

# LINEEYE®

## Multi Protocol Analyzer

# LE-8200A LE-8200

New portable protocol analyzer "LE-8200(A)" with color display runs by battery power.

Standard Board Supports

RS-232C

RS-422

RS-485

Expansion Boards Support

TTL

I<sup>2</sup>C

SPI

IrDA

CAN

LIN

FlexRay

USB

LAN

Wide Color LCD

Mega Speed Measurement

Giga Byte Long Hour Record



NEW

LE-8200A



- Records data in the USB flash drive
- Generates digital waveform



LE-8200



LINEEYE®

# Multi Protocol Analyzer Battery-powered Portable Communications Analyzer

# LE-8200A/ LE-8200



A product incorporating features for the protection of the global environment, such as the elimination of toxic substances, and a power-saving design.

The LE-8200(A) is the top-level model of battery-powered portable communications analyzers. The LE-8200(A) has an enlarged display in response to an increasing demand without degrading the excellent portability of the LE Series. The LE-8200(A) is ideal for development tests of communications systems, industrial equipment, a variety of in-vehicle networks, and after-sale services for products along with trouble analysis.

**A battery-powered model in B5 size, weighing 1.1 kg, and operating continuously for 4 hours.**

### RS-422/RS-485 (RS-530) measurement port

Used for X.21, RS-449, and V.35 communications over dedicated cable<sup>(\*)1</sup> with no extra attachments required.

### DC input connector

Used to connect the AC adapter (provided) that covers a global range of power supply voltage.

### External signal terminal

Used for external signal voltage measurement input and external trigger I/O signals.

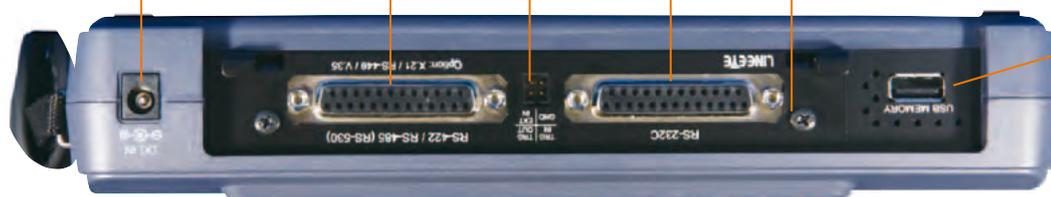
### RS-232C (V.24) measurement port

Used to connect the dedicated cable<sup>(\*)1</sup> with DSUB 9 pins for measurement.

### Exchangeable measurement board

### USB2.0 Connector(Host)

Saves date in the USB flash drive (LE-8200A only)



### 5.7-inch TFT color display

Provided with a power-saving white LED backlight.

### Hand strap

### Power supply ON/OFF switch

Auto power-off is possible.

### Function keys

Used to make displayed code changes or screen mode changes.

Special data items are expressed in individual signs.

(Example of display signs)

|  |                              |
|--|------------------------------|
|  | Start flag                   |
|  | End flag                     |
|  | Short frame                  |
|  | Block check OK               |
|  | Block check NG               |
|  | Parity error                 |
|  | Framing error                |
|  | PE and FE simultaneous error |
|  | Break                        |

Idle time (frame interval time)

Time stamp (frame arrival time)

### Menu key

Used to begin operations.

### Line State LED

Continuously displays the state of communications line with a 2-color LED.

|  |                              |
|--|------------------------------|
|  | Red: ON space state          |
|  | Green: OFF mark state        |
|  | OFF: Not in use or not wired |

### Measurement start key

Automatic repetitive measurement is possible at specified times.

<sup>\*</sup>1: An optional dedicated cable is required.  
<sup>\*</sup>2: The optional PC Link software is required.  
<sup>\*</sup>3: The CF card slot guarantees the operation of only LINEEYE's optional CF card.



# Powerfully backing up the measurement of communications networks of ubiquitous society.

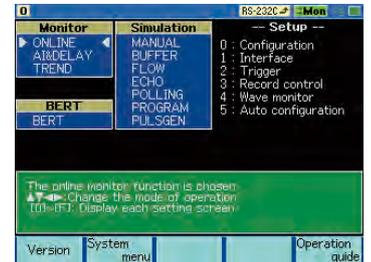
## 5.7-inch Large-sized Color TFT LCD

The large-sized LCD is an easy-to-understand color display showing a flow of communications protocol and data transmitted or received, thus greatly improving the efficiency of measurement data analysis. Furthermore, the display of an English or Japanese guide accurately supports high-level measurement over communications.

[Example of Japanese display]



[Example of English display]



## Supports TTL, I<sup>2</sup>C, SPI, IrDA, CAN, LIN, FlexRay, USB, and LAN

Supports various types of communications protocols widely used over RS-232C/422/485. Also supports new communications standards by exchanging the measurement board.

See pages 8 and 12 for details.

## Measurement Functions Developed in Response to Customers' Demands

Incorporates improved measurement functions, such as the comparison display of two divided areas, precise time stamp recording in 1- $\mu$ s units, and improved triggering with the simultaneous detection of eight conditions.

See pages 4 and 5 for details.

## Long Recording Time of Communications Data

Incorporates a 100-MB capture memory that is ideal for the analysis of high-speed, large-volume communications. The use of external memory enables the continuous recording of data for as long as several days.

See page 4 for details.

## Supports Logic Analyzer Analysis and Analog Waveform Analysis

Realizes precise timing analysis and waveform observation easily with no general-purpose measuring instruments used. LE-8200A generates edited digital waveform.

See page 5 for details.

## Measurement at Low to Mega Speeds

Using high-precision DPLL technology for open baud rate support, transmission and reception speeds can be separately set to 4 effective digits for measurement tests.

See page 4 for details.

## Measurement Linked with PC

The PC link function(\*), which realizes PC-linked measurement, enables high-speed USB connections, thus performing the remote monitoring of measuring objects at high speed. \*: The optional PC Link software is required.

See page 13 for details.

### AUX connector

Used for printing out and firmware updating.

### USB2.0 connector (Device)

PC linking is possible at high-speed transmission.<sup>(2)</sup>

### CF card slot

The CF card with a maximum capacity of 64 Gbytes is supported.<sup>(3)</sup>

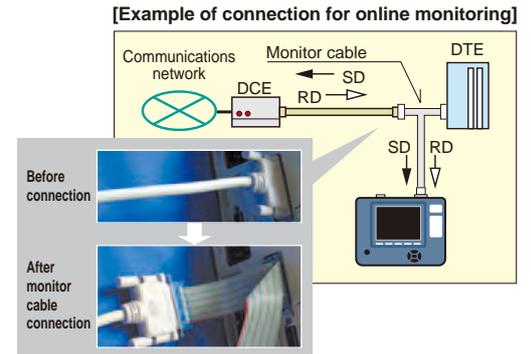
**Incorporating remote monitor, simulation, and BERT functions to improve the efficiency of the development testing and trouble analysis of RS-232C/RS-422/RS-485 communications.**

Multi Protocol Analyzer  
**LE-8200A/  
LE-8200**



# The monitor function exactly records and visualizes communications data.

The line monitor function allows the recording of communications data and provides an easy-to-understand large-sized display without affecting the communications lines. This function makes it possible to grasp the conditions of transmission and reception, thus greatly shortening the required time of troubleshooting. As a standard feature, the LE-8200(A) supports a variety of communications standards, such as binary synchronous communications (BSC) for character-synchronous transmission, and high-level data link control (HDLC) for bit-synchronous transmission as well as asynchronous communications that are widely used for PC peripheral and microcontroller applications. Furthermore, it supports Modbus communication used for FA systems. By adding an optional expansion kit, the LE-8200(A) will support many more communications standards.



[Example of display with line state]



[Example of X.25 protocol translation]

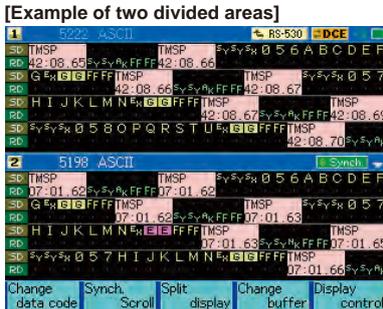


[Example of Modbus translation]



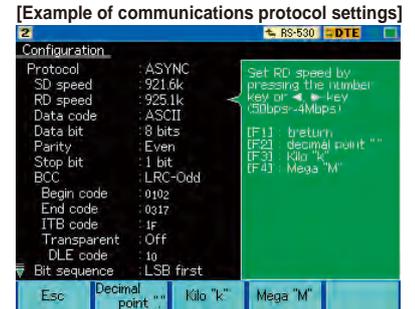
## Display of Two Divided Areas for Ease of Comparison

The display of two divided areas is convenient for the comparison of normal and abnormal communications log records. It is possible to scroll the two divided areas on the upper half and lower half of the screen individually or simultaneously, which allows the comparison of the two communications records efficiently.



## Freely Set with Four Effective Digits for Transmission and Reception

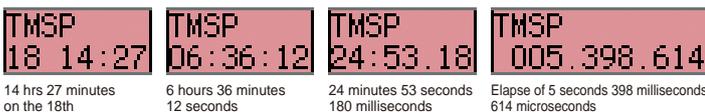
Using high-precision DPLL technology for open baud rate support, transmission and reception speeds can be separately set with 4 effective digits to a baud rate range between 50 bps and 4 Mbps. The required conditions of transmission or reception data, such as the bit configuration, bit transfer sequence, polarity, and modulation format can be freely selected to meet many test situations.



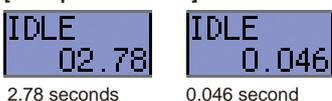
## High-precision Time Stamp Recorded at 1-μs Intervals

The time stamp shows the transmission or reception time of the head data of each communications frame. In addition to the conventional real-time time stamp, the LE-8200(A) incorporates a high-precision time stamp that records the elapsed time of transmission or reception at minimal 1-μs intervals from the start of measurement. This function has widened the range of applications from the narrowing down of data on a specified time-and-date basis and delicate timing basis. Moreover, the LE-8200(A) displays idle time, thus making it possible to check the response time and timeout of transmission or reception at a glance. In addition, it is possible to judge each frame in ASYNC communications by specifying a non-communications period of 1 to 100 ms or end data.

[Example of time stamp]



[Example of idle time]



## User Defined Translation Function

Users can translate designated data string in the frame to the specific characters or numbers. It is useful to analyze data of unique protocol format.

## Long Recording Time Allowing Rolling back to Points of Communications Failures

The LE-8200(A) has 100-MB capture memory that gains high-speed access to mega-speed communications, and is provided with ring and fixed buffer modes. The user can select the ring buffer mode for endless recording or the fixed buffer mode to stop recording automatically when the memory is full. Furthermore, the LE-8200(A) incorporates an auto save function that makes it possible to save the monitored content of captured memory on a high-capacity CF card or USB flash drive (LE-8200A only) in a specified file size continuously. This is useful for identifying rare communications failures of unknown causes.

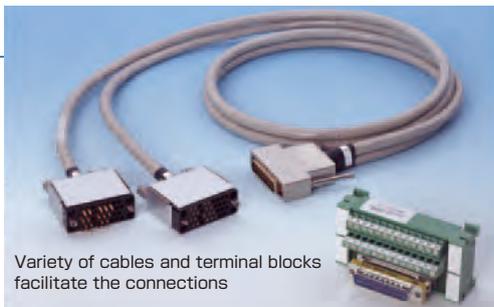
[Continuous recording time reference \*1]

| Applicable transmission speed | Main memory only    | 64GB CF card *2  |
|-------------------------------|---------------------|------------------|
| 9600bps                       | Approx. 6 hours     | Approx. 154 days |
| 1Mbps                         | Approx. 220 seconds | Approx. 40 hours |

\*1: In the case of full-duplex transmission of 1-kilobyte data at 1-millisecond intervals, both transmission and reception data will consume 4-byte memory for each capture.  
\*2: With the optional CF-64GX used. USB flash drive is usable on LE-8200A.

