

LE-8500XR-RT

LE-8500X-RT

Quick Start Guide

Thank you for your purchase of LE-series.

This booklet tells you only the basic operation. For more detailed information, please refer to the instruction manual (PDF) in the utility CD attached to the product.

When you unpack the product, make sure you have all following items

<input type="checkbox"/> Protocol Analyzer	1
<input type="checkbox"/> Interface Sub-board [SB-R2TS1] (attached to the analyzer)	1
<input type="checkbox"/> DSUB 25pin monitor cable [LE-25M1]	1
<input type="checkbox"/> DSUB 9pin monitor cable [LE-009M2]	1
<input type="checkbox"/> DSUB25pin-9pin conversion adapter	1
<input type="checkbox"/> 5 wires TTL probe cable [LE-5LS]	1
<input type="checkbox"/> Hand strap (Already mounted)	1
<input type="checkbox"/> Wide input AC adapter (Input :AC100-240V / Output :DC9V)	1
<input type="checkbox"/> USB cable (Type A-C)	1
<input type="checkbox"/> Utility CD	1
<input type="checkbox"/> Quick Start Guide (this booklet)	1
<input type="checkbox"/> Carrying bag [LEB-01]	1
<input type="checkbox"/> Warranty	1

Please let us know if you find any damage to the product or accessories lacking.

Outline

The LE-8500X-RT series is a handy-type communication protocol analyzer that has a measurement board that supports RS-232C/RS-530, RS-422/485, and TTL signals as its standard board. The online monitor function, simulation function, BERT (bit error rate test) function, etc. can be used according to the test situation, so it can be widely used for development, inspection, and failure diagnosis of communication systems and communication equipment.

USER LIMITATION

This product has not been developed for the use that needs exclusively high reliability and safety: aerospace apparatus, trunk communication apparatus, nuclear control apparatus, medical apparatus related with life maintenance etc. Therefore, do not use for those purposes.

LE-series models with Wi-Fi function (IEEE 802.11b/g/n) emit radio wave. Please do not use it near a medical device, microwave, high-level electronics, TV, radio, wireless station for mobile communication, or specified low power radio station. To use LE-series in the place where an administrator limits the use of radio devices, follow the instruction of the administrator.

The Wi-Fi module used for the LE-series conforms to SRRC(China), FCC (USA), CE (EU), TELEC (Japan), KCC (Korea), ISED (Canada), NCC (Republic of China), however, as its product (LE-series) the Wi-Fi function is available only in Japan, USA, Canada, and EU nations in compliance with RE directive (2014/53/EU).

To use the product other than above countries, order LE-series without Wi-Fi function.

Please contact the sales department for more details.

Representation of the Operating Procedure

- Key operation is described in [].
- Continuous key operation is described as follows.
ex) Press [MENU] and then [0] → [MENU],[0].
- Screen display is described in “ ”.
- (P-No.) indicates the referring page.

Safety Information

Please do not use the line monitor in the following conditions.

[Description of the symbol and mark]



Warning: There is a possibility of getting hurt, such as a death or a serious injury.



Caution: There is a possibility of getting injured or damaging the product.



