
USB 2.0 Protocol Analyzer

LE-650H2 / LE-650H2-A

INSTRUCTION MANUAL

Before Using the Product

Introduce

Thank you for your purchase of USB Protocol Analyzer LE-650H2/LE-650H2-A.

Please read the operating instruction carefully before use to ensure safe operation of LE-650H2/LE-650H2-A.

Please be sure to save this Manual.

After installing the online help, you can use it from the software menu "Help" (or click the "" icon).

NOTICE

- This manual is a common instruction manual for LE-650H2 / LE-650H2-A.
Since the operation method and screen are almost the same, they are explained by the same screen.
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- The image of this manual may be difficult to see due to its size. For details of the image, refer to the online help (or the pdf file of the attached CD).

USER LIMITATION

This product has been developed for the purpose of using as an analyzer only, and has not been developed for the use that needs exclusively high reliability and safety; aerospace apparatus, trunk communication apparatus, nuclear control apparatus, medical apparatus related with life maintenance and etc. Also, this product does not warrant the use for those purposes. If you use for those purposes, please consider the safety measures against fail-safe etc. on your responsibility.

Read this first ! !

Please read the operating instruction carefully before use to ensure safe operation of LE-650H2/LE-650H2-A. The general safety rules are provided for your benefit to protect you and those around you. Please read and follow them to avoid unnecessary injury and damage to the product and property and touse LE-650H2/LE-650H2-A right and safely.

Before you use this LE-650H2/LE-650H2-A, please familiarize yourself with the contents (symbols,marks) provided below.

[Explanation of the symbols (The degree of the hazard factor)]

-  **WARNING** The symbol denotes that improper handling poses a risk of causing death or serious injury.
-  **CAUTION** "The symbol denotes that improper handling poses a risk of causing injury or damage to the product and property."

*"Injury" indicates injury, burn, an electric shock, or the like which does not require hospitalization or the extend over a long period of hospital visit.

*"Damage to the product and property" indicates damage expansion related to a house, a building, furniture, apparatus, livestock or apet.

[Explanation of the figure marks(concrete detail)]

-  Indicates prohibition (things that you must not do)
-  Indicates comslsion (things that you must do)

 WARNING	
	*Stop using LE-650H2/LE-650H2-A immediately when smoke or smells emanate from LE-650H2/LE-650H2-A.The continuous use may result in an electric shock, a burn and/or fire.
	*Do not disassemble, modification or repair LE-650H2/LE-650H2-A Failure to observe this may result in injury, an electric shock, fire and/or a breakdown due tooverheating.
	*Do not throw LE-650H2/LE-650H2-A into a fire, or expose to heat. Failure to observe this may result in fire, fire due to explosion and/or injury.
	*Do not use LE-650H2/LE-650H2-A if any form of liquid or foreign matter entered LE-650H2/LE-650H2-A . Failure to observe this may result in an electric shock and/or fire.
	*Do not use in the place which generates inflammable gas etc.This may result fire. Keep the products away from water.Failure to do so may result in the heat generation, an electric shock and/or unit malfunction.
 CAUTION	
	<p>Do not place LE-650H2/LE-650H2-A in the following places. Failure to observe this may result in overheating, a burn, an electric shock and/or breakdown.</p> <ul style="list-style-type: none"> ■ a place where strong magnetic field and static electricity are generated, a dusty place ■ The places with the humidity and temperature exceeding the tolerance level, and with a rapid temperature change. ■ a place where unstable place and vibration are generated ■ a place exposed to direct sunlight, a circumference of fire or the place where it is filled with heat ■ a place with danger of the electric leak and water leak

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Outline

LE-650H2/LE-650H2-A is apparatus which connects with a PC, and analyzes "USB Protocol". "USB Protocol" is recorded on the hard disk of PC on real time, and it is displayed intelligibly for a LE-650H2/LE-650H2-A Software window.

- HIGH/FULL/LOW speed modes automatic identification
The device speed to observe is judged automatically.
- Continuous record a max.10Gbyte (Max. 40Gbyte for LE-650H2-A)
Monitored USB data is recorded up to 10Gbyte into the PC hard disk drive. And the screen can be also scrolled during analysis. It is effective in the analysis of the unspecified trouble which rarely happens.
- Intelligible Display
“Packets” in monitored data is intelligibly displayed per “Transaction”.
“Standard device request” and “Descriptor” are translated in detail.
- Trigger function linking with other measuring instruments
It is possible to specify up to 16 sets of trigger which can execute the actions in sequence. When receiving error or specific packets, you can select start and stop of measurement or trigger output which is effective to link with other measuring instruments.
- Upgraded Off-Line Analysis Capability
It is easy to find data which you are interested in from enormous recorded measurement data by filtering. To learn more about details, please refer to the online help.functions and Find functions.

Composition

Please check whether the following have gathered at the time of delivery of goods.

< LE-650H2/ LE-650H2-A >

- USB Analyzer : 1
- USB cable (with A-B plug 1.8m/0.9m) : 2
- CD-ROM (LE-650H2 software) : 1
- Installation manual : 1
- Warranty/Customer registration card : 1

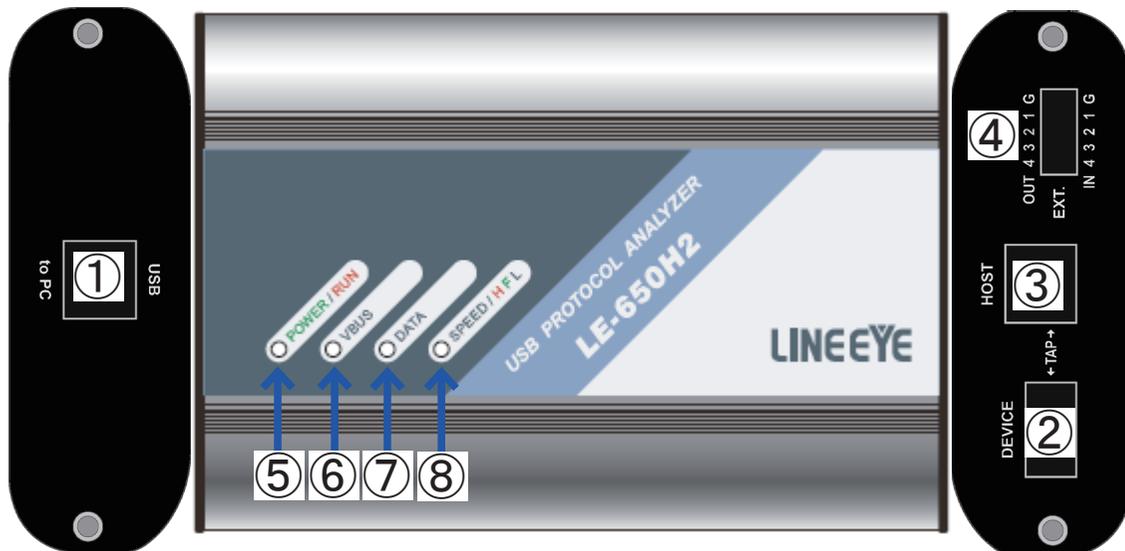
If any item lacks, please contact the distributor where you purchased the product or us.

System Requirement

- PC
 - PC/AT compatible. CPU:Core 2 Duo or later (Core i series or later recommended). Memory:1GByte or more
 - A USB 2.0 port can be used.
- HDD
 - 30MByte free space is required to install the software.
 - In addition to the above, a log data recording area is required.
- Display resolution
 - 1024 x 768 pixel or more is recommended.
- OS
 - Windows® 7 (32-bit / 64-bit) / 8.1 (32-bit / 64-bit) / 10 (32-bit / 64-bit)

1. Explanation of each part

< LE-650H2 / LE-650H2-A >



1. USB connector for analysis PC	Connect to an analysis PC with the attached cable.
2. USB device connector	Connect to a USB device to be measured.
3. USB host connector	Connect to a USB host to be measured.
4. External trigger connector	External trigger input / output port 10-pin connector * 1
5. POWER/RUN	Lit in green: The Power is ON and in measurement-standby state Lit in red: In measurement Blink in orange: Overflow occurred When the buffer memory inside the main unit is full * 2
6. VBUS	Indicates the voltage level of VBUS. Lit in green: Approximately 4.5V or higher Off: Less than about 4.5V
7. DATA	Indicates the data communication status between the measurement target USB host and the device. Lit in green: When transferring data between the USB host and the device Lit in red: The USB bus status is "BUS RESET" Lit in orange: SUSPEND
8. SPEED H/F/L	The speed of the USB device being measured (Hi-Speed / Full-Speed /Low-Speed) is shown. Lit in green: Full-Speed Lit in red: Hi-Speed Off: Low-Speed

* 1 An optional 5-wire probe cable (model number LE-5LP2) can be used.

* 2 When it lights in orange, it stays in orange even after a free space is made in the internal memory. When the log operation is started again, it lights in green.

2. Installation of software and drivers

2-1. Installation of PC soft and USB Driver (Windows7/8.1/10)

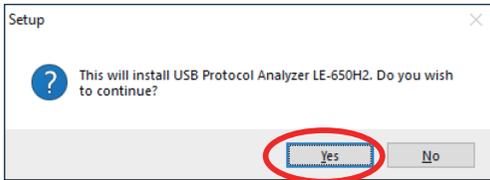
Insert the attachment CD-ROM into the CD-ROM Drive of PC.

Then, the installer automatically starts. If it does not start automatically, click "setup.exe" on the CD-ROM.

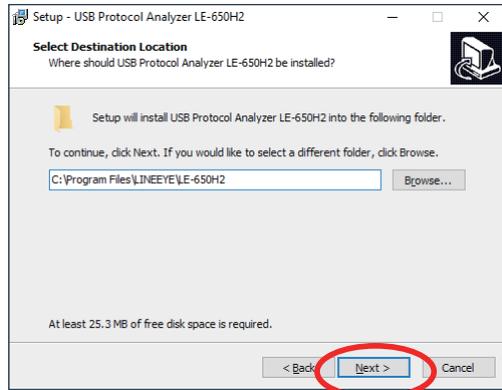
Attention: Please install the software before connecting the analyzer.

The driver will be available when connecting the analyzer to the PC at the first time after installing the software.

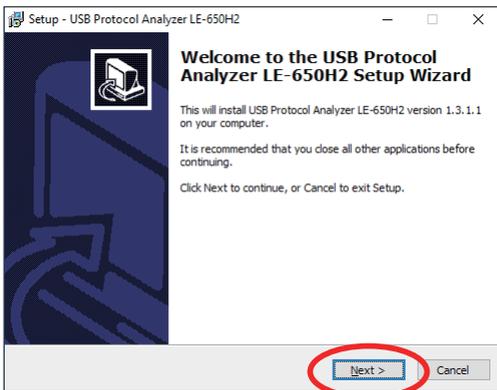
1. The setup dialog box appears. To start the setup wizard, click "Yes."



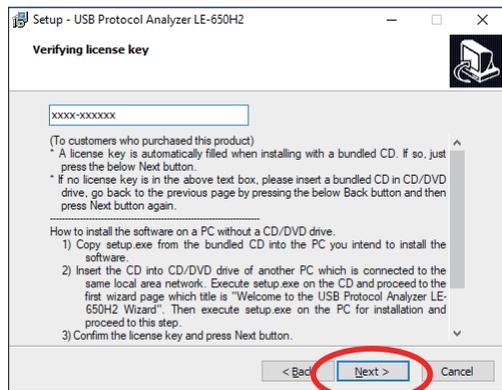
4. Click "Next" to continue. If you would like to select a different folder, click Browse.



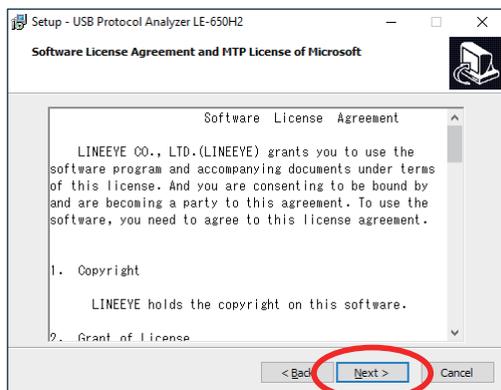
2. Click "Next", when following setup dialog is displayed.



5. The license key will automatically appear when "Verifying license key" dialog is displayed. Then click "Next" to continue.

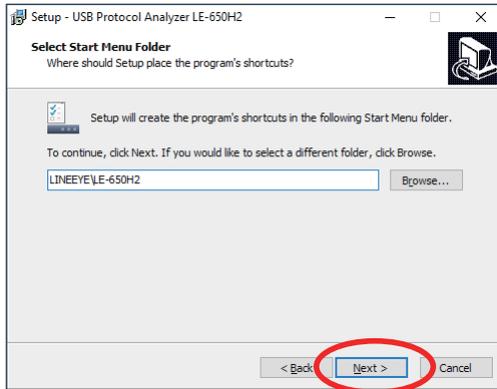


3. Confirmation of Software licence agreement and MTP(Media Transfer Protocol) licence of Microsoft are displayed. To use these functions of MTP, you need to accept the license agreements and click "Next".



*In case of installing the trial version, click "Next" without filling the blank.

