

# 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

CAN

LIN

CAN FD

CXPI

USB

LAN

EtherCAT

Wide Color LCD

Mega Speed Measurement

Giga Byte Long Hour Record



LE-8200A



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



LE-8200



LINEEYE®

# Multi Protocol Analyzer **LE-8200A/** Battery-powered Portable Communications Analyzer **LE-8200**

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>(\*)</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.

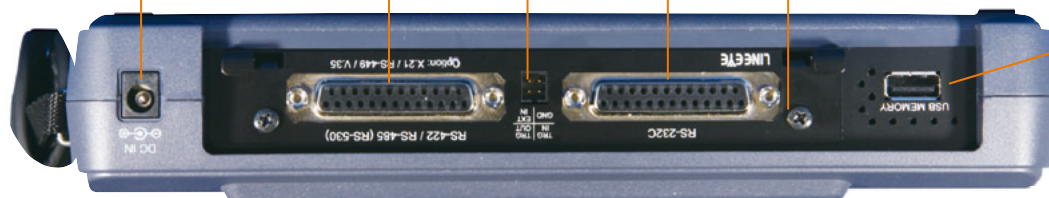
## RS-232C (V.24) measurement port

Used to connect the dedicated cable<sup>(\*)</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.

	In RS-232C communications	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.

\*1: An optional dedicated cable is required.

\*2: The CF card slot guarantees the operation of only LINEEYE's optional CF card.

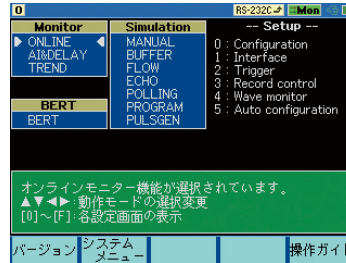


# Powerfully backing up the measurement of communications networks of ubiquitous society.

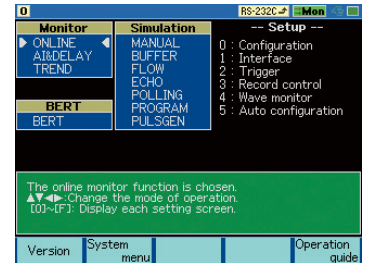
## 5.7-inch Large-sized Color TFT LCD

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, CAN, LIN, USB, LAN, and EtherCAT

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.

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.

### CF card slot

The CF card with a maximum capacity of 128 Gbytes is supported.<sup>(\*)</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.

Standard Protocol

Async X.25

Sync PPP

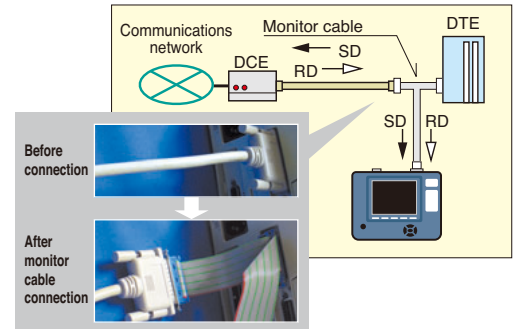
BSC Modbus

SDLC PROFIBUS

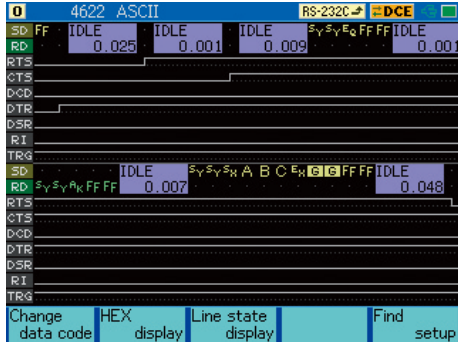
HDLC

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.

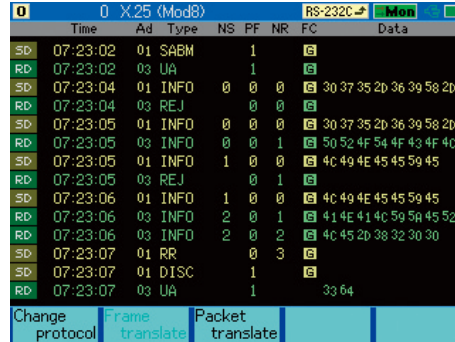
[Example of connection for online monitoring]



[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.

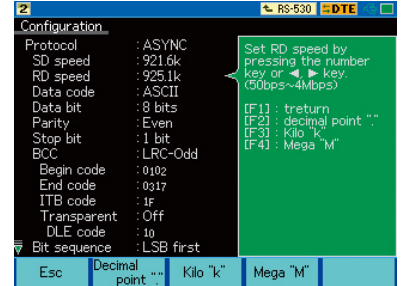
[Example of two divided areas]



## 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.

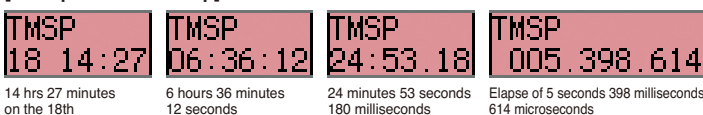
[Example of communications protocol settings]



## 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.

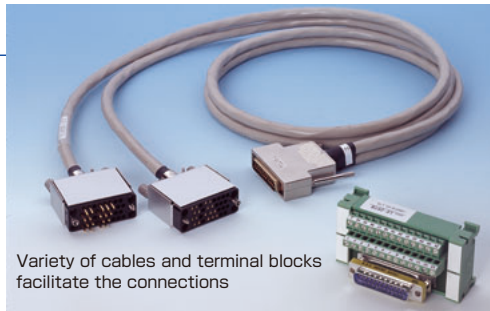
[Continuous recording time reference \*1]

Applicable transmission speed	Main memory only	128GB CF card *2
9600bps	Approx. 6 hours	Approx. 300 days
1Mbps	Approx. 220 seconds	Approx. 80 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-128GX 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.



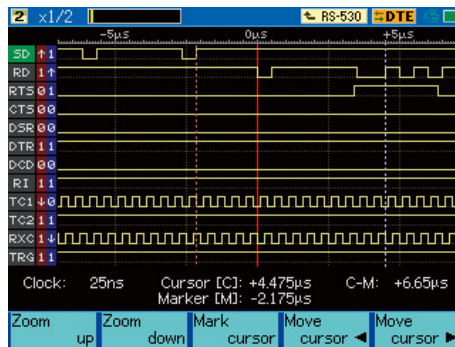
Variety of cables and terminal blocks facilitate the connections



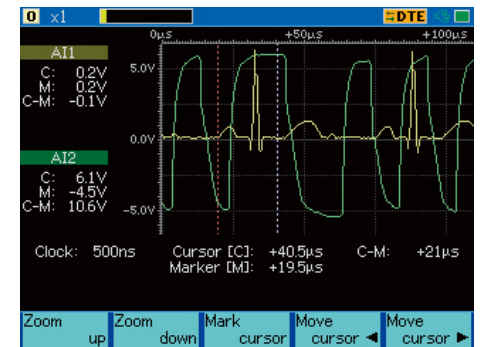
## Supports Logic Analyzer Function/ Digital Waveform generation (\*), and Analog Waveform Analysis \*LE-8200A only

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.

0	Factor	Action
0	Trigger0	Error --> TRG OUT
1	Trigger1	Idle time --> Save
2	Trigger2	Line --> Timer
3	Trigger3	Line --> Timer
4	Trigger4	Character --> Trigger switch
5	Trigger5	Character --> Stop
6	Trigger6	Time/Count --> Stop
7	Trigger7	Error --> Buzzer

Select the trigger by ▲ or ▼ key. Enable and Disable the trigger by [F1],[F2] key. Detailed setting can be set by the number key or [Enter] key.

