LINEEYE

OPTIONAL KIT
FOR MULTI PROTOCOL ANALYZER
LE-8200A/LE-8200

USB Communications Expansion Kit
OP-SB84

Instruction Manual

The 7th Edition

Instruction

Thank you for your purchase of OP-SB84.

To use it correctly, you are advised to read and understand this instruction manual thoroughly. Keep this together with the warranty card. If you encounter any problems, you will find helpful information in this manual.

NOTICE

It is prohibited to reprint or duplicate any part or the whole of this instruction manual without prior permission from LINEEYE.

The content of this instruction manual and specifications of the products are subject to change without any notice.

This instruction manual has been designed and edited with great care to give you all necessary information. If you have any questions, feel free to send your inquiries to LINEEYE.

LINEEYE makes no warranty or guarantee, either expressed or implied with respect to its quality, performance, merchantability, or fitness for a particular purpose. LINEEYE shall not be liable for direct, in-direct, special, incidental, or consequential damages resulting from any defect in the product. The warranty and remedies set forth above are exclusive and in lieu of all others.

USER LIMITATION

This product is not intended to be incorporated into systems that equire extremely high reliability and safety, such as aerospace equipment, trunk communication equipment, nuclear power control equipment, and medical equipment related to life support. Therefore, do no use for those purposes.

Safety Information

Read this first !!

Here, for users of the products, the important notice to prevent hazard to the human and to prevent damage to the property. And it describes safe and right way to use the products. Before using, please read the main contents after you understand the following Warning and Caution.

⚠ Warning   There is a possibility of accidents, such as a death or a serious injury, may occur.

⚠ Caution   There is a possibility of accidents, such as a injury , and property damage may occur.

⚠ Warning
● Stop using the analyzer immediately when smoke or smells emanate from itself. Continuous use may result in an electric shock, a burn and/ or fire.
●Stop using the analyzer when a liquid or foreign substance get into the analyzer. This may result in an electric shock or fire. ➔ Immediately switch off the analyzer and unplug it.
● Do not disassemble, modify or repair analyzer. This may result in a injury, an electric shock, fire, explosion and/or a breakdown due to overheating.
●Do not put the analyzer in fire or heat them. This may result in a injury and fire due to overheating or explosion.

⚠ Warning

🚫	●Do not leave the analyzer in the following conditions. Strong magnetic field, static electricity or dusty place. Temperature and humidity above the specification. Condensation Place. Not flat, or shaking place. Place affected by direct sun or near the fire or where the hot air is. Place with leaking water or electricity.
🚫	●Do not touch the parts of this interface board. It will cause the electric shock, fire and the product malfunction.

⚠ Caution

🚫	●Do not connect the USB cables to the OP-SB84 before connecting it to the analyzer.

■■ Contents ■■

Chapter 1 Before Using the Product

1.1 Unpacking

When you unpack the product, make sure of the following:

· The product has not been damaged during transportation.
· You have received all standard accessories listed below.

☑	Interface Board	1
☑	CD-ROM (firmware etc.)	1
☑	Line State Sheet D	1
☑	USB cable (1.8m)	1
☑	Instruction Manual (This book)	1
☑	Warranty Card	1

Please contact your LINEEYE distributors if you find any damage to the product caused by transportation, or if there are accessories lacking.

1.2 Overview

OP-SB84 is the interface expansion board for multi protocol analyzer LE-8200A/LE-8200. This is for measuring the UBS communications.

It has some functions such as On-Line Monitor, VBus Measurement.

1.3 Option

External trigger input / output cable for Ext Connect
● LE-5LP2 : 5-wire probe cable
● LE-62BG : A cable with test clip (In a set of 2)

Chapter 2 Basic Operation

2.1 Preparation Before Measuring

Before starting measurement, install the OP-SB84 firmware and change the interface expansion board and line state sheet.

2.1.1 Installation of Firmware

Install the OP-SB84 firmware, which is recorded in the CD-ROM. Follow the instructions below.

1) Connection to the analyzer

Connect the AUX(RS-232C) of analyzer and the serial port of the PC using a AUX cable. Connect the AUX port of analyzer and the COM port of PC.

Or, connect USB ports of analyzer and PC.

<Attention>

When the analyzer is connected to the PC through the USB cable, the Windows requires the USB driver. The USB driver is stored in the CD-ROM.

📖 For installation to the Windows 7 / 8.1 / 10, please refer to Analyzer manual.

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2) Configuration of analyzer

Use the AC adapter to run the analyzer.

For COM port connection, set AUX conditions as below.

Speed:	115200/230400
Data bit:	8
Parity:	None
X-control:	Off

（Speed should be the same setting in respect of that of the transferring software "le8firm".）

3) Invoking of the firmware loader

Turn off the power of analyzer. Turn on the power again while pressing [Shift]+[File]. The firmware loader will be executed.

4) Executing the transferring software "le8firm"

Open the file of "le8firm.exe".

5) Transfer the firmware

   i) Select "USB/Serial Port" from "Method".

   ii) Click [Next]

   iii) Click [Select] and select the firmware "OPSB84.FW2",

   iv) Click [Start]. "Complete" will appear on the window.

   v) Click [Close].

6) Reboot the analyzer

"Firmware write succeeded. "will appear when completing the firmware transfer. Reboot the analyzer to use the OP-SB84 firmware.

Turn off the analyzer. After changing to the expansion board(OP-SB84), it will work as OP-SB84 firmware.

<Attention>

Do not turn off the power of the analyzer while installing the firmware. That will cause the problems (cannot turn on the power) and need to send back the product to LINEEYE.

■ Firmware for the standard board/other interface boards.

Once OP-SB84 firmware is installed, you can simply change the expansion board(OP-SB84) to the standard board(or other interface boards) while the analyzer's power off and turn on its power. Then proper firmware will automatically start.

2.1.2 Inserting the Interface Board

To exchange an interface board inserted in the analyzer to OP-SB84, follow the instructions.
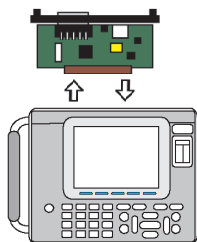
1) Turn off the analyzer.

2) Screw off M3 screws on the expansion slot of analyzer.

3) Remove the board pulling the handles of board.

4) Insert the interface expansion board (OP-SB84) into the slot completely.

5) Screw it on using M3 screws.

2.1.3 Line State Sheet

Change the line state sheet to the one comes with the OP-SB84.

Original Line state sheet

Line state sheet for OP-SB84
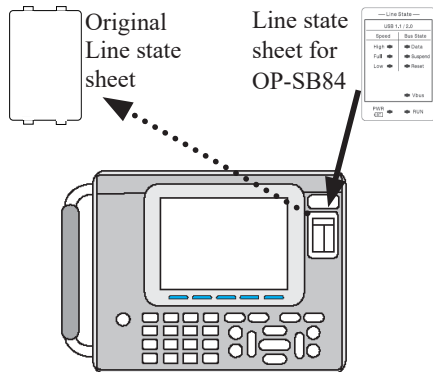
1) Remove the original line state sheet.

2) Replace the line state sheet for OP-SB84.

   📄 Please do not lose the removed line state sheet.

2.2 Ports of the Interface Expansion Board
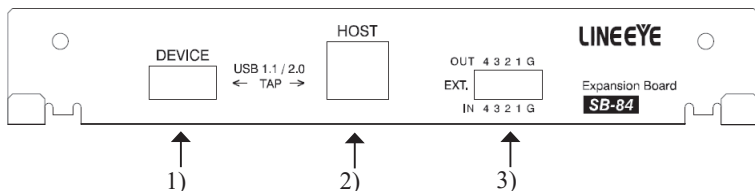
1) DEVICE   Connect to the USB Device (USB controller etc.).

2) HOST   Connect to the USB Host (PC etc.).

3) EXT.   Output or Input ports for External Trigger function.

Use the USB cables, which comes with the analyzer.

An external signal trigger becomes effective when [Factor]-[Ext trigger] and the item [Trigger out] of trigger setup are enabled.

▤   A mil connector of 2.54 mm pitch is suitable for "EXT". LE-62BG(Option), which is two cables with test clips can be used for "EXT."