## Search Feature

The LE-8200(A) allows the scrolling or paging of measured data freely. This powerful feature makes it possible to search specific data items from a large volume of measured data and transmission or reception frames along with time stamps within a specified period, thus greatly increase the efficiency of offline analysis. The powerful search feature allows you to locate specific data and perform counting.



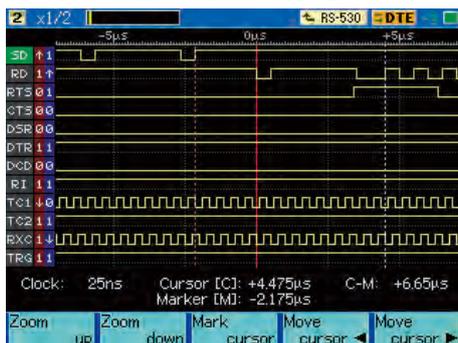
Variety of cables and terminal blocks facilitate the connections



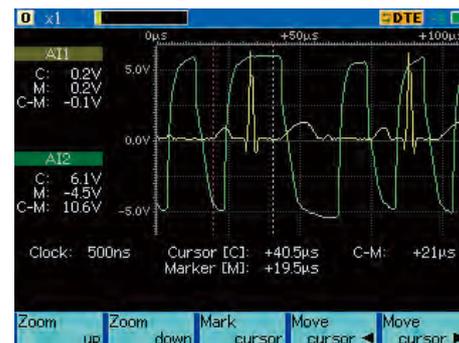
**Supports Logic Analyzer Function/ Digital Waveform generation (\*), and Analog Waveform Analysis \*LE-8200A only New Function**

The logic analyzer function, which digitally displays the waveforms of communications line timing on 12 lines simultaneously, operates at a sampling rate up to 100MHz. Besides, the adoption of function keys ensures the operation of the time cursor with ease. LE-8200A can edit monitored waveforms using logic analyzer function and generate them with different timing for error finding. Furthermore, if the OP-SB85L (option) is use, measurement of analog voltage waveforms at a maximum rate of 40M samples per second will be possible. Therefore, you will be able to realize detailed waveform observation without carrying a heavy measuring instrument on a business trip. You can also use it for educational purposes, comparing documents for communications protocol.

[Example of Logic Analyzer Analysis]



[Example of Analog Waveform Analysis]

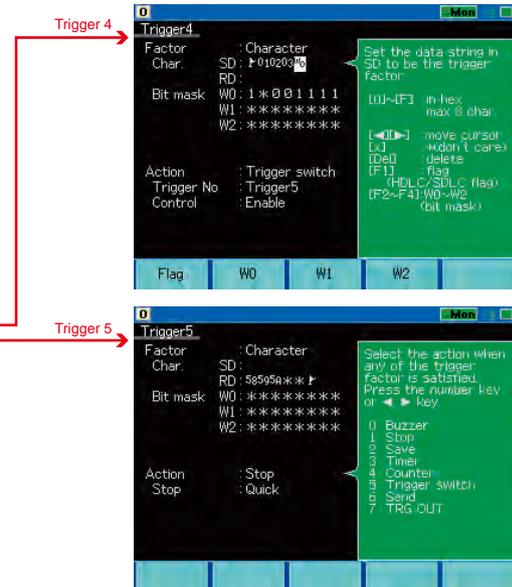


**Trigger Function with Detection Capability Reinforced Twice**

The trigger function controls the operation of measurement when the function detects specific communications status. Conventional models have four combinations of trigger conditions and trigger actions. On the other hand, the LE-8200(A) is provided with eight combinations for ease of making settings that are more flexible. This function not only enables the detection of eight types of conditions simultaneously but also makes it possible to detect particular conditions in sequence. Complicated communications events can be precisely grasped.

**[Contents of trigger settings]**

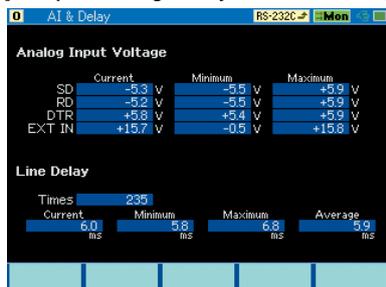
- Trigger 0: External trigger output in case of error generation.
- Trigger 1: Saves the data before and after idle time on the external memory when the idle time exceeds the set value.
- Trigger 2: Starts timer 0 when the specified signal line is 1.
- Trigger 3: Stops timer 0 when the specified signal line is 0.
- Trigger 4: Enables trigger 5 when start flags 01h, 02h, 03h, and F1h or 01h, 02h, 03h, and F3h are detected in sequence in SD.
- Trigger 5: Stops measurement immediately when 58h, 59h, 5Ah, arbitrary 2-byte data, and the end flag are detected in sequence in RD.
- Trigger 6: Stops measurement when timer 0 coincides with the set value.



**Voltage Measurement of Communications Line with Ease**

With the feature of delay time measurement, a period of change of the communications control line from the present state to another can be measured at a 0.1-ms resolution. The feature is added with a function to measure the maximum, minimum, and present voltage amplitudes of SD, RD, DTR, and external EXT signals over RS-232C. This allows ease of the voltage amplitude measurement of wiring in connectors where the probes of testers cannot reach smoothly, thus contributing to the investigation of communications trouble caused by an insufficiency in the amplitudes of signals resulting from a circuit voltage drop.

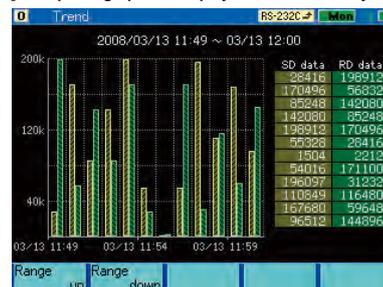
[Example of analog & delay time measurement]



**Graphic Display of Hourly Communications Status**

This statistical analysis feature is used to measure the volume of communications and the number of occurrence times of specific communications status for a specified period ranging from 1 second to 240 minutes with the results graphically displayed. Condition 0 and condition 1 of the trigger function can be specified as target items. Therefore, it is possible to grasp not only the change of communications traffic (the rate of line usage) but also the number of transmission and reception times of specific data strings and the occurrence frequency tendency of errors on a time zone basis. Furthermore, the auto range display with increased graphic resolution allows ease of seeing slight changes.

[Example of graphical display of statistical analysis]

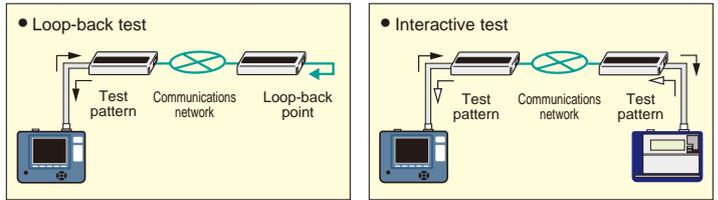




## Measure transmission quality of communications lines by a loop-back or interactive connection.

BERT function enables you to evaluate parameters (bit error count, block error count) conforming to ITU-T G.821 Notification, hence enabling error rate evaluation and fault point identification. Elaborate test patterns and functions such as bit error forced interrupt are comparable to dedicated equipment.

[Example connection for BERT]



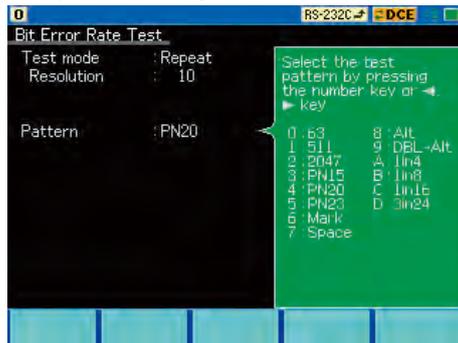
### Many of test patterns

Evaluation is possible in ASYNC or SYNC mode, by specifying measurement period or test pattern. Three patterns are added for longer measurement period.

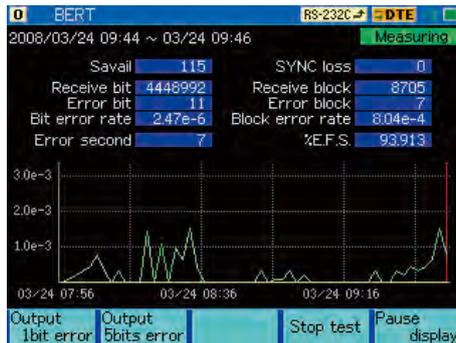
### Graphs for specified measurement period

Records the results of more than one specified measurement period by using repeat mode. The movement of graph enables you to check the error rate easily.

[Example of BERT setting]



[Example of BERT measurement]



[Contents of BERT measurement]

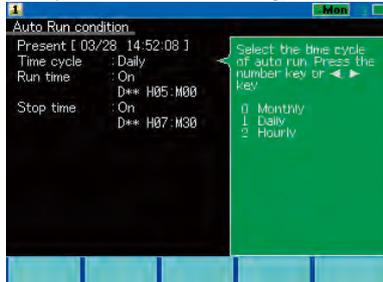
|                  |                                  |                  |
|------------------|----------------------------------|------------------|
| Savail           | Available measurement in seconds | 0~9999999(sec)   |
| Receive bit      | Effective bits received          | 0~9999999~9.99E9 |
| Error bit        | Error bit count                  | 0~9999999~9.99E9 |
| Bit error rate   | Bit error rate                   | 0.00E-0~9.99E-9  |
| Sync loss        | SYNC loss count                  | 0~9999           |
| Receive block    | Effective blocks received        | 0~9999999~9.99E9 |
| Error block      | Block error count                | 0~9999999~9.99E9 |
| Block error rate | Block error rate                 | 0.00E-0~9.99E-9  |
| Error second     | Error second                     | 0~9999999(sec)   |
| %E.F.S           | Normal operation rate            | 0.000~100.000(%) |

## Full of Convenient Functions for Efficient Measurement

### Auto RUN / STOP Function

By making start and end time settings, automatic measurement will be possible for the specified period. This feature is useful for unmanned measurement with only an analyzer left on site.

[Example of auto RUN/STOP setting]



The screen on the right-hand side is set to make measurement from 5:00 a.m. to 7:30 a.m. automatically on a daily basis.

### File Management Function

The file management feature makes it possible to save a number of test conditions and measurement data in PC-compatible format on the optional high-capacity USB flash drive (LE-8200A only) and CF card. This functions supports file sorting and filtering, thus greatly improving file search performance. Moreover, the LE-8200(A) is safely designed. Therefore, if an automatic backup is set, measurement data will be saved automatically on completion of measurement.

[Example of file management]



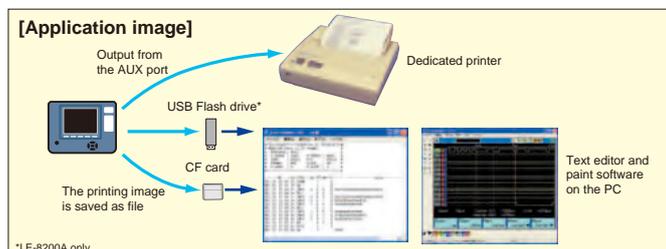
### Monitor Condition Auto Setting

The communications conditions of lines, such as the communications speed and framing of the lines, can be automatically detected if relatively large volumes of communications data with few errors flows in the lines. This is effective for monitoring lines of unknown communications conditions.

\* Accurate auto settings will not be possible for small volumes of communications data or data that contains many errors.