**Trigger 4**

Factor: Character  
Char: SD: F010203

Bit mask: W0: 1\*001111  
W1: \*\*\*\*\*  
W2: \*\*\*\*\*

Action: Trigger switch

**Trigger 5**

Factor: Character  
Char: RD: 58595A\*†

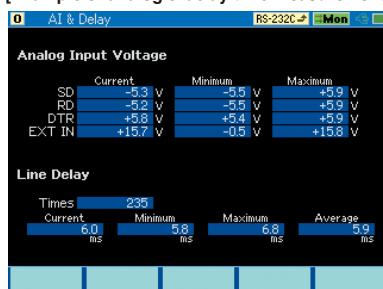
Bit mask: W0: \*\*\*\*\*  
W1: \*\*\*\*\*  
W2: \*\*\*\*\*

Action: Stop

## 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.

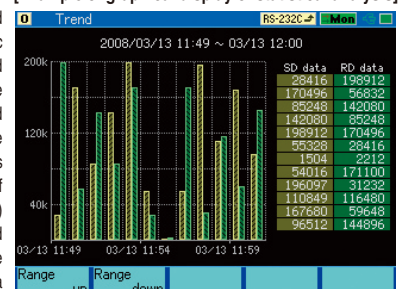
[Example of analog & delay time measurement]



## 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]

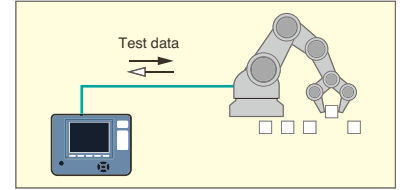


# Simulation function provides the actual operating environments.

With the simulation feature, LINEEYE protocol analyzers act as the counterpart to the target device and perform transmission and reception tests according to protocol. Even in the early stages of development when matching devices are not available, it provides six types<sup>(1)</sup> of simulation modes. Error handling process can be checked by sending data with parity errors. Margins can be evaluated by intentionally shifting communications speed. For example, test the 9600bps target device at 9840bps speed. In addition, data transmission can be linked with the changes in the signal lines, and an automatic control of RS-485 transmission driver IC is supported.

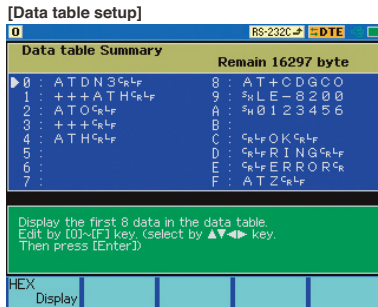
\*LE-8200A has PULSGEN mode for generating digital waveform. (7 modes in total) >> P5 for more details

[Example of connection for simulation]



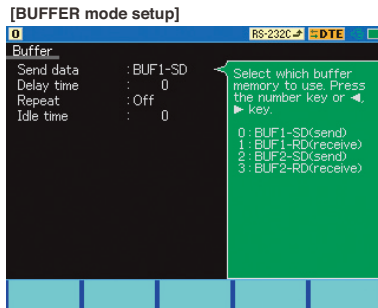
## MANUAL mode

The MANUAL mode allows you to send the data registered in transmission table which corresponds to the "0" to "F" keys. The data can be sent with one press of a key. While checking replies from a unit under development with the monitoring feature, you can easily and simply test the communications process. You can also send fixed data by pressing a key combination of the SHIFT and "0" to "D" keys, as well as turn RTS/CTS and DTR/DCD signal lines on/off with the SHIFT and "E"/"F" key combinations.



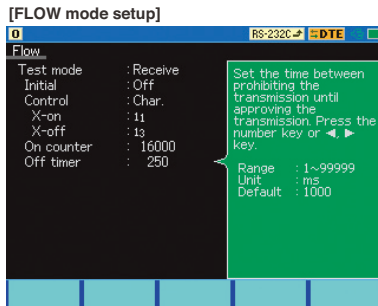
## BUFFER mode

In the BUFFER mode, you can select between transmission and reception, and send transmitted or received data that has been captured in the buffer using the unit's monitoring capabilities, as simulation data without requiring further manipulation. This mode is effective in conducting reproducibility tests using the same data as that monitored under actual communications conditions.



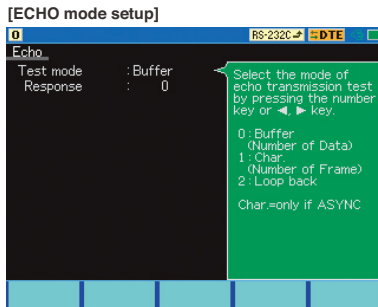
## FLOW mode

Flow control can be simulated on the transmission and reception-lines using X-on/off flow control or the control line handshake. In the transmission mode, up to 16 cycles of data from transmission start until a generated interrupt request can be displayed. In the reception mode, you can set the number of received data cycles until a transmission interrupt request is generated, as well as the time until the transmission resume request is generated.



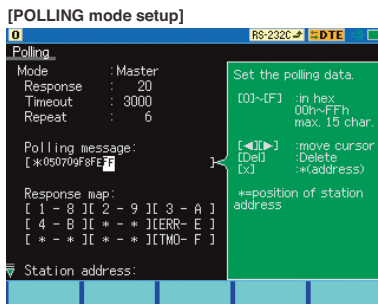
## ECHO mode

In the ECHO mode, LINEEYE protocol analyzers internally return received data. Buffer echo to send back data by a frame, character echo to send back data by a character and loop back echo to return by the hardware can be selected. It is used to test display terminals and communications terminals.



## POLLING mode

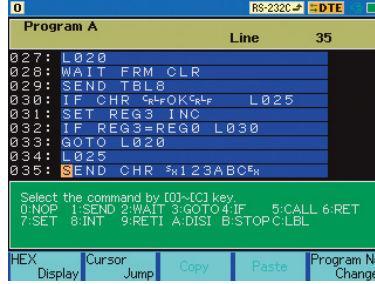
The POLLING mode simulates the slave and master units in multidrop (1:N connection) polling protocols. In the slave mode, the LINE EYE protocol analyzers check the number of received frames that are assigned their address and whether errors occur or not, replying with user-set data. In the master mode, they send polling messages to 32 slave units, and check and display replies from each slave.



## PROGRAM mode

By creating a purpose-specific command program, the communications protocol can be flexibly simulated alongside condition monitoring. The program is created using the menu selection, so it is easy to master.