2.3 Line State LED

Line State LEDs on the analyzer have the different meaning when changing to the different expansion board.

Change the line state sheet, which comes with the OP-SB84, and understand the meaning of each LED.

LED		Condition
High		High Speed(ON)
Full		Full Speed(ON)
Low		Low Speed(ON)
Data	Blinking	Receiving USB packets
	Off	No USB packets
Suspend		Suspend(ON)
Reset		Reset(ON)
Vbus		VBus(ON)
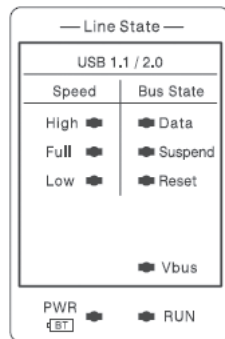
▤   "Vbus" LED lights when voltage of VBus is about 4.5V or above.

2.4 Functions

Press [Menu] and select the function by [▲][▼][▲][▼] keys.
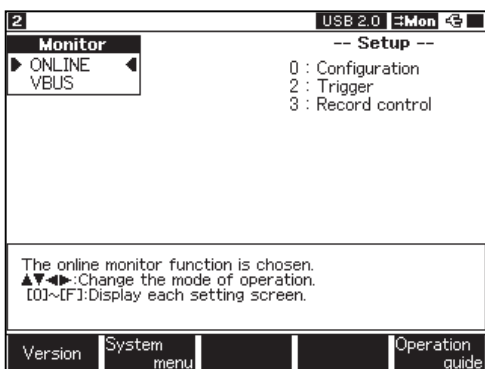
ONLINE : On-line monitor function

VBUS : VBus monitor function

2.5 Battery Drive Runtime

The OP-SB84 (inserted in the analyzer) can work by the battery drive for about 100 minutes. When running the important test, use the AC adapter and save the data into the CF card (option) for backup.

▤ Use the Auto-save function if necessary. Refer to the manual of analyzer for more details.

Chapter 3 Online Monitor Function

ONLINE monitor function is for recording the USB frames with the time stamp information into the Buffer memory.

3.1 Connection

Switch ON of Analyzer power.

Press [MENU] to show the top menu.

Move the pointer (▶   ◀) to [ONLINE].

Make settings for measurement at 0,2,3 of "-- Setup --" field.

Press [Run] and connect to (1)USB device and (2)USB host with USB cables like below.

▤ While Analyzer turns off the power, it might be possible that communication between USB devices (HOST and Device) cut off or loose communication. Please connect the USB devices while Analyzer turns on the power.

(2)Host   (1)Device

-12-
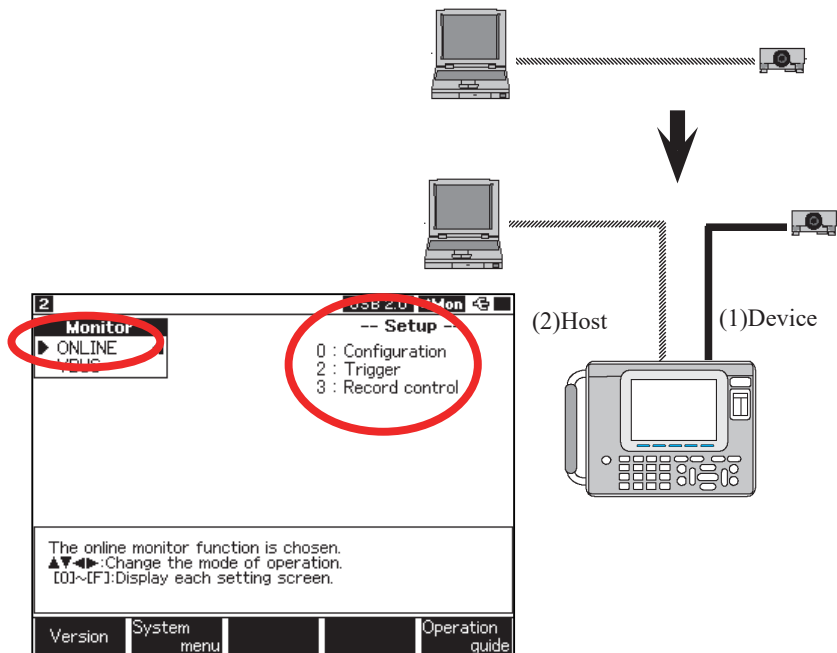
3.2 Filter Setup

Set the filter conditions from top menu -> [0]"Configuration" to capture the specified USB packets.
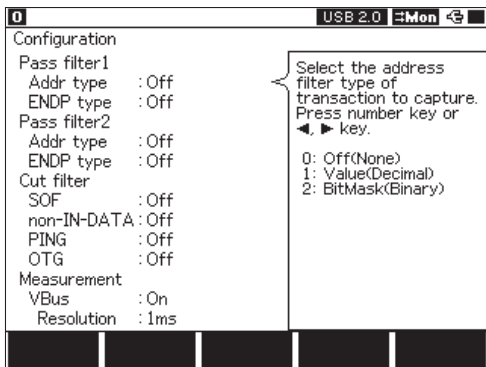
≣ PRE packets and SPLIT packets are always captured even when those filters are applied.

Example of pass filter)

If the actual communication was "RPE-IN-DATA-PRE-ACK" and IN transaction does not matched to the filter conditions, it will be displayed as "PRE-PRE".

≣ When the first byte of illegal packet matches to PID of the token packet, it is possible that the packet will be the target of filter.

■ Pass filter 1/2

Captures the Transactions with specified address and endpoint.

• Addr type / ENDP type

Select the input way from Value(Decimal) or Bit mask(Binary) for Address or Endpoint of Transactions to be captured.

• Address / Endpoint

Input the number of Address or the Endpoint of Transactions to be captured in Decimal or Binary.

■ Cut Filter

• SOF

When Setting On, SOF packets will not be captured.

• non-IN-DATA

When Setting On, IN transactions (such as IN or IN-NAK only) except for "IN-DATA" will not be captured.

▤ Even though this filter is applied, if the logs of external trigger (or VBUS) come next to IN packets, the transaction will be captured without DATA packets.

• PING

When Setting On, PING transactions will not be captured.

• OTG

When Setting On, OTG events will not be captured.

▤ LINEEYE plans to upgrade the function to log OTG bus events in the future. Current version only supports the logging of VBus status.

▤ Analyzer records logs when following status change into another status.

VBus Condition	Range	Display
VBus off	+0V to +0.5V	Vbus Off
VBus session end	+0.5V to +1.4V	Vbus Session-end
VBus session start	+1.4V to +4.6V	Vbus Session-valid
VBus on	+4.6V over	Vbus On

▤ It is possible that there is some capturing loss of VBus data for a large amount of data, because the priority is for logging USB data.

■ Measurement

• VBus

Does not capture measured data of VBus by Off.

Captures measured data of VBus by On.

Select a measuring period by "Resolution".

Records VBus measuring data with following conditions depending on the speed.

Speed	VBus logging condition
High/Full	Records VBus log data soon after the SOF packet.
Low	Records VBus log data just before the token packet.

▤ VBus function can be used by OP-SB84 v1.06 or later.

▤ At Low speed, please do not set the measurement period shorter than the transmission period of a token packet.

3.3 Trigger Setup

    📄 Refer to Chapter 4 Trigger Function.

3.4 Data Recording Configuration

From top menu, press[3]:"Record control".

Items listed below can be set.

Item	Content
Buffer area	Whether a memory is used as one capture buffer or two capture buffers can be selected.
Protect	Prevents the data stored in the buffer memory from being inadvertently overwritten.
Full stop	Ring Buffer Setting
Auto save	Saves data being measured onto a memory card. (Only for ONLINE)
Auto backup	Automatically saves the data in the capture buffer when you press [Stop] key.