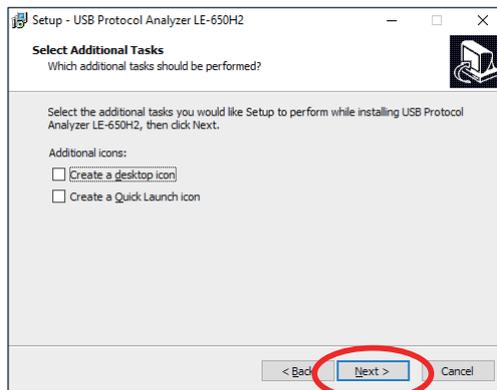
6. Click “Next” to continue. If you would like to select a different folder, click Browse.



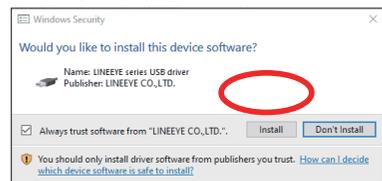
9. Click [Next] when starting the installation of the device driver.



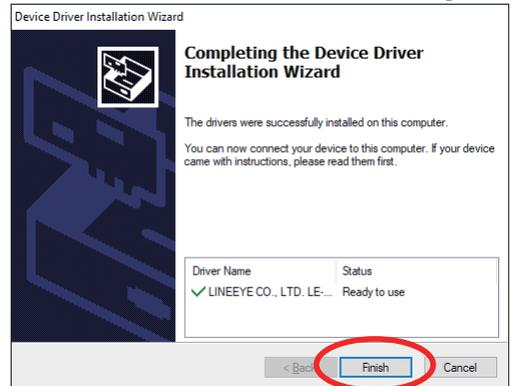
7. Select the additional tasks which you would like Setup to perform, then click “Next”.



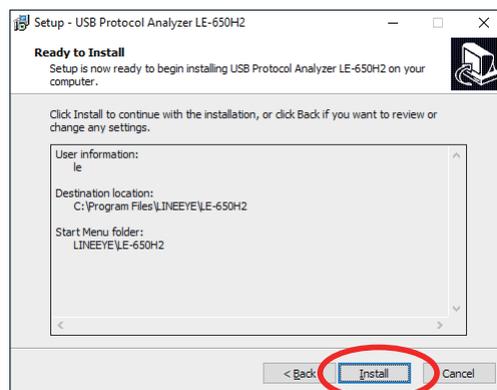
10. Click “Install”, when the following dialog is displayed.



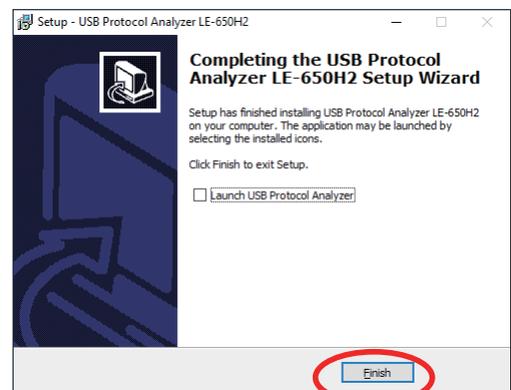
11. When the following dialog is displayed, the installation of driver has been done. Click [Finish].



8. Click “Install” to continue with the installation.



12. Installation of software will be started. When the set-up wizard is completed, the installation is finished. Click [Finish].



2-2. Installation to PC via LAN

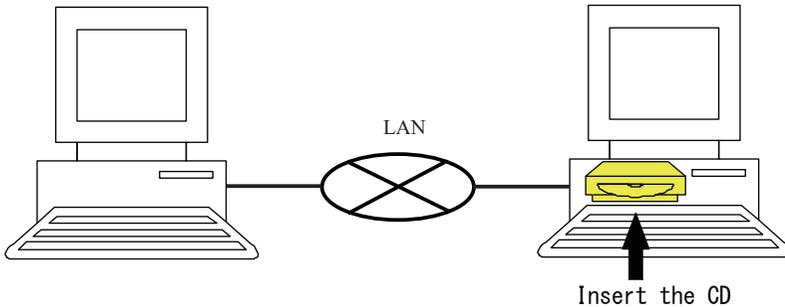
You can install the software to the PC which does not have a CD drive via LAN, using another PC with a CD drive.

*You can also install it using an external CD drive, but here we will explain other methods.

1. Insert the CD to the PC with a CD drive.

The PC for installation without a CD drive

The PC with a CD drive



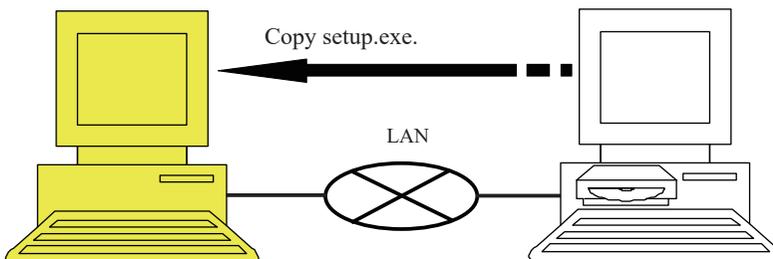
2. Set the property of the CD drive to access from the PC without the CD drive (for more information, please consult your network administrator).

3. Copy "setup.exe(v1.0.0.2 or above)" to the appropriate folder in the PC without the CD drive.

*If you have the CD which version is v1.0.0.1 or below, install the latest software from LINEEYE web-page.

The PC for installation without a CD drive

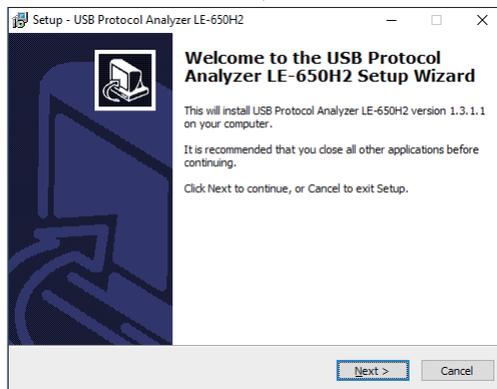
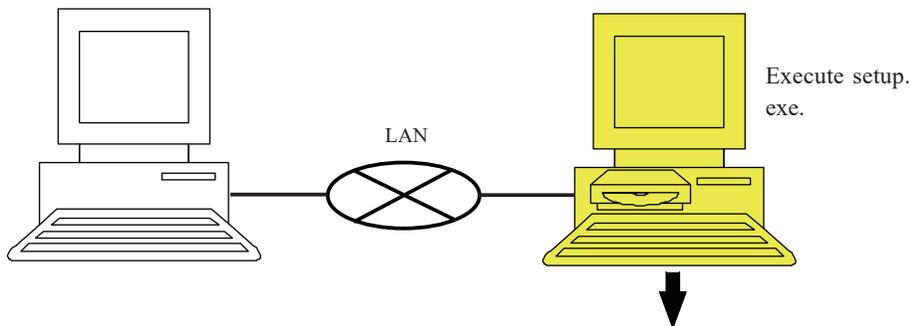
The PC with a CD drive



4. Execute “setup.exe” in the PC with the CD drive. Then proceed the process until “The USB Protocol Analyzer LE-650H2 setup wizard” appears.

The PC for installation without a CD drive

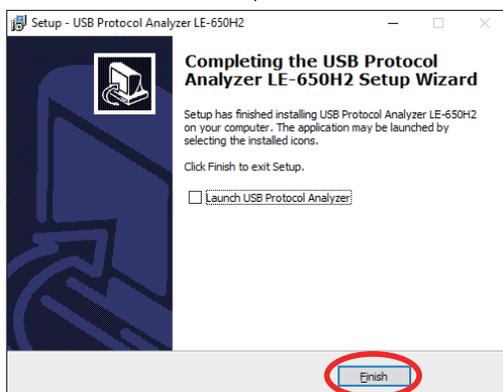
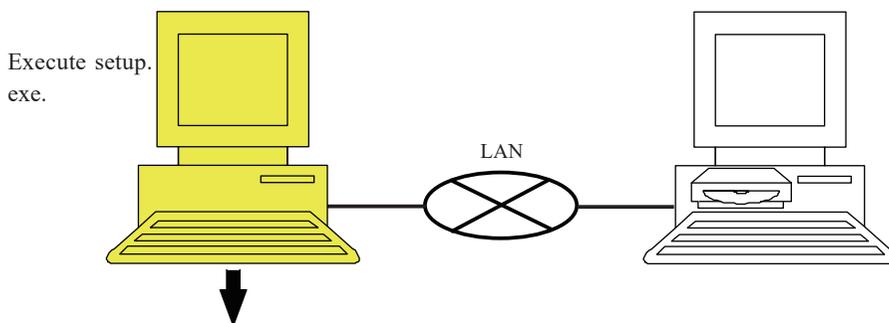
The PC with a CD drive



5. Execute the “setup.exe” from the PC without the CD drive. The license key number is automatically filled and then complete the setup wizard.

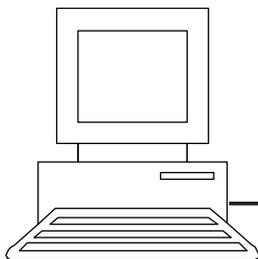
The PC for installation without a CD drive

The PC with a CD drive

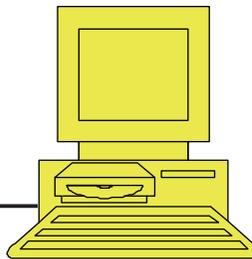


6. After finishing the installation at (5), cancel the setup wizard started at (4).

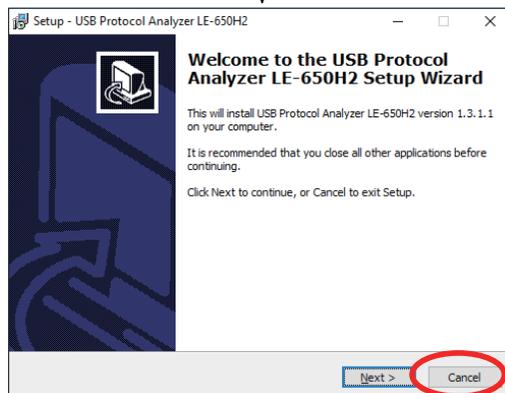
The PC for installation without a CD drive



The PC with a CD drive



LAN



2-3. About Version Up

The latest version of monitoring software can be used by downloading it from our website. However, it requires a “license” to use new functions which are added later than about 1 year after your purchase of the product.

Note: Bug fixing can be updated without this limitation.

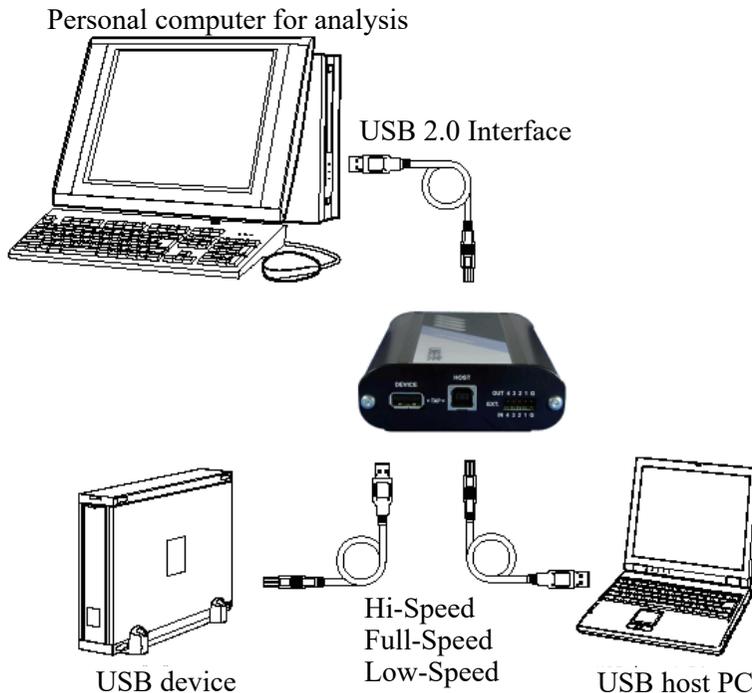
3. Connection

3-1. Basic connection

USB protocol analyzer LE-650H2 / LE-650H2-A displays and records the captured log on a PC. This PC used for displaying and recording is called "Analysis PC."

The host PC for USB protocol analyzer needs to have a USB interface supporting USB2.0 High-Speed.

Connect the USB connector on the back of USB protocol analyzer LE-650H2/LE-650H2-A to the USB port on analysis PC by using the USB2.0 High-Speed (Certified) cable as the figure below shows.



< Notes on connection with analysis PC >

The connection with the analysis PC must be made by USB2.0 Hi-Speed. Please note that it will not work when connected at Full-Speed caused by such as the use of poor quality USB cable.

When the setting in the Windows power management has an option such as putting the system to sleep when the operation is not performed for a certain period of time and the option is abled, "The error occurred while transferring the log data.Log operation has been stopped." message may appear during measurement and the measurement may be stopped. To avoid this, if there is such a setting, please disable it.