### [PROGRAM mode setup]



### • Meaning

- 027: Label 020
- 028: Wait new receiving frame
- 029: Transmit data table 8
- 030: If receiving "CR, LF, O, K, CR, LF", jump to label 025
- 031: Set register 3 +1
- 032: If value of register 3 is equal to register 0, jump to label 030
- 033: Jump to label 020
- 034: Label 025
- 035: transmit "SX, 1, 2, 3, A, B, C, EX"

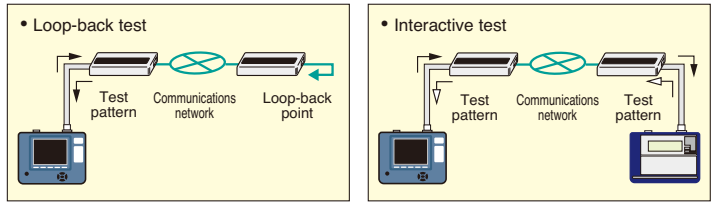
### [PROGRAM mode commands table]

Command	Operation
SEND CHR □□□□□□□□	Data transmission up to 8 characters.
SEND TBL□	Data transmission of the specified data table.
SEND REG□	Data transmission of the data table specified by a register value.
SEND BUF	Transmits data in the frame buffer.
SEND KEY	Transmits data in the transmission data table corresponding to keystroke.
SEND DA□□ + REG□	Transmits data of the data array specified by additional value of preset value of the data array number and the value specified by register number.
SEND BRK	Transmits a break signal (ASYNC only)
SEND FRM	Transmits the X.25 frame
WAIT CHR □□□□□□□□	Waits for the particular character string of up to 8 characters to be received.
WAIT FRM CLR/NOCLR	Waits for a frame to be received.
WAIT TRG□	Waits for a specified trigger condition to be specified.
WAIT TM □□□□	Waits for a specified period of time.
WAIT KEY	Waits until one of the keys from 0 to F is pressed.
WAIT LN □□=□	Waits until the logical values of the control lines meet with the setting.
WAIT MLT	Executes multiple WAIT commands. If one WAIT command is satisfied, all sequential WAIT commands are released.
GOTO L □□□	Jumps to a specified label number.
IF CHR □□□□□□□□ L □□□	Branches to a specified label number if the particular character string is included in the frame buffer.
IF TRG□ L □□□	Branches to a specified label number if the trigger conditions are satisfied.
IF TM□ L □□□	Branches to a specified label number if the timer exceeds the setting value.
IF CT□ L □□□	Branches to a specified label number if the counter exceeds the setting value.
IF LN □□=□ L □□□	Branches to a specified label number if the logic values of control lines meet with the setting.
IF REG□ □ REG□ L □□□	Branches to a specified label number if the inequality relation between registers is satisfied.
IF TBL□ L □□□	Branches to a specified label number if it is satisfied with data of table specified by the table number.
IF DA □□+REG□ L □□□	Branches to a specified label number if data in the frame buffer is satisfied with data in the data array specified by the additional value, which is the sum of the designated value of a data array number, and the value designated in the register number.
IF FT □□□□ L □□□	Branches to a specified label number if received frame number is matched with the specified type.
CALL L □□□	Jumps to a subroutine marked with a specified label number.
RET	Returns from the subroutine.
SET REG□ □□□□□□	Sets a value to register, or increments or decrements the register.
SET LN □□ = □	Sets a value of the control line.
SET TM□ □□□□□□	Sets a value to the timer, or controls the start, the stop or the restart of the program.
SET CT□ □□□□□□	Sets a value to the counter, or increments or resets the counter.
SET BZ	Sets the buzzer.
SET OUT	Outputs a pulse to the trigger out terminal.
SET DA □□ □□□□□□□□	Sets data to the data array.
SET DV □□ REG □□	Sets the specified number of characters on contents in register as a character string to the data array.
SET MOD (8/128)	Sets frame modulo for X.25 processing in the Program simulation.
SET AD □□□	Sets frame address to transmit by SEND FRM command.
SET VS □□□	Sets/edits V(S) status value
SET VR □□□	Sets/edits V(R) status value
SET PF□	Sets P/F bit of a frame to transmit by SEND FRM command.
SET DP □□□□	Sets/edits data pointer
INT TRGO L □□□	Jumps to the subroutine marked by the specified label number when the condition of trigger 0 is satisfied.
RETI L □□□	Returns from subroutine started by the INT command.
DISI TRGO	Disables an interruption.
STOP	Stops the running of simulation operation.
L □□□	Enters a label number in a range from 0 to 999 in decimal notation.

## 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]



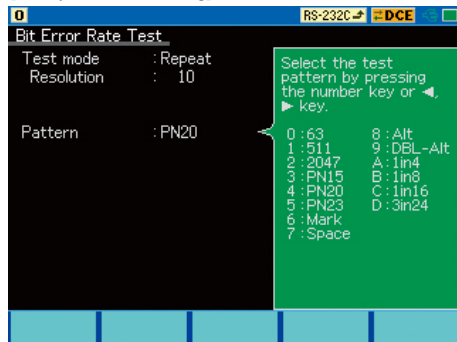
### Many of test patterns

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

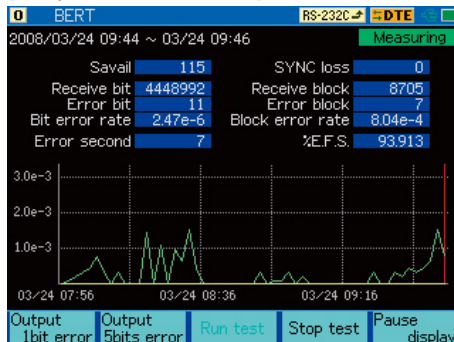
### Graphs for specified measurement period

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]

Savall	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]

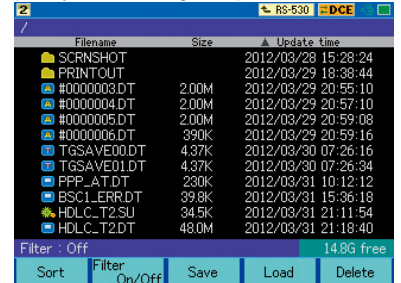


The screen on the right-hand side is set to make measurement from 5:00 a.m. to 7:30 a.m. automatically on a daily basis.

### 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]



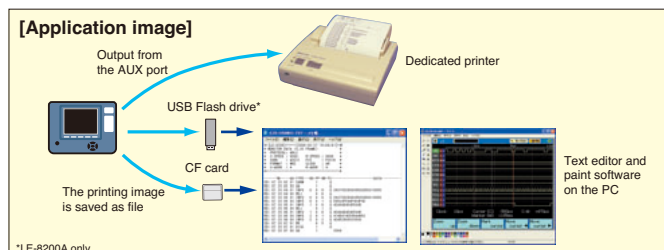
### Monitor Condition Auto Setting

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.

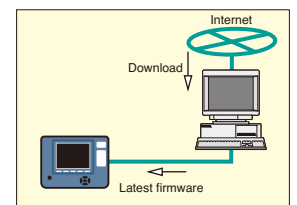
### File Printout Function Functional Enhancement

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.



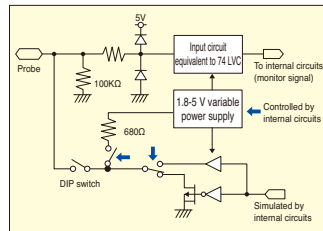
## TTL I<sup>2</sup>C SPI TTL/I<sup>2</sup>C/SPI Communications Expansion Kit OP-SB85L

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).



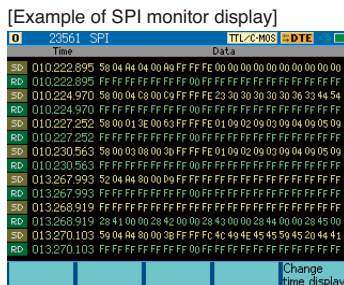
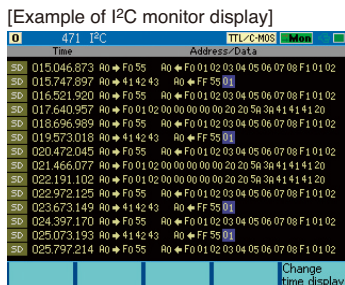
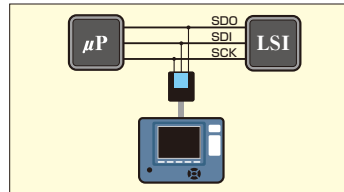
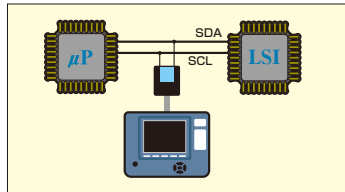
### Support for a broad range of power supply systems.