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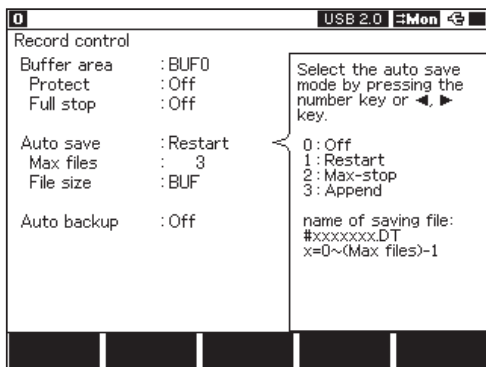
☐ Please refer to the Analyzer instruction manual about setting. Because these items are basically same as those on using Standard board with Analyzer.

☐ Items of "Full stop(Ring buffer)" and "Auto save" are added on version 1.02 of OP-SB84.

☐ In "Auto Save" function, it is possible that there is some capturing loss for a large amount of data, because saving to the CF card cannot be proceeded at the same time. ("Overrun" will be displayed in the screen.) And the packet right above the "Overrun" may be broken off midway, in that case, it can not be displayed correctly.

Broken off Data packet can not be displayed correctly.

"Overrun" display

3.5 Auto Run Configuration

At the menu display, push [F5] "System Menu" ->[4]Auto run, and go to configuration for auto run. Set Start time and Stop time of Auto measurement.

☐ How to configure is basically in common with standard interface of Analyzer. Please refer to the manual of Analyzer to configure.

☐ Two functions - a function to turn off the power while waiting, and a function with which it checks the power supply from AC power cable before it starts to measure – have been added to OP-SB84v1.06 or later.

3.6 Start and Stop Measurement

Starting measurement

When pressing [Run], the analyzer starts measurement, and captures data in the buffer. The state of receiving packets can be confirmed through the display.

Stopping measurement

Press [Stop] to finish the measurement. And it also stops when the trigger condition is formed. On ONLINE mode, it automatically(FULL Stop : On or Auto Save : MAX-stop) stops when the buffer becomes full.

  ▤ Please refer to the Analyzer instruction manual about how to make files of ".SU(setting data)"and ".DT(measured data)".

  ▤ While measuring, Display Control cannot be used and all data will be displayed. (3.8 Display Control).

3.7 Standard Display

On this mode, one captured data or Bus event is displayed per one line.

When SOF packets are captured continuously, they are summarized and displayed in one line.

Press [▲][▼][Page Up][Page Down] keys for scrolling.

Press [Data] key. "Standard display" can be changed to "Detailed display".

Press [F5] "Find setup" to use the search function.

Press [Shift]+[F5] "Display setup" to use the display control function.

  ▤ While measuring, some messages, such as "Device Requests" cannot be displayed.

(1)USB transfer mode
  (2)Time stamp
      (3)Data position of displayed data
          (4)PID / Event
            (5)Information
               (6)Trigger/CRC error

```
|0|    0  Basic                    USB 2.0 ⊟Mon ◁ ■
    Time (m:s.ns)     PID/Event          Information
   00:00.950702800    Reset
   00:00.953702483    Suspend
   00:01.087412433    Reset
 ▼ 00:01.088132800    Devchirp
   00:01.089610100    Hubchirp
Hs 00:01.137745033    SOF    173(3)
   00:01.137745033 VBus Voltage: 4.99 V
   00:01.137745033 VBus Current:  +45 mA
Hs 00:01.137870033    SOF    173(4) - 1A0(2)
Hs 00:01.182626200   SETUP   0: 0 / GET_DESC:DEV
Hs 00:01.182626533   DATA0   80 06 00 01 00 00 40 00(8)      |0| C
Hs 00:01.182627083    ACK
Hs 00:01.182747233    SOF    1A0(3)
Hs 00:01.182772866    IN     0: 0
Change                                    Find
time display                                  setup
```

(1)USB transfer mode

    USB transfer mode.

    "Ls" in low speed, "Fs" in full speed and "Hs" in high speed.

(2)Time stamp

    Displays the spent time from the start of measurement.

    Press [F1] "Change time display" to change the unit of time in turns.

- Minute : Second. Nano second(Values more than an hour are not displayed.)
- Hour : Minute : Second. Micro second(Values less than one micro sec are not displayed.)
- Elapsed time from the time the previous packet or event occurred(Second .Nano second).

(3)Data position of displayed data

    Displays the position of the data on the top line. It can be used for jumping to the pointed data.

    ▤ On standard display, inputting the number of data position by the numerous key enables to jump to the pointed data.

(4)PID / Event

Shows PID of USB packets and Kind of Events.

The packet with illegal PID or illegal length of USB standard is displayed by the hexadecimal numbers "[XX]".

(5)Information

Shows "Address : Endpoint" of USB Token packets, eight characters of the beginning of the payload in DATA packets, the summary of SOF packets and the status of external input pin.

<Example of Device requests>

Device request	Display	xx
GET_STATUS	GET_STATUS	
CLEAR_FEATURE	CLR_FEATURE	
SET_FEATURE	SET_FEATURE	
SET_ADDRESS	SET_ADDR[xx]	USB-Address
GET_DESCRIPTOR	GET_DESC : xx	Refer to the below
SET_DESCRIPTOR	SET_DESC : xx	Refer to the below
GET_CONFIGURATION	GET_CFG	
SET_CONFIGURATION	SET_CFG [xx]	Value is this configuration
GET_INTERFACE	GET_IF	
SET_INTERFACE	SET_IF [xx/xx]	Value of interface / alternate setting
SYNCH_FRAME	SYNCH_FRAME	
Class specific device request	Class specific	
Vebder' definition	Vendor specific	

DESCRIPTOR's detail	Display
DEVICE	DEV
CONFIGURATION	CFG
STRING	STR
INTERFACE	I/F
ENDPOINT	EDP
DEVICE QUALIFIER	D.Q
OTHER SPEED CONFIGURATION	OSC
INTERFACE POWER	I.P
OTG	OTG
DEBUG	DBG
INTERFACE ASSOCIATION	I.A
HID descriptor (HID class)*	HID
Report descriptor (HID class)*	REP
Physical descriptor (HID class)*	PHY

▤ "HID", "REP", "PHY" are displayed on OP-SB84 version 1.02 or above.

(6)Trigger/CRC error

Shows [C] in yellow when there is CRC error and [*Trigger number] in red when the trigger condition was met.

<USB packets>

PID/Event	Meanings	Information	Meanings
SOF	SOF packet	*** (*)- ***(*)	***-*** is the frame number. At μSOF, (*) shows the ordinal number of same μSOF in the range of 0 to 7.
SETUP IN OUT	Token packets except for SOF	*** : ***	Address : Endpoint
PING	PING packet	*** : ***	Address : Endpoint
DATA0 DATA1 DATA2 MDATA	DATA packets	********	From 2nd byte to 9th one of DATA packet
ACK NAK STALL NYET	Handshake packets	--	--
PRE ERR	Special packets	--	--
SPLIT	SPLIT packet	**** / ****	Start split or Complete split / Full or Low speed
[**]	Illegal packets (In the case of illegal PID or illegal data length, show the first byte of the packet numerically.)(Example 1)	********	Show the data on and after the second byte of the packet through its 9th byte.

- All numbers are shown in HEX.

- When the USB signals of a measuring object is not in a good condition, the analyzer may not record USB packets correctly.

- If the first byte of the data is conforming to a proper PID and its data length is illegal, the data will be displayed as illegal packet and checked for CRC. (Example 2: The first byte of 69h corresponds to the PID of IN packet, but its data length is illegal as IN packet.)

- If a packet is lack of first byte (PID) and the first received data byte corresponds to proper PID and its data length is legal, the received packet will be displayed as normal USB packets. (Example 3: The first byte "OFh" corresponds to the proper PID of MDATA and the data length is legal.)

<Illegal packets display>

PID/Event	Information	Meanings
Reset	--	USB bus reset (The SEO status of D+/D- signal is detected in the range no fewer than 2.5 usec / 3.1ms if High Speed, nor more than 139.8 msec.)
Suspend	--	Suspend (The non-communication status not in SEO status over 139.8 msec. is detected)
Disconncet	--	Disconnect (The SEO status of D+/D- signal over 139.8 msec. is detected)
Devchirp		Device chirp
Hubchirp		Hub chirp
VBUS	Off	VBus off
VBUS	Vbus Session-end	VBus Session ends
VBUS	Vbus Session-valid	VBus Session starts
VBUS	Vbus On	VBus on
VBus Volotage	*.** V	VBus measured value
VBus Current	+/- ***mA	VBus measured value
EXTIN	* : * : * : *	Satisfaction of external trigger * indicates the logical status of each input terminal.