Warning

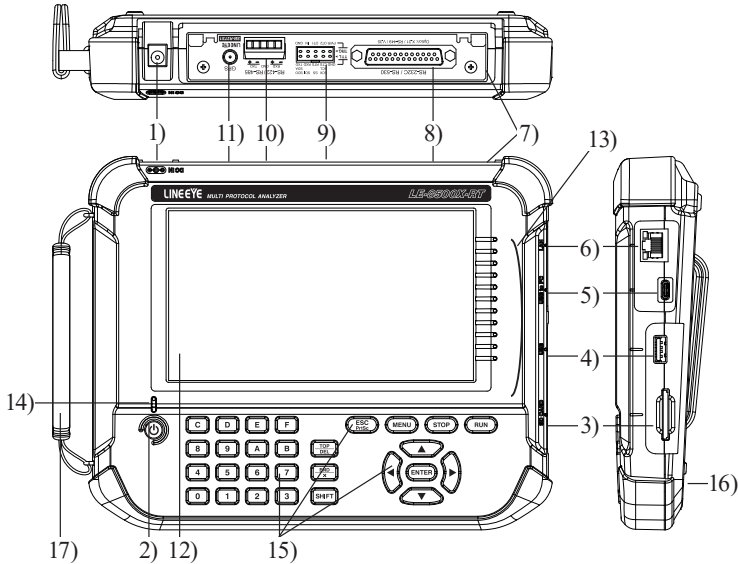
- Do not disassemble, modify or repair the line monitor
This may result in an injury, electric shock, and ignition.
- Turn off the power of analyzer and unplug the cables immediately when emanating smoke, odor or sound.
Continuous use may result in an electric shock, injure or ignition.
- Do not use the line monitor if there is inflammable gas.
This may result in ignition and explosion.
- Turn off the power and unplug the line monitor immediately when liquid or foreign substance gets into the line monitor.
Continuous use may result in ignition, electric shock and malfunction.
- Do not touch the line monitor with wet hand.
This may result in an electric shock and malfunction.
- Do not use the battery other than attached Lithium ion battery.
Do not short the electrode of the battery. Do not modify, decompose or heat the battery.
It may cause the ignition and explosion.



Caution

- Do not give a strong impact to the line monitor.
- Do not place the line monitor in following conditions.
 - Not flat or vibrated place.
 - Temperature or humidity is above the specification.
 - Change the temperature rapidly. ▪ Have a direct sun or near the fire.
 - Magnetic field. Have static electricity.
- Do not use the line monitor near the following devices.
 - Medical device, such as a heat pacemaker.
 - Automatic control devices easily affected by radio waves.
 - Devices controlled by the radio waves.

Nomenclature



N a m e	F u n c t i o n
1) AC adapter plug	Connects the AC adapter, which serves as a battery charger.
2) Power Switch	Press it for more than 1 sec to turn on/off the analyzer.
3) SD Card Slot	The inlet for a SD/SDHC card.
4) USB Host Port	Connection port for a USB flash drive and Printer.
5) USB Device Port	USB Type-C connector connected to a PC or battery charger.
6) LAN port	RJ-45 connector. Link: LED (right), 1000BASE-T connection: LED (left) Used when connecting to a PC via wired LAN.
7) Interface Sub-Board	The SB-R2TS1 sub-board is installed. It can be exchanged with other optional measurement sub-boards.
8) RS-232C/RS-530 port	RS-232C (V.24) and RS-422/485 (RS-530) measurement ports ^{(*)1} Dsub25 pin (female)
9) TTL,trigger I/O port	TTL measurement port and external signal I/O port. Pin header, 10 poles
10) RS-422/485 port	RS-422/485 port RS-422/485 measurement port ^{(*)1} . Detachable terminal block, 5 poles.
11) Connector for GPS antenna	SMA (female) connector When synchronizing the time with GPS, connect the optional GPS antenna.
12) 7 Inch Color Display	Touch panel of electrostatic capacity.
13) Line State LED	Display the status of measuring interface.
14) Power LED	Lighting in green when using. Blinking in red when charging battery.
15) Keypad	Entering commands and other operation
16) Battery Cover	Open/close when replacing the battery.
17) Hand strap	Use to hold the product.

*1 : The RS-422/485 signal lines of the RS-422/485 port and the RS-232C/RS-530 port are connected inside the unit, so do not connect them at the same time.

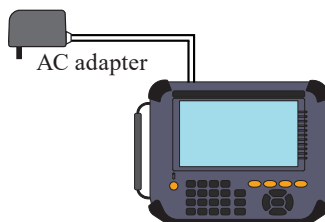
Power Supply and Battery

This analyzer runs by attached AC adapter, or built-in rechargeable battery.

■ Power Source

This analyzer runs by attached AC adapter, or built-in Lithium Ion battery.