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.

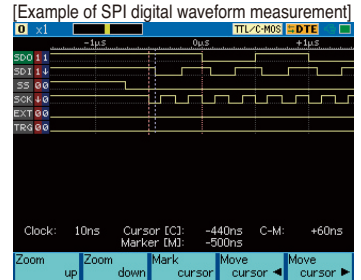
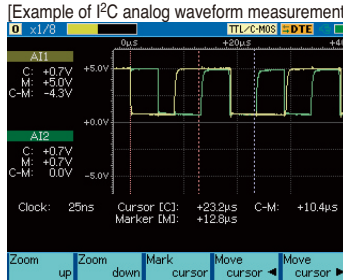


### Ideal for UART ports or TTL-level HDLC

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 <sup>(*)</sup>	ASYNC, ASYNC-PPP, SYNC/BSC, HDLC/SDLCL/X.25, I <sup>2</sup> C, SPI, BURST
Test Function <sup>(*)</sup>	Monitor, Simulation, BERT
Baud Rate	ASYNC: ASYNC-PPP, SYNC, BURST: 50bps~4Mbps <sup>(2)</sup> HDLC: 50bps to 4Mbps <sup>(2)</sup> on standard, 115.2Kbps to 12Mbps <sup>(3)</sup> on using OP-FW12G SPI: 50bps to 2.15Mbps <sup>(4)</sup> , 115.2Kbps to 20Mbps <sup>(5)</sup> on using OP-FW12G 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 3.3V setting: High: Min 2.0V, Low: Max 0.8V 2.5V setting: High: Min 1.7V, Low: Max 0.7V 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. <sup>(6)</sup>
Output Level Voltage	High: Min Selectable signal level - 0.4V, Low: Max 0.5V <sup>(7)</sup>
Analog Measurement Port	Measurement channel: 2 Input impedance: 1MΩ (Acceptable input range: ±25V) Measurement range: ±6V / ±12V (8 bits resolution) Sampling cycle: 1mS ~ 25nS, 15 steps 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 Expansion Firmware

Firmware for High-speed communications

### OP-FW12GA

Firmware for High-speed HDLC/SPI communications

### OP-FW12G

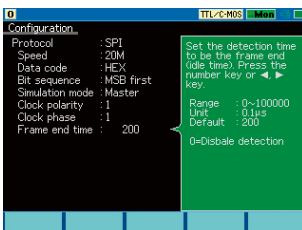
OP-FW12GA is an expansion firmware to extend the measurable speed range for the communications such as the bit synchronous communication (HDLC/SDLCL/X.25/CC-Link etc.), SPI, UART(Async), and Profibus-DP. By processing major processes for monitoring by FPGA it captures the communication data with time stamps of micro-second unit. It makes the basic functions of LE-8200A/LE-8200 such as monitoring and simulation adapt to more rapid speed communication. OP-SB12G is an expansion firmware to extend the supportable speed range for the communications of bit synchronous communication such as HDLC and SPI only.

	OP-FW12GA	OP-FW12G
HDLC	○	○
SPI	○	○
UART	○	×
PROFIBUS	○	×

Note: OP-FW12G does not support ASYNC.



Note: Only OP-FW12GA or OP-FW12G can be installed to LE-8200A/LE-8200. (Install of both models at the same time is not supported.)



### Specification

Interface	RS-422/485 <sup>(*)</sup> , TTL <sup>(2)</sup> , SPI <sup>(2)</sup>
Protocol	HDLC, SDLCL, X.25, CC-LINK (NRZ/NRZI, AR clock <sup>(3)</sup> ), SPI ASYNC (UART) <sup>(4)</sup> , PROFIBUS-DP <sup>(4)</sup>
Speed	115.2Kbps to 6Mbps (full duplex) / 12Mbps (half duplex) SPI only: 115.2Kbps to 20Mbps <sup>(5)</sup>
Error Check	FCS error (CRC-ITU-T), Abort, Short frame, Brake, Framing error, Parity error, BCC error
Time Stamp	9 digits (0 to 134217727) Resolution: 1ms, 100µS, 10µS, 1µS
ID Filter (HDLC)	Specified address frame (16-bit length, don't care and bit mask are available.)
Simulation	Transmits a pre-set data table (160 tables, total of 16Kbyte data) for 1 time or repeatedly by the key operation.
Trigger	Factor: Specified send/receive data, errors such as FCS/BCC errors, detection of external signal Action: Automatically stops the monitoring or outputs a pulse from the trigger terminal
Accessory	Firmware CD, Instruction Manual

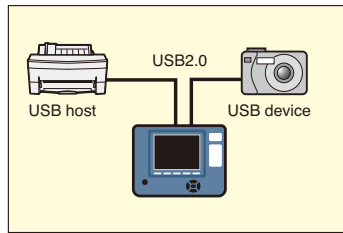
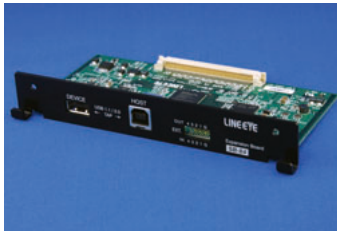
\*1: RS-530 port is equipped. For the connection LE-25TB or LE-530TB are useful. \*2: OP-SB85L is needed. \*3: The synchronous clock are provided by the send/receive data. \*4: Only OP-FW12GA supports ASYNC and PROFIBUS-DP. \*5: When transmission data continues more than 16Kbyte, max speed may be at max. 6Mbps. For simulation, the max speed is 12Mbps (master mode)/ 6Mbps (slave mode).



## USB

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

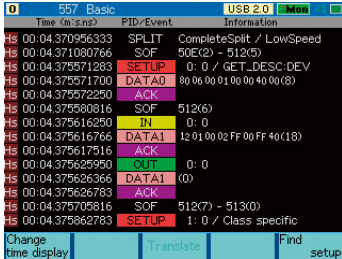
This interface expansion kit supports real-time monitoring of USB 2.0 protocol and power measurement of VBUS. Since USB 2.0 data can be measured easily without using a personal computer but using the analyzer only, this kit is ideal for the inspection and troubleshooting of installed apparatuses in addition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



#### Records in the CF card or USB flash drive(\*) \* 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]

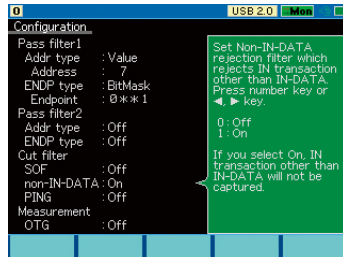


○Detailed translation is possible by the PC software of LE-650H2 after transferring the measured data to a PC. Data can be converted to a text format.

#### 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]



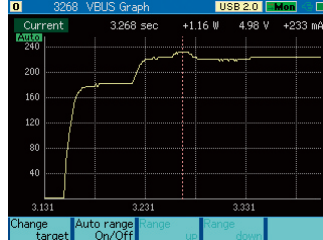
#### Powerful sequential trigger

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.