▤ Refer to "3.2 Filter Setup" for threshold voltage of VBus status.

▤ "Device chirp" detects K state in USB high speed level.

▤ "Hub chirp" detects K-J repeating state in USB high speed level.

3.8 Retrieval Function

The retrieval function enables you to find the specific data.

Press [F5] "Find setup" for setting the retrieval conditions. Press [F5] for forward search, or press [Shift] + [F5] for backward search. (While displaying on the Data display, press [F] for forward search or [E] for backward search.)

Press [F5] "Find setup" for setting the retrieval conditions at Standard Display.

■ Factor
Select a retrieval condition item below.
• Transaction
• Data
• CRC Error
• Trigger

■ Action
Select "Action" to be taken upon a complete retrieval.
• Display
Data which satisfies the retrieval condition is displayed at the top line of the screen.
• Count
The count, which is the number of times the retrieval condition was satisfied, is displayed in the function display section.

■ Transaction

Select the conditions of transaction which includes the frames to be searched.

• Token PID

Select Token packet's PID to add it to search conditions. Select "Off" not to do so.

• Hand shake PID

Select Handshake packet to add it to search conditions. Select "Off" not to do so.

• Addr type/Address

Select the input method for address at Addr type, and enter numbers at Address to add it to search conditions. Select "Off" not to do so.

• ENDP type/Endpoint

Select the input method for endpoint at ENDP type, and enter numbers at Endpoint to add it to search conditions. Select "Off" at ENDP not to do so.

▤ If there is an event log, such as EXTIN between Token packet and Handshake packet, the Handshake packet will not be the target of retrieval.

▤ If four items are all "Off", all transaction will be the target of retrieval.

■ Data

Select the conditions of Data which includes the frames to be searched.

• Addr type/Address

Select the input method for address at Addr type, and enter numbers at Address to add it to search conditions. Select "Off" not to do so.

• ENDP type/Endpoint

Select the input method for endpoint at ENDP type, and enter numbers at Endpoint to add it to search conditions. Select "Off" at ENDP not to do so.

• Data

Set the data pattern from 1 to 8 bytes of DATA packet for search.

"∗" means any pattern.

▤ Search function of data pattern is added on OP-SB84 version 1.02.

■ CRC Error

Searches the frame with CRC error. There is no other conditions.

■ Trigger

Searches the frame or event with triggers.

• Trigger

Select the number of trigger to be searched.

3.9 Display control
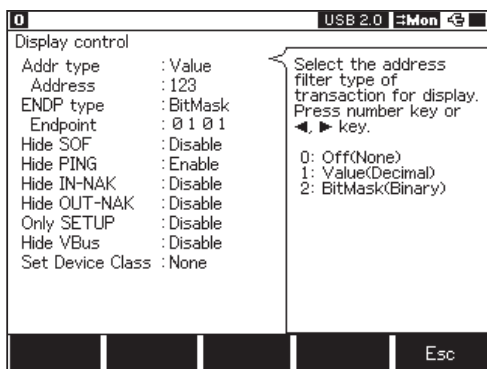
In Standard Display after measuring, only packets that is belonging to the specific kinds of transaction are indicated, otherwise packets belonging to the specific kinds of transaction are not indicated.

In Standard Display or Detailed Display, press [Shift] + [F5] "Display setup" to go to "Display control" window. Display conditions like below can be set.

• Addr type/Address

  Select the input method for Address of transaction at Addr type, and enter numbers at Address to add it to display conditions. Select "Off" not to do so.

• Select the input method for Token packet's endpoint at ENDP type, and enter numbers at Endpoint to add it to display conditions. Select "Off" at ENDP not to do so.

• Hide SOF

  Select "On" to hide SOF packets.

• Hide IN-NAK

  Select "On" to hide IN-NAK transactions.

• Hide OUT-NAK

  Select "On" to hide OUT-NAK transactions.

• Only SETUP

  Select "On" to hide Any transactions except for one of SETUP's.

▤ If an event log, such as EXTIN comes between one tranaction, the Display Control function excepts "Hide SOF" may not work properly. (For example, only a Handshake packet is displayed in mistake.)

• Hide VBus(OP-SB84 v1.06 or later)

Select "On" to hide VBus measuring data.

• Set Device Class (After version 1.02 of OP-SB84)

Displays the Class specific device requests("Class specific") as the class request according to the selection at this section.
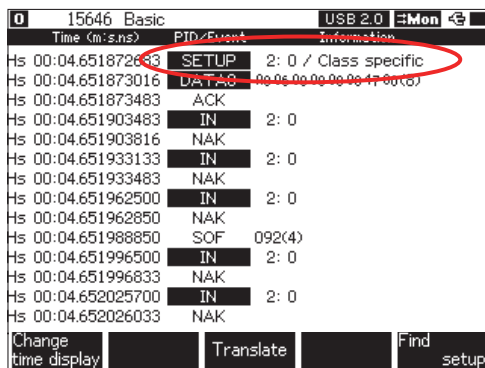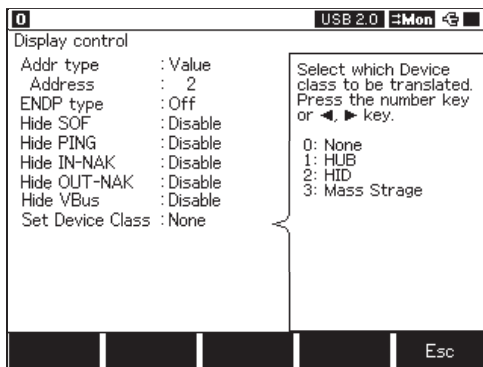
Standard display:

Ordinary display(Selected "None")

Screenshot 1:

0	15646 Basic		USB 2.0 ⊟Mon ⏏■
	Time (m:s.ns)	PID/Event	Information

Hs 00:04.651872683 SETUP 2: 0 / GetHubDescriptor
Hs 00:04.651873016 DATA0 09 29 04 E0 00 32 64 00 47 96 (8)
Hs 00:04.651873483 ACK
Hs 00:04.651903483 IN 2: 0
Hs 00:04.651903816 NAK
Hs 00:04.651933133 IN 2: 0
Hs 00:04.651933483 NAK
Hs 00:04.651962500 IN 2: 0
Hs 00:04.651962850 NAK
Hs 00:04.651988850 SOF 092(4)
Hs 00:04.651996500 IN 2: 0
Hs 00:04.651996833 NAK
Hs 00:04.652025700 IN 2: 0
Hs 00:04.652026033 NAK

Change time display   Translate   Find setup

Standard display:
Display when HUB is selected at "Set Device Class"

Screenshot 2:

0		USB 2.0 ⊟Mon ⏏■

Device request (Class-specific) ─────────
 Direction of device requests : Device->Host
 Request type : Class request (1)
 Receiver : Device (0)
 Request code : Unknown (6)
 wValue : 0 (0x0000)
 wIndex : 0 (0x0000)
 Length of data transfer : 71
Data ─────────
    +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +A +B +C +D +E +F
 0000 : 09 29 04 E0 00 32 64 00 FF

Esc

Translate Display:
Ordinary display
(Selected "None")

Screenshot 3:

0	USB 2.0 ⊟Mon ⏏■

Device request (Class-specific) ─────────
 Direction of device requests : Device->Host
 Request type : Class request (1)
 Receiver : Device (0)
 Request code : GetHubDescriptor
 Index of String Descriptor : 0
 Descriptor Type : (0)
 Length of data transfer : 71
Descriptor (HUB) ─────────
 Length(Bytes) : 9
 Descriptor Type : HUB descriptor (41)
 Number of downstream facing ports : 4
 Logical Power Switching Mode : Ganged power switching
 Compound device : Hub is not part of a compound device.
 Over-current Protection Mode : Global
 TT Think Time : 32 FS bit times.