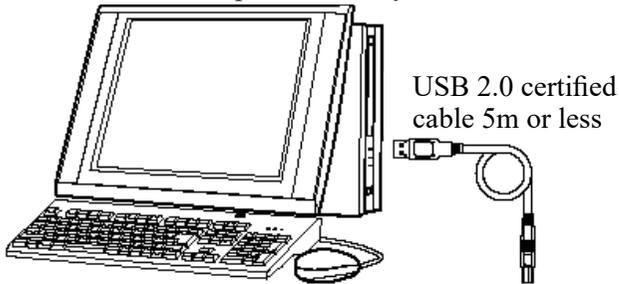
3-2. Notes on the USB cables

- Use the cable which has attested all USB2.0 standards for the USB connection. All must use the USB2.0 standard certified cable to connect USB.
- Follow the conditions below such as the length of the USB cable.

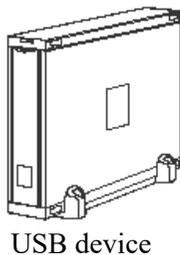
Connecting LE-650H2 / LE-650H2-A to the USB protocol analyzer host PC

- Use One USB2.0 standard certified cable 5m or shorter.
- Do not use a hub or extension cable on the way.

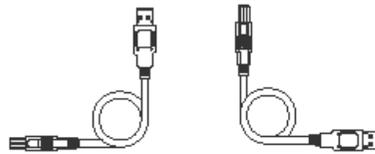
Personal computer for analysis



USB 2.0 certified
cable 5m or less



USB device



Hi-Speed
Full-Speed
Low-Speed



USB host PC

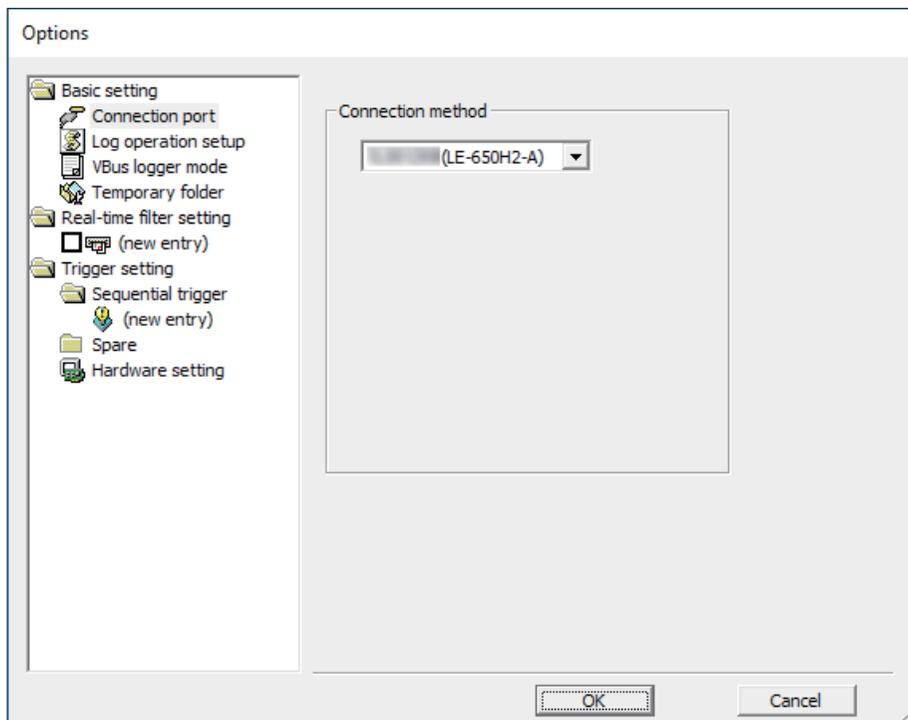
Connection with the measurement targets

- Make a TAP connection to the analyzer as shown in the figure using the attached shorter USB cable and the USB cable which was used to connect the devices to be measured.
- Keep the total length of the two cables as short as possible.(3m or less recommended)

4. Basic operation

1. Connect the analysis computer and LE-650H2 / LE-650H2-A with the included USB cable.
For the detail see "3. Connection" on page 12.
2. The analysis software automatically detects that the LE-650H2 / LE-650H2-A is connected and initializes the LE-650H2 / LE-650H2-A hardware. You can start measurement after when the POWER / RUN LED of LE-650H2 / LE-650H2-A lights up in green.
3. Set the analysis software.
Start the software and select "Options" "Connection port" from "Log" in the menu.
The dialog shown below appears.
Select the serial number (LE-650H2) / serial number (LE-650H2-A) from the "Connection method" list.

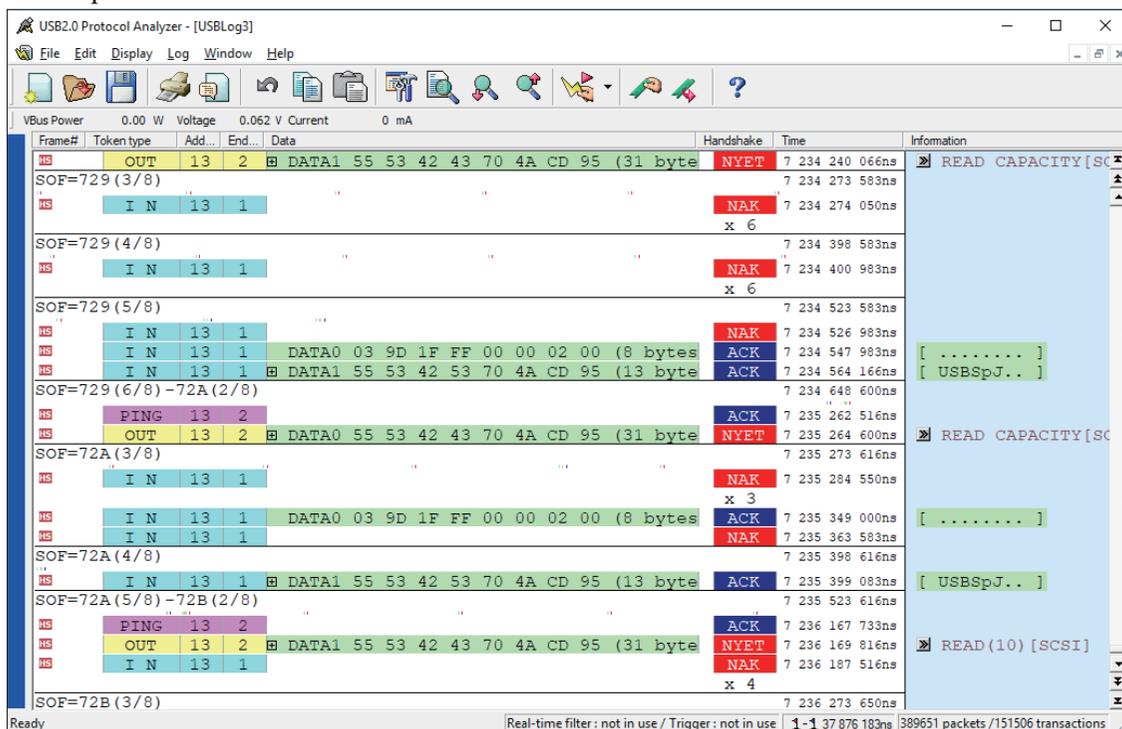
This setting is required only when you run the analysis software for the first time.



4. Connect the USB host and USB device which you want to measure to LE-650H2 / LE-650H2-A.
* We recommend you to connect only the USB device for which you want to acquire logs, and do not connect other USB devices.

5. Press the space key or the "Log start" button to start the measurement.
6. While saving the data from the first USB packet found to the HDD / SSD of the analysis PC, it displays it on the screen with an easy-to-understand transaction unit. The analysis software can scroll the data display even during the measurement.

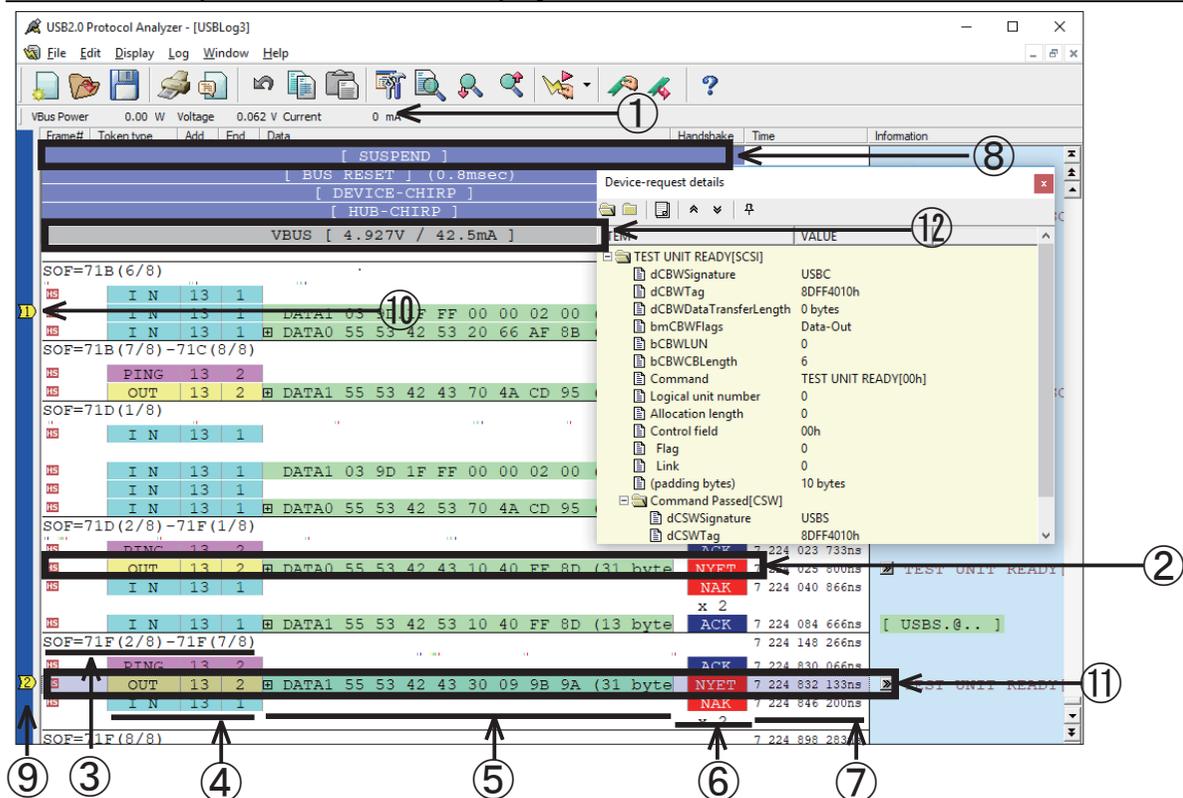
< Example of measurement >



7. When you finish the analysis/measurement, press the space key or the "Stop" button to finish the measurement.
 - * If a large amount of data is measured, it may take several minutes after stopping.
8. If necessary, use the display filter and search function to perform analysis. (You can quickly search and display the communication data you want to see.)
9. If you want to save the measured data, save the log to a file.
 - * If you want to extract only the necessary communication data part to organize and save it, click "New" from the "File" menu to create a new log window, and use the "Copy" and "Paste" functions to paste and put it together to this new log window.

5. The display screen

5-1. Explanation of Packet Display

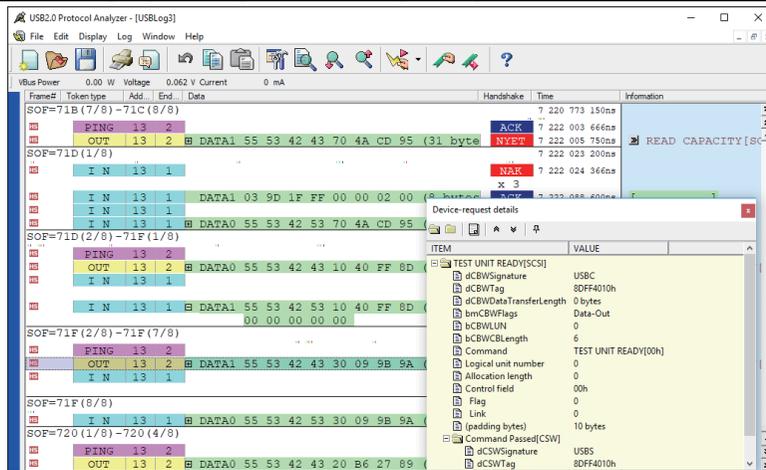


- ① : VBus measurement bar The power (W), voltage (V), and current (mA) of the BUS line being measured are measured and displayed.
- ② : Displays plural packets as a transaction in one line.
- ③ : Display SOF (Start of Frame). In the High-Speed device, the micro frame is displayed as "(1/8)" - "(8/8)". Because a Low-Speed device does not generate SOF packets, nothing appears in this column.
- ④ : Displays token packets. (Token type / Address / End point)
- ⑤ : It shows the first 8 bytes of the data packet and the total number of data. Click "+" to display all data. Each data is displayed in ASCII on the right side.
Hover your mouse over this part to see the contents of the packet including the CRC value.
- ⑥ : Displays handshake packets. You can also display all the transactions that repeat in the display filter settings.
- ⑦ : Displays elapsed time.
- ⑧ : Displays the USB bus state.
 - BUS RESET : Displays when the USB bus reset is issued.
 - SUSPEND : Mainly displays when communications with devices stop.
 - DISCONNECT : Mainly displays when the USB device is disconnected.
 - DEVICE-CHIRP : It is displayed when device chirp is detected.
 - DISCONNECT : It is displayed when hub chirp is detected.
- ⑨ : Marks the user-defined transactions from 1 to 99.
- ⑩ : Display the communication speed for each transaction.
e.g.) 「HIGH : **HS**」 / 「FULL : **FS**」 / 「LOW : **LS**」
- ⑪ : Highlights transaction which you select with a mouse.
- ⑫ : If you check "Record VBus voltage/current with USB log" in the log operation settings, the VBus voltage / current log will be recorded by the selected cycle.