- 📖 The battery running time is approx. 4 hours. (The running time is different by the usage of analyzer.)
- 📖 It does not run by the bus power from the USB device port.



■ Charge the Battery

Built-in Lithium Ion battery is charged while the power is supplied by the AC adapter. It is also chargeable by the bus power from the USB device port.

Power supply	Analyzer	Status	Charge Time	Power LED blinking
AC adapter	OFF	—	About 3.5 hours	Approx. 1sec cycle
	ON	Stop measuring	Max. 6 hours *1	Approx. 4sec cycle
		Measuring	No charge	No blinking
USB bus power	OFF	Use attached USB cable	Max. 6 hours *1	Approx. 4 sec cycle
		Use Type-C battery charger etc. *2	About 4.5 hours	Approx. 1.5 sec cycle
	ON	—	No charge	No blinking

*1 : This will not be full charging because of the small amount of current (approx. 160mA).

*2 : It will be the same when it connects to the PC with a USB port in Type-C connector.

- 📖 This analyzer is not charged in full before shipping. To use the analyzer at the first time, charge it full.
- 📖 Charge the analyzer under the temperature of 5 to 40 °C. It will not start charging below 5 °C.
- 📖 If you are not going to use it for a long term, charge the battery in full. After that, try to charge the battery every 6 months.

■ Replacement of battery

If the analyzer can no longer drive by the battery, or the service time after charging becomes extremely short, replace the battery.

Refer to the instruction manual for more details of replacement of battery.

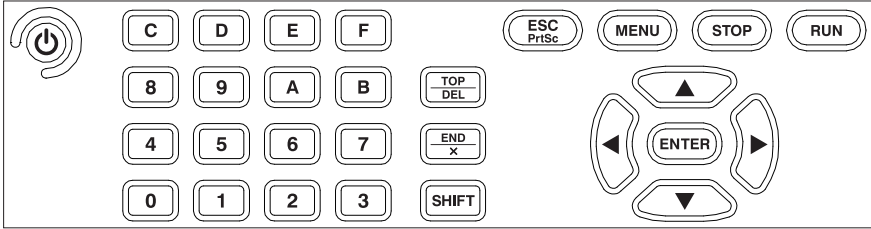
- 📖 Old battery has to be handled in an appropriate manner.

⚠ Warning < Notice for battery >



- Do not short the terminal of the battery.
 - Use the battery and battery charger specified by LINEEYE.
 - Do not disassemble or modify the battery.
 - Do not leave the product in a hot place such as in a car or near a heat source.
- They may cause the battery to overheat, ignite, explode, electric shock, leak, or malfunction.

Key operation


There is a keyboard to input data and operate commands.



■ Keys

Operations	Function
[]	Turn ON/OFF the power. Press it for more than 1sec.
[]	Start monitoring, measuring or testing operation.
[STOP]	Stop monitoring, measuring or testing operation.
[MENU]	Return to the top menu.
[ESC]	Return to the previous display. Return to the data display from configuration.
[▲], [▼]	Scroll one data line. Move the cursor on the condition setting.
[◀], [▶]	Scroll one character of data. Change the setting on the condition setting.
[ENTER]	Apply selected settings.
[0] ~ [F]	Enter numerical values.
[TOP/DEL]	Delete the entry indicated by the cursor.
[END/X]	Enter the data of “Don't Care”.
[SHIFT]	Press to use the expanded alternate function of each key.
[SHIFT]+[TOP/DEL]	Jump to the top of data.
[SHIFT]+[END/X]	Jump to the end of the screen.
[SHIFT]+[ESC]	Save the screen image. / Hardware copy.
[SHIFT]+[MENU]	Display/hide the description of LEDs.
[SHIFT]+[RUN]	Brighter the LCD back light.
[SHIFT]+[STOP]	Darker the LCD back light.
On the top menu [SHIFT]+[0]	Switch to the normal mode
On the top menu [SHIFT]+[3]	Switch to the high-speed mode

* [X]+[Y] indicates the operation of pressing [X] and [Y] together at the same time.