Esc

Translate Display:
Display when HUB is selected at "Set Device Class"

3.10 Detailed Display

Shows the detailed information of the packets or the events, which are pointed at a cursor.

Press [Data] key while displaying at Standard Display or Translate Display to move to Detailed Display.

☰ CRC type and DATA packet's payload can be checked here.

☰ Both Dump data and ASCII data are shown to display payload of data packets. By pressing [F1] key, the ASCII data can be hidden. (OP-SB84 version 1.02 or above)

☰ Pressing [F5] and [F4] key enables to move to another Data packets. (OP-SB84 version 1.02 or above.)

3.11 Translate Display

Shows the translations of Device requests and Descriptor.

Press [F3]"Translate" to move Translate Display.

On Standard Display, when SETUP packet or Special packet(PRE,SPLIT) is on the top line, "Translate" is available.

```
┌─────────────────────────────────────────────┐
│ 0                          USB 2.0  ⇉Mon ⊕ □ │
│ Device request (Get descriptor) ──────       │
│  Direction of device requests : Device->Host │
│  Request type : Standard request (0)         │
│  Receiver : Device (0)                        │
│  Request code : GET_DESCRIPTOR (6)           │
│  Index of string descriptor : 0             │
│  Descriptor type : Configuration descriptor (2)│
│  Languages : Undefined (0x0000)              │
│  Length of data transfer : 9                 │
│                                               │
│                                               │
│                                               │
│                                               │
│                                               │
│                    Esc                        │
└─────────────────────────────────────────────┘
```

▤ Standard Device Descriptor and Standard Device Request can be translated.

▤ When event logs, such as EXTIN, enter into the data after SETUP, the translation may break off.

3.12 Printing Out Data

Recorded data can be printed as it is displayed (formatted) on the screen.
Operation : Press [Print] and then input the number of pages ([0]-[9]), and press [F1](Change format). Press [Enter].

```
┌─────────────────────────────────────────────┐
│ 2      13  Basic           USB 2.0  ⇉Mon ⊕ ■ │
│     Time (m:s.ns)    PID/Event     Information│
│    00:03.170745083   Suspend                  │
│    00:03.186806950   Reset                    │
│    00:03.187527300   Devchirp                 │
│    00:03.190979883   Hubchirp                 │
│ Hs 00:03.265196016   SOF    4D0(2) - 55C(5)  │
│ Hs 00:03.405608150  SETUP   0: 0             │
│ Hs 00:03│    Page :         10000    │        │
│ Hs 00:03│                             │        │
│ Hs 00:03│    Type : Packet(F1 Key)   │        │
│ Hs 00:03.405627083  DATA1  12 01 00 02 00 00 00 40(18)│
│ Hs 00:03.405627883   ACK                      │
│ Hs 00:03.405645433   OUT    0: 0       0 C   │
│ Hs 00:03.405645766  DATA1  (0)               │
│ Hs 00:03.405646183   ACK                      │
│ Change                              Find      │
│ time display                        setup    │
└─────────────────────────────────────────────┘
```

- 📄 Refer to the manual of analyzer "Printing function" for more details.
- 📄 Regardless of the setting of analyzer, OP-SB84 outputs 80 characters per line.

```
Sample : Standard Display
*=[LE-8200]=====[2013-02-20 16:00:51]=*
* Model    : LE-8200                   *
* Version  : 1.03                      *
* Extension : OP-SB84                  *
* Serial No.: 38807015                 *
* Start time: 2013-02-20 16:00:31      *
* Stop time : 2013-02-20 16:00:41      *
*--------------------------------------*
*  PROTOCOL: USB                       *
*======================================*

SP----TM(h:m:s.us)----PID/Infomation-----------------------
  00:00:00.000000000 Suspend
  00:00:00.000000000 Reset
Hs 00:00:01.001700000 SETUP   1: 0 / CLR_FEATURE
Hs 00:00:01.001700150 DATA0 00 01 01 00 00 00 00 00 (8)
Hs 00:00:01.001700433 ACK
```

```
Sample : Detailed Display
*=[LE-8200]=====[2013-02-20 16:00:51]=*
* Model    : LE-8200                   *
* Version  : 1.03                      *
* Extension : OP-SB84                  *
* Serial No.: 38807015                 *
* Start time: 2013-02-20 16:00:31      *
* Stop time : 2013-02-20 16:00:41      *
*--------------------------------------*
*  PROTOCOL: USB                       *
*======================================*

SP----TM(h:m:s.us)----PID/Infomation-----------------------
  00:00:00.000000000 Reset
  Time stamp : 00:00:00.000000000
  Packet name : EVENT
  Reset
SP----TM(h:m:s.us)----PID/Infomation-----------------------
Hs 00:00:01.001700000 SETUP   1: 0 / CLR_FEATURE
  Speed type : High speed
  Time stamp : 00:00:01.001700000
  Packet type : Token
  Packet name : SETUP
  Address/Endpoint : 1/0
  CRC : 1Dh ( CRC5:Check OK )
SP----TM(h:m:s.us)----PID/Infomation-----------------------
Hs 00:00:01.001700150 DATA0 00 01 01 00 00 00 00 00 (8)
  Speed type : High speed
  Time stamp : 00:00:01.001700150
  Packet type : Data
  Packet name : DATA0
  Packet length : 8
  CRC : AEE5h ( CRC16:Check OK )
         +0 +1 +2 +3 +4 +5 +6 +7  +8 +9 +A +B +C +D +E +F
    0000 : 00 01 01 00 00 00 00 00
```

```
Sample : Translate Display
*=[LE-8200]=====[2013-02-20 16:00:51]=*
* Model    : LE-8200                   *
* Version  : 1.03                      *
* Extension : OP-SB84                  *
* Serial No.: 38807015                 *
* Start time: 2013-02-20 16:00:31      *
* Stop time : 2013-02-20 16:00:41      *
*--------------------------------------*
*  PROTOCOL: USB                       *
*======================================*

SP----TM(h:m:s.us)----PID/Infomation-----------------------
  00:00:00.000000000 Reset
  Time stamp : 00:00:00.000000000
  Packet name : EVENT
  Reset
SP----TM(h:m:s.us)----PID/Infomation-----------------------
Hs 00:00:01.001700000 SETUP   1: 0 / CLR_FEATURE
  Speed type : High speed
  Time stamp : 00:00:01.001700000
  Packet type : Token
  Packet name : SETUP
  Address/Endpoint : 1/0
  CRC : 1Dh ( CRC5:Check OK )
     -- Device request (Clear feature) -----------
   Direction of device requests : Host->Device
   Request type : Standard request (0)
```
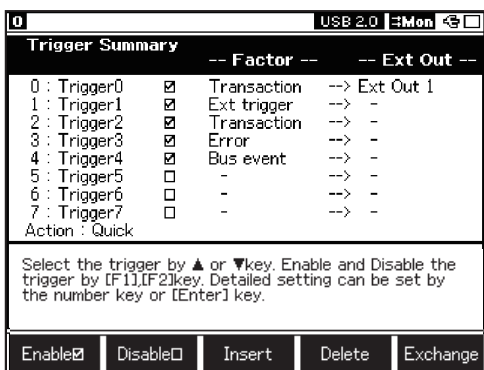
Chapter 4 Trigger Function

Trigger Function is to start a specific action upon occurrence of a specific event (Factor) as Trigger. On the basis of the specific event, it enables the analysis of data flow which is difficult to analyze under normal monitor operation.

4.1 Trigger Summary

From top menu, press [2]: "Trigger" to move "Trigger summary".

To change the trigger settings, press the numerical key or move the pointer and press [Enter].

```
┌─────────────────────────────────────────────┐
│ 0                      USB 2.0  ≡Mon  ⊕□     │
│ Trigger Summary                              │
│                     -- Factor --   -- Ext Out -- │
│  0 : Trigger0    ☑  Transaction  --> Ext Out 1 │
│  1 : Trigger1    ☑  Ext trigger  -->   -      │
│  2 : Trigger2    ☑  Transaction  -->   -      │
│  3 : Trigger3    ☑  Error        -->   -      │
│  4 : Trigger4    ☑  Bus event    -->   -      │
│  5 : Trigger5    ☐  -            -->   -      │
│  6 : Trigger6    ☐  -            -->   -      │
│  7 : Trigger7    ☐  -            -->   -      │
│ Action : Quick                               │
│ ─────────────────────────────────────────── │
│ Select the trigger by ▲ or ▼key. Enable and Disable the │
│ trigger by [F1],[F2]key. Detailed setting can be set by │
│ the number key or [Enter] key.               │
│ ─────────────────────────────────────────── │
│ Enable☑ │ Disable☐ │ Insert │ Delete │ Exchange │
└─────────────────────────────────────────────┘
```

The trigger can be the sequential trigger which starts from "Trigger0".