< Mark and meaning >

Mark	Meaning
	Indicates that there was a CRC error.
	Indicates a transaction which contains a PRE (preamble).
	Indicates SSPRIT (start SPLIT).
	Indicates CSPLIT (Complete SPRIT).
unknown	If there is a packet ID (PID) that is not defined in the USB 2.0 standard, Displayed when the packet ID is normal but the packet length is unreasonably short (or long)

5-2. Detailed display of request / descriptor by class



If there is a transaction which begins from the "SETUP" packet as shown in a figure, a "request type"  and the mark will be displayed on the right side. Device request details window" like the right opens when  mark is clicked with the mouse, and information on request descriptor is displayed in the shape of the tree.

<Types of device requests supported>

- Standard device request
- HUB Class-Specific device request
- HID Class-Specific device request
- Audio Class-Specific device request
- Communication Class-Specific device request
- MassStorage/Bulk Only Transport-Specific device request
- Printer Class-Specific device request
- USBTMC Class-Specific device request
- Video Class-Specific device request
- Wireless controller Class-Specific device request
- *only for HCI protocol for Bluetooth dongle

<Types of descriptors supported>

- Standard descriptor
- HUB Class-Specific descriptor
- HID Class-Specific descriptor
- Audio Class-Specific descriptor
- Communication Class-Specific descriptor
- Video Class-Specific descriptor

* The USB protocol analyzer software searches the log data for GET_DESCRIPTOR requests in order to identify the class / subclass to which the target device request belongs. Therefore, if the GET_DESCRIPTOR request related to the Configuration descriptor does not exist in the same log data, it may be displayed as "Undefind" because the class to which it belongs cannot be identified. In this case, specify the class in "Device Class Setting". However, device classes which the USB protocol analyzer LE-650H2 / LE-650H2-A does not support will be displayed as "Undefind".

* By clicking the arrow on the upper right of the request details display window, you can display the previous and next device request details. You can adjust the density of the device request details window by sliding the knob on the slide bar on the right side.

<Commands specific to the supported device class>

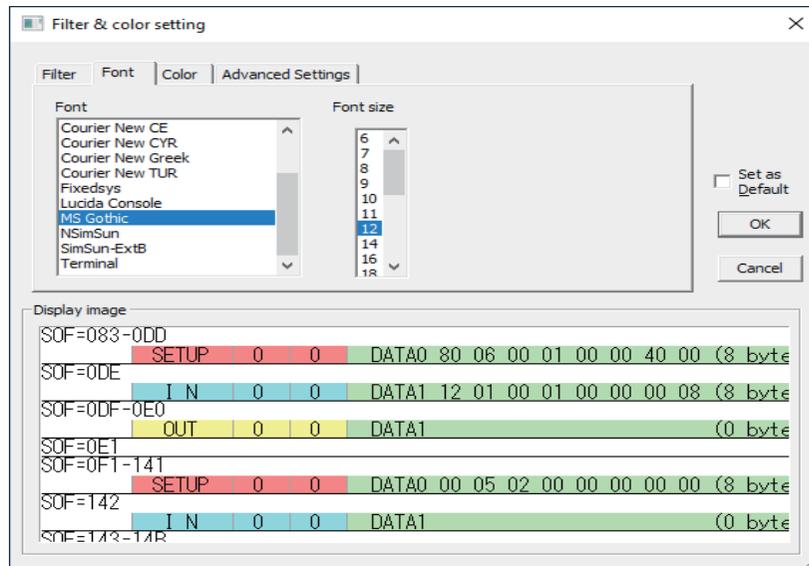
- Mass Storage / Bulk Only Transport commands
- USBTMC class commands
- Operations, Responses, and events of MTP/PTP
- Bluetooth dongle HCI protocol commands and events

5-3. How to set the screen display

You can set and change the screen display as you like.

< Operating procedure >

1. Click "Display Filter / Color" from the [Display] menu.



*The above figure is the screen when the font is set.

2. The following items can be changed in the "Filter&color setting" dialog.
Refer to the "Display image" at the bottom and make the settings as necessary.
 - Filter
By this function, you can check only necessary data and hide other packets and transactions.
(See "● Display Filtering Function" for the detail)
 - Font
By this function, you can change the display font and font size.
 - Color
This specific characters and background color of each packet.
 - Advanced settings
This makes it possible to change the open methods for the device-request details window.
3. After entering the settings, press "OK" to confirm.

* If you check "Set as Default" when you press "OK" to confirm, this setting will be reflected in the newly opened log windows after it.

●Display Filtering Function

This function displays only the applicable transactions on specific conditions. This function makes it possible to quickly verify only the desired packets/transactions without displaying unnecessary packets/transactions.

< Display filtering conditions >

Hide SOF packets (*)	Hides the SOF packet. When capturing data from the Low-Speed device only, those settings are not required because it does not generate SOF packets.
Display the repeatability NAK transactions collectively.	When the NAK responses, such as "IN-NAK transaction," the "OUT-NAK transaction", etc., have occurred continuously, those transactions are collectively indicated by the number of times. For example, "x13" means to receive the same transactions 13 times in a row.
Display SETUP transactions only	Displays the transactions only including SETUP.
Hide PING transactions	Hides the states of waiting transmission, in the bulk transfer of HS device (PING token -> NAK handshaking)(LE-650H2only).
Hide IN-NAK transactions	Hides the states with no transmission, mainly in bulk transfer/interrupt (In token -> NAK handshaking).
Hide OUT-NAK/SETUP-NAK transactions	Hides invalid transmission data, mainly in bulk transfer (OUT token -> DATA packet -> NAK handshaking).

●USB address / endpoint

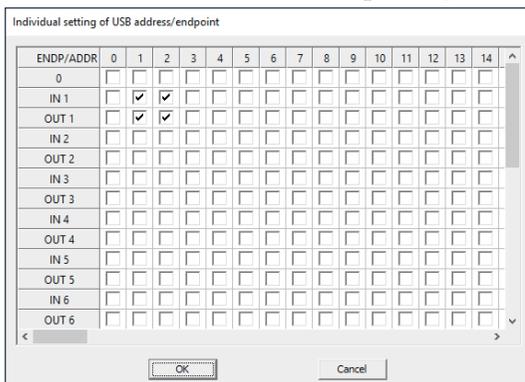
To perform filtering according to the USB address/end point number, select the conditions from the group box of "USB address / end point."

This displays only the specified address/end point. Input address/end point as follows.

< Input value example >

Input method	Input value
When setting only one	1
When setting the plural (separates by comma)	1, 3, 5
When setting the plural continuously (hyphenation)	1-5

Click "Advanced" button to set separately.



The "Display Filtering Function" temporarily hides a specific transaction from the screen or print but does not delete the hidden transactions from the log.

Therefore, even when the log data in the file is saved under the display filtering condition, all the log data is saved in the file, including the temporarily-hidden transactions.

Note : Because the display structure is assembled again according to the filter setting when the condition of the display filtering is changed, it might take time until all the transactions are displayed when the amount of the log data is large.

6. Log settings and save

6-1. Log operation settings

You can configure the following settings by clicking "Options" from the "Log" menu.

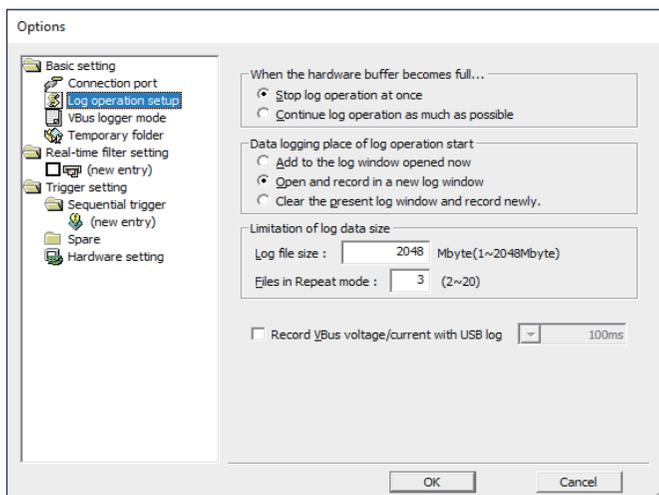
- Selection of USB port to connect the analyzer
- Detailed settings for log operation
- Specifying a temporary folder and setting regarding how to check the free space

< Operation method >

1. Connection port setting

Select either the serial number (LE-650H2) or the serial number (LE-650H2-A) from the drop-down list.

2. Log operation setup

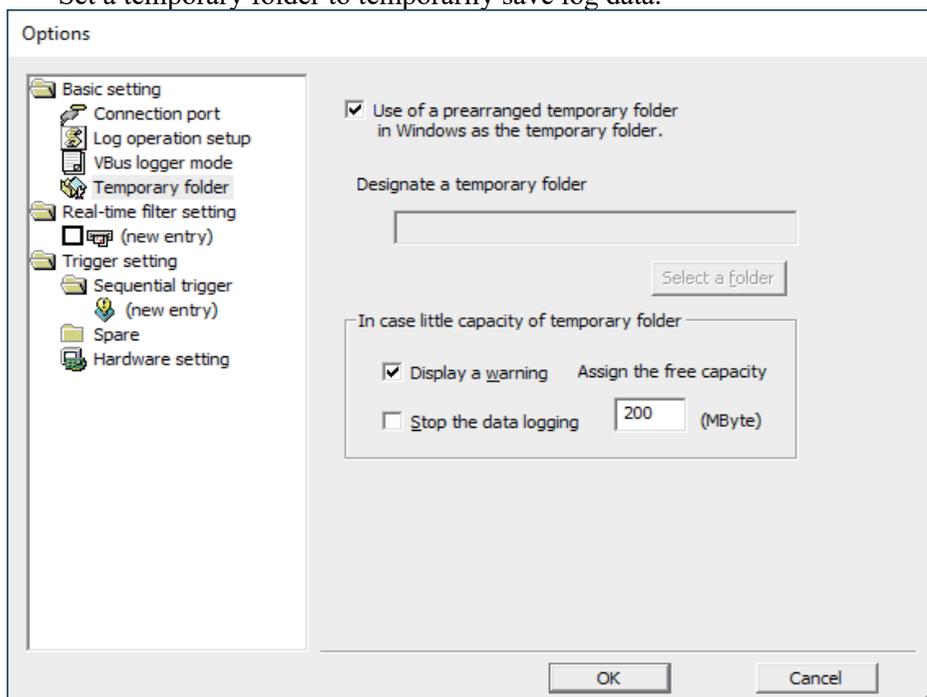


Item	Meaning • Function
When the hardware buffer becomes full	Stop log operation at once The log operation stops when the buffer memory is full (default setting).
	Continue log operation as much as possible When the buffer memory is full packets are discarded. When the buffer memory have space again subsequent recording is resumed, but since the packets were discarded when the buffer memory was full, the transaction structure may not be correct.
Data logging place of log operation start	Add to the log window opened now Add new log data to the end of the current log and record it.
	Open and record in a new log window Open a new log window and log to it.
	Clear the present log window and record newly Erases all data recorded in the current log window and records a new log.
Limitation of log data size	Log file size When the specified log size is reached while logging, the logging operation is automatically stopped or writing to the next file is started.
	Files in Repeat mode Specify the number of files to open when acquiring logs in repeat mode.
Record VBus voltage/ current with USB log ^(*)	VBus voltage / current recording ^(*) When checked, the VBus voltage and current are recorded at the selected cycle with the USB communication packet at the same time.

* This is a function after v1.3.0.0. It will not work on the analyzer whose license has expired.

3. Temporary folder

Set a temporary folder to temporarily save log data.



Use of a prearranged temporary folder in windows as the temporary folder	Use the Windows default temporary folder as the temporary folder.
Designate a temporary folder ^(*3)	(When the "Use of a prearranged temporary folder in windows as the temporary folder" check box is OFF) Specify a temporary folder. Do not specify a non-existent folder or a network-connected folder. We recommend that as a temporary folder you specify a folder on the same drive as the drive where you want to save the log data .
Select a folder	(When the "Use of a prearranged temporary folder in windows as the temporary folder" check box is OFF) Open a folder browser to select a temporary folder. Do not select CD, DVD drives or folders on the network.
Display a warning	If the free space of the temporary folder falls below the set value during log operation, a warning dialog appears but the logging operation continues as it is. When the free space is completely exhausted, the log operation will stop automatically ^(*1) .
Stop data logging	If the free space of the temporary folder falls below the set value during log operation, log operation stops immediately ^{(*1)(*2)} .
Assign the freecapacity	Set the limit value of the free space for "Display a warning" / "Stop data logging" in MByte units.

*1 : There can be a slight lag before the warning is actually displayed or the log operation stops.