 Shortcut keys are available from [MENU] and [0] ~ [F].

To go back the factory setting, press “System Settings” -> “Version”-> “Factory reset”
→ [Version] (P9)

Initial Settings

To turn on the power, press [POWER] for a second. After displaying the opening screen for about 15 seconds, it will start running.

Select the language at the first time using the analyzer. If it is selected already, it displays the top menu.

Both LE-8500XR-RT and LE-8500X-RT display the model number as “LE-8500X” on the opening screen.

To set each configuration, touch the configuration menu or select by [▲], [▼],[◀],[▶] keys and then press [ENTER].

To set each items, touch the item or select by arrow keys or [0] ~ [F] keys.

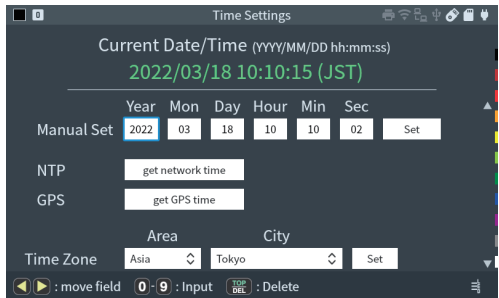
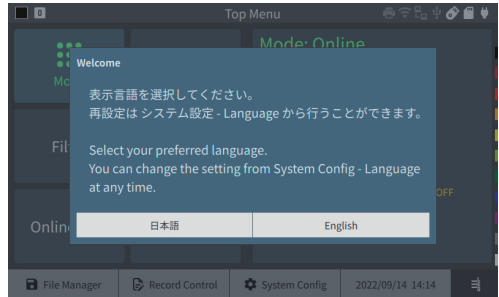
To set the current time, touch the current time on the right bottom of the screen.

Shortcut key [MENU] , [D]

The current time is displayed in the order of Year/Month/Day, Hour: Minute: Second (24hour).

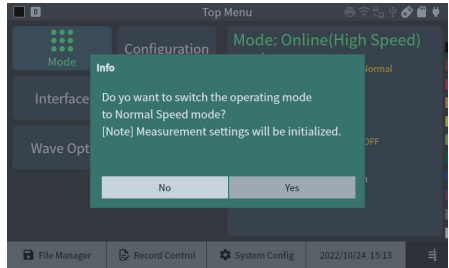
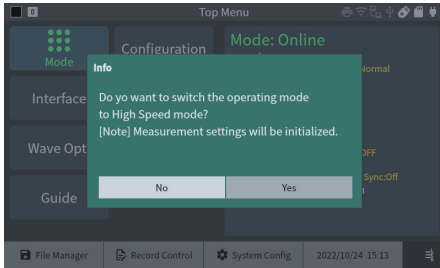
If using the GPS antenna, received time from GPS is displayed.

- Information of time and date is used for time stamp and Auto start/stop. Make sure to input the current time and date precisely.



■ Switching between the normal mode and the high-speed mode

The LE-8500X-RT can be used by switching between a mode for normal measurements and a high-speed mode that supports measurements of up to 20Mbps (30Mbps for SPI only). In the high-speed mode, only Online, Manual, and PULSGEN can be used, and some functions such as triggers and items that can be set are also different than the ones of the normal mode. Press [SHIFT]+[0] on the top menu screen to enter normal mode, and press [SHIFT]+[3] to enter the high-speed mode.



Basic Measurement Settings

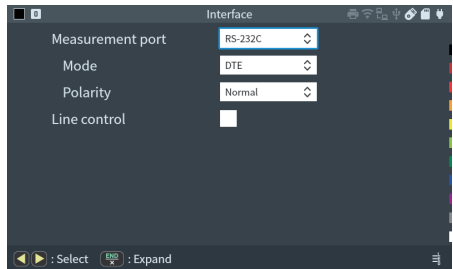
■ Interface : Select a measurement port of analyzer.

