# USB2.0 Protocol Analyzer  *LE-650H2*

## Specifications

| Model | LE-650H2 | LE-650H2-A |
|---|---|---|
| Standard | USB2.0/1.1 | |
| Speed | HIGH (480Mbps)/ FULL (12Mbps)/ LOW (1.5Mbps) Automatically detect and run | |
| Storage Capacity — Analyzer | Capture memory: 128MB | |
| Storage Capacity — PC | HDD/SDD: Max.10GB (Can be specified every 1MB) | HDD/SDD: Max.40GB (Can be specified every 1MB) |
| Recording Method | Record data on the HDD/SSD of the PC (can be record multiple log files continuously.) Record USB packet and USB device status *1 (Bus Reset, Suspend, Disconnect, Device Chirp, Hub Chirp) along with time stamp. | |
| VBUS Measurement Accuracy | Voltage: range 0 to 8V, Accuracy ±1%FS<br>Current: range -0.9A *2 to 1A, Accuracy ±1%FS | |
| VBUS Measurement Cycle | 100ms - 1ms (4 steps) | 0.1ms – 1ms (13 steps) |
| Time Stamp | 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, multiple particular address/end points. | |
| Filter — Display | Display (or do not display) SOF, IN-NAK, OUT-NAK, SETUP-NAK, PING, 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). | |
| Trigger — 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). | |
| Trigger — External | 4 external trigger input (TTL level) and 4 external trigger output (LVTTL level).<br>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), MassStorage (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/MassStorage (Bulk Only Transport)/Printer/USBTMC class, standard descriptors, each descriptors in HUB/HID/Audio/Printer/USBTMC/Communication class, command of MassStorage/Bulk Only Transport (SCSI transparent command set, supporting SFF-8070i), Operations of MTP/PTP, Responses, events, Video class can be displayed in detail. | |
| Statistic analysis function | The total number of transactions, transfer bytes, and the average transfer rate of specified data for each address/end point. | |
| Mark/Jump function | Up to 99 marks can be set (Able to make comments on each mark) | |
| 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.) | |
| Print function | Specified ranges of recorded data can be printed. | |
| 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：10 to 85%RH (No condensation) | |
| Dimensions, weight | 86(W)×130(D)×30(H)mm, approx.210g | |
| Accessories | Analyzer, PC software CD, USB cable x2 (1.8m/0.9m), Instruction manual, Warranty | |
| System Requirement | OS: Windows® XP/Vista/7(Japanese/English Windows®)<br>CPU: Recommend to use upper model than "Core 2 Duo"(Upper than "Core i series")<br>RAM: More than 1GB. USB port: USB2.0 *3<br>Additional Memory: HDD or SSD. 30MB plus enough capacity to record log data. | |

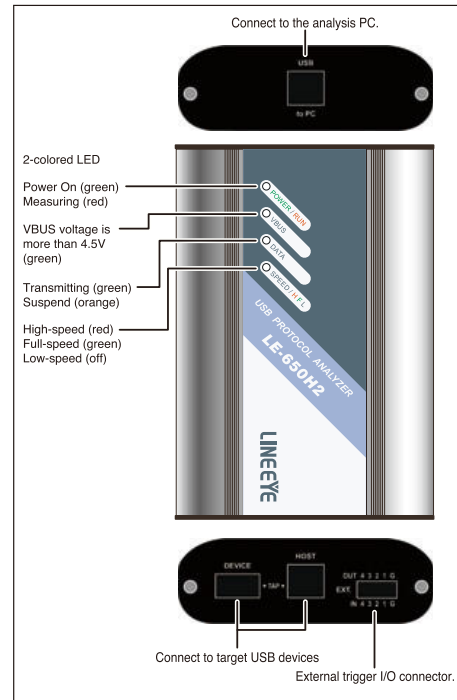*1: Bus Reset, Suspend, Disconnect are recorded under the following condition.

| 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.
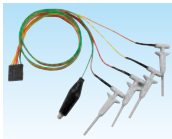*3: Need to have a USB2.0 port, which supports High-speed transfer.

## Nomenclature



Connect to the analysis PC.

2-colored LED
Power On (green) / Measuring (red)
VBUS voltage is more than 4.5V (green)
Transmitting (green) / Suspend (orange)
High-speed (red) / Full-speed (green) / Low-speed (off)

Connect to target USB devices

External trigger I/O connector.

## Product Lines

| Product Name | Model | Note |
|---|---|---|
| USB2.0 Protocol Analyzer Standard Model | LE-650H2 | Max memory: 10GB<br>VBUS measurement cycle: Min.100ms |
| USB2.0 Protocol Analyzer Advance Model | LE-650H2-A | Max memory: 40GB<br>VBUS measurement cycle: Min.0.1ms |
| H2-A Upgrading | LE-H2-A001 | Upgrade LE-650H2 to LE-650H2-A (*1) |
| U2 Updating License | LE-H2-UP01 | Remove the lock to start measurement from the analyzer (*1)(*2) |

(*1): Need to apply the serial number.
(*2): It is necessary to update the PC software in the future. For 12 months from the purchased date, the latest version of software is available without this licence. It is not necessary when using the PC software as a viewer of measured data.

## OPTIONS

5-wire probe cable
### LE-5LP2



A cable with test clips suitable to the external trigger of 4 inputs or 4 outputs connector. Length: 0.5m

Test clip with harness
### LE-62BG



A cable with test clip suitable to the external trigger I/O connector. In a set of 2. Length: 0.5m

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