#### 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(μs)	Power(mW)	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	+0.36	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	+133
3.159	+0.69	5.00	+137
3.160	+0.75	5.00	+149
3.161	+0.78	5.00	+156
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
Auto Save Function	Automatically save the USB log data in the external memory. (*1)
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. (*2)
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. (*2)
Trigger Function	Condition: Error, Transaction, Bus event, External signal (sequence action is available), VBUS voltage/current Action: Outputs signal from the external terminal, Stops logging (offset specify is available)
Retrieval Function	Retrieve the specified frame or event and display the top of data or count the number of data. (*2)
VBUS Measurement Function	VBUS voltage (0 to 8 V), current (-2 to 2A), power consumption can be measured by specified interval (1ms to 1s). The dump display, graph display, and text/csv conversion are available.
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

\*1: 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. \*2: Advanced filtering, retrieval, and various class-translation are possible by the PC software of LE-650H2 on a PC.

## Current Loop

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

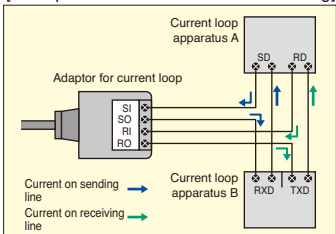
This expansion kit supports the current loop communications, which is utilized in the FA field even now. For current loop communications, this kit realizes monitoring data, testing data sending/receiving, and measuring bit error rate.



#### Monitoring the current loop communications

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

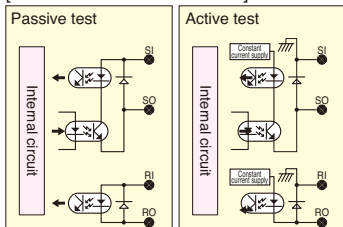
##### [Example of line connection for monitoring]



#### 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

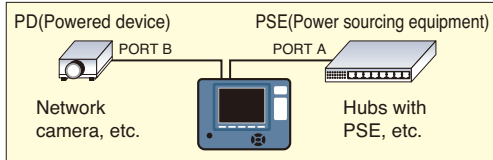
Interface	Current loop communications (4-pole terminal block, 7.62mm pitch/M3 screw)
Measurement signal	SD, RD
Baud rate	19.2 Kbps max. (*1)
Test Function	Monitor, Simulation, BERT
Transmission Reception Circuit	Reception: Photodiode with a reverse connection protection diode. (*2) Transmission: Photo-transistor with a reverse connection protection diode. (*2) 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. 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 Sampling: 1 KHz to 40MHz (15 steps) Measurement range: ±6 V/±12 V
Digital Waveform Analysis	Display waveform of current status on Current loop. 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-SB85R combined with the OP-1C can be an equivalent set.

# Stand-alone measurement of LAN is realized easily. New model for EtherCAT has been added.

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

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.



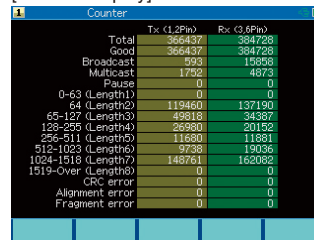
○ This kit can judge the PSE or type of the PoE.



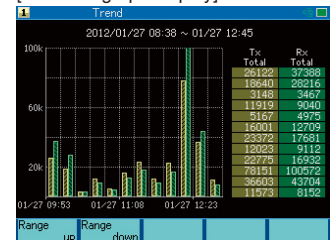
### Statistic function

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

[Counter display]



[Statistics graph display]



### 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]

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.

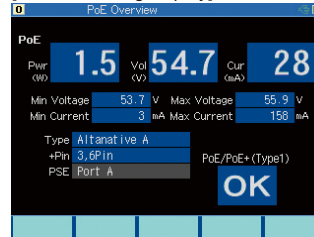
[Summary of transmission table]

[Protocol editor display]

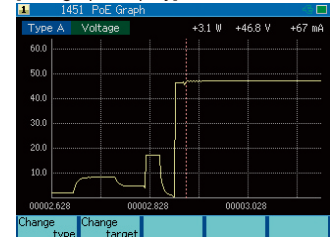
### PoE measurement function

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]

## LAN Expansion Kit for LAN (PoE) Communications OP-SB89

OP-SB89 is the expansion kit for monitoring test of 10Base-T/100Base-TX Ethernet communication. You can analyze the communication by packet capturing and measure the power of PoE. The model also provides the cable testing by using its cable test port to know the length, breaking, short-circuit, and split pair of the cable



### Monitor function

As the measurement ports are fail-safe tap the communication line keeps working if the power of the analyzer is down. Depending on the testing situation you can use the following two monitoring modes.

Monitor mode	Online mode	Repeat mode
Measurement action	Stops measurement after using 100M of buffer memory.	It continues monitoring using the buffer memory divided in two.
Real-time display	No	Yes
Auto save	No	Automatic saving into an external storage memory up to 128GB.
Capture ability	High	Worse than online mode
Main purpose	Measure and capture all the frames on the communication line of high data volume.	Long time logging of the data on the communication line of low data volume.

### PoE measurement function \*PoE+ is not supported

It can measure the voltage, current, power consumption of the PoE line of PSE (power sourcing equipment) to PD (powered device).

### Useful function for field use

It has various useful functions for LAN construction such as PING function (useful for linking test), port blinking function (used to detect the port which the cable from OP-SB89 is connected), and cable test function.

[Cable test display]



[PING display]

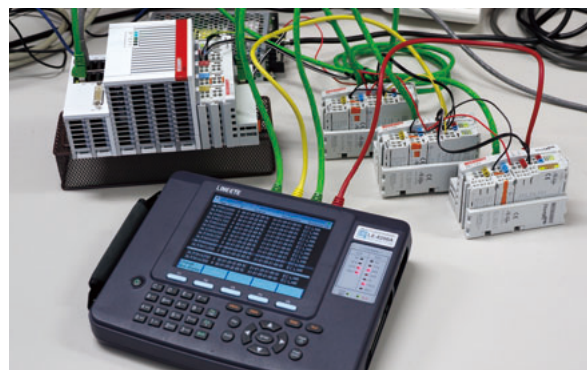
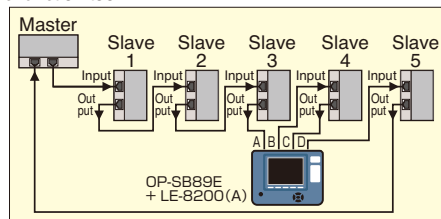


### Statistic function

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

## LAN Expansion Kit for LAN (2ch, supporting EtherCAT) OP-SB89E

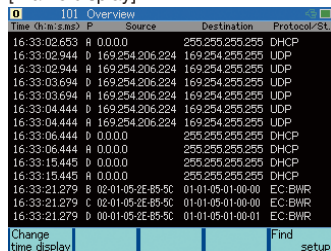
OP-SB89E is the expansion kit for Ethernet which has 4 measurement ports. It can capture communications of 2 lines by using its 4 ports for tap connection. As it also can monitor input and output of EtherCAT slave and calculate the time rag of them, it is useful for trouble-shooting and development of industrial Ethernet communication devices. The model has the packet generation function to output a test frame and the statistic function too.



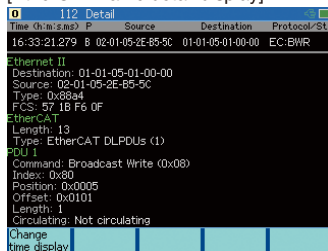
### Monitor funtion

It captures 2 Ethernet lines simultaneously and saves the data with high-resolution time stamps of minimum 40ns resolution. You can monitor only the specified frames by using the filter. As the A, B, C, and D ports are the passive taps and do not make any delay, they serve as fail-safe taps and regardless of ON/OFF of the power of analyzer the target communication keeps communicating. As same as OP-SB89G and OP-SB89, the captured data can be transported to PC by using the utility software "lepcapvt" and converted to .pcap format to analyze the data by Wireshark.