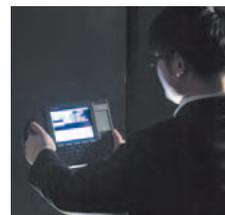
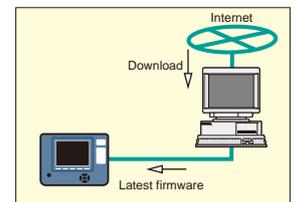
### File Printout Function Functional Enhancement

The continuous printing of measurement data as well as the printing of screen display is possible in an appropriate format selected from a wide variety of formats according to the display mode of the screen. Printing images of text files and bitmap files can be saved on the USB flash drive(LE-8200A only) and the CF card, thus saving paper resources and making it possible to utilize data on personal computers at the same time.



### Firmware updating

The latest firmware with additional functions and improvements can be found on our website. Support to new communications standards and new functions with no interface change will be available by simply updating the firmware. When you download it to your PC, you can update the firmware over a serial cable or a USB cable.



The LE-8200(A) incorporates a backlight, thus ensuring ease of operation in places with insufficient illumination.



A carrying bag is provided for ease of transportation.

# Additional data types can be measured by adding an interface expansion kit.



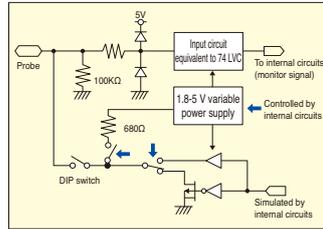
## TTL I<sup>2</sup>C SPI TTL/I<sup>2</sup>C/SPI Communications Expansion Kit OP-SB85L

This interface expansion kit is equipped with a communication measurement port at TTL/C-MOS signal levels and a high-speed analog measurement port. This kit is ideal for observing/testing communication status by directly probing the communication line between the communication LSI and interface IC on printed circuit boards (PCB).



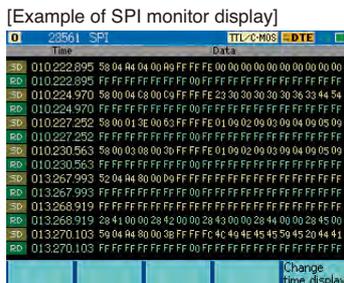
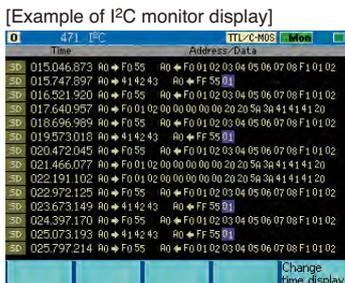
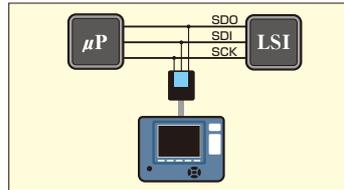
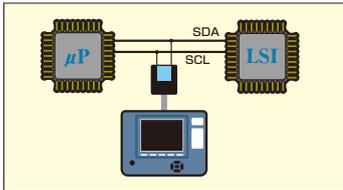
### Support for a broad range of power supply systems.

This TTL/C-MOS measurement port can monitor signal levels of a broad range of power supply voltages. Of course, this port outputs a signal level ideal for the power supply system of the testing target during simulation.



### Monitor and simulate I<sup>2</sup>C/SPI

For I<sup>2</sup>C/SPI, this kit can not only monitor communication data but also simulate the master and slave stations. For I<sup>2</sup>C, 7 or 10-bit address is selectable. For SPI, the order of bit sending and a topological relation between the clock and data are selectable.

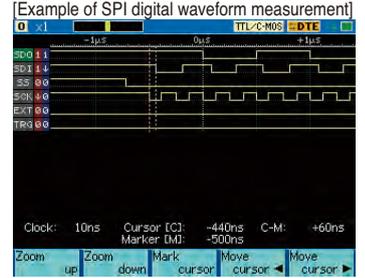
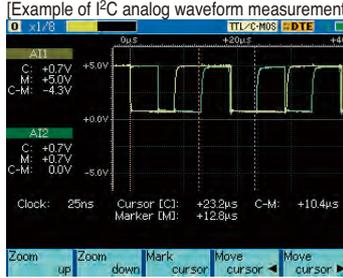


### Ideal for UART ports or TTL-level HDLC

This kit is ideal for evaluation of microcomputer UART ports for ASYNC communications or communications modules which use TTL-level HDLC. It is also possible in the BURST mode to monitor such communications as cases when the clock is provided only when data are sent.

### Waveform analysis function

The high-speed analog measurement port can measure waveform at a maximum speed of 40 M samples per second, which makes it possible to observe signal's rising waveforms. In addition, the communication measurement port with a test clip is usable as a logic analyzer with a maximum speed of 100 M samples per second, which is ideal for the measurement of delicate signal delay time.



### Specification

|                           |   |
|---------------------------|---|
| Interface                 | TTL / CMOS (For I <sup>2</sup> C, SPI)  |
| Probe Signal              | SD (SDA/SDO), RD (SDI), RTS (SS), CTS, EXIN, TXC (SCL/SCK), RXC, Trigger IN, Trigger OUT (Lead length: 170mm)   |
| Protocol                  | ASYNC, ASYNC-PPP, SYNC/BSC, HDLC/SDLC/X.25, I <sup>2</sup> C, SPI, BURST  |
| Test Function (*1)        | Monitor, Simulation, BERT   |
| Baud Rate                 | ASYNC, ASYNC-PPP, SYNC, BURST: 50bps~4Mbps (*2)<br>HDLC: 50bps to 4Mbps (*2) on standard, 115.2Kbps to 12Mbps (*3) on using OP-FW12G<br>SPI: 50bps to 2.15Mbps (*4), 115.2Kbps to 20Mbps (*5) on using OP-FW12G<br>I <sup>2</sup> C: max. 1Mbps (50K, 100K, 200K, 384K, 417K, 1Mbps for simulation) |
| Signal Level              | Selectable from 5.0V/3.3V/2.5V/1.8V of power signal level   |
| Input Impedance           | 100KΩ (0V ≤ Vin ≤ 5V) (Acceptable input range: -1V to +7V)  |
| Input Level Threshold     | 5.0V setting; High: Min 3.5V, Low: Max 1.5V<br>3.3V setting; High: Min 2.0V, Low: Max 0.8V<br>2.5V setting; High: Min 1.7V, Low: Max 0.7V<br>1.8V setting; High: Min 1.2V, Low: Max 0.6V  |
| Output Circuit            | Select Open collector with the pull-up resistor of 680Ω, Open collector without pull-up resistor, or Push-pull output of CMOS. (*6)   |
| Output Level Voltage      | High: Min Selectable signal level - 0.4V, Low: Max 0.5V (*7)  |
| Analog Measurement Port   | Measurement channel: 2<br>Input impedance: 1MΩ (Acceptable input range: ±25V)<br>Measurement range: ±6V / ±12V (8 bits resolution)<br>Sampling cycle: 1mS - 25nS, 15 steps<br>Record length: 4K point   |
| Digital Waveform Analysis | Sampling cycle: 1ms - 10ns cycle, 16 steps  |
| Composition               | Dedicated expansion board, high-speed TTL probe pod, relay cable (length: 800mm), probe unit (LCU-01), 3-wire probe cable (LE-3LP2)   |

\*1: In BURST Mode for capturing data at all clock SYNC, only the monitor mode is supported. I<sup>2</sup>C and SPI do not have the BERT function. \*2: Applied in the full duplex. In the full duplex, 2.15Mbps at Max. \*3: Applied in the half duplex. In the full duplex, 6Mbps at Max. \*4: MAX 20Mbps (Monitor) or 4Mbps (Simulation), when the continuous transfer speed is less than 1K bytes. \*5: Applied in the monitor mode. In the simulation mode, the speed is up to 12Mbps. \*6: Set from the analyzer. Outputting CMOS is recommended on simulation of which speed is more than 2Mbps. \*7: Applied when the current is 4mA.

## Speed enhancement High-speed HDLC/SPI Communications Firmware OP-FW12G

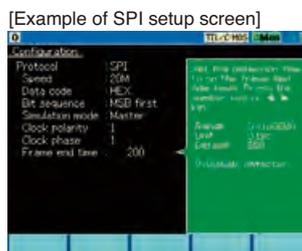
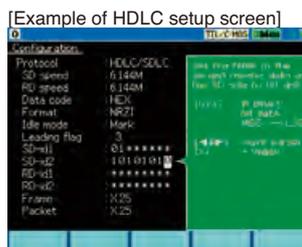
This expansion firmware raises the speed of measurement tests for bit synchronous communications (such as HDLC/SDLC/X.25 or CC-Link) and SPI communications. This firmware processes main measurement items completely with a FPGA, thus precisely capturing communication data along with time stamps in 1-μs units.

### HDLC and CC-Link

This firmware captures only the frames with a specified address (16 bits directly after the flag) to analyze them efficiently. For RS-485 half duplex communications, it is also possible to display the frames with a specified address on the SD side, and the other ones on the RD side to sort them so that they can be recognized easily.

### SPI

This firmware can support all the four patterns of SPI transmission timing using a combination of clock polarities/phases. In addition, even if the SS signal is fixed to the low state, frames can be separated by setting up the pause time of the transmission clock on a 0.1 μs basis, so the relation between the transfer command and data can be analyzed efficiently.



### Specification

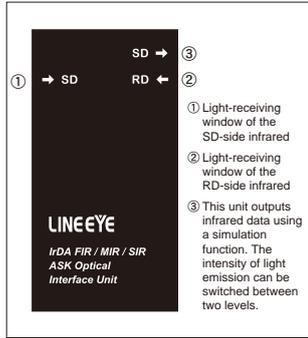
|                     |   |
|---------------------|---|
| Interface           | RS-422/485 (*1), TTL (*2), SPI (*2)   |
| Protocol            | HDLC/SDLC/X.25, CC-Link: NRZ/NRZI format, AR clock (*3)<br>SPI: Clock polarity/phase selectable   |
| Baud Rate           | HDLC, CC-Link: 115.2Kbps to full duplex 6Mbps/ half duplex 12Mbps (*4)<br>SPI: 115.2Kbps to 20Mbps (*4) (*5)<br>Speed is freely set to four effective digits    |
| ID Filter (*6)      | Specify address frame (16 bit length, don't care and bit masks available)   |
| Error Check (*6)    | FCS Error (CRC-ITU-T), Abort, short frame   |
| SPI Frame Detection | SS rising, idle time of transferring clock (unit: 0.1us)  |
| Time Stamp          | 9 digits (0 to 134217727) Resolution: 1mS, 100μS, 10μS or 1μS   |
| Trigger Function    | Set 2 triggers (sequential setting available) up to 8 characters (don't care and bit masks available), communication error (HDLC only), external trigger input. |
| Simulation          | Transmit pre-set data table (16 tables, total of 16K data) corresponding to the numerical keys.   |
| Composition         | Firmware CD, Instruction Manual   |

\*1: Use a RS-530 port. LE-25TB (DSUB25 pin terminal) or LE-530TB is useful to connect to the target device. \*2: Necessary to have OP-SB85/OP-SB85L. \*3: The synchronous clock extracted from the transmission and reception data. \*4: Necessary to have OP-SB85L for high-speed simulation of TTL/SPI. \*5: When transmission data continues more than 16byte, max speed may be at max. 6Mbps. For simulation, max 12Mbps (master mode)/ 6Mbps (slave mode). \*6: HDLC/SDLC/X.25, CC-Link only.

**IrDA ASK**

**Expansion Kit for Infrared Communications OP-SB85IR**

This expansion kit can measure/test IrDA (SIR/MIR/FIR) or ASK infrared communications. This kit is equipped with not only a monitoring function of infrared communication data but also a simulation function to send test data by infrared light emission, which is ideal for the development of portable apparatuses with infrared communications ports.



**Data can be analyzed in detail on the translated display.**

The data display screen can be switched to the translated display screen simply by pressing the [Data] key even during monitoring. This makes it possible to analyze the content of sent/received IrDA data frames.