*2 : Normally, use the setting with "Stop data logging". If the free space of the temporary folder becomes extremely small (several Mbytes or less), it may not be able to execute processing such as displaying, searching, and saving logs.

* 3: The specification of the temporary folder is applied to "the newly opened log window after the temporary folder is specified".

If the log is acquired for an already open log window, the temporary setting of when the log window is opened is used.

6-2. Saving a log file

To save the log data in the file, click "Save" or "Save As" from the File menu. Even if you start logging new data after saving data and try to close the window, the file save dialog appears. Name the file to save the updated data if needed.

Because it is not deleted from log data, a transaction hidden by "Display Filtering Function" is also saved in the file.

Note: If you want to narrow down and save only specific data, Apply " Real Time Filter function *1", "Trigger function *2", "Edit(log file) *3", etc.

*1 : Refer to "7-4. Real Time Filter"

*2 : Refer to "8. Trigger settings"

*3 : Open a new file and edit the necessary information with "Copy" and "Paste".

< Save format >

.usr	USB protocol analyzer software packet file. This is a file for saving main log and mark information.
.uvd	The transaction data base file that software uses when the log file opens again. The file helps short the processing time when you display the log again or change the display filter conditions. *Even if you delete the file, it will be created again by opening and closing the log data.
.vbl	Log files for VBus Logger Mode

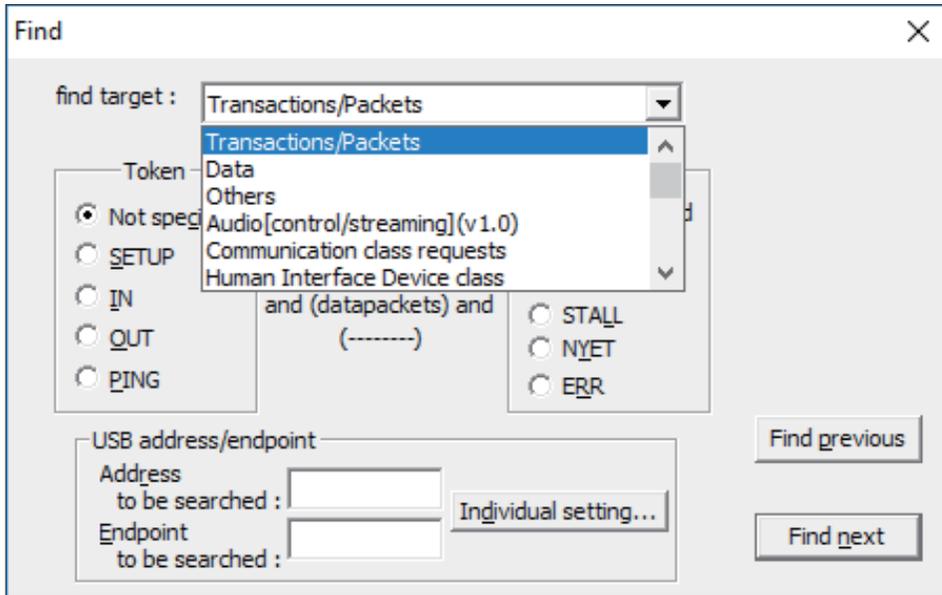
7. Useful functions

7-1. Retrieval Function

You can retrieve a specific type of packets.

< How to use the retrieval function >

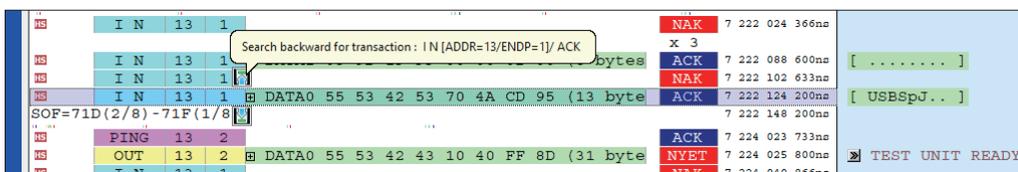
1. Click "Find" from "Edit" menu to display the following dialog.



2. Select the object which you want to retrieve from "find target".
 - * Refer to "USB address / endpoint" on page 19 for USB address / endpoint settings.
 - "Transactions/Packets"
Retrieves by combining the token packet and the handshaking packet.
 - "Data"
Retrieves the data character string.
 - "Others"
Retrieves the SOF number and the error packet (CRC error/PID error).
 - "Requests/Commands"
Retrieve each class/standard requests. Retrieve class commands.
3. Click "Find previous" "Find next".
4. Data that matches the search conditions will blink.

< Transactions/Packets retrieval >

Put the mouse pointer on the specific transaction at the data display, arrows appear above and below the transaction. To search transactions of same conditions (token, address, end point, handshake), click the arrow.

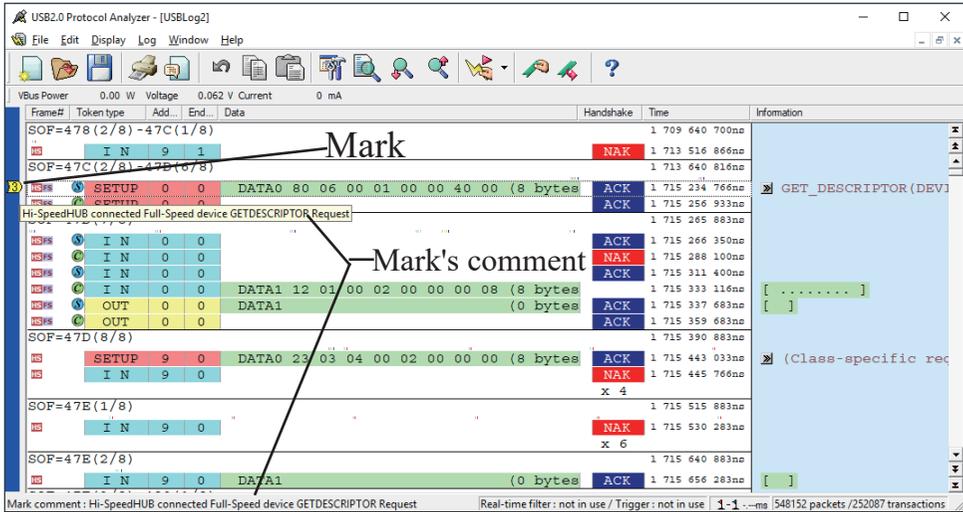


7-2. Mark Function

Using "Mark Function", you can put sequential numbers on a transaction in the log.

For example, marks can be put at the point where the USB host controller identifies a new USB device and starts setting up, or at the point where the USB device starts a transmission. An arbitrary mark comment can be input to each mark, and the explanation can be added to analyzed content and transaction.

It is convenient to use the "Mark Function" not only for view ability but also for jumping to the marked position "Jump Function" when analyzing the transactions.



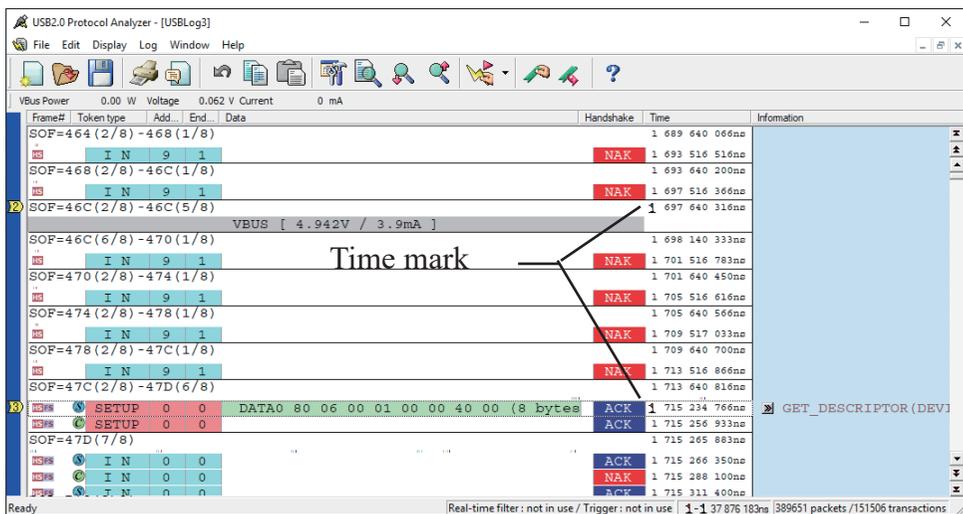
When the mouse cursor is over the mark, the mark comment is displayed in pop up.

Moreover, the mark comment is displayed in the statusbar when jumping to the mark by "Jump function."

7-3. Time Mark Function

Using "Time Mark function," you put the mark to two transactions, and can have the elapsed time between the transactions displayed. You can make the time mark by clicking the "elapsed time display" part of the transaction. Click the elapsed time column of another transaction.

The elapsed time between two marked transactions is displayed in the statusbar.



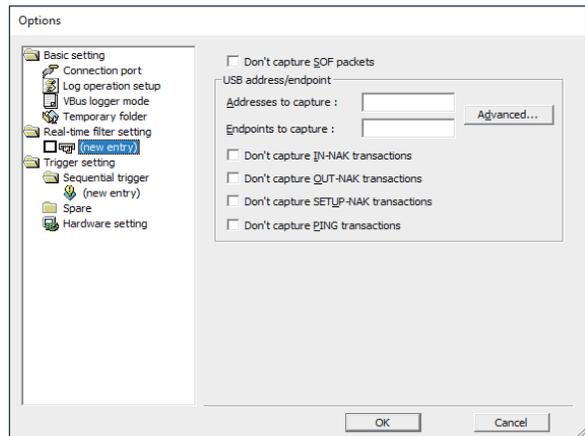
7-4. Real Time Filter

This function makes it possible to capture the necessary log data only onto host PC and to decrease the file size of the log data.

< Operation procedure >

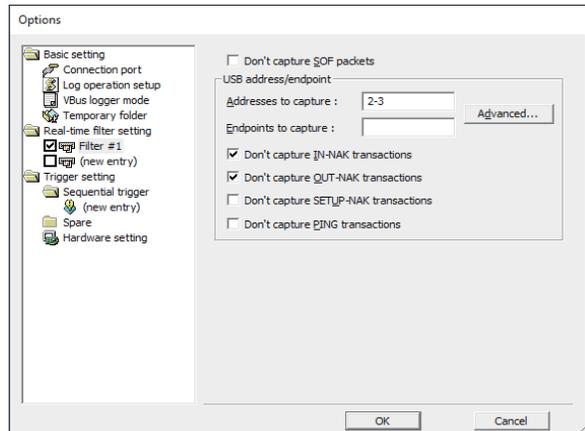
1 : Click "Setup" from "Log" menu.

2 : Click "new entry" of "Real-time filtering settings" at the left side of "Setting for logging" dialog.



3 : Selects the transaction which includes addresses/endpoints to capture and token/handshake not to capture.

* Refer to "9-1. USB Device Class Setting" for USB address / endpoint settings.



4 : To close "Detailed designation for USB address/endpoint" dialog, and go back to "Real-time filtering settings."

If you want to change the item name of real-time filter which has been set, it is possible by right-clicking or F2 key.

5 : Confirm that the left side of the item name of real-time filter you want to operate is checked, and click "OK." Captures logs when filter is effective after starting logging.

* : When restarting the application, real-time filter is null.

However, puts the check again when you want to use real-time filter, because the contents of the filter setting is stored.

* : Note when setting the plural

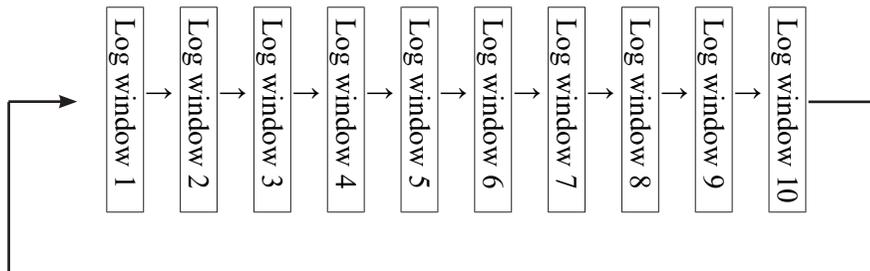
Only one setting of real time filter which is checked in the left side will be effective.

* : Cancellation and delete of the settings

Remove the check at the left side of the item name to cancel temporarily leaving the settings. When you want to delete the settings, click the item name then delete by "Delete" key, or right-click on the item name then click "Delete."

7-5. Repeat Mode

This function allows you to capture more than log data of 2GB, and to capture up to about 10GB (up to about 40GB for LE-650H2-A). This mode lets log data go to from 2 and 5th (2 and 20th for LE-650H2-A) log window in order as ring buffer. Then, when log data is over the set value, the existing log is deleted and the new log only is recorded.