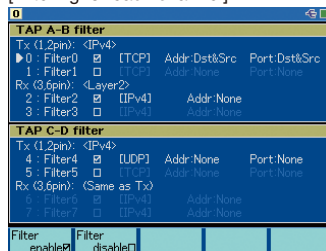
[Frame display]



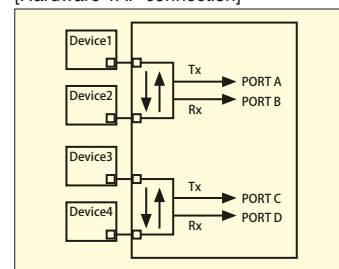
[EtherCAT frame detail display]



[Filtering for each channel]



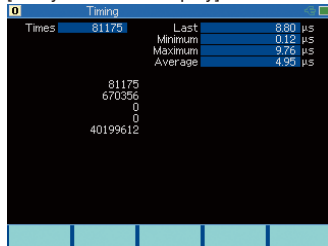
[Hardware TAP connection]



### Delay time measurement function

By the send/receive time (time stamp) of the communication frame it measures the time gap of receiving timing of between the ports. By the function which is useful for real-time Ethernet devices evaluation you can measure the time used for processing by checking the time gap of the packets which comes in and go out from an Ethernet slave or can measure the response time between a Modbus TCP master and a slave. The last, minimum, maximum, and average value of the time gap are displayed in real-time.

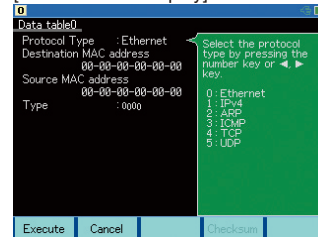
[Delay time result display]



### Packet generation function

It can output an arbitrary test frame from the port A and B. You can set the frame gap for each frame and it can transmit them in the wire rate or at an arbitrary timing. The function is useful for simulation test in device development and the evaluation of communication line.

[Protocol editor display]



### Specification

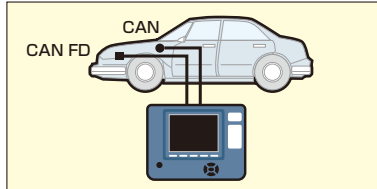
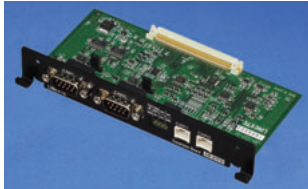
Model	OP-SB89G	OP-SB89E	OP-SB89
Measurement port	Port A, B 1CH Ethernet/PoE	Port A, B, C, D 2CHs Ethernet	Port A, B: 1CH Ethernet/PoE Port C: Cable test port, Class A pseudo PD port
Measurement Interface	10Base-T / 100Base-TX / 1000BASE-T		10Base-T / 100Base-TX
Fail-safe tap (*1)	Between port A and B		Between port A and B
Monitor function (*2)	Measures and logs Ethernet frames		Measures and logs Ethernet frames (*3)
Time stamp	13 digits, minimum resolution: 40ns		13 digits, minimum resolution: 1µs
Recordable frames (*4)	Max. 48,000 to 1,048,000 frames (equivalent to 100Mbyte)		Max. 48,000 to 1,388,000 frames (equivalent to 100Mbyte)
Frame Size	60~9Kbyte		60~2047byte
Translatable protocol	IPv4, ARP, ICMP, TCP, UDP, DHCP	IPv4, ARP, ICMP, TCP, UDP, DHCP, EtherCAT	IPv4, ARP, ICMP, TCP, UDP, DHCP
Trigger	Level coincidence with the external input, detection of the specified frame. Can stop measurement by the trigger.		Level coincidence with the external input. Can stop measurement by the trigger.
Filter function	Can monitor specified frames only.		
Search function	Can search specified frames and retrieve/count it.		
Auto save function	Can save captured data automatically into the external memory as a log file.		Can save captured data automatically into the external memory as a log file (REPEAT mode only).
Utility software	A utility software to convert the log file into pcap file is attached. Supported OS: Windows® 7/8.1/10		
Packet generation function	Can output an arbitrary packet in wire rate from port A. Max 16 types of packets can be transmitted for specified number of times or continuously. Frame gap can set for each packet.	Can output an arbitrary packet in wire rate from port A or B.	—
Delay time measurement function	—	Displays the time gap in µs unit between the receiving timing of the specified ports. (Current, maximum, minimum, and average value are displayed.)	—
Statistic function	Takes statistics of values of 2 frame counters by specified interval (0 to 240 minutes) and graph it. All the frame counter value can be displayed in real-time.		
PoE measurement function	PoE(IEEE802.3af) / PoE+(IEEE802.3at) Continuous measurement, logging, judge, and display of the power consumption, voltage, current Interval: 1ms to 1s. Max recording times: 4 million times. Voltage: 0 to 60V (±1% F.S.). Current: 0 to 600mA (±2% F.S.). Conversion of logged data to text/csv format is available.	—	PoE(IEEE802.3af) Continuous measurement, logging, judge, and display of the power consumption, voltage, current Interval: 1ms to 1s. Max recording times: 4 million times. Voltage: 0 to 60V (±1% F.S.). Current: 0 to 380mA (±2% F.S.). Conversion of logged data to text/csv format is available.
PSE detection function	—	—	Detects the PSE connection with the port C and blink the LED.
Cable test function	—	—	Measures cable length, break, where short-circuit occurs, and split pare.
PING function	Sends PING command and display the response situation.		
Port blink function	Makes the link LED of the connected hub blink periodically.		
Accessories	Interface expansion board, line state sheet, LAN cable, Utility CD		

\*1: It will not affect the communications between the target devices even when the power of analyzer is down. \*2: Under the high load network it may cause loss in capturing. \*3: Works in ONLINE mode (in which it stops recording when the memory is filled in full) or REPEAT mode (continuous recording). \*4: The frames are recorded with additional information.

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

## CAN FD CAN CXPI Expansion Kit for CAN FD/CAN/CXPI communications OP-SB87FD NEW

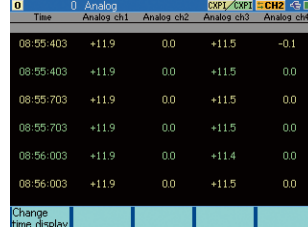
OP-SB87FD is an expansion kit which supports CAN (used widely for in-vehicle device / FA), CAN FD (next-generation in-vehicle communication which can transmit more data in high-speed), and CXPI (developed in Japan to substitute direct wiring which was difficult to be networked) communication.



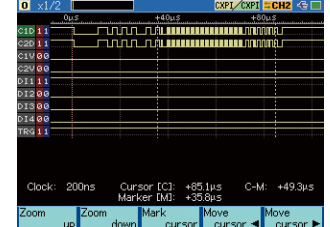
### Analog measurement function and logic analyzer measurement function

By the analog measurement function it can monitor and log the voltage of 4 external signals with the communication data, or measure it by the specified sampling interval (1ms to 10min) as an analog data logger can do. By the logic analyzer function you can analyze the delicate timing gap between the communication signals of CAN or CAN FD and the external signal.