[Example of IrDA raw data display]



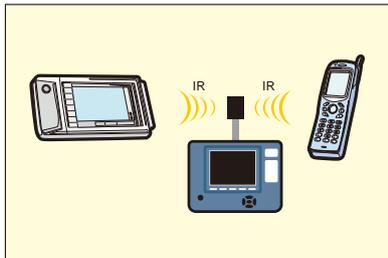
[Example of IrDA translated data display]



**IrDA sent/received data are observed easily.**

Setting is easily completed simply by placing an infrared measurement pod between the measurement target apparatuses.\* Even if communication speed changes while IrDA data are sent between those apparatuses, this kit switches speed and frame format automatically by analyzing the IrLAP protocol, making it possible to measure data seamlessly.

\* The probe pod for monitoring IrDA data is a patent technology of LINE EYE Co., Ltd.



**Specification**

|                           |  |
|---------------------------|--|
| Interface                 | Infrared rays, Photodiode: HSDL-3602 equivalent  |
| Measurement Signal        | SD, RD   |
| Protocol                  | IrDA1.1 (SIR/MIR/FIR), ASK type  |
| Test Function             | Monitor / Simulation   |
| Baud Rate (bps)           | 2400, 9600, 19.2K, 38.4K, 57.6K, 115.2K, 576K, 1.152M, 4M  |
| Automatic Speed Detection | Automatically detect target speed following IrLAP protocol. (*1)   |
| SIR Frame Format          | Asynch conformance (speed 2400bps - 115.2Kbps)<br>[BOF]+[ADDR]+[control]+[information]+[FCS]+[EOF]<br>It is possible to set not capturing after second BOF.    |
| MIR Frame Format          | HDLC conformance (speed 576Kbps, 1.152Mbps)<br>[STA]+[STA]+[ADDR]+[control]+[information]+[FCS]+[STO]  |
| FIR Frame Format          | 4PPM encoding type (speed 4Mbps)<br>[PA]+[STA]+[ADDR]+[control]+[information]+[FCS]+[STO]  |
| Output Emission Level     | High/Low interchangeable for simulation.   |
| Analog Waveform Analysis  | Measure signal voltages of 2 channels and display in analog waveform. (*2)<br>Sampling: 1KHz to 40MHz (15 steps), 4K points<br>Measurement range: ±6 V / ±12 V |
| Digital Waveform Analysis | Display emission level of infrared rays digital waveform. (Low: emission, High: light off)<br>Sampling cycle: 1ms - 10ns cycle, 16steps                        |
| Composition               | Dedicated expansion board, IrDA probe pod, relay cable [length: 800mm], 3-wire probe cable [LE-3LP2].  |

\*1: Cannot have the automatic speed detection on IrSimple protocol. To measure only transferring data for IrSimple, set the speed to 4Mbps. \*2: Peripheral circuit is measured and not IrDA emission signal itself. \*3: Monitoring only. For simulation, transmission data signal toward IrDA photodiode is measured.

**Current Loop**

**Expansion Kit for Current Loop Communications OP-SB85C**

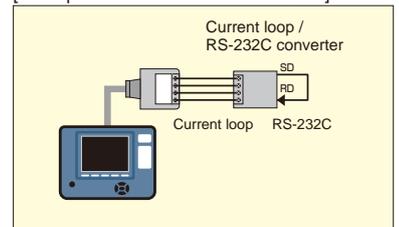
This expansion kit supports the current loop communications, which is utilized in the FA field even now. For current loop communications, this kit realizes monitoring data, testing data sending/receiving, and measuring bit error rate.



**Measuring error rate in the current loop communications**

By making data loop back on the side of the apparatus tested, error rate can be measured by comparing the sent and received data.

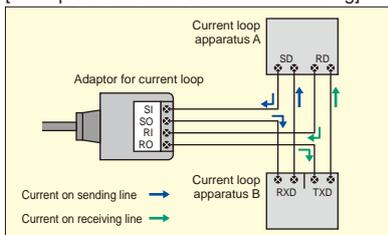
[Example of line connection for BERT]



**Monitoring the current loop communications**

Data are monitored by connecting this kit to the circuit monitored in series.

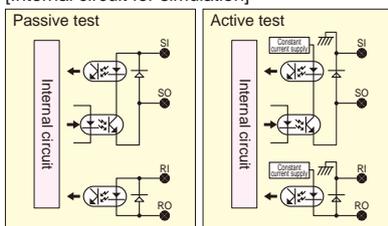
[Example of line connection for monitoring]



**Testing data sending / receiving in the current loop communications**

Data sending/receiving can be tested in passive and active manners.

[Internal circuit for simulation]



**Specification**

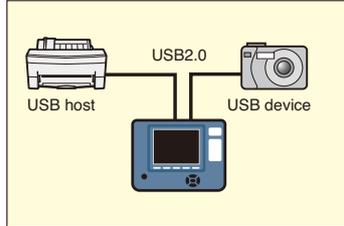
|                                |  |
|--------------------------------|--|
| Interface                      | Current loop communications (4-pole terminal block, 7.62mm pitch/M3 screw)   |
| Measurement signal             | SD, RD   |
| Baud rate                      | 19.2 Kbps max. (*1)  |
| Test Function                  | Monitor, Simulation, BERT  |
| Transmission Reception Circuit | Reception: Photodiode with a reverse connection protection diode. (*2)<br>Transmission: Photo-transistor with a reverse connection protection diode. (*2)<br>Acceptable max current: 70mA, Acceptable max voltage: 40V |
| Monitor current level          | 10 to 60mA   |
| Circuit type                   | Select passive type or active type. (*3)   |
| Current Supply                 | Supply from inner power supply if active type is selected.<br>Select 20 mA or 40mA. (*3)   |
| Signal Polarity                | Select normal (receive when carrying current) or invert (receive when not carrying current) (*4)   |
| Analog waveform analysis       | Signal voltages of 2 channels are measured and displayed in analog waveform<br>Sampling: 1 KHz to 40MHz (15 steps)<br>Measurement range: ±6 V / ±12 V  |
| Digital Waveform Analysis      | Display waveform of current status on Current loop.<br>Sampling cycle: 1ms - 10ns sampling, 16 steps.  |
| Composition                    | Dedicated expansion board, current loop adapter (OP-1C) (*5), relay cable [length: 800mm], 3-wire probe cable (LE-3LP2)  |

\*1: The baud rate is restricted by the cable length and current. \*2: Current restriction resistor is not equipped. When using an external power supply, prepare a resistor not to exceed the max current capacity. \*3: Select from the DIP switch on the current loop adapter. \*4: Set in the analyzer. \*5: OP-1C (Current Loop Adapter) is sold separately as well. OP-SB85L or OP-SB85IR combined with the OP-1C can be an equivalent set.

# Stand-alone measurement of USB/LAN is realized easily by adding expansion kits.

## USB Expansion Kit for USB 2.0 Communications OP-SB84

This interface expansion kit supports real-time monitoring of USB 2.0 protocol and power measurement of VBUS. Since USB 2.0 data can be measured easily without using a personal computer but using the analyzer only, this kit is ideal for the inspection and troubleshooting of installed apparatuses in addition to the development of USB apparatuses.



| LED     | State   |
|---------|---|
| High    | High-speed mode   |
| Full    | Full-speed mode   |
| Low     | Low-speed mode  |
| Data    | Blinking: USB packets being received<br>Not lighting: No USB packet |
| Suspend | Suspended   |
| Reset   | Reset   |
| Vbus    | Vbus  |



The line-state indication sheet can be switched according to the measurement board.

### Records in the CF card or USB flash drive<sup>(\*)</sup>

\*LE-8200A only

This kit judges the USB transmission speed of the device measured (1.5/12/480 Mbps) automatically, and displays the communication data and bus events of USB on the color LCD in a real-time manner as recording them in the 100 MB of capture memory incorporated in LE-8200(A) together with time stamps. In addition, this kit can record communication data in a large-capacity external memory continuously. Since there is a branch circuit with a high-impedance amplifier in the measurement section, the target USB line is not influenced.

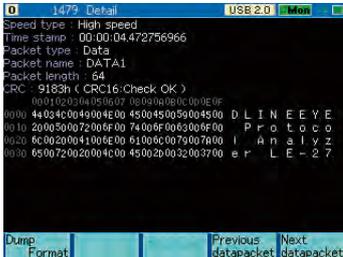
[Example of basic display screen]



[Example of translated display screen]



[Example of dump display screen]



○Detailed translation is possible by the PC software of LE-650H2 after transferring the measured data to a PC. Data can be converted to a text format.

### Data can be captured and displayed efficiently.

This kit is equipped with a log filter to capture efficiently the target USB packets only and a display filter to minimize analysis time.

[Example of setup screen]



This is a setup example which captures only the transactions with a particular address (7) and a particular end-point (a binary number four digits long, and the first and fourth digit are 1 and 0, respectively) as eliminating the transactions such as IN-NAK, which is not necessary but occurs frequently. The "non-IN-DATA: On" setting in the "Cut filter" section means that IN transaction is not captured if no DATA packet comes after that IN transaction comes.

### Powerful sequential trigger

This kit is equipped with a powerful triggering function which detects triggering conditions such as a communication error or occurrence of a particular transaction and stops issuing external signals and measurement automatically. Since up to eight conditions can be traced sequentially, data can be analyzed in an advanced manner by operating this kit together with an external instrument even in a complicated condition.

[Example of setup screen]



This setting means that the condition is fulfilled when a transaction configured with IN (with an address of 7 and an end-point of 3 or 2), DATA (with a payload of "51 52 53 01" or "51 52 53 81", and ACK packets has been detected in the third time. Then, a trigger mark is recorded, and the L-pulse is output to the external output terminal 1.

### VBUS measurement function

This kit is equipped with a function to continuously measure the voltage, current, and power consumption of the VBUS line at up to 1 ms intervals as standard equipment. Data can be measured at any time easily because this kit is usable just by connecting the USB cable and troublesome probing is not necessary. It is also helpful for preparing a test report that measured data can be saved in a CSV file.

[Example of VBUS graph display]



[Example of VBUS dump display]

| Time[Sec] | Power[W] | Voltage[V] | Current[mA] |
|-----------|----------|------------|-------------|
| 3.149     | +0.02    | 5.10       | +3          |
| 3.150     | +0.02    | 5.09       | +3          |
| 3.151     | +0.13    | 4.98       | +26         |
| 3.152     | +0.29    | 5.02       | +57         |
| 3.153     | +0.35    | 5.02       | +72         |
| 3.154     | +0.42    | 5.02       | +84         |
| 3.155     | +0.50    | 5.02       | +99         |
| 3.156     | +0.56    | 5.01       | +111        |
| 3.157     | +0.59    | 5.01       | +118        |
| 3.158     | +0.65    | 5.01       | +130        |
| 3.159     | +0.69    | 5.00       | +137        |
| 3.160     | +0.75    | 5.00       | +149        |
| 3.161     | +0.78    | 5.00       | +155        |
| 3.162     | +0.80    | 5.01       | +160        |