Shortcut key [MENU] ,[1]

For Simulation, select DTE or DCE mode and polarity.

📄 For Monitoring, polarity has to be set as well.

Operation mode : Tap “Mode” to select the operation mode for testing.



→ [Monitor Function] (P14)

→ [Simulation Function] (P17)

→ [BERT (Bit Error Rate Test) Function] (P20)

The normal monitor function is “Online”.

Depending on the function, the operating conditions are set from “- Opt.”.

Tap “Send Table” to register the transmission data used in the simulation function.



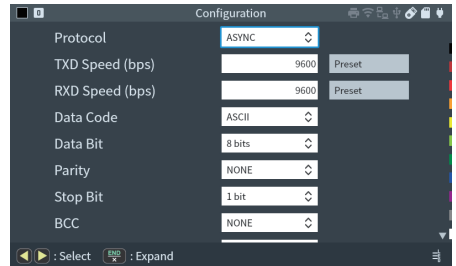
■ Configuration Select basic communication conditions.

Shortcut key [MENU], [0]

The items that can be set differ between the normal mode and the high-speed mode.

Protocol :

Select Asynchronous (ASYNC),
Character synchronous (SYNC/BSC),
Bit synchronous (HDLC/SDLC), I2C
or SPI



Speed :

Select from “Preset” or set any speed
in 4 significant digits with the keys
[0] to [9], [C] (decimal point), [D] (K
kilo), [E] (M mega).

- Other settings such as data code, data bit, parity, stop bit need to be set for some protocols.

BCC :

Select BCC type, begin code and end Code etc. If selecting transparent mode,select DLE (Data Link Escape) code.

Bit sequence :

Select “LSB first” for normal use.

Frame end time :

Set the time of non-communication state which is recognized as a frame end.

Frame end code :

Frame end code can be set up to 2 characters.

- Frame end code is necessary to record time stamp.
- Necessary settings are different in each protocol.
- Auto configuration is available.

→ [Communication Condition Auto Setting Function] (P7)

■ Record control Set recording conditions of measured data.

Shortcut key

[MENU] ,[B]

□ Additional info.

Idle time :

Select ON/OFF of idle time (noncommunication time) and time resolution.

Cannot be set in high speed mode.

Time stamp :

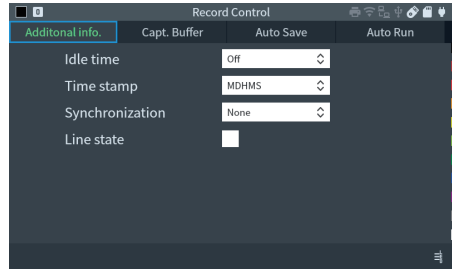
Select ON/OFF of time stamp and time resolution.

Synchronization :

Set this to synchronize the timestamp with the GPS/PPS signal.

Line state :

Mark on the check box, then status of RTS, CTS, DCD, DTR, DSR, RI and TRG(trigger input) are recorded along with data.



□ Capture Buffer :

Recording Area :

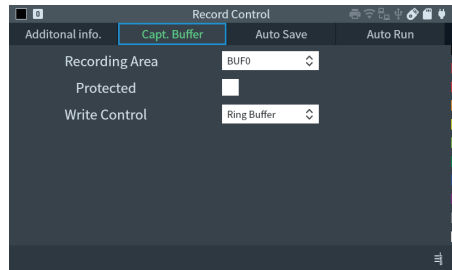
“BUF0” means full buffer. “BUF1/BUF2” means capture buffer is divided into two and use half of them for recording.

Protected :

Prevent data stored in the buffer memory from being inadvertently overwritten.

Write Control :

Select Ring buffer (endless recording) or Full stop when the capture buffer is full.



□ Auto Save

Set the conditions for automatic saving of the measured data to a storage device such as a USB memory.

→ [Auto Save] (P8)

→ [Auto back-up function] (P25)

□ Auto Run

Start measuring automatically at the specific period of time.