When all the enabled triggers are satisfied in their sequence, the stop and continuation of measurement operation which were set up by "Action" will be done.

■ Setting the trigger enable/disable

Enable or disable each trigger by [F1], [F2].

   ▤ "Trigger 0"-> "Trigger 7"operates in sequence. If the previous trigger does not become effective, the next trigger will not be effective.

   ▤ If the Error, Transaction and Bus Event are all set in "Off", the trigger is not formed. If addition, further trigger conditions will be ineffective.

■ Insert, Delete or Exchange

Press [F3] "Insert" to insert the trigger setting. Press [F4] "Delete" to delete the trigger setting. And press [F5] "Exchange" to exchange the trigger settings. [F3] "Insert" is to duplicate the trigger setting of cursor position and the setting of "Trigger 7" will be deleted.

4.2 Trigger Setting Display

On "Trigger summary", press the number key from [0] to [7], or move the pointer to some position from "Trigger 0" to "Trigger 7" and press [Enter], Trigger Setting Display appears.
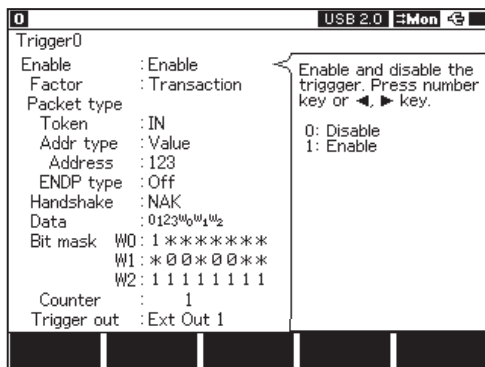
■ Enable

Select "Enable" to make the trigger enabled.

■ Factor

Select the trigger condition.

Items	Trigger condition
Error	CRC error , PID error
Transaction	Transaction
Bus event	Bus event
Ext trigger	A status of the four external input pins

<Error>

- CRC

  Select "On" to add CRC error to the trigger conditions.

- PID

  Select "On" to add PID error to the trigger conditions.

▤ When one of selected items occurs, the trigger condition is formed.

<Transaction>

- Token

  Select Token PID to include the Token packet for trigger condition.

▤ If "None" is selected, Token packets will not be the target of trigger condition, regardless of the setting of "Addr type/Addres" and "ENDP type/Endpoint".

- Addr type/Address

  Set the Address of transactions for trigger conditions.

- ENDP type/Endpoint

  Set the Endpoint of transactions for trigger conditions.

- Handshake

  Select the Handshake packet for trigger conditions.
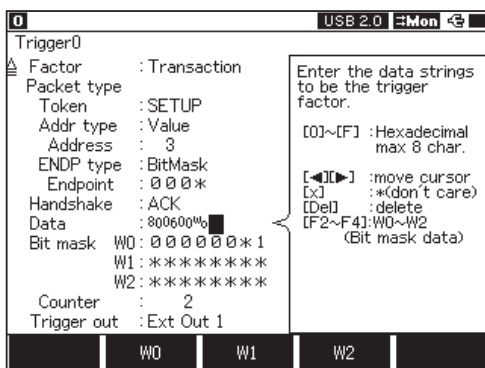
- Data

  Set the DATA packet's payload for trigger conditions.

▤ If there is no character, Data Packet will not be the trigger condition.

▤ If there is no character and other items are set "Off", it will be an invalid setting.

<Example of transaction setting>

| Token | : SETUP | (Token packet is SETUP) |

| Adder type | : Value | |
| Address | : 3 | (Address is 3) |

ENDP type   : Bit mask
 Endpoint   : 000*   (Endpoint is 1 or 0)

Handshake   : ACK   (Handshake is ACK)

Data   : 80 06 00 W0
Bit mask   W0 : 000000*1
             (Head of DATA packet's payload is "80 06 00 03" or "80 06 00 01")

Counter   : 2
(When the transaction which agrees with all conditions above comes twice, the
trigger condition is formed and trigger mark is saved with the log data.)

Trigger out : Ext out 1   (Low pulse will be output from External output pin 1.)

First formation

Second formation
(Trigger 0 has been
formed.)

<Bus event>

Select "On" of each Bus event for trigger conditions.

- RESET
- SUSPEND
- DISCONNECT

▤ When one of selected items occurs, the trigger condition is formed.

<Ext trigger>

Set the status of the four external input pins for trigger conditions.

Signals of the external input pins will be checked per 10us.

▤ "*" is "Don't care".

▤ The log "EXTIN" will be recorded when the trigger condition is satisfied.
However, when the communication band of USB is tight, it is possible that the log
will not be recorded, since priority is given to recording USB data.

<VBus>

The Ranges (Voltage/Current) set here are to be a target of trigger judgement.

Voltage: VBus measurement value (voltage) is to be a trigger condition.

Current: VBus measurement value (current) is to be a trigger condition.
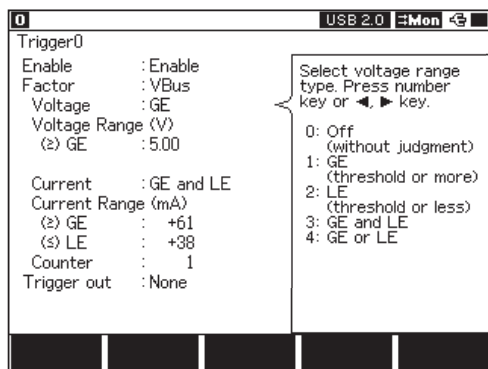
▤ Only when "VBus:On" is selected at configuration, the trigger condition is judged.

▤ The resolution of current measurement is bigger than 1mA, thus the threshold can
be adjusted to proper value after setting it at "Current".

- If both "Voltage" and "Current" are valid, when either "Voltage" or "Current" meets the condition, the trigger condition is judged to be met.
- Trigger flag is displayed at the end of the current of VBus log data.

■ Counter

Set the number of occurence of trigger conditions. When the number of occurence filled the designated number, the trigger will be satisfied.
- At the satisfaction of trigger counters, the trigger log is recorded. And if output setting is enabled, a pulse will be output from the external output pin.

■ Trigger out

Select the external output pin to output a pulse when the trigger condition is satisfied.
- If "5: Repeat" is selected (described at "4.3 Trigger Action Setting"), a pulse is output every time the last enabled trigger is satisfied.
- If the trigger conditions are satisfied continuously, external output pin keeps low level outputting. After 10us from the last trigger satisfaction, it returns to high level.
- If the trigger condition is met continuously, External output pin keeps the low level output. From the last trigger satisfaction it returns to high level after 10us.

▼The trigger condition is satisfied. ▼ ▼ ▼ ▼

H(+5V)
L(GND)

About 10 us   About 10 us
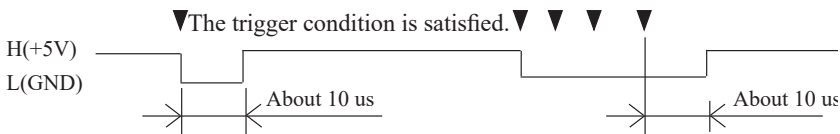
4.3 Trigger Action Setup

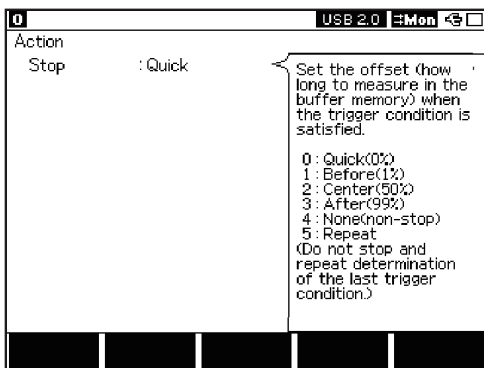Move the cursor to the "Action", and press [Enter] to setup the action of measurement after all of the trigger conditions are satisfied.