### Specification

|                               |  |
|-------------------------------|--|
| Interface                     | USB 1.1/2.0, USB standard A/B receptacle 1 each  |
| Applied speed                 | HIGH (480Mbps) / FULL (12Mbps) / LOW (1.5Mbps) Automatic detection   |
| Memory Capacity               | 100MB  |
| Record Type                   | Ring buffer or Full stop mode  |
| Auto Save Function            | Automatically save the USB log data in the external memory. <sup>(1)</sup>   |
| USB Log Display               | Packet (SOF, IN, OUT, SETUP, DATA0, DATA1, ACK, NAK, STALL, PRE, DATA2, PING, MDATA, SPLIT, ERR, NYET, [Unknown]), Bus event (Reset, Suspend, Disconnect, Chirp, Vbus level), Translation (Standard device request, Standard device descriptor), HUB/HID class translation, Name of device request on Mass storage. <sup>(2)</sup> |
| Time Stamp                    | Resolution 16.7nsec for Max. 20 hours. Elapsed time and Time between two packets are selectable.   |
| Log Filter                    | IN transactions without SOF/ IN-DATA, PING transactions, Vbus level. Record transaction of specific address/ endpoint.   |
| Display Filter Function       | Display or hide transaction of SOF, IN-NAK, OUT-NAK, SETUP, PING, specific address/ end point. <sup>(2)</sup>  |
| Trigger Function              | Able to set 8 trigger conditions. Triggers are proceeded in a sequence from Trigger 0.   |
| Trigger Condition             | Errors(CRC and PID errors), Transaction (address/end points, Token and Handshake packets in combination, Payload of max 8 bytes from the head of DATA packets), Bus events, and the logical state of 4 external input pins.  |
| Trigger Action                | Output a signal from an external terminal after satisfaction of trigger condition. Stop measurement after satisfaction of the last trigger. Repeat the last trigger condition. Log continuously.   |
| Retrieval Function            | Retrieve the specified frame or event and display the top of data or count the number of data. <sup>(2)</sup>  |
| VBUS Measurement Function     | Measure Vbus Current/ Voltage/ Power and display in Dump or Graph. Interval: 1ms - 1s (10 steps), Measuring times: 1 to 4194304 Voltage : 0 to +8V (Accuracy : ±1% FS) Current : -2 to +2A <sup>(3)</sup> (Accuracy : ±2% FS)  |
| Data Conversion, Printout     | Log data: Convert to text files, print out and save. <sup>(4)</sup> Vbus measured data: Convert to text/csv files, print out and save.   |
| External Signal Input/ Output | TTL level input: 4, TTL level output: 4, Able to set work with trigger condition.  |
| Composition                   | Interface expansion board, Line state sheet D, USB cable, Utility CD   |

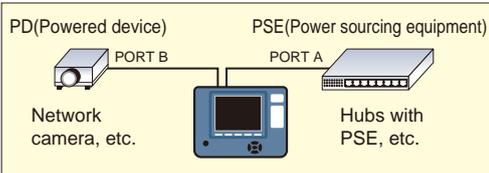
<sup>1</sup>: On using ring buffer, measured USB data can be saved up to the capacity external memory. However, it is possible that there is some capturing loss for a large load data. <sup>2</sup>: Advanced filtering, retrieval, and various class-translation are possible by the PC software of LE-650H2 on a PC. <sup>3</sup>: "s" means the current direction from the device to host device. <sup>4</sup>: It consumes much time to convert a large USB data into a text file on LE-8200(A). In this case, it is recommended to use "LEUCVT\_WIN" which is much faster than LE-8200(A).

## LAN

### Expansion Kit for LAN (PoE) Communications OP-SB89G

**NEW**

This kit supports the measurement test of Giga bit Ethernet LAN. It is equipped with Monitor function for analyzing data, Packet Generation function for testing network, and PoE (Power Over Ethernet) function for measuring power of PoE/PoE+ apparatuses. It is ideal for developing built-in apparatuses with LAN ports, evaluating communications, and maintaining/checking network cameras and wireless hubs compliant with the PoE specification.



○ This kit can judge the PSE or type of the PoE.

### Monitor function

Records data frames of Ethernet LAN at a minimum resolution of 40ns and displays on the LCD. Filter function enables to monitor specific frames only. The measurement port is a fail-safe tap, so that the target line is not disconnected even if power supply to the analyzer is interrupted.

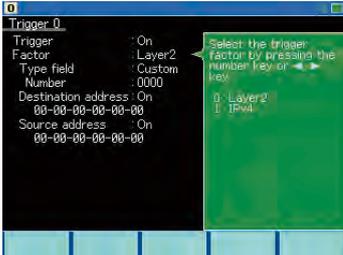
[LAN frame display]



[LAN translation display]



[Trigger configuration display]



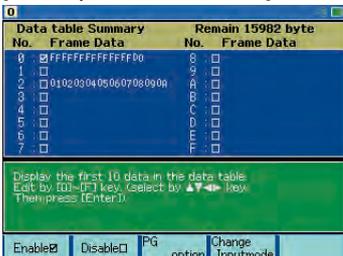
It is possible to stop the measurement automatically after the occurrence of triggers, such as external input and specific frames.

○ Log data can also be analyzed using free software such as Wireshark.  
 \* Dedicated utility software is available, which converts a measured log file into a file of the Wireshark (.Pcap) format.

### Packet Generation Function (PG)

Generate specified packets at a maximum 1Gbps line rate. It is ideal for network load test.

[Summary of transmission table]



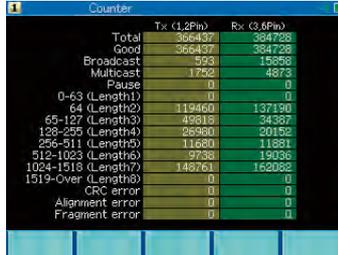
[Protocol edition display]



### Statistic function

This kit can collect statistics of chronological change of communication traffic and the number of error packets.

[Counter display]



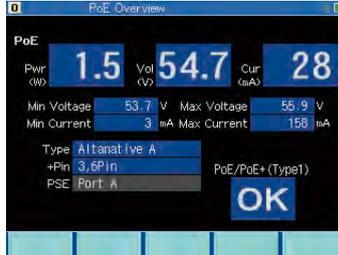
[Statistics graph display]



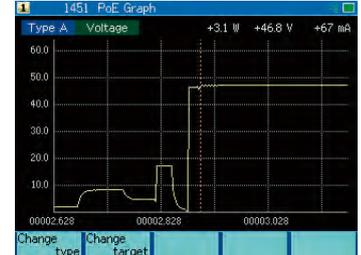
### PoE measurement function

This kit can be used as power logger of PoE and PoE+. It can measure the voltage, current, and power consumption between the power sourcing equipment (PSE) and powered device (PD).

[PoE measuring display]



[PoE graph display]



### PING function and Port Blinking function

Pinging is helpful for the link confirmation test. Port blinking is a function which flashes the link lamps on the hub, which is useful for identifying multiple cables coming out of the floor. This kit is equipped with some useful functions for developing LAN devices and also for on-site tests.

[PING configuration display]



[PING display]



### Specification

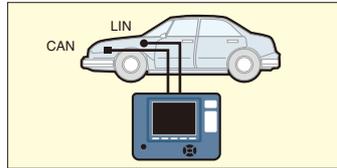
|                            |  |
|----------------------------|--|
| Interface                  | Port A, B: 10BASE-T/ 100BASE-TX/ 1000BASE-T  |
| Monitor Function           | Measures and records LAN frames by TAP connection (*) of A/B ports. Frame size: 60byte-2Kbyte, Time stamp (13 digit, Min. resolution: 40ns.) Auto stop by external signal trigger or specific frame detection.   |
| Recording Frame            | Max. 48,000 - 1,048,000 frames (equivalent to 100Mbyte)(**)  |
| Detailed translation       | Translatable protocol: IPv4, ARP, ICMP, TCP, UDP, DHCP   |
| Filter function            | Monitors specified frames only.  |
| Auto save function         | Automatically saves the captured data into an external memory.   |
| Retrieval function         | Retrieves specific frames and displays/counts it.  |
| Conversion to pcap file    | A conversion software to Etherreal/ Wireshark format (pcap) is attached.(***)  |
| Statistic function         | Take statistic of two frame counters for a specified interval (1-240 minute), and displays it in a graph. Displays all frame counter values in real time   |
| PoE function               | Measures and records power consumption / Voltage / Current / Power supply type (Alternative A/B, power supply port, polarity), OK/NG statement between devices of PoE (IEEE802.3af) / PoE+ (IEEE802.3at). Interval: 1ms-1s. Max recording time: 400 million. Voltage: 0-60V (±1% F.S.). Current: 0-600mA (±2% F.S.). |
| PG Function                | Transmits any packet by wire rate from Port A<br>Transmits up to 16 kinds of packets for specified number of times or continuously. Able to set frame gap for each packets.  |
| PING function              | Transmits PING commands to PortA/B and displays response time and number of times.   |
| Port Blink function        | Blinks the LEDs of the connected HUB periodically  |
| Print out/ Data conversion | Log data: Converts to text file, prints out and saves to external memory.<br>PoE measurement data: Converts to text/ CSV files, prints out and saves to external memory.   |
| Accessories                | Interface expansion board, Line state sheet E, LAN cable, Utility CD   |

\*1: Port A/B has the fail-safe TAP and will not affect the communications between the target devices even when powering off the analyzer.  
 \*\*2: Records 12byte of additional information per a frame.  
 \*\*3: Conversion software is for Windows Vista/7/8.

# Large-capacity recording improves efficiency of the development of on-board networks and data analysis.

## CAN LIN Expansion Kit for CAN/LIN Communications OP-SB87

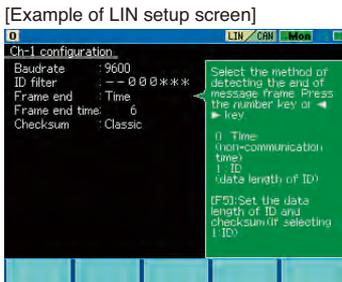
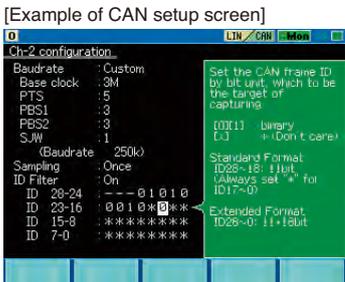
This interface expansion kit can measure up to two channels of CAN/LIN communication data, which are broadly used in the FA field and in-vehicle communications, in a free combination. This kit can simultaneously measure external signals for four lines as digital or analog signals while measuring communication data.



### Monitoring functions

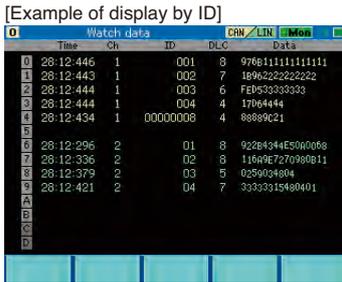
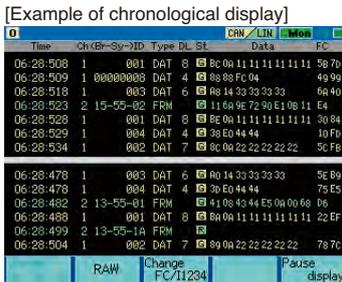
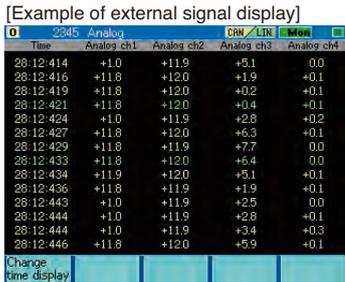
**○ CAN**  
This kit supports CAN 2.0B, in which both the frames of 11-bit ID and 29-bit ID are used. Data can be evaluated flexibly using the free speed setting and the function for specifying bit capture timing.

**○ LIN**  
Data length and check-sum format can be specified for each ID of the target data. Measurement can be started quickly by specifying a frame end time even if data length is not clear.



**○ CAN and LIN communication data are monitored in a real-time manner. They can be analyzed by switching the display format using a single-touch operation.**

**○ External signals can be captured at specified intervals (1 ms to 10 min.) as well as recorded in synchronization with communication data.**

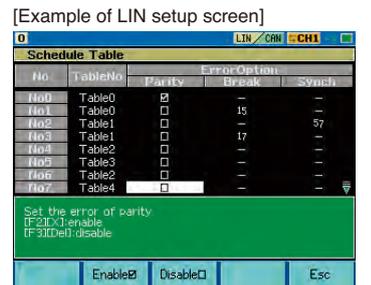
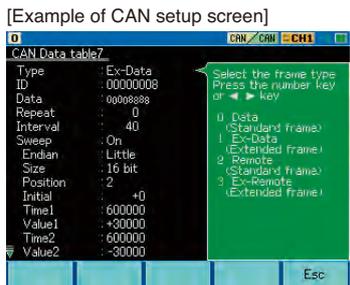


### Simulation function

This kit can become a communication node of CAN / LIN to test sending / receiving data to the under-developed target apparatus.