→ [Auto Run Function] (P26)

■ Trigger Set the trigger conditions.

→ [Trigger setting] (P21)

■ Wave monitor Set the conditions of logic analyzer function.

→ [Timing Waveform Measurement Function] (P23)

System Setting and Version

Touch “System Settings” from top menu.

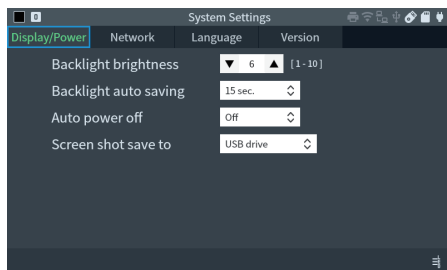
Shortcut key [MENU],[C]

Touch each tab or press [SHIFT]+[▶], [SHIFT]+[◀]

□ Display / Power

Set backlight brightness, automatic dimming for power saving, auto power off function, screenshot, and printer settings.

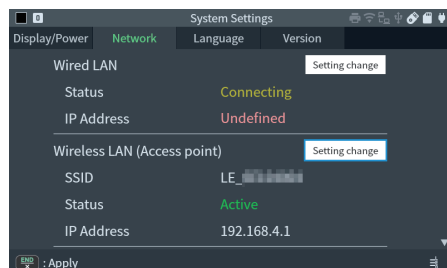
☰ Auto Power Off function does not work during measurement.



□ Network

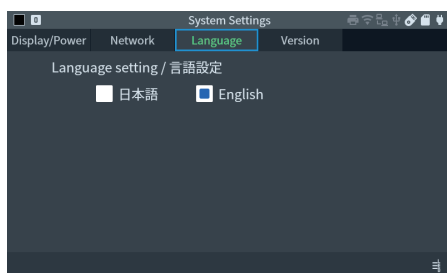
Set each setting for wired LAN and wireless LAN. As a factory setting, wireless LAN is turned off. To change the setting of wireless LAN, touch “Setting change” and select “station mode” or “access point mode”.

☰ LE-8500X-RT does not have the wireless function



□ Language

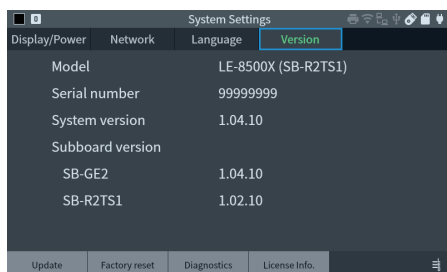
Select language from Japanese or English.



□ Version

Serial number and firmware version are displayed.

It is able to update the firmware and reset the firmware.



Connect to the Target Devices

Set the measurement port of this analyzer on the interface setting screen.

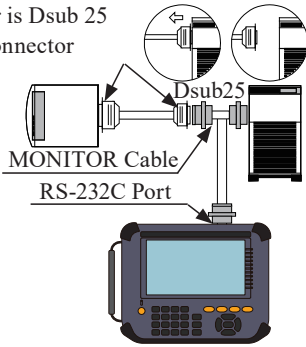
Shortcut key [MENU],[1]

■ Connect to RS-232C

Connect RS-232C connectors of the target devices to the RS-232C port of analyzer using monitor cable.

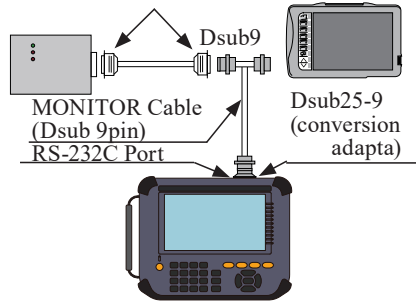
□ For monitoring

Either is Dsub 25 pin connector



If the connector of either target device is Dsub 25 pin, use attached Dsub 25 pin monitor cable (LE25M1) to connect to the analyzer.