On [0], [1], [2] or [3], when the trigger conditions are satisfied the measurement will stop according to the condition.

On [4] or [5], the measurement will not stop.

Setup	Action
0:Quick	Just after the last trigger condition is satisfied, stops the measurement.
1:Before	After the last trigger condition is satisfied and then about 1 % data of the buffer is captured, stops the measurement.
2:Center	After the last trigger condition is satisfied and then about 50 % data of the buffer is captured, stops the measurement.
3:After	After the last trigger condition is satisfied and then about 99 % data is captured, stops the measurement.
4:None	Even after the last trigger condition is satisfied, continues the measurement.
5:Repeat	Even after the last trigger condition is satisfied, continues the measurement. And the available trigger conditions are checked continuously.

Chapter 5 VBUS measurement

Measures power consumption, voltage and current between USB host and USB device.
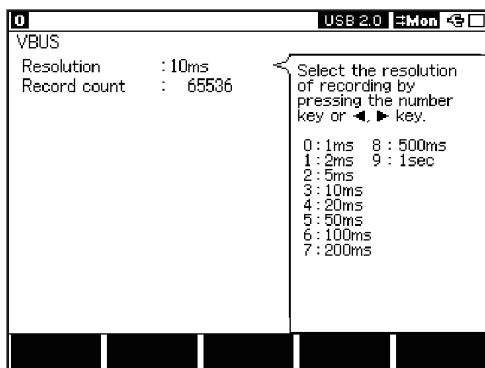
5.1 Connection

Connect USB host to "HOST" port and USB device to "DEVICE " port of the analyzer.

Refer to "3.1 Connection".

5.2 Setup

On the top menu, press [6]"VBUS options" to set the condition of VBus measurement.

■ Resolution

Select the cycle which carries out VBus measurement.

■ Record count

Input the number of the times for VBus measurement (1 to 4194304).

5.3 Start and Stop Measurement

When pressing [Run], the analyzer starts measurement, and automatically stops the measurement when the specified number of records are completed.
Measurement duration is equal to the specified time of "Resolution" x the numbers of "Record count". Press [Stop] to stop measurement before its completion.

- 📄 Please refer to the Analyzer instraction manual about how to make files of ".SU(setting data)"and ".DT(measured data)".

- 📄 To prevent the analyzer's malfunction , do not put the voltage over 8.5V on the VBus line.
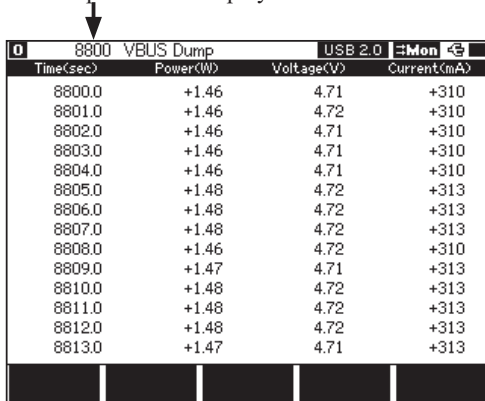
5.4 Display

Press [Data] to change the display of "VBUS Dump" and "VBUS Graph" consecutively.

- 📄 During measurement, press [F5] to pause and resume display update.

- 📄 About Current display, "+" means the current direction from A connector ("HOST") to B connector ("DEVICE") of the analyzer. And "-" means the opposite.

- 📄 The measurable range of voltage is 0.00V to +8.00V, and that of current is from -2000mA to +2000mA.

■ Dump Display
The measurement results are displayed in a list.

Data position of displayed data

| Time(sec)	Power(W)	Voltage(V)	Current(mA)
8800.0	+1.46	4.71	+310
8801.0	+1.46	4.72	+310
8802.0	+1.46	4.71	+310
8803.0	+1.46	4.71	+310
8804.0	+1.46	4.71	+310
8805.0	+1.48	4.72	+313
8806.0	+1.48	4.72	+313
8807.0	+1.48	4.72	+313
8808.0	+1.46	4.72	+310
8809.0	+1.47	4.71	+313
8810.0	+1.48	4.72	+313
8811.0	+1.48	4.72	+313
8812.0	+1.48	4.72	+313
8813.0	+1.47	4.71	+313

Power   :Power(W)

Voltage   :Voltage(V)

Current   :Current(mA)

- 📄 In the Dump display, input position number and press [Enter] to jump to the appointed position.(OPSB84 version 1.02 or above)

■ Graph Display

The measurement result is indicated in the graph.
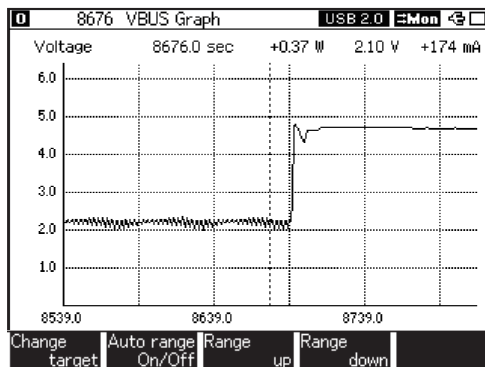
The range of the graph is automatically optimized by the measured value.

Cursor of the display can be moved to left and right with the key [◀][▶] .

Press [F1] to change the display from Current, Power to Voltage in turn.

The indicatory range is moved with the key [PageUp][PageDown].

▤ Press [F2] to select "Auto Range On/Off".

▤ At "Auto Range On", the range can be arranged by "Range up" and "Range down".

▤ Values on the top of display shows the values at the cursor position.

5.5 Use of data

Measurement data can be saved on CF card in the form of a text file or a CSV file. They are utilizable with a word processor or spreadsheet software on PC.

Preparation:

Insert a CF card to the analyzer.

Press [MENU], [F2], [F] to "Print out Condition". Select "File" at "Output".

Procedure of saving measured data.

1. Do measuring VBus data.

2. Press [Data] to Dump Display.

3. Move the screen to the top of data for saving by scrolling or paging.

4. Press [Top] when saving all data.

5. Then press [Print], and input the number of pages to be saved.

   📄 One page consists of 66 lines. To save all data, input a large number, such as 99999. To save a large amount of data, it may consume some time.

6. Press [F1] "Change output type". Select "Normal" (Text format) or "CSV" (CSV format).

7. Press [Enter]. The data is saved to CF card in the selected format.

   The data files are in the "PRINTOUT" folder in the CF card.

   If "AUX" is selected at "Output" in "Print out Condition", the measured data will be output from AUX (RS-232C) port of the analyzer.

Text	CSV

<pre>*=[LE-8200]=====[2013-02-20 16:01:52]=*
* Model   : LE-8200   *
* Version   : 1.03   *
* Extension : OP-SB84   *
* Serial No.: 38807015   *
* Start time: 2013-02-20 16:01:21 *
* Stop time : 2013-02-20 16:01:22 *
------------------------------ 	
* RESOLUTION : 1MSEC   *
==============================
 	
------TM(s.ms)-----POWER(W)----VOLTAGE(V)---CURRENT(mA)---
     0.520   -0.00   0.02   -22
     0.521   -0.00   0.02   -22
     0.522   -0.01   0.55   -22
     0.523   +0.00   4.05   +0
     0.524   +0.01   3.98   +2
     0.525   +0.01   4.00   +2
     0.526   +0.01   4.00   +2
     0.527   +0.01   4.00   +2
     0.528   +0.01   4.00   +2
     0.529   +0.01   4.23   +2
     0.530   +0.03   4.88   +6</pre>
	<pre>0.520,-0.00,0.02,-22
	0.521,-0.00,0.02,-22
	0.522,-0.01,0.55,-22
	0.523,+0.00,4.05,+0
	0.524,+0.01,3.98,+2
	0.525,+0.01,4.00,+2
	0.526,+0.01,4.00,+2
	0.527,+0.01,4.00,+2
	0.528,+0.01,4.00,+2
	0.529,+0.01,4.23,+2
	0.530,+0.03,4.88,+6
	0.531,+0.05,4.93,+10
	0.532,+0.05,4.94,+10
	0.533,+0.05,4.95,+10
	0.534,+0.05,4.95,+10
	0.535,+0.05,4.95,+10
	0.536,+0.05,4.95,+10
	0.537,+0.05,4.95,+10
	0.538,+0.05,4.95,+10
	0.539,+0.05,4.95,+10
	0.540,+0.05,4.95,+10
	0.541,+0.05,4.95,+10
	0.542,+0.05,4.95,+10</pre>

   📄 It consumes much time to convert a large USB data into a text file on LE-8200A/ LE-8200. In this case, it is recommended to use leucvt_win which is much faster than LE-8200A/LE-8200.
   Please refer to "6.1 Data Conversion Software (leucvt_win)" for more information.