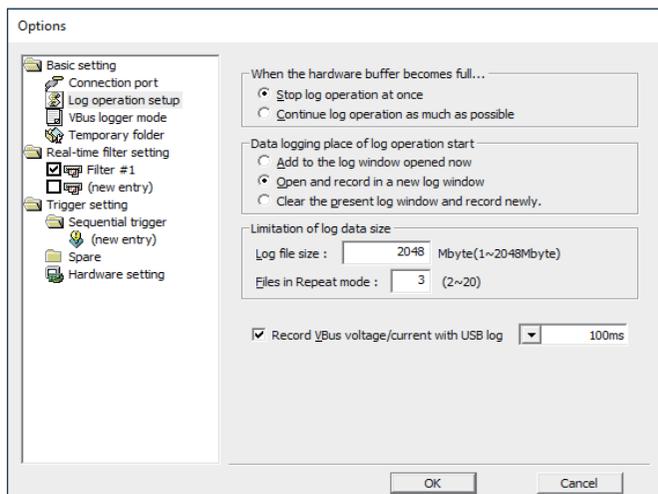


< Operation procedure >

1 : Click "Setup" from the "Log" menu.

2 : Click "Log operation setup" from the "Basic settings" at the left side of "Setting for logging" dialog.

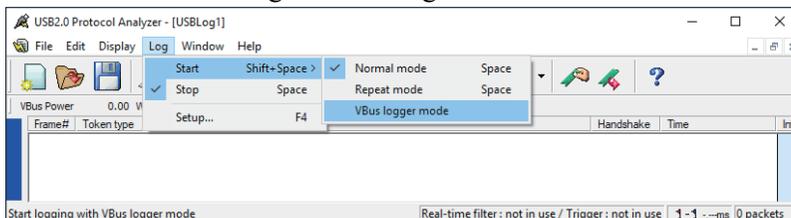
3 : In "Limitation of log data size" at the right side of "Setting for logging" dialog, inputs a maximum size of data per log file into "max" and inputs the number of the open files into "Files in Repeat mode". "The maximum size of log data per file is up to 2GB, and the number of file to open is up to 5th (up to 20th for LE-650H2-A).



Also, set "Continue log operation as much as possible" for "When the hardware buffer becomes full." If "Stop log operation at once" is selected, stops logging when the hardware buffer becomes full.

4 : To close "Setting for logging" dialog, click "OK."

5 : Select "Repeat mode Space" of "Start" from the "Log" menu. Or to select "Repeat mode" click the mark at the right side of log start at the tool bar.



6 : On starting logging, the specified number of the files open and the log is captured as a ring buffer until the log stops.

7 : After the log stops, you can analyze or save the necessary data in the opened log windows.

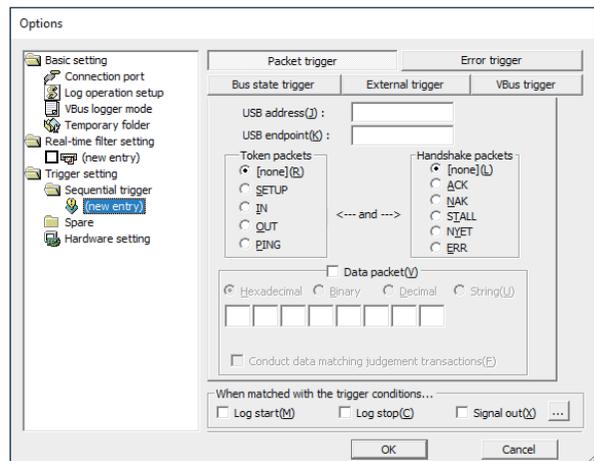
8. Trigger settings

- By using this feature, can perform log stop and trigger output from near the data which you want to confirm.
- The plural trigger condition and trigger operation are set beforehand, and the trigger condition can be judged one by one.

< Operation procedure >

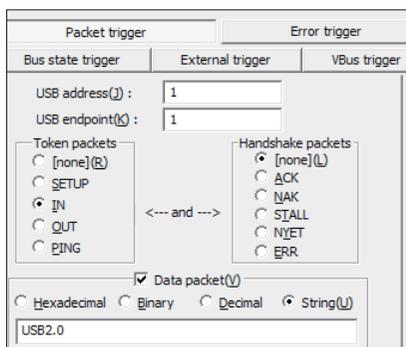
1. Click "Setup" from "Log" menu.
2. Click "new entry" from "Sequential triggers" of "Trigger settings" at the left side of "Setting for logging."
3. Selects the method of trigger to set from Packet trigger, Error trigger, Bus state trigger、External trigger, VBus trigger

To set the plural, click each trigger buttons pressing "Ctrl." When setting the plural, each triggers operates by "OR."

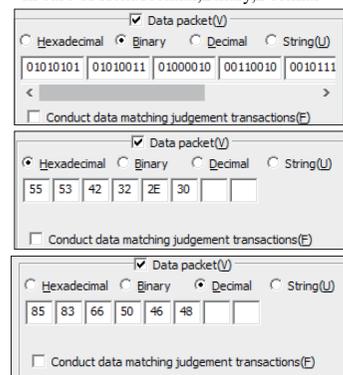


• Packet trigger

Log operation can be stopped and trigger output can be performed with the specified packet.



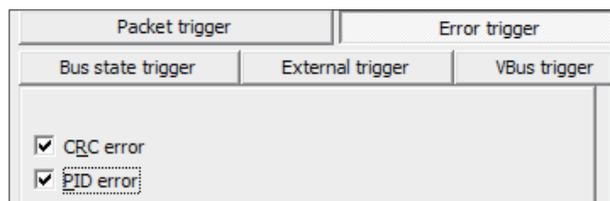
In case of Hexadecimal, Binary, Decimal



You can select the USB device address, endpoint, token packet / handshake packet, and configure the setting for the data-packet-match judgment.

• Error trigger

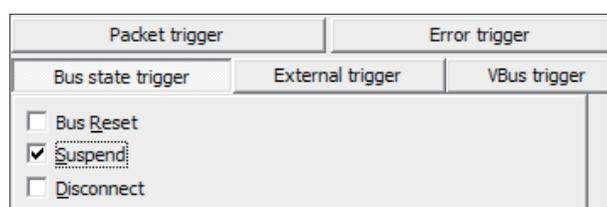
By using this feature, can perform log start and stop external logs from near the data which each error generated. Select the kind of the error to be target of the trigger operation from "CRC error" or "PID error".



• Bus state trigger

By using this feature, you can start and stop external logs and trigger output when the Bus State Trigger happens.

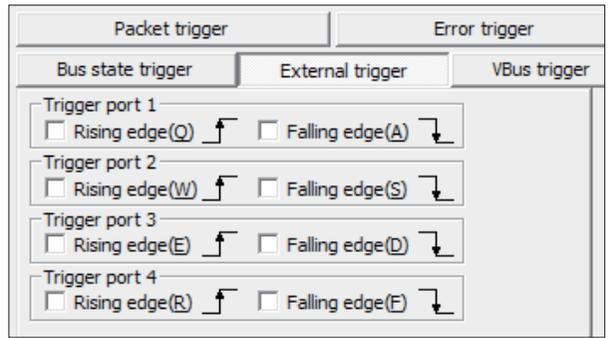
Select error type from "Bus Reset", "Suspend" and "Disconnect".



- External trigger

External trigger I/O connection port on the back side of LE-650H2 / LE-650H2-A allows you to start and stop external logs, and also it allows you to perform the signal output to the outside when the specific conditions are satisfied.

* For external triggers, in the hardware settings, "Post trigger size (trigger position)", "External trigger input (selection of level edge)", "Output (selection of level pulse output)", and "initial state of the Output" setting is necessary. Also, do not check the unused external trigger terminals as they are in an undefined status.



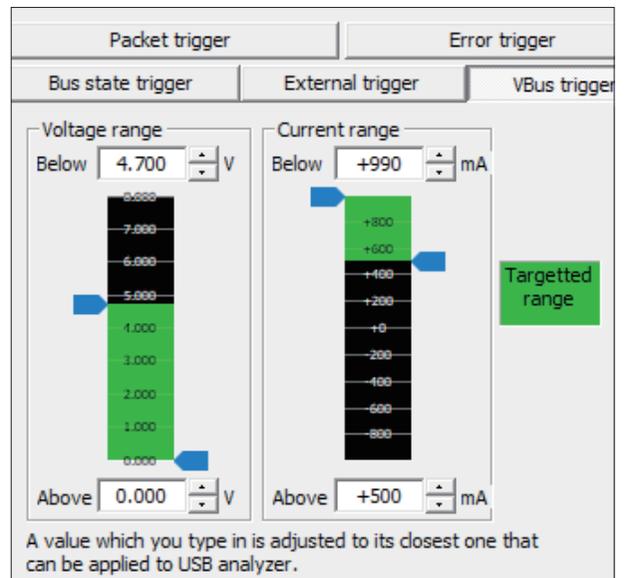
- VBus trigger

With this function, you can stop the logging or execute a trigger output by the VBus voltage/current value.

Configure the "Targetted range" with regard to the Voltage range and the Current range. Blank the column which you will not use. When you set both the voltage and the current, the trigger will be generated by OR conditions.

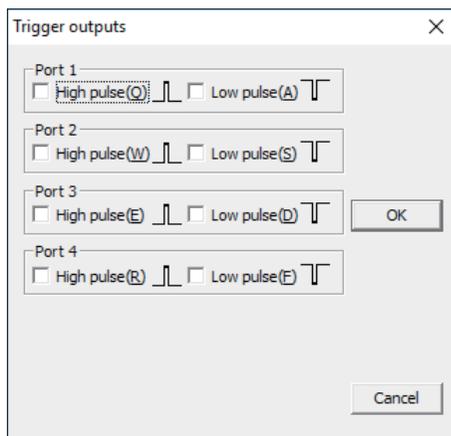
Click "Log operation setup" at the left side of "Setting for logging" dialog.

Put a check mark on "Record VBus voltage/current with USB log".



4. Selects the operation of "When trigger conditions match," from "Log start" or "Stop logging", "Signal out." When "Signal out" is selected, click  button at the right side.

Select the output port and its "High pulse" or "Low pulse", and then click [OK] to close the [Trigger outputs] dialog.



5. Leave the trigger conditions you want to use for logging of this time to "Sequential triggers", and drag and drop the item names of other trigger conditions to "Spare settings" folder icon. Furthermore, to change sequence to judge the trigger conditions, replace the item names in "Sequential triggers" folder by drag and drop. You can also change the priority of triggering. The trigger is executed from the upper item name.

Note : When setting the plural

- Can set the trigger conditions and the trigger operation up to 16th.
- Can set "Stop logging" only one each in "Sequential triggers" folder.

6. After completing the settings, click "OK" to store the settings. To change the item names such as "Trigger 1", click the item name and press "F2", or right-click on the item name and select "Rename."

Note : Stop the software once, and restart.

All the trigger setting conditions will move to "Spare settings" folder after stopping the software of LE-650H2/LE-650H2-A.

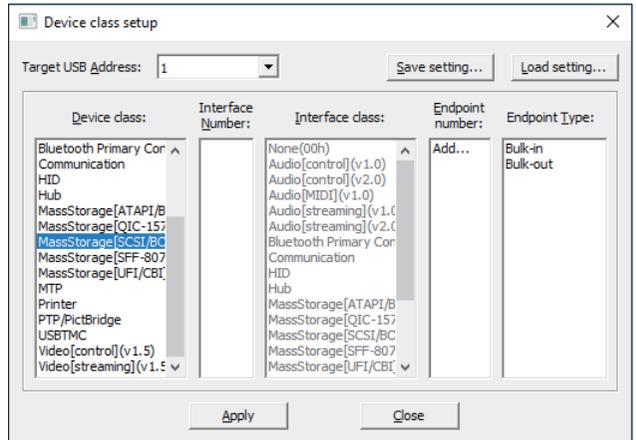
9. Detailed analysis function

9-1. USB Device Class Setting

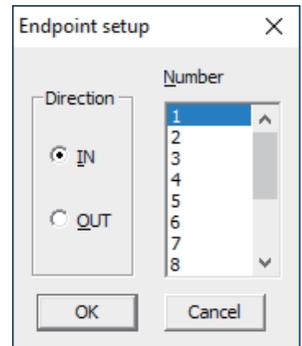
Even you do not have any emulation information in the log file, you can display translation information by setting "USB Device Class Setting".

< When only mono feature device >

1. Click "Device Class Setting" in the "Edit" dialog.
2. Input address which you want to display translation information in the "Target USB Address".
3. Select the class for the address from "Device Class".
4. Click "Add" in the "Endpoint List" and open the dialog for "Endpoint setup".



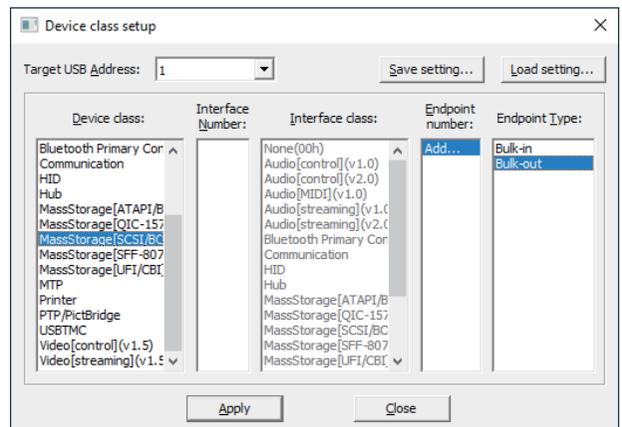
5. Select the end point number and direction, and click "OK".
6. Check whether or not the setting in "5" is displayed in the end point list, and click the end point.
7. If there is something displayed in the "Endpoint Type", select the transmitting method.
8. Repeat "4" to "7", if you have more than one end points.
9. Click "Apply" and check whether or not the translation is displayed in the information Window.
10. Click "Close" and close the "Device Class Setting" Window.