Both Dsub 9 pin connector

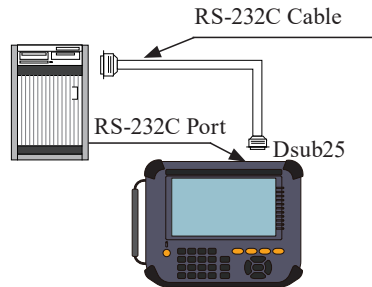


If the connectors of both target devices are Dsub 9 pin, use attached Dsub 9 pin monitor cable (LE-009M2) and Dsub 25-9 conversion adapter to connect to the analyzer

□ For Simulation

Connect analyzer and target device one by one.

Connect as following, concerning the specification of target device (DTE/DCE) and RS-232C cable.



- DTE device -----Straight cable ----- Analyzer (DCE setting)
- DCE device -----Straight cable ----- Analyzer (DTE setting)
- DTE device ----- Cross cable ----- Analyzer (DTE setting)
- DCE device ----- Cross cable ----- Analyzer (DCE setting)

■ Connection to RS-530, X.20/21, RS-449, V.35

By connecting an optional measurement cable to the RS-232C/RS-530 port of this unit, you can execute a data monitoring and fault diagnosis not only for devices with RS-530 interfaces, but also for devices with X.20/21, RS-449, and V.35 interfaces.

This port can also be used to measure RS-422 lines with control lines such as RTS and CTS.

For details on the signal arrangement, see the instruction manual.

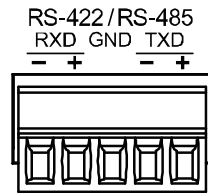
Option Name	Model	Description
X.21 monitor cable	LE-25Y15	DSUB 15pin, Y branch, for X.20/21
RS-449 monitor cable	LE-25Y37	DSUB 37pin, Y branch, for RS-449
V.35 monitor cable	LE-25M34	M type 34pin, Y branch, for V.35
RS-530 cable	LE-25S530	DSUB 25pin, for RS-530
Terminal block for DSUB 25 pins LE-25TB	LE-25TB	All the signals of DSUB 25pins can be taken from the 25pin terminal block

■ Connect to RS-422/485

Connect appropriate signals of target device to the RS-422/485 port.

- ☞ Connect TXD+ and TXD-, and RXD+ and RXD- using twisted pair cable.

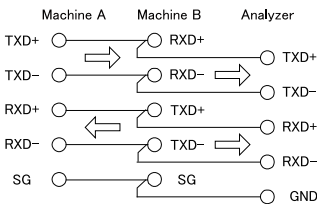
< RS-422/485 port >



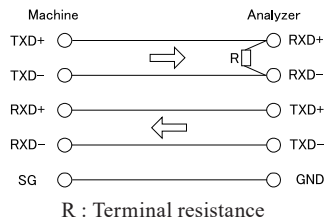
*This is the removable terminal. Remove it from analyzer first, connect cables and return it to the analyzer.

□ RS-422 Full-duplex

Monitoring between A and B

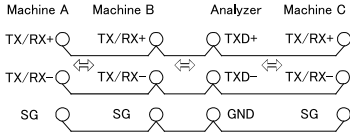


Simulating



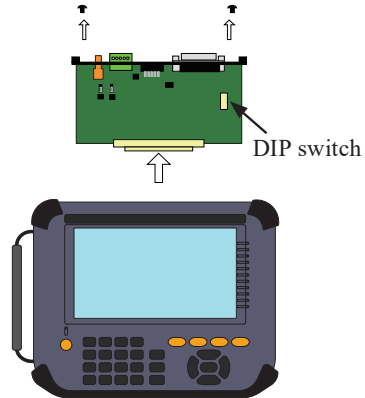
□ RS-485 Half-duplex

Monitoring/Simulating



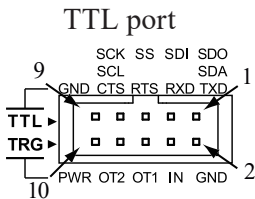
📄 When this unit is the end of the line, remove the interface sub-board from the main unit, turn on the DIP switch, and connect the 120 Ω terminating resistor.