**○ CAN**  
This kit returns ACK automatically when a normal frame is received. Up to 16 type(272types with sub-tables) of test frames registered in advance can be sent at specified intervals using key operations. In addition, this kit can automatically change the data which is located in a specified position of the registered frames, so that the behavior of the under-development apparatus can be tested for the changed data.

**○ LIN**  
When simulating a master mode, up to 16 types of LIN frames registered in advance can be specified and sent in a free order for up to 16 steps. Since presence/absence of a parity error or an arbitrary BREAK length can be specified for each step, a flexible testing environment is realized including abnormal cases. When simulating a slave mode, a registered frame with the same ID is sent automatically in response to the request from the master.



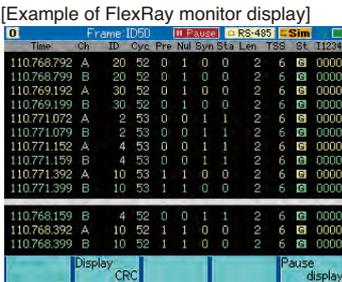
### Specification

|                               |   |
|-------------------------------|---|
| Interface                     | CAN: Conforming to ISO11898/ISO15159-2 standards (*1) (DSUB 9-pin connector x 2)<br>LIN: Conforming to ISO9141 (header 3-pin connector x 2)   |
| Transceiver                   | CAN: TJA1050/1054 equivalent, LIN: TJA1021 equivalent   |
| No. of channels               | 2 channels of CAN/LIN, or 1 CAN and 1 LIN.  |
| Expansion protocol            | CAN2.0B, device network, LIN (Rev1.1, 1.2, 1.3, 2.0, 2.1)   |
| Baud Rate (bps)               | CAN: 1 Mbps max. LIN: 26 Kbps max.  |
| Monitor function              | CAN: Standard/Expansion format, bit timing arbitrary settings<br>LIN: Set a frame end by idle time or ID setting. Arbitrary baud rate settings.   |
| ID Filter                     | Record specific ID (bit mask is available).   |
| Time stamp                    | Resolution : "Hr/Min/Sec", "Min/Sec/ms", 100us, 10us, 1us (9 digits)  |
| Trigger function              | Specify the trigger conditions and actions (max. 8 kinds). Sequential action are available.   |
| Trigger condition             | Error (Break, Sync, Parity, Framing, Checksum) (*2), specific data frame (Channel, ID, Payload), specific remote frame(channel, ID), timer and counter coincidence, external signal logic |
| Trigger Action                | Measurement stop, saving in a memory card, timer/ counter control, specific data transmission, buzzer, validation of trigger conditions   |
| Simulation function           | Pre-registered data (max. 272 kinds for CAN, max. 16 kinds for LIN) is transmitted by key operation. Increase/decrease data in the appointed position in a frame (sweep) (*3)             |
| CAN test                      | Transmit selected test frame for a specific number of times.  |
| LIN test                      | Master mode: transmit test frame in the specific order.<br>Slave mode: transmit when ID frame is matched.   |
| Communication error test (*4) | Parity error, Length of Break field (unspecified: 13bit), SYNC field value (unspecified: 55h)   |
| External signal input         | Real-time display of 4-channel external signal state with LED<br>Record signal logic in synchronization with data<br>Measure signal voltage continuously (Range: ±15 V, Accuracy: ±1%FS)  |
| Composition                   | Dedicated expansion board, line state indication sheet B, DB9 monitor cable (LE-009M1) x2, 3-wire probe cable (LE-3LP) x2, 8-wire probe cable (LE-8EX)                                    |

\*1: It is selectable by changing the inner relay of analyzer setting. \*2: It is available only by LIN except Checksum error. \*3: It is possible to set an endian, initial and 3 types of desired value, and desired time. \*4: It is available only by LIN.

## FlexRay Expansion Kit for FlexRay Communications OP-SB88

This interface expansion kit can simultaneously measure up to two channels of FlexRay communication data, which is used for a high-speed on-board network. Since communication data and analog signals of four points can be measured simultaneously, the relation between peripheral apparatuses and communication data can also be surveyed.



**○ Monitoring can be performed simply by setting a communication speed.**  
**○ One kit can simulate two FlexRay nodes.**  
**○ Data can be sent immediately because of the preset parameters.**

**<Paid support option>**  
This option is necessary for technical support regarding the usage of OP-SB88 and version upgrade. For details, contact our sales representative.

### Specification

|                       |  |
|-----------------------|--|
| Interface             | FlexRay V2.1A, Connector: DSUB9pin x2, header 3pin x2  |
| Transceiver           | TJA1080 or RS-485 (*1) 2 channels each   |
| Baud Rate             | 10Mbps, 5Mbps, 2.5Mbps   |
| Monitor Function      | Specific address frame. (16bit length, don't care and bitmask available)   |
| Log Filter Condition  | Received channel, each bit of indicator, ID, cycle counter   |
| Display format        | Frame, payload, specific frames (channel/ ID/ cycle counter) at the appointed position, event counter, external signal voltage   |
| Trigger Function      | Condition: 6 sets of appointed channel, indicator, ID, cycle counter, payload data (max. 16 data, don't care and bitmask available), error (Header CRC error/ Frame CRC error), external signal status<br>Action: Measurement end, count, external signal output |
| Simulation Function   | Transmit or receive data by two FlexRay nodes supported cold-start. (*2)   |
| Transmission Test     | Test frame(0 to 254 bytes, Max. 784 kinds) repeatedly, event by key selection, start up frame/ Synch frame, preamble indicator available, wake-up/ media access test symbol  |
| External Signal Input | Display 4 channels of status of external signals in LED at real time.<br>Record signal status corresponding to data.<br>Measure signal voltage continuously (range: ±15, accuracy: ±3%FS)  |
| Composition           | Expansion board, firmware CD, Line state sheet(B), two DB9 monitor cable (LE-009M1) x2, Two 3-line-probe cable (LE-3LP) x2, 8-line-probe cable (LE-8EX)  |

\*1: RS-485 is equivalent to SN65HVD0388E. Select JFA1080 or RS-485 from analyzer. \*2: Pre-set protocol of inner two nodes of analyzer and test board of Freescale for transmission and reception.

# LE-PC800G Enhances the Link between Analyzers and your PC

PC Link Software

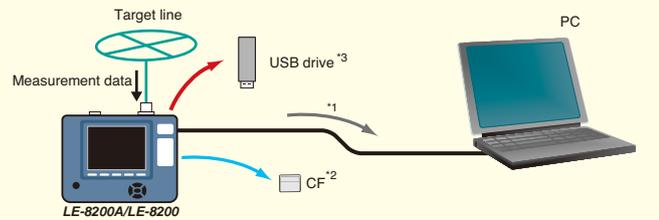
## LE-PC800G

\*Cannot be used with OP-SB87, OP-SB88, OP-SB89, OP-SB89G and OP-SB84.

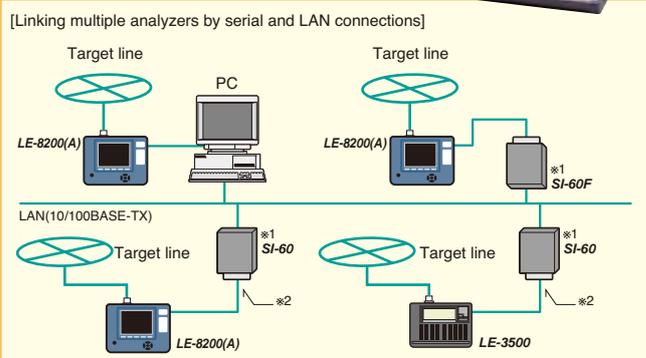
Enables simultaneous control of multiple analyzers from a PC

The LE-PC800G supports serial connections through the COM port, USB connections, and LAN connections via LINEEYE LAN-Serial converter, thus enabling remote measurement by multiple analyzers connected at the same time. It also allows you to browse measurement data saved in memory cards and convert data.

### [ USB / Serial connections and CF card / USB flash drive ]



\*1: The PC Link software is not provided with a USB cable. Prepare a USB cable if you intend to use USB connection. The LE-2V AUX cable provided to the analyzer is available in the case of serial connection.  
 \*2: LE-8200A / LE-8200 can save data in the CF card. An interface to read the CF card is required on the PC side.  
 \*3: LE-8200A can save data in the USB flash drive.

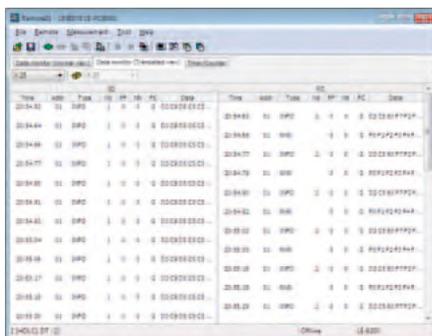


\*1: SI-60/SI-60F is a LAN-serial converter supported by LE-PC800G. Target analyzer is identified by specifying IP address of SI-60/SI-60F on the remote setting window of LE-PC800G.  
 \*2: Optional AUX cable for DSUB 25-pin (LE-2C). Set the DTE/DCE switch of SI-60 to DTE.

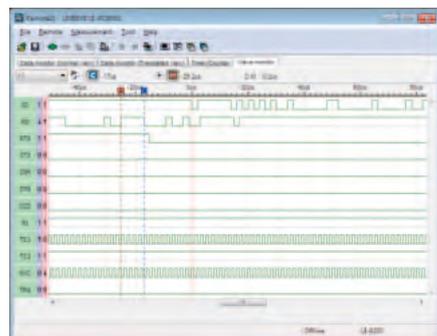
Allows the measurement data to be checked on your large PC screen.



▲ Normal display



▲ HDLC translation display



▲ Logic analyzer display

Records communication logs continuously on PC up to a maximum of 16GB

The remote monitor function allows to record the data measured by an analyzer on the hard disk of PC. The fixed buffer mode and ring buffer mode are available. The former stops recording when the specified data size is reached, and the latter records data endlessly within the limit of the specified size.

[Standard time for continuous recording on hard disk \*1]

| Target line speed *2 | When 1 GB is specified :<br>(e.g.: 1 MB x 1,000 files) | When 16 GB is specified :<br>(e.g.: 8 MB x 2,000 files) |
|----------------------|--|---|
| 9600 bps             | Approx. 60 hrs   | Approx. 960 hrs   |
| 19200 bps            | Approx. 30 hrs   | Approx. 480 hrs   |
| 38400 bps            | Approx. 15 hrs   | Approx. 240 hrs   |

\*1: In case of full-duplex communications line for transmission at 1 ms interval per 1 KB.  
 \*2: Maximum communications speed that ensures recording of measurement data without failure will be about 1/5 of serial transfer speed between analyzer and PC.

Converts the recorded data to text format or CSV format all at once

Multiple files of communications logs can be converted to text or CSV format for use on word processor or spreadsheet. Conversion to text is based on the print format of the analyzer. In consideration of analysis on general search tool, it is possible to delete decorative guides or time data, and to specify conversion of sender or receiver data only.

Changes the System Language Automatically

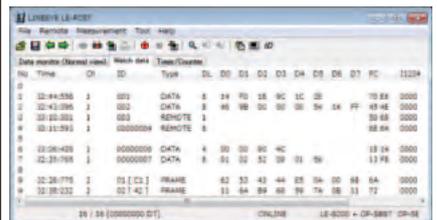
The system language alternates automatically between English and Japanese according to that of OS. This facilitates introduction of the software to development bases outside Japan.