Chapter 6 Utility Software

6.1 Data Conversion Software(leucvt_win)

"leucvt_win" is the utility software which converts USB data files (.DT) measured by OP-SB84 into text files on PC. It can also convert VBus data files into both text files and csv files.

"leucvt_win" coverts files much faster than converting by the Analyzer itself.

> 📄 "leucvt_win" coverts into text file much faster than Analyzer.

<Summary>
  1) Preparation

    1. Make a directly in the PC, and copy "lepcpcvt.exe" there.
    2. Copy saved data in the CF card to the directly made in 1.

  2) Convert Data

    1. Double-click on "leucvt_win.exe".
    2. Click on "..." at "Folder" and select the directly.

    (Measured data files (.DT) copied in the directly)

    3. Measured data files (.DT) appear at "File list:".

    (Press "Refresh" to update the file information.)

    4. Click the file to convert. It is able to select more than one files at once. Press

        "Select all" to select all files. Press "No select" to cancel the selection.
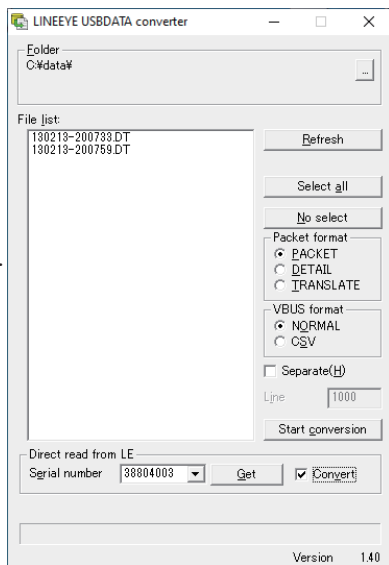
    5. Select the format.

        When it is a USB packet data,

                PACKET (only the basic display)

                DETAIL (basic and detailed display)

                TRANSLATE (basic, detailed, and translated display)

When it is a VBUS data,

NORMAL (text format)

CSV (csv format) – In this case the extension will be .csv.

Select from the above. It is applied to all the files which selected at (4).

6. Select the [Separate] check box to output the files in specified line numbers. Minimum line number is "10" and maximum is "10000".

(When it reaches "10000", it will display [error] and stop outputting.)

7. Press "StartConversion" to start conversion.

8. After the conversion, ".txt" or ".csv" format file of the same name will be made in the same directly.

3) About data transfer

1. Input the serial number (written on the back side of the analyzer which is connected to PC by USB) at "Serial number".

2. Press "Get" to transfer the data recorded in the analyzer to PC.

3. As soon as it completes the transfer, enter the file name and save the data.

4. When the item "Convert" is checked, it converts the transferred data directly.

6.2 LE-650H2 analysis software

It is able to use the analysis software for USB analyzer "LE-650H2/LE-650H2-A" to read the captured and analyze it on the PC.

▤ Download the software from LINEEYE webpage.

▤ To use the software, turn off the VBUS measurement function.

(Menu[0]->"Configuration"->"VBus: OFF".) Measurement data with VBUS measurement function cannot be read by the software.

Chapter 7 Maintenance

7.1 Troubleshooting

Problem	Cause/Remedy	
Unable to monitor	Cause	1) The cable connection is wrong. 2) The filter setting at "Configuration" is not appropriate for the target situation.
	Remedy	1) Check the cable connection. 2) Adapt the filter setting at "Configuration" to the target situation. 　(If the filtering is unnecessary, disable all filter settings.)
After measuring of ONLINE mode, no data is displayed.	Cause	Display filter may work.
	Remedy	On the standard data display, press [Shift] + [F5] to go to "Display setup". Then disable the display filters.
Measured USB data has many errors.	Cause	Less integrity of USB signals
	Remedy	Use shorter USB cable with the USB certification (for reducing error). If the USB host device is a PC, try to change the USB port of the PC. (to reduce errors)
USB host does not recognize USB device via the analyzer.	Cause	1) The power of the analyzer is off. 2) VBus voltage becomes lower because of the total length of USB cables (in the case of VBus powered device).
	Remedy	1) Turn on of the analyzer before connecting cables. 2) Use shorter USB cable or Y cable.
Unable to make power off	Cause	Unexpected events have been happened.
	Remedy	Press and hold the power key for a while.

Chapter 8 Specification

Item	Description
Applicable Analyzer	LE-8200A/LE-8200
Interface	USB 1.1/2.0 A/B receptacle 1 each
Applied speed	HIGH (480Mbps) / FULL (12Mbps) / LOW (1.5Mbps)Automatic detection, Automatic switching
Memory capacity	Capture memory of Analyzer is 100MB
Record type	Ring buffer or Fixed size buffer
Auto save function	On ONLINE Monitor Function automatically saves the monitored USB data as communications log file in the external memory.[*1]
USB log display	USB Packet : SOF, IN, OUT, SETUP, DATA0, DATA1, ACK, NAK, STALL, PRE, DATA2, PING, MDATA, SPLIT, ERR, NYET, and [Unknown] Bus event : Reset, Suspend, Device disconnect, Device chirp, Hub chirp, OTG Vbus event Translation : Standard device request, Standard device descriptor. Measure VBUS voltage/current simultaneously.
Timestamp	Resolution 16.7nsec. for Max. 20 hours Elapsed time and Time between two packets are selectable.
Log filter function	Record or not record SOF, IN transactions without IN-DATA, PING transactions, OTG Vbus event, Specific address, and Specific endpoint.
Display filter function	Display or hide SOF, Transaction of IN-NAK, SETUP, PING, specific address and specific end point.[*2]
Trigger function	Able to set 8 trigger conditions(Trigger 0 to 7). Triggers are proceeded in a sequence from Trigger 0.
Trigger condition	Errors(CRC and PID errors), Particular address/end points, Packet types(TOKEN and HAND SHAKE packets in combination), Data packets (max 8 bytes from the head of DATA packet's payload), Bus events, VBUS voltage/current, logical state of 4 external signal.
Trigger action	Outputs a pulse signal from an external terminal after satisfaction of trigger condition.Stop measurement after satisfaction of the last trigger, repetition of the last trigger condition, continuously logging.
Retrieval function	Retrieves the specified frame or events to display and displays the top of data or counts the number of data.
VBUS measurement function	Vbus measurement(Dump or Graph(Current,Voltage, Power)) Voltage : 0.00V to +8.00V (Accuracy : ±1% FS) Current : -2000mA to +2000mA[*3] (Accuracy : ±2% FS)
Conversion and Printout of Data	USB data can be converted to text files, printed out and saved to external memory. Vbus measured data can be converted to text files and csv files.
External input or output pins	4 TTL level inputs and 4 TTL level outputs Linked with trigger function

*1: Able to record up to the capacity of external memory (CF card, USB flash drive). However, it is possible that there is some capturing loss for a large load data, because saving to the external memory cannot be proceeded at the same time.

*2: Translation of various class specific descriptors and device requests will be supported in the future version's up.

*3: About Current, "+" means the current direction from A connector ("HOST") to B connector ("DEVICE") , and "-" means the opposite.

There is a registration page on our web site.
(https://www.lineeye.com)
Please register your product for further support.
We will provide you the firmware update
 information and sales information etc.

LINEEYE CO., LTD.

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