Byte Error is reported.

8.8 Spurious Data

If data is detected but doesn't begin with a synchronization pattern then the display will report Spurious Data.

8.9 Both Lines High

The data encoding scheme is such that the D+ and D- lines should never both be high at the same time. If this condition is encountered an error is reported.

8.10 Spurious End of Packet

An End of Packet condition should only appear at the end of a data packet. If the condition appears at any other time it will be reported as an error.