## Specifications

|                               |  |  |  |
|-------------------------------|--|--|--|
| Analyzer connection           | Serial, USB, and LAN (with SI-60/SI-60F unit sold separately)  |  |  |
| No. of connectable analyzers  | Multiple analyzers can be connected and controlled simultaneously.(No. of connectable analyzers depends on the performance of PC.) |  |  |
| Key emulation function        | Presents the analyzer's display on the PC screen to enable control in a manner as if operating the analyzer.                       |  |  |
| Measurement condition setting | Measurement conditions (communications parameters, trigger and simulation data) can be input and edited on the PC.                 |  |  |
| Remote monitor function       | Starts/stops measurement with analyzer, displays the measurement data on PC screen, and records data continuously.                 |  |  |
|                               | Recording modes  | Fixed buffer mode (Records data up to the specified size) or ring buffer mode (Records data endlessly while leaving the latest data of the specified size) can be selected.  |  |
| Display modes                 | Recording capacity   | Max. 16 GB can be specified up to 2,000 files in the unit of 1/2/4/8 MB data file.   |  |
|                               | Selectable among raw data, protocol translation and logic analyzer waveform.   |  |  |
|                               | Raw data   | Displays communications data accompanied by idle time, time stamp and line status. Character code (10 kinds) and character size (small/medium/large) can be changed.   |  |
| Display area                  | Protocol translation   | Translates and displays SDLC, X.25 and LAPD protocols. (Target protocols planned to be increased.)   |  |
|                               | Logic analyzer   | Enlarges and reduces waveform, measures time between cursors, and rearranges signals.  |  |
| Display area                  | Display window size can be changed.  |  |  |
| Character codes               | ASCII, EBCDIC, JIS7, JIS8, Baudot, Transcode, IPARS, EBCD, EBCDJK, HEX (in hexadecimal including error codes)                      |  |  |
| Search function               | Counts or displays the data that matches the search key.   |  |  |
|                               | Search key   | Specified data string of max. 8 characters (don't care and bit mask available), idle time beyond a specified duration, specific time stamp (don't care available), error (parity, framing, BCC, break/abort, short frame) external trigger matching data |  |
| Text-CSV conversion function  | Specified number of recorded files can be converted to text or CSV format all together.  |  |  |
| Bitmap conversion function    | Analyzer's display shown by key emulation can be saved to bitmap files.  |  |  |
| System requirements           | PC   | PC / AT compatible   | CPU: Pentium3 1GHz or faster<br>RAM: 512 MB or more (recommended)<br>HDD: 5 MB + free bytes on the measurement data area |
|                               | OS   | Windows® Vista® /7/8   |  |
| Composition                   | CD (Software) x 1, instruction manual x 1, user registration card x 1  |  |  |

## PC Link Software for CAN/LIN

For OP-SB87 **LE-PC87**



This software links your PC and analyzer equipped with CAN/LIN communications expansion kit to analyze collected CAN/LIN data on your PC.

- USB, Serial and LAN connection to the PC
- Key emulation function for remote control
- Recode CAN/LIN data into the PC at maximum 16GB
- Display the specific ID frame at real time
- Data and timestamp search, text/CSV conversion
- Set the analyzer conditions from the software
- Read the measured file on the external memory
- OS: Windows® Vista®/7/8

## LE-8200A/LE-8200 Specification

|  |  |
|--|--|
| Interface                                      | RS-232C (V. 24), RS-422/485 (RS-530)   |
| Expansion measurement interface <sup>(1)</sup> | RS-422/485 terminal block [LE-25TB,LE-530TB], X. 20/21 [LE-25Y15], RS-449 [LE-25Y37], V. 35 [LE-25M34], 1.8V/2.5V/3.3V/5.0V TTL/I <sup>2</sup> C/SPI [OP-SB85L], Infrared communication IrDA/ASK [OP-SB85IR], Current loop [OP-SB85C], CAN/LIN [OP-SB87], FlexRay [OP-SB88], LAN (PoE supported) [OP-SB89G], USB2.0 [OP-SB84]      |
| Standard Protocol                              | ASYNC (Asynchronous), ASYNC-PPP, Character synchronous SYNC/BSC, Bit synchronous HDLC/SDLC/X. 25, Modbus   |
| Optional Protocol                              | I <sup>2</sup> C, SPI, BURST <sup>(2)</sup> , IrDA(IrLAP), CC-LINK, CAN, Devicenet, LIN, FlexRay, Ethernet, USB  |
| Synchronous clock                              | ST1 (DTE transmission clock), ST2 (DCE transmission clock), RT (DCE reception clock), AR (The synchronous clock extracted from the edge of the transmission and reception data)  |
| Capture memory <sup>(3)</sup>                  | Capacity : 100MB It is composed of DDR-SDRAM of which allows high-speed access .<br>Two separated screens. Auto backup <sup>(4)</sup> . Error erasure prevention. Choose ring buffer or fixed size buffer.   |
| Backup memory                                  | Capacity:4MB It can be saved the measurement data and conditions by the built-in lithium battery for 10 years.   |
| Max. speed                                     | Full duplex: 2.150Mbps / Half duplex: 4.000Mbps  |
| Speed setting range                            | 50bps to 4.000Mbps Freely set to four effective digits, separately for transmission and reception. (Margin of error: ± 0. 01% or less)   |
| Expansion speed (HDLC mode)                    | 115.2Kbps to 12Mbps [OP-FW12G]   |
| Data format                                    | NRZ, NRZI, FM0, FM1, 4PPM, ASK, Manchester 0, Manchester 1   |
| Data code                                      | ASCII, EBCDIC, JIS7, JIS8, Baudot, Transcode, IPARS, EBCD, EBCDIK, HEX   |
| Character Framing                              | ASYNC : data bit (5, 6, 7, 8) + parity bit (0, 1) + stop bit (1, 2)<br>Character synchronous : data bit + parity bit (6 or 8bits in total) Bit synchronous : data bit (8bits)  |
| Parity bit                                     | NONE, ODD, EVEN, MARK, SPACE   |
| Multiprocessor bit                             | MP (multiprocessor) bit is shown with a special mark.  |
| Bit transmission order                         | LSB first or MSB first (switchable)  |
| Polarity inversion                             | Normal, Invert (switchable)  |
| Error check                                    | Parity (ODD, EVEN, MARK, SPACE), Framing, Break, Abort, Short frame, BCC (LRC, CRC-6, CRC-12, CRC-16, CRC-ITU-T, FCS-16, FCS-32). BCC permeation mode.   |
| Online monitor function                        | Communication log is recorded continuously and displayed in the LCD without affecting the communication lines.   |
| Idle time display                              | OFF (no record); Resolution: 100ms, 10ms, 1ms; Max 999. 9 sec  |
| Time stamp display                             | OFF (no record); Date time stamp: unit selectable among "Day/Hr/Min", "Hr/Min/Sec", "Min/Sec/10ms". Expansion time stamp: "Yr/Mon/Day/Hr/Min", "Mon/Day/Hr/Min/Sec" and "Day/Hr/Min/Sec/10ms"; Elapsed time from the measurement start: Resolution 100μsec/10μsec/1μsec (9digits)  |
| Line status display                            | Records and displays the wave form of 7 signals (chosen from RS(RTS), CS(CTS), ER(DTR), DR(DSR), CD(DCD), CI(RI), TRGIN(external trigger input) along with the transmission/ reception data.   |
| Address filter                                 | Records only frames of the specified address. (only when HDLC/SDLC/X.25)   |
| Data display and operations                    | Pause in capture, two seperated screens, scroll, paging, jump to the specified screen.   |
| Bit shift display / Line Break                 | Entire frame can be shifted to the right or left in 1 bit increments. ASYNC frames can be displayed in the new line by each time stamp.  |
| Protocol translation display                   | SDLC (modulo 8/128), ITU-T X.25 (modulo 8/128), LAPD, PPP, BSC, IrLAP, I <sup>2</sup> C, User defined  |
| Line status LED                                | Two color LEDs of SD, RD, RS(RTS), CS(CTS), ER(DTR), DR(DSR), CD(DCD), CI(RI), ST1(TXC1), ST2(TXC2), RT(RXC).  |
| RS-232C  | Logic ON (red) , logic OFF (green) , no connection NC (light off)  |
| Other I/F                                      | Logic ON (red) , logic OFF or no connection NC (light off)   |
| Interval timer                                 | 4kinds; Max. count: 999999 (Resolution: 1ms ,10ms ,100ms)  |
| General-purpose counter                        | 4kinds; Max. count: 999999   |
| Data counter                                   | For SD and RD (1 each): Max. count: 4294967295   |
| Trigger function                               | Up to 8 pairs of trigger condition and action can be specified. (sequential action, which validates another condition after one condition satisfied, is also possible.)  |
| Trigger condition                              | Communication error (Parity, MP, framing, BCC, break, abort, short frame can be specified individually.), communication data string up to 8 characters (don't care and bit mask available), idle time more than the specified duration, match time/counter value, logic status of interface signal line and external trigger input |
| Trigger action                                 | Stops measurement/test (offset can be set), validates trigger condition: controls timer (start/stop/restart), controls counter (count/clear), activates buzzer, saves monitor data on a memory card, sends the specified character string (during manual simulation), sends pulse to external signal                               |
| Data search function                           | Retrieves the data with specific condition from capture memory.  |
| Search condition                               | Communication error (Parity, MP, framing, BCC, break, abort, short frame),communication data string up to 8 characters (don't care and bit mask available), idle time more than the specified duration, specified timestamp (don't care available), trigger matching data.   |
| Search action                                  | Shows the match data at the top or enumeration display (selectable)  |
| Monitor conditions auto setting                | Measurement conditions such as protocol, transmission speed, (max. 115.2Kbps), data code, synchronous character and BCC check can be set.  |
| Auto run/stop function                         | Enables measurement to start and end at the specified time at the selected repeating cycle (monthly, daily, hourly).   |
| Auto save function                             | Automatically saves the monitored data in the capture memory and saves as communications log file in the CF card.  |
| File size                                      | BUF (capture memory size) , 1MB , 2MB , 4MB , 8MB, 16MB , 32MB , 64MB  |
| Max files                                      | 1024   |
| Delay time function                            | Measures and displays the interval of change in the interface signal line. (current/min/max/average, resolution: 0. 1ms)   |
| Signal voltage measuring function              | Measures and displays the value of voltage amplitude: SD, RD, ER(DTR), external signal EXIN. (current/min/max, range± 15V resolution : 0.1V)   |
| Statistical analysis function                  | Takes statistics and displays graphs of transmission/reception data count, number of frames, and satisfied trigger condition count. Range:1 sec - 240min   |
| Logic analyzer function                        | Measures the logical change of the interface signal in the sampling clock period, and displays its wave.   |
| Sampling clock                                 | 1KHz to 100MHz (16 steps)  |
| Sampling memory                                | Min 4,000  |
| Trigger condition                              | Trigger conditions in the ONLINE monitor functions match. Logical status match between interface signal line and external signal.  |
| Trigger position                               | Before, center, after  |
| Zoom in/out                                    | x10, x5, x2, x1, x1/2, x1/4, x1/8, x1/16, x1/32, x1/64   |
| Other functions                                | Time measurement by cursor, signal line exchange, signal status search   |