[Example of analog measurement]



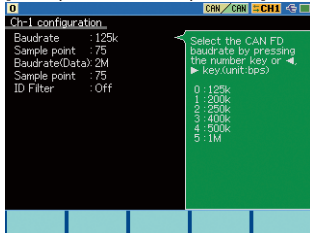
[Digital waveform of CAN FD including the high-speed communication]



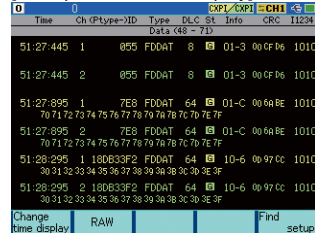
### Monitor function

It can monitor CAN FD, CAN, or CXPI communication by specifying the interface for the 2 measurement channels. In the monitor display it shows the time stamp (minimum resolution 1us), frame ID, frame type, data length, result and value of CRC check, and data field. Besides them, in the case of CAN FD it shows the value of BRS bit and ESI bit, and in the case of CAN FD(ISO) it shows stuff bit counter field information.

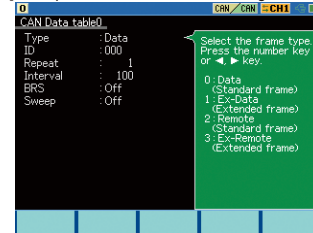
[Example of CAN setup screen]



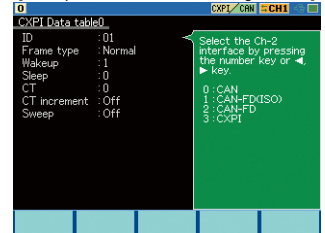
[Example of CAN FD display]



[Example of CAN FD data table registration]

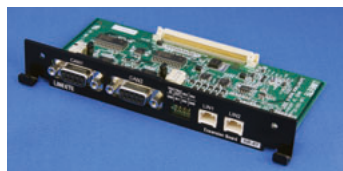


[Example of CXPI data table registration]



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

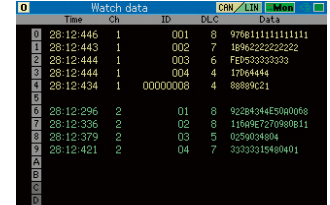
This interface expansion kit can measure up to two channels of CAN/LIN communication data, which are broadly used in the FA field and in-vehicle communications, in a free combination. This kit can simultaneously measure external signals for four lines as digital or analog signals while measuring communication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



### Watch data function

It captures data frame of specified ID and display the latest data on the specified line. From the many captured frame data you can check the change of the data of the ID which you need to know.

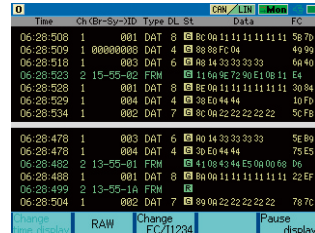
[Example of display by ID]



### Monitor function

For 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. For LIN the 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 idle time even if data length is not clear.

[Example of CAN/LIN monitoring]



### Simulation function

For CAN, this kit returns ACK automatically when a normal frame is received. 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. For LIN, when simulating a master mode, LIN frames registered in advance can be sent in a free order for up to 16 steps. The presence/absence of a parity error or an arbitrary BREAK length can be specified for each step. When simulating a slave mode, a registered frame with the same ID is sent automatically in response to the request from the master.

### Specification

Model	OP-SB87FD	OP-SB87
Measurement interface	CAN/CAN FD: ISO11898-1:2015/ISO11898 (two Dsub9 pin connectors) CXPI: JASO D 015-3:2015 (two header3 pin connectors)	CAN: ISO11898/ISO11519-2 standards (two Dsub9 pin connectors) LIN: ISO9141 (two header 3-pin connectors)
Transceiver	CAN/CAN FD: MCP2542FD or equivalent CXPI: BD41000AFJ or equivalent	CAN: TJA1050/1054 or equivalent LIN: TJA1021 or equivalent
Measurement channels	2 channels	
Protocol	CAN-FD(ISO/Non-ISO), CAN2.0B, DeviceNet, CXPI	CAN2.0B, DeviceNet, LIN (Rev1.1, 1.2, 1.3, 2.0, 2.1)
Speed	CAN FD: Max 1Mbps (5Mbps for high-speed mode), CAN: Max 1Mbps, CXPI: Max 20Kbps	CAN: Max 1Mbps, LIN: Max 26Kbps
Monitor function	CAN FD/CAN: Standard format/Extended format CXPI: Standard format/Burst frame	CAN: Standard format/Extended format LIN: Divides data to frames by non-communication time. Arbitrary speed can be set.
Time stamp	Resolution : "Hr/Min/Sec", "Min/Sec/1ms", 100us, 10us, 1us can be specified.	
Simulation	Can transmit pre-registered data (up to 16 types). CAN FD/CAN: Can respond to reception of specified frame by the trigger function. CXPI: Schedule transmission is available at master/slave mode.	Can transmit pre-registered data (up to 272 types for CAN and 16 types for LIN). CAN: Can respond to reception of specified frame by the trigger function. LIN: Schedule transmission is available at master/slave mode.
Trigger function	Condition: Specific data frame (Max 8 characters), specific remote frame, error, timer/counter value, external trigger input Action: Measurement stop, saving in a memory card, timer control, counter control, specification data transmission (CAN FD/CAN only), buzzer, validation of trigger conditions	
External signal input	Real-time display of 4-channel external signal state with LED Record signal logic in synchronization with data Measure signal voltage continuously (Measurement range: ±15 V)	
Accessories	Expansion board, line state sheet B, DB9 monitor cable *1 x 2, 3-wire probe cable(LE-3LP2) x 2, 8-wire probe cable(LE-8EX), utility CD-ROM (only OP-SB87FD)	

\*1: LE-009M2 is attached for OP-SB87FD and LE-009M1 is attached for OP-SB87. (The cables are different in gender of the plug.)

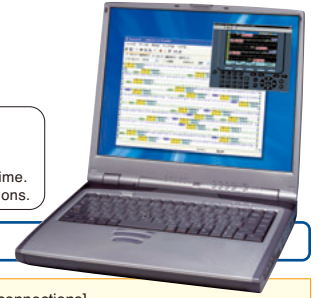
# LE-PC800G Enhances the Link between Analyzers and your PC

PC Link Software

## LE-PC800G

\*Cannot be used with OP-SB87(FD), OP-SB88, OP-SB89, OP-SB89G, OP-SB89E and OP-SB84.

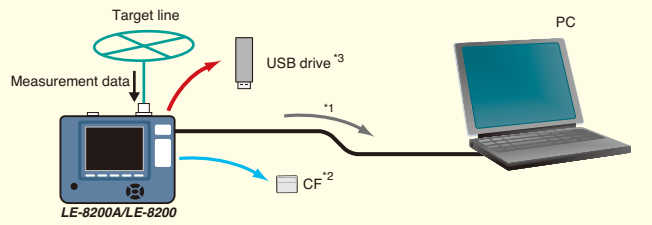
LE-PC800G light edition is attached to LE-8200A/LE-8200. The light edition has the following restrictions.  
 \*The continuous recording is limited up to 10 minutes.  
 \*How much to convert .dt files to .txt files is limited to 3 at one time.  
 The product version of LE-PC800G does not have these restrictions.



### Enables simultaneous control of multiple analyzers from a PC

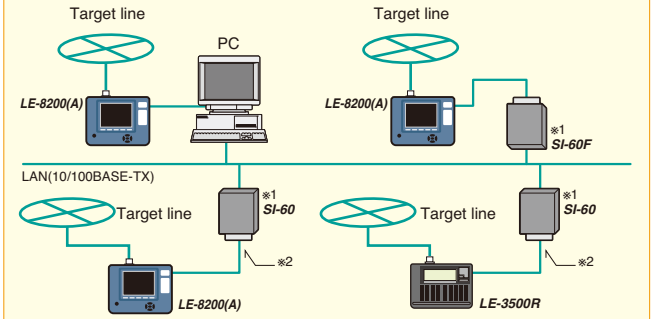
The LE-PC800G supports serial connections through the COM port, USB connections, and LAN connections via LINEEYE LAN-Serial converter, thus enabling remote measurement by multiple analyzers connected at the same time. It also allows you to browse measurement data saved in memory cards and convert data.