*You can save/load the settings of device class, interface and endpoint by clicking the "Save Setting" and "Load Setting" button.

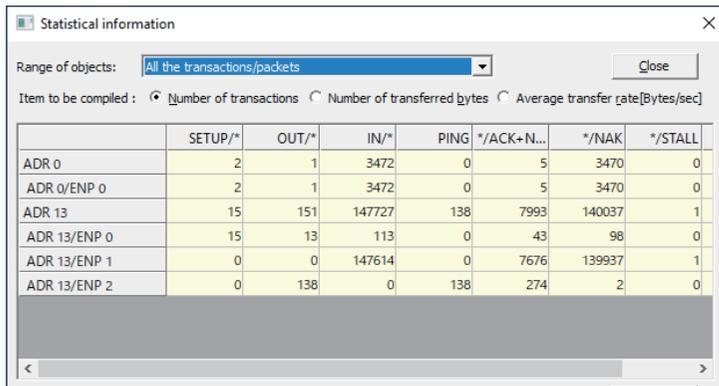
Save/Load the settings will be operated for each USB address. If you want to save/load the setting for multi USB address, you must save/load the settings for each address.

*Set as "When only mono feature device", even if you have multi USB devices.



9-2. Statistical Information

This function helps statistically check data by totaling the following regarding the log: total transactions, transfer bytes, and transfer rate [bytes/sec]. Statistical Information of each address or each address/endpoint will be displayed.



	SETUP/*	OUT/*	IN/*	PING	*/ACK+N...	*/NAK	*/STALL
ADR 0	2	1	3472	0	5	3470	0
ADR 0/ENP 0	2	1	3472	0	5	3470	0
ADR 13	15	151	147727	138	7993	140037	1
ADR 13/ENP 0	15	13	113	0	43	98	0
ADR 13/ENP 1	0	0	147614	0	7676	139937	1
ADR 13/ENP 2	0	138	0	138	274	2	0

< Operation >

1. Select the target area: "Entire transactions/packets" or "Selected."
2. Select the type: total transaction, transfer bytes, and transfer rate [bytes/sec].
3. Right-clicking each item of the packets selects each type of the packets to display or hide.
4. Clicking the update button during capturing the log shows the information updated at the point.
5. Clicking the head of the table, such as "IN," helps arrange data in ascending or descending order.
6. You can copy and paste those data to another application like Excel. At first, select the necessary range of data; second, copy it by pressing Ctrl and C keys; finally, paste it to another application.

9-3. Operation Report Creation and Miscellaneous Items

The USB protocol analyzer software pastes log data to the text editor via the clipboard.

< Operation procedure >

1. Select the range of the data in the log window which you want to paste to the text editor with the mouse. To select the continuous/discontinuous range of data, click with the Shift or Ctrl key.
2. Click "Copy" from the Edit menu to set the range on the clipboard.
3. Paste it to the text editor. (Generally, press "Ctrl+V," or click "Paste" from the Edit menu.)

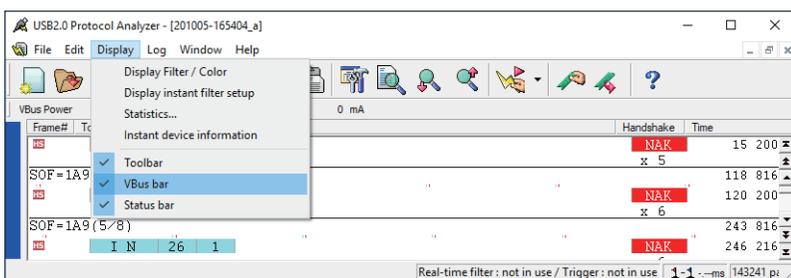
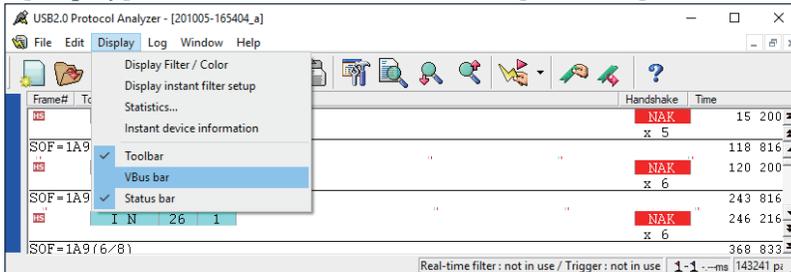
*You can "Drag-and-drop" to paste it, if the text editor supports the function.

*If you select and paste the large range of data to the text editor, an error may occur. In such a case, divide the range into several small parts and repeat "Copy" and "Paste" operation.

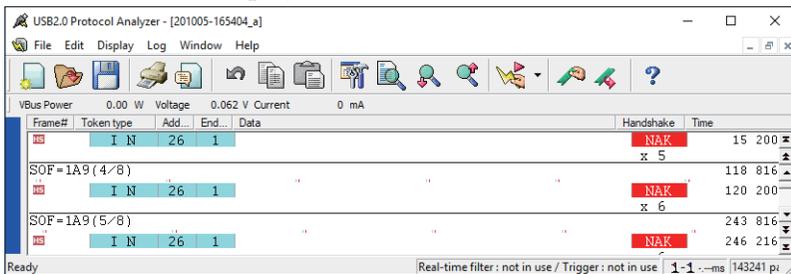
10. About the measurement of VBus value(Voltage(V),Current(mA),Power(W))

You can measure the VBus value (Voltage (V), Current (mA), Power (W))of the USB to be measured and display it in real time.

1.Click [Display] from the menu bar and mark on [VBus bar] to check the VBus value



2.VBus measurement is displayed as shown below.



11. VBus Logger mode

Measure VBus voltage, current, power consumption at the specified cycle, and display in graph. Measured data can be saved at CSV format and pasted to the spreadsheet software.

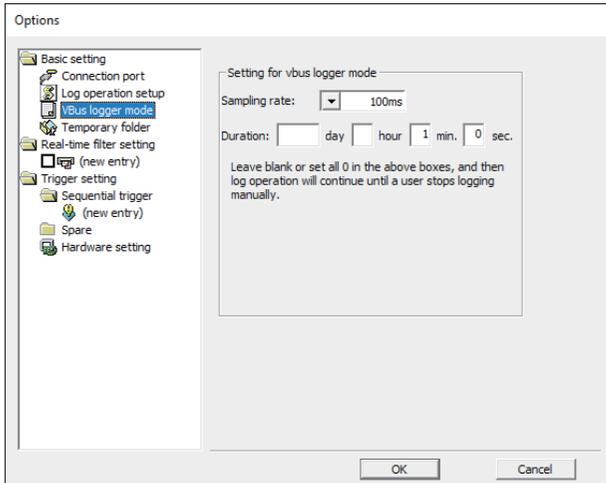
* "VBus logger mode" is supported from software version v1.1.0.0.

< Operation >

1. To set VBus measurement setting, click [Log]-> [Set up]-> [VBus logger mode]. Specify the VBus sampling rate and enter the measurement time.

* In the VBus logger mode, "Log operation setup" in the "Log" menu is not applied.

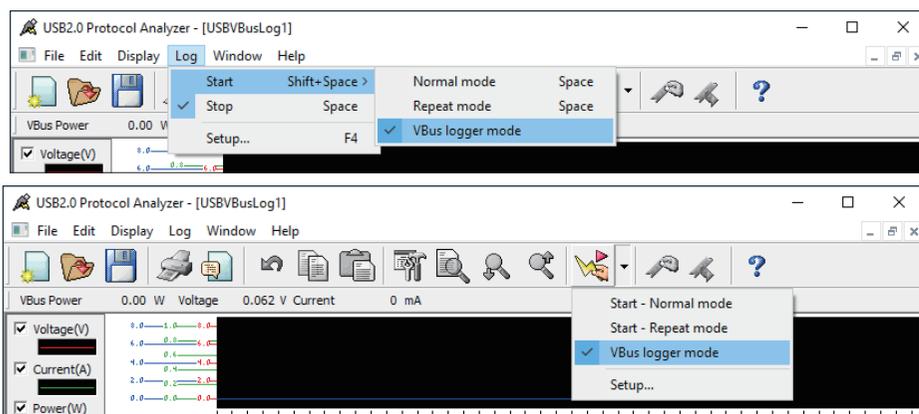
* If you leave the measurement time blank, it will automatically stop when the recorded data reaches 2GB.(5 bytes are used for one sampling.)



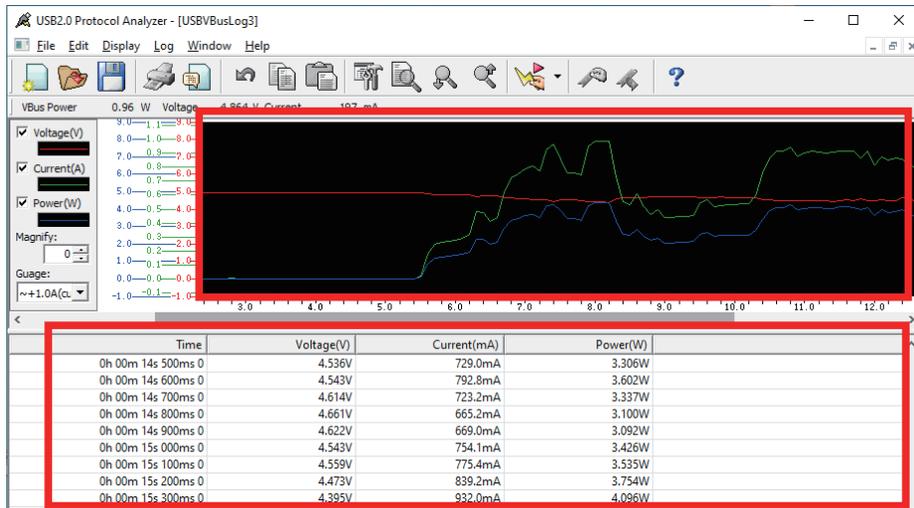
model	Sampling rate
LE-650H2	100msec , 200msec , 500msec,1sec
LE-650H2-A	0.1msec , 0.2msec , 0.5msec,1msec , 2msec , 5msec, 10msec , 20msec , 50msec, 100msec , 200msec , 500msec,1sec

2. Click [Log]-> [Start]-> [VBus logger mode]

(Or select [start --VBus logger mode] from the measurement start button) to start the VBus measurement.



3.VBus measurement data will be displayed and recorded.



Graph

Damp Data

4.Stop measurement.

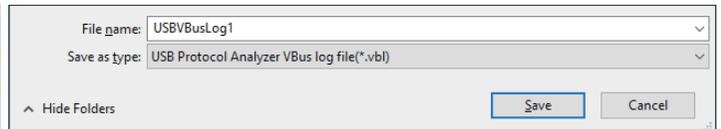
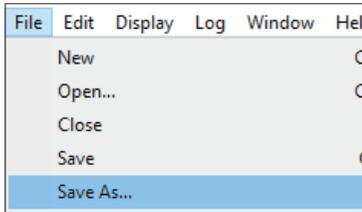
It stops measuring automatically when it passes the measurement period, or records 2GB of data. To stop measuring manually, press stop button or select [Log] --> [Stop]

5.Log data can be saved and outputted as CSV file after the measurement.

*You cannot select the range of data when outputting CSV file.

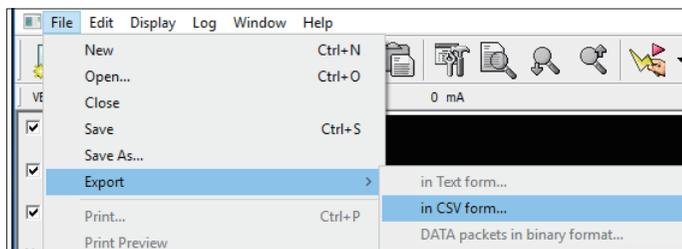
▪ Save logfile (.vbl file)

Select [File] --> [Save as...] to save logfile.



▪ csv output

Select [File] --> [Export] --> [in CSV form] to output as CSV file.



12. OP-SB84 data conversion

The software of LE-650H2 can read the log file(file extension: DT) measured by OP-SB84, (the USB expansion board of LE-8200(A)), to display the data and save it as the log file of LE-650H2 (file extension: usr).

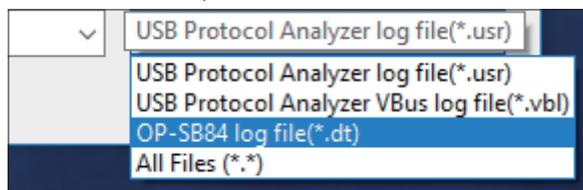
*If the data file contains both USB data and VBus measurement data, the file cannot be opened by LE-650H2 software.