|  |  |
|--|--|
| Bit error rate test                    | At DTE or DCE mode (It is possible to change the pin arrangement ), line quality measurement test such as error rates can be done by loop back test or interactive test.   |
| Communication mode                     | Synchronous (SYNC), Asynchronous (ASYNC)   |
| Measuring speed                        | 50bps~4.000Mbps, freely set to four effective digits   |
| Measurement mode                       | Continuous measurement, specifies the number of receiving bit, specifies the time to measure, repeatedly measurement at the unit of 1 - 1440 min.  |
| Test pattern                           | 2 <sup>6</sup> -1, 2 <sup>9</sup> -1, 2 <sup>11</sup> -1, 2 <sup>15</sup> -1, 2 <sup>20</sup> -1, 2 <sup>23</sup> -1, MARK, SPACE, ALT, DBL-ALT, 3in24, 1in16, 1in8, 1in4  |
| Error bit insertion / notification     | Inserts 1-bit or 5-bit error in test pattern by key operation. Outputs a pulse to the external trigger terminal when finding an error bit.   |
| Measurement range                      | It is able to measure the parameter of the ITU-T advice G.821.<br>Effective received bit (0 to 9999999 to 9.99E9), bit errors (0 to 9999999 to 9.99E9), bit error rate(0 to 9.99E-9 to 1), block errors (0 to 9999999 to 9.99E9), block error rate (0 to 9.99E-9 to 1), Savail(available measurement time: 0 to 9999999sec), loss count (synch loss: 0 to 9999), error duration (0 to 9999999sec), %EFS (normal operation rate: 0.000 to 100.000%) |
| Simulation function                    | Enables transmission/reception test of any given data in DTE or DCE mode (selectable with pin assignment).   |
| Transmit data entry                    | Can be registered in 16 types of transmission data tables (Total of 16 K data).  |
| Error data entry                       | A part of transmission data can be registered as error data such as parity error.  |
| Line control mode                      | Auto (Controls transmission timing with RS(RTS), CS(CTS), ER(DTR), CD(DCD) signal lines automatically in 1 ms increments) or manual (key operation) can be selected.   |
| Transmit driver control                | Auto control (Turns ON driver only before and after data transmission) or manual mode (link with ER(DTR), CD(DCD) key operation) can be selected during simulation of RS-485.  |
| MANUAL mode (Manual test)              | Sends the data assigned to operation keys each time a key is pressed, while checking communications status on the display. Can be used together with the trigger function.   |
| FLOW mode (Flow control test)          | Simulates the X-on /X-off control data and flow control procedures of RTS/CTS control line. (Sender and receiver selectable)   |
| ECHO mode (Echo test)                  | Sends the received data frame by frame (buffer echo), by data (character echo) or by loop back.  |
| POLLING mode (Multi-polling test)      | Simulates multi-polling communications procedures. (Sender and receiver selectable)  |
| BUFFER mode (Buffer transmission test) | Reproduces transmission of selected data (SD or RD) captured in memory by monitor function.  |
| PROGRAM mode (Program simulation)      | Creates a simulation program (Max. type: 4, Max steps: 512) using the dedicated commands (46 types) to test the communication procedure.   |
| PULSGEN mode                           | Outputs the waveform measured by the logic analyzer function.  |
| File management function               | Measurement data and condition can be saved in the external memory. And the format of the data/condition can be used in the PC.  |
| File types                             | Measurement data (.DT), measurement condition (.SU), trigger save data (TG SAVEnn.DT), auto save data (#nnnnnnn.DT), auto back-up data(@AUTOBU0/1/2.DT)  |
| File controls                          | Normal file display, sort display, file display by specified type, save, load, delete, delete all, format  |
| External memory                        | 2G byte to 64G byte CF card (only the LINEEYE guarantees to use), or USB flash drive up to 64G byte (LE-8200A only)  |
| Printout function                      | Measurement data can be printed in various formats.<br>Text files can be saved in the external memory. Screen image can be printed and saved in the external memory.   |
| LCD                                    | 5.7 inch TFT color liquid crystal display. 320 x 240 dot. LED back light can be adjusted.  |
| AUX(RS-232C) port                      | Mini DIN8 pin connector. Communication speed: 9600bps to 230.4Kbps (6 steps) Print out data, Can be used with PC [PC link software], Can be used to upgrade the firmware.  |
| USB2.0 device port                     | B-connector in device side. Transfer data in high-speed. Can be used with PC [PC link software], Can be used to upgrade the firmware.  |
| USB2.0 host port                       | A-connector in host side. Transfers data in high speed. Used for connecting USB flash drive.   |
| Power supply                           | Built-in nickel hydrogen battery or AC adapter DC9V, 2A(AC100 to 240V, 50/60Hz).   |
| Battery operating time <sup>(*)5</sup> | About 4 hours Power saving mode: Auto back light off, Auto power off (It will not work while measuring.)   |
| Battery charging time                  | About 2.5 hours  |
| Ambient temperatures                   | In operation : 0 to 40 degrees, In storage : -10 to 50 degrees   |
| Ambient humidity                       | In operation : 20~80%RH (No condensation), In storage : 10~85%RH (No condensation)   |
| Standard                               | CE(class A), EMC(LE-8200A:EN61326-1:2013,LE-8200:EN61326-1:2006)   |
| Dimension <sup>(*)6</sup> , mass       | 240 (W) x 190 (D) x 48 (H) mm , about 1.1Kg  |

\*1 : To have the function, optional accessory described in "[ ]" is need. \*2 : Mode in which all data is imported in synch with clock edge.  
 \*3 : Only 1M of capture memory will be backed up by the battery. Transmission/reception data, idle time, time stamp, line status consume 4 bytes of memory at each capture.  
 \*4 : This function automatically saves the measurement data in the external memory or back up memory, when the measurement end. \*5 : Under the normal operation.  
 \*6 : Hand strap is not contained.



**Standard Set**

- Portable communication analyzer..... 1
- DSUB 25-pin monitor cable (LE-25M1)..... 1
- DSUB 9-pin AUX cable (LE2-8V)..... 1
- External signal input/output cable (LE-4TG)..... 1
- Hand strap..... 1
- Line state sheet..... 1
- AC adapter (3A-183WP09)..... 1
- Carrying bag (LEB-01)..... 1
- Utility CD..... 1
- Instruction manual..... 1
- Warranty..... 1

\*Hand strap is already set in the analyzer.

# Options for LE-8200A/LE-8200

## ● Cables / terminal blocks / Converter



Monitor cable for DSUB 25-pin  
**LE-25M1**  
Branch cable for monitoring communication lines over general DSUB 25-pin.

1.5m 0.1m  
DB25(Male) DB25(Male) DB25(Female)

\*Same as the cable packed with analyzer.



Monitor cable for DSUB 9-pin  
**LE-259M1**  
Branch cable for measuring RS-232C over DSUB 9-pin of PC, etc.

1.5m 0.2m  
DB25(Male) DB9(Female) DB9(Male)



Terminal block for DSUB 25-pin  
**LE-25TB**  
Converts analyzer's RS-485/422 port (DSUB 25-pin specification) to terminal block specification.

DB25 Terminal block  
1 1  
2 2  
3 3  
...  
25 25



X.21 Monitor cable  
**LE-25Y15**  
Branch cable for measuring X.20/21 over DSUB 15-pin. (Shield type)

1.2m  
DB25(Male) DB15(Male) DB15(Female)



RS-449 Monitor cable  
**LE-25Y37**  
Branch cable for measuring RS-449 over DSUB 37-pin. (Shield type)

1.2m  
DB25(Male) DB37(Male) DB37(Female)



Terminal block for RS-530  
**LE-530TB**  
Converts TXD/RXD/GND signals on RS-530 port into terminals.

RS-530 Terminal block  
RXD- 3 1  
RXD+ 16 2  
GND 7 3  
TXD- 2 4  
TXD+ 14 5



V.35 Monitor cable  
**LE-25M34**  
Branch cable for measuring V.35 over M34-pin.

1.5m  
DB25(Male) M34(Male) M34(Female)



RS-530 cable  
**LE-25S530**  
Shield cable for RS-530 interface.

1.5m  
DB25(Male) DB25(Male)



DB9 monitor cable  
**LE-009M1**  
Monitor cable for measuring CAN and FlexRay over DSUB 9-pin.

1.5m 0.1m  
DB9(Male) DB9(Female) DB9(Male)

\*Same as the cable packed with OP-SB88/OP-SB87.



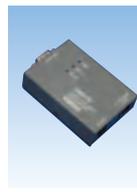
3 Line probe cable  
**LE-3LP**  
Probe cable for measuring LIN and FlexRay signal.  
\*Same as the cable packed with OP-SB88/OP-SB87.



External signal cable  
**LE-4TG**  
Probe cable for inputting/ outputting external signal.  
\*Same as the cable packed with analyzer.



AUX cable for DSUB 9-pin  
**LE2-8V**  
Cable for connection AUX (RS-232C) port of an analyzer with PC (DSUB 9-pin DTE specification).  
• Length: 2.5m  
\*Same as the cable packed with analyzer.



LAN-RS232C converter  
**SI-60F**  
Converter for connecting an analyzer and a PC via LAN.

## ● Carrying bag



Carrying bag  
**LEB-01**  
Bag with pockets for storing and carrying accessories such as AC adapter, cables, etc.  
\*Same as the carrying bag packed with analyzer.

## ● Memory card



64G byte CF card  
**CF-64GX**  
64G byte compact flash card.  
\*It is verified by the analyzer.

\*The photo is for illustrative purpose only



32G byte CF card  
**CF-32GX**  
32G byte compact flash card.  
\*It is verified by the analyzer.

\*The photo is for illustrative purpose only

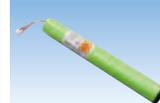
## ● AC Adapter



Wide input AC adapter  
**3A-183WP09**  
Input: AC100-240V, 50/60Hz  
Output: DC9V, 2A  
Plug: center⊕

\*Same as the carrying bag packed with analyzer.

## ● Battery pack



NiMH battery pack for replacement  
**P-20S**  
• Rating: 6V, 2100mAh

\*Battery pack for replacement.

## Compact thermal Printer Options

### Compact thermal printer DPU-414-41B-E

Built-in battery, dedicated roll paper (x1) included.  
\*AC adapter and cable are not prepared. Provide them separately.

### Compact Thermal Printer Set DPU-414-PA

Includes printer (DPU-414-41B-E), roll paper x1, AC adapter, and printer cable (LE2-8P).

### Handy thermal printer for on-site printout of measurements

- Prints 40 digits per line in normal mode and 80 digits in reduced mode.
- High-speed printing at 52.5 characters per second.
- Incorporates eco-friendly NiMH battery.
- Supports Centronics parallel and RS-232C ports.
- Dimensions: 160(W)x 170(D)x 67(H)mm
- Weight: Approx. 690g (including built-in NiMH battery)



- AC adapter for DPU-414 PW-C0725-W1-U**  
Input: AC100V~240V  
Output: DC7.0V, 2.5A(center⊕)
- Roll paper TP-411L TP-411L**  
Thermal roll paper for DPU-414. 10 rolls per carton.  
Width: 112mm Length per roll: Approx. 28m
- Battery pack for DPU-414 BP-4005-E**  
Same as NiMH battery built-in DPU-414-41B-E.  
4.8V, 1200mAh
- AUX cable for DPU-414 LE2-8P**  
Cable for connection AUX(RS-232C) port of analyzer and serial port of DPU-414 (printer). • Length: 1.5m

## MULTI PROTOCOL ANALYZER **LE-3500**



Standard model of multi protocol analyzer has mega speed measurement, wide memory capacity and program simulation functions.

|                   |  |
|-------------------|--|
| Baud Rate         | Full duplex 1.544 Mbps<br>Half duplex 2.048 Mbps |
| Memory            | 6.4 Mbyte  |
| Display           | Monochrome with back light                       |
| Battery Operation | 8 Hours  |
| Dimensions        | 210(w)x154(D)x38(H)mm                            |
| Weight            | Approx. 790g                                     |



Read the instruction manual provided with the product before use and use the product as explained in that manual. Using the product in ways not guaranteed in the manual, connecting it to systems outside of the specified ranges and remodeling can all cause trouble and damage. LINEEYE CO. LTD. will assume no responsibility whatsoever for trouble or damage arising because of unauthorized ways of use.

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