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



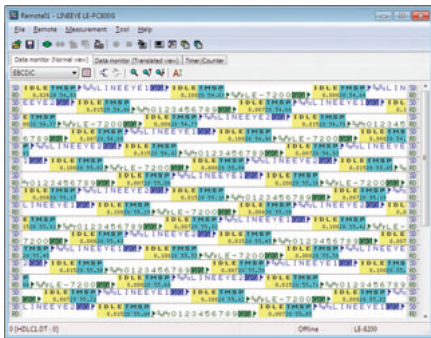
\*1: The PC Link software is not provided with a USB cable. Prepare a USB cable if you intend to use USB connection. The LE-82V AUX cable provided to the analyzer is available in the case of serial connection.  
 \*2: LE-8200A / LE-8200 can save data in the CF card. An interface to read the CF card is required on the PC side.  
 \*3: LE-8200A can save data in the USB flash drive.

#### [Linking multiple analyzers by serial and LAN connections]

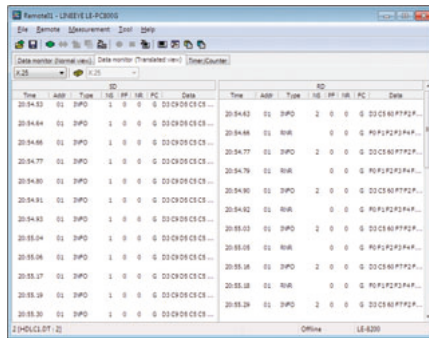


\*1: SI-60/SI-60F is a LAN-serial converter supported by LE-PC800G. Target analyzer is identified by specifying IP address of SI-60/SI-60F on the remote setting window of LE-PC800G.  
 \*2: Optional AUX cable for DSUB 25-pin (LE-8C). Set the DTE/DCE switch of SI-60 to DTE.

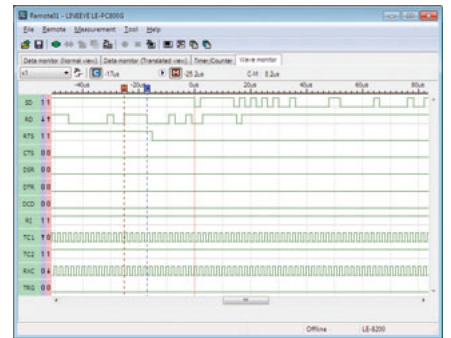
### Allows the measurement data to be checked on your large PC screen.



▲ Normal display



▲ HDLC translation display



▲ Logic analyzer display

### Records communication logs continuously on PC up to a maximum of 256GB

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 : (e.g.: 1 MB x 1,000 files)	When 16 GB is specified : (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	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.	
	Recording capacity	Max. 256 GB can be specified up to 2,048 files in the unit of 1/2/4/8/16/32/64/128 MB data file.	
		Selectable among raw data, protocol translation and logic analyzer waveform.	
Display modes	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.	
	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) Counts or displays the data that matches the search key.		
Search function	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 RAM: 512 MB or more (recommended) HDD: 5 MB + free bytes on the measurement data area
	O S	Windows® 7/8/8.1/10	
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**

No.	Time	Ch	ID	Type	DL	DO	D1	D2	D3	D4	D5	D6	D7	FC	32334
1	32:44:558	1	001	DATA	6	14	FD	18	9C	1C	2E				70 6E 0000
2	32:43:396	1	002	DATA	8	46	9B	00	00	00	14	FF			45 4E 0000
3	32:10:201	1	003	REMOTE	1										50 69 0000
4	33:11:593	1	00000004	REMOTE	6										6E 64 0000
5															
6	33:06:428	1	00000006	DATA	4	00	00	90	4C						1E 14 0000
7	32:35:765	1	00000007	DATA	6	01	02	52	08	01	56				13 F8 0000
8															
9	32:28:775	2	01 [ C1 ]	FRAME	62	53	43	44	ES	0A	00	68	6A		0000
A	32:38:232	2	02 [ 42 ]	FRAME	11	6A	69	68	59	7A	0B	11	72		0000

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 256GB
- 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® 7/8/8.1/10

## 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], Current loop [OP-SB85C], CAN/LIN [OP-SB87], CAN FD/CAN/CXPI [OP-SB87FD] LAN[OP-SB89/OP-SB89E/OP-SB89G], USB2.0 [OP-SB84]
Standard Protocol	ASYNC (Asynchronous), ASYNC-PPP, Character synchronous SYNC/BSC, Bit synchronous HDLC/SDLC/X. 25, Modbus, PROFIBUS
Optional Protocol	I <sup>2</sup> C, SPI, BURST <sup>(2)</sup> , IrDA(IrLAP), CC-LINK, CAN, Devicenet, LIN, CAN FD, CXPI, Ethernet, EtherCAT, 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 . 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, OP-FW12GA]
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) 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, 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, or USB flash(LE-8200A only).
File size	BUF (capture memory size) , 1MB , 2MB , 4MB , 8MB, 16MB , 32MB , 64MB
Max files	2048
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 4,096
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. 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 9.99E8sec), loss count (synch loss: 0 to 9.99E8), error duration (0 to 9.99E8), %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 160 types of transmission data tables (16x10 groups. 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 (47 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 128G byte CF card (only the LINEEYE guarantees to use), or USB flash drive up to 128G byte (LE-8200A only)
Printout function	Measurement data can be printed in various formats. Text files can be saved in the external memory. Screen image can be printed and saved in the external memory.
Remote Control	PC link soft (light edition <sup>(*)5</sup> ), library for controlling analyzer (available on web page).
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>(*)6</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(EN61326-1:2013)
Dimension <sup>(*)7</sup> , mass	240 (W) x 190 (D) x 48 (H) mm , about 1.1Kg

\*1 : To have the function, optional accessory described in "[I]" 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 : The light edition has some restrictions. \*6 : Under the normal operation.

\*7 : 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 (6A-181WP09)..... 1
- Carrying bag (LEB-01)..... 1
- Utility CD (LE-PC800G light version included)..... 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.

\*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.



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



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



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



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



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



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



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

\*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



128G byte CF card  
**CF-128GX**  
128G byte compact flash card.  
\*It is verified by the analyzer.

\*The photo is for illustrative purpose only



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

\*The photo is for illustrative purpose only

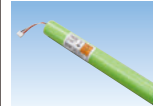
## • AC Adapter



Wide input AC adapter  
**6A-181WP09**  
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.

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

Sister Product



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

Baud Rate	2.048 Mbps
Memory	64 Mbyte
Display	Monochrome with back light
Battery Operation	7 Hours
Dimensions	210(w)×154(D)×38(H)mm
Weight	Approx. 760g

## ■ Expansion Kit

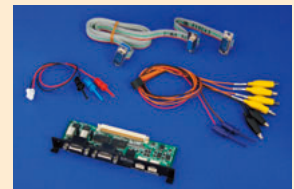
### For TTL/PC/SPI **OP-SB5GL**

Can monitor communications of RS-232C(V.24), TTL/C-MOS signal level.



### For CAN/LIN **OP-SB7GX**

Can monitor 2 channels of CAN/LIN communication (which are widely used in FA and car industry) at the same time.



**SAFETY WARNING**

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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