< Operation >

1. Open the log file(.DT)

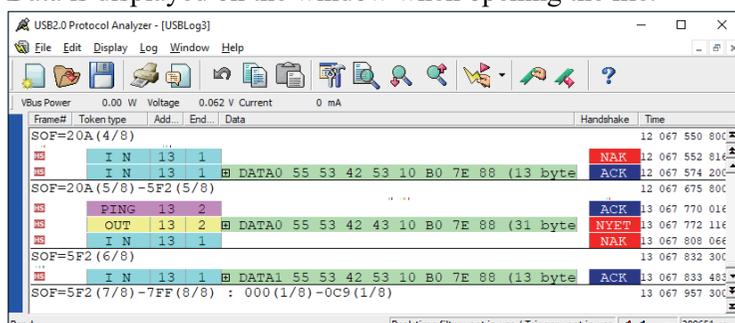
Drag and Drop the log file(file extension: DT) to the main window of LE-650H2.

Or click [File]-> [Open...].



2. Display the data

Data is displayed on the window when opening the file.



Unique display on OP-SB84

OP-SB84 display	After loading the data to the log LE-650H2
「RESET」	{ BUS RESET }
*No record during the reset period	*Displays without record of the reset period.
「VBUS OFF」	{ VBUS OFF }
「Session end」	{ Session end }
「Session valid」	{ Session valid }
「VBUS ON」	{ VBUS ON }
No record of the time of packet's end.	Records the time of packet's end. * Dummy value
Trigger No(0-7)	Display as Trigger No(1-8)
A flag for matched trigger condition is displayed for each packet.	A flag for matched trigger condition is displayed for each transaction. *If multipul flags are appeared, the lowest number is displayed.
Trigger log of external input is displayed in chronological order.	If there is a trigger log of external input in the transaction, it is displayed after the transaction.
「--Overrun--」	{ BUFFER OVERFLOW }
If incomplete packet information is recorded, fot exsample at the time of overruning data,incomplete data is displayed or not displayed anything.	{ CORRUPT PACKET }
If some of the data in the file is corrupt, it will not display.	{ CONVERSION ERROR }

3. Save the data

Click [File]-> [Save As...] to save the data as the log file (file extension: usr).

13. Function / reference

Description of each function of the menu

Menu item	Toolbar	Shortcut key	Function
New		Ctrl+N	Open a new log window.
Open...		Ctrl+O	Open a saved file.
Close			Close a log window. If the log data needs to be saved to a file, the save dialog appears.
Save		Ctrl+S	Save the log data under the current file name. If the file has no name, the save dialog appears.
Save as...			Save the log data under a new name.
Export		Ctrl+E	Save in, Text format · CSV format · DATA packet: binary format or any format ^{*1} .
Print...		Ctrl+P	Print out the log data. Can print out only the selected area of the log data.
Print Preview			Shows the print preview page.
Print Setup...			Set up the printer.
Exit		Alt+F4	Exit the USB protocol analyzer software.
Undo		Ctrl+Z	Undo the last paste.
Copy		Ctrl+C	Copy the log data selected in the log window to clipboard in the text format.
Paste		Ctrl+V	Paste some of the log data copied to clipboard at the end of the active log window.
Select all		Ctrl+A	Select all transactions displayed.
Invert selection		Ctrl+I	Invert the selected and non-selected transactions.

*1 Save as export. Exported data cannot be loaded into the USB protocol analyzer software again.

Text format	When selecting "Text format", it will save the data in almost same format as displayed data.	
CSV format	When selecting "CSV format", it will save the data in following format.	
	File type	Detail
	CSV(with comma:with trigger output) (*.CSV)	Save data with trigger occurrence information
	CSV(with comma) (*.CSV)	without trigger occurrence information
DATA packet: binary format	When selecting "Binary format", it will save only DATA packet in binary format. Set the address/endpoint and save the data. To save data in the existing file, select "Add to existing file". To save data after removing some data on the top/end, input the number of bytes to remove.	

* All above format will be saved either from "whole log data" or "only selected data".

Notice : Exported data cannot be loaded into the USB protocol analyzer software again.

Menu item	Toolbar	Shortcutkey	Function
Add/Delete Mark		F9	Mark the selected row with a number. Or, delete it.
Mark List/Edit		Shift+F9	Shows the table for marks.
Go to the Next Mark		F8	Jump to the next mark from the selected row with a mark. Jump to the first mark of the row below if the selected row does not have any mark.
Go to the Specified Mark		Shift+F8	Jump to the specified mark. Selecting this menu displays the table for marks.
Jump to trigger position		Ctrl+F8	Jump to the transaction that has trigger mark. When it has the plural marks, jumps in order of trigger mark from "1" whenever Ctrl+F8 is pressed.
Jump to next VBus voltage/current		F7	The focus jumps to the next VBus voltage and current. (Jump downwardly)
Jump to previous VBus voltage/current		Shift+F7	The focus jumps to the previous VBus voltage and current. (Jump upwardly)
Find		Ctrl+F	Find packets based under the specific conditions.(More Information).
Find Next		F3	Find packets under the previous conditions downward.
Find Previous		Shift+F3	Find packets under the previous conditions upward.
Device Class Setting			Select the device class setting for the translation display. Use this feature when you have no emulation information in the recorded log.
Add Comment			Insert the comment to the log file.
Display Filter / Color			Sets the display methods for log data. Has filter which displays or hides specific packets and transactions; font which sets display font; color which sets color for character or background.
Add Filtering setup dialog			In this dialog, you can check/select the settings which are previously set in the instant filtering function.
Add Filtering setup dialog			In this dialog, you can check/select the settings which are previously set in the instant filtering function.
Instant Device Information			If you select the transaction, appropriate device information will be displayed.
(Log Window List)			Switch over to another log window.
VBusMeasurementbar			Displays or hides the VBusMeasurementbar.
Status bar			Displays or hides the status bar.

Start		(Space)	Start logging data. Select the normal , repeat mode, or VBus Logger mode. Also, jump to "Log setting" from here and set each setting such as real time filter , trigger setting and VBus Logger mode
Stop		(Space)	Stop logging data.
Setup			<ul style="list-style-type: none"> ▪ Basic setting about log operation ▪ Setting about real time filter ▪ Setting about trigger setting ▪ Setting about VBus Logger Mode
Help		F1	Display this Help file. *You can also install it using an external CD drive, but here we will explain other methods.
Version Information			Display the current version of Software and its revision histories.

14. UNINSTALL

1. From the Windows settings screen

In case of Windows 10, open "Apps" at the setting screen from the window panel.

Select "Apps & features" from the application list, and then select "USB Protocol Analyzer LE-650H2" from the list.

Press "Uninstall" to uninstall.

2. From the Windows Control Panel

You can also uninstall the program by clicking "Uninstall" of "USB Protocol Analyzer LE-650H2" (folder name where the program is installed) in "Programs and Features" from the "All control Panel Items" item.

* The procedure is the same for Windows 7, Windows 8.1, and Windows 10.

15. Specifications

Model		LE-650H2	LE-650H2-A
Standard		USB2.0/1.1	
		HIGH (480Mbps)/FULL (12Mbps)/LOW (1.5Mbps)Automatically detect and run	
Storage Capacity	Analyzer	Capture memory 128MB	
	PC	HDD/SSD: Max.10GB (Can be specified every 1MB)	HDD/SSD: Max.40GB (Can be specified every 1MB)
Recording Method		Record USB packets, device status* ¹ (Bus Reset, Suspend, Disconnect, Device Chirp, Hub Chirp, VBUS value) on the HDD/SDD of the PC through the capture memory of LE-650H2 (can record multiple log files continuously).	
Time Stamp		Records timestamps along with USB packets and External input trigger log. 16.7ns for 5 hours max., then start from 0 again.	
Packets		SOF, IN, OUT, SEUP, DATA0, DATA1, DATA2, ACK, NAK, STALL, PRE, PING, MDATA, SPLIT, ERR, NYET, Unknown.	
Speed Display		Display communication speed per transaction in HS, FS or LS.	
Filter	Log	Record (or do not record) SOF, IN-NAK, OUT-NAK, SETUP-NAK, PING with or without multiple particular address/end points.	
	Display	Display (or do not display) SOF, IN-NAK, OUT-NAK, SETUP-NAK, PING with or without multiple particular address/end points.	
Trigger	Condition	Particular address/end points, packet type (Token/ Hand shake packets in combination), errors (CRC/ PID), data packets (8byte max, Hex/Decimal/Binary or character input, with or without bit mask.) and bus state (Bus Reset, Suspend, Disconnect), external trigger (edge or level specification possible), VBUS voltage and current.	
	Action	Possible to specify actions enable with log stop, and external trigger output (with or without levels or pulses) in sequence (up to 16 sequence).	
	External	4 external trigger input (TTL level) and 4 external trigger output (LVTTTL level). Connector: 10pin male (2.54mm pitch 961210-5604 or equivalent)	
Search Function		SOF, IN, OUT, SETUP, PING, ACK, NAK, STALL, NYET, ERR, idle status more than specified value, error (CRC, PID, DATA toggle sequence, transaction structure), Mass Storage (SCSI, ATAPI, SFF-8070i), PTP/MTP, Audio, HID, HUB, Printer, Video, Communication, USBTMC class command, unknown log information, specific address/end points in combination, standard request, data search (Hex/Decimal/Binary, character), trigger point, mark.	
Color Display Customization		Packets can be color-coded separated.	
Detailed Display		Standard requests, peculiar device requests to HUB/HID/Audio/Communication/Mass Storage (Bulk Only Transport)/Printer/USBTMC/Video/Wireless controller Class-Specific device request(only for HCI protocol for Bluetooth dongle) class, standard descriptors, each descriptors in HUB/HID/Audio/Printer/USBTMC/Communication/Video class, command of Mass Storage/Bulk Only Transport (SCSI transparent command set, supporting SFF-8070i), Operations of MTP/PTP, Responses, events, commands and events of HCI protocol for Bluetooth dongle, class can be displayed in detail.	
Mark/Jump function		Up to 99 marks can be set (Able to make comments on each mark)	
Statistic analysis function		The total number of transactions, transfer bytes, and the average transfer rate of specified data for each address/end point.	

VBUS Measurement Accuracy		Voltage: range 0 to 8V, Accuracy $\pm 1\%$ FS Current: range -0.9A*2 to 1A, Accuracy $\pm 1\%$ FS	
VBus measurement Bar		Display (or do not display) VBus measurement Bar.	
VBus logger mode	Measurement Cycle	100ms - 1s (4 steps)	0.1ms – 1s (13 steps)
	Storage Capacity	HDD/SSD: Max.2GB *Automatically stop measurement on getting the data of 400,000,000 sampling(2Gbytes) from the beginning of measurement.	
	Graph display	Display voltage, current, and power consumption in graph at real time.	
	Dump display	Display voltage, current, and power consumption in dump display at real time.	
Save		Save log file data, export in text/CSV/binary for data payload, copy/paste via a clipboard. (Able to make comments on saved data.) *VBus logger mode has only the function of saving log files and CSV outputting.	
Print function		Specified ranges of recorded data can be printed. *VBus logger mode does not have this function.	
Measurement port		USB standard A/B receptacle: 1 each	
USB2.0 port		USB standard B receptacle, Connect to the analysis PC	
LED Indicator		2-colored LED, POWER/RUN, VBUS, DATA, SPEED (High:red, Full:green)	
Power Supply		USB Bus power (current consumption: 400mA max)	
Ambient Temperature		In operation: 0 to 40°C In storage: -20 to 60°C	
Ambient Humidity		In operation: 20 to 80%RH In storage: 20 to 85%RH (No condensation)	
Standard		CE(class A)	
Dimensions, weight		86(W)×130(D)×30(H)mm, approx.210g	
System Requirement		OS: Windows® 7(32/64bit)/8.1(32/64bit)/10(32/64bit) (Japanese/English Windows®) CPU: Recommend to use upper model than "Core i series" RAM: More than 1GB. USB port: USB2.0 Additional Memory: HDD or SSD. 30MB plus enough capacity to record log data.	

*1: Bus Reset, Suspend, Disconnect are recorded under the following condition.

Bus Reset	The SEO status of D+/D- signals is detected within a range between 2.5us and 139.8ms
Suspend	A non-communication period not in the SEO status is detected for 3ms or over.
Disconnect	The SEO status of D+/D- signals is detected for 139.8ms or over.

Note: The USB device status may not coincide with the actual bus state of the applicable device at the time of USB cable connection or disconnection because the D+/D- signals will be unstable.

*2: Display a minus value when VBUS current flows from the device to the host.

16. Warranty and after-sales service

Warranty

- When you face any problems
Please contact LINEEYE distributors or LINEEYE.
- The warranty card is
The warranty card his attached to this product. Please confirm its description and keep it in the safe place.

Warranty period : 1 year from the date of shipment from LINEEYE (It does not include software contents)
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User Registration

For after service and other information, please register your product in our Website. (<https://www.lineeye.com>)

Version up

You can update the version free of charge from our HP for 1 year after purchase. For the product which passed the 1 year you can update it for a fee.(Please make user registration when upgrading the version.)

Repair

- If the contents of this manual do not help and solve the problem, please contact us in detail.

Model	Le-650H2 or LE-650H2-A
Serial Number	8 digit numbers
Purchase Date	Year, Month, Day
Details of malfunction	As detailed and specific as possible

- Repair within the warranty
LINEEYE repairs, following the repair regulations. Please provide the details of malfunction.
- Repair after the warranty
LINEEYE will repair the products at your own expense.

After Support

Read “FAQ” in our Website or email us.Please refer to “FAQ”. We also have support by email regarding the technical issue. When you use it, please register your product via our website.

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.

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