Switch Number	Signal Name	Switch Number	Signal Name
1	TXD	6	RTS
2	TXC1	7	DTR
3	RXD	8	CTS
4	RXC	9	DSR
5	TXC2	0	DCD



■ Connect to TTL interface

Connect appropriate signals of UART, I2C and SPI to the TTL port of analyzer using attached probe cable.



MIL box type 10pin header ^{*1}			Cable color
Signal Name	Pin	Input/Output	LE-5LS
TXD,I2C of SDA,SPI of SDO	1	I/O ^{*2}	Brown
RXD,SPI of SDI	3	I	Red
RTS,SPI of SS(CS)	5	I/O ^{*2}	Orange
CTS,I2C of SCL,SPI of SCK	7	I/O ^{*2}	Yellow
Signal ground	9	-	Green
Signal ground	2	-	
IN: Trigger input	4	I	
OT1: Trigger output 1	6	O	
OT2: Trigger output 2	8	O	
PWR: Power for external ^{*3}	10	-	

*1: 2.54mm pitch. Equivalent to “HIF3FC-10PA-2.54DS(71)” of HIROSE Electric.CO.,LTD.

*2: It is used for output of simulation, except SPI slave simulation (SS and SCK are inputs).

*3: TTL voltage (max. 30mA) is outputted when simulating.

□ External Trigger Terminal

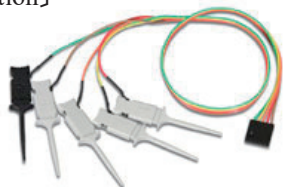
External trigger input level is LVTTTL (3.3V). External trigger output is open collector output type and pulled up in 5V by 10KΩ in the analyzer.

Attached 5-wire TTL probe can be used for connection of external trigger. To use the TTL probes for both TTL and external trigger, prepare additional one.

→ [Trigger Function] (P21)

5wire TTL probe (LE-5LS)

[Option]

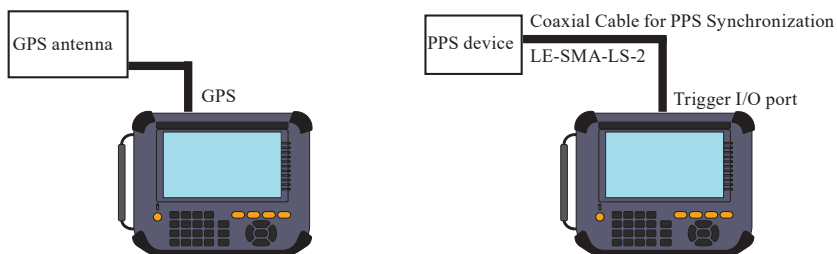


length : 360mm

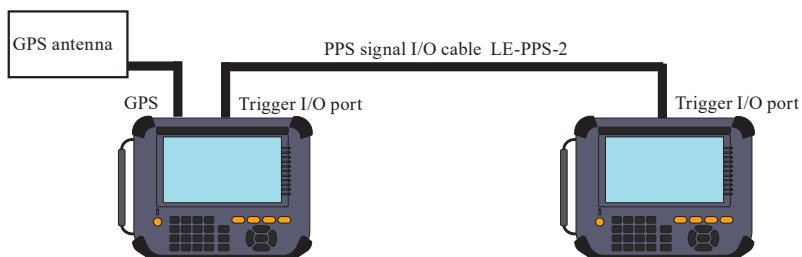
If the target devices are easily affected by radiation noise from the analyzer, try to use the shielded cable and add the ferrite core on the cable.

■ GPS, external PPS connection device

The time stamps can be synchronized by the PPS signals obtained from GPS or external PPS devices (such as LE-8500X or LE-8600X with a GPS antenna connected).








To use one GPS active antenna and synchronize 2 sets of LE-8500X-RT, connect devices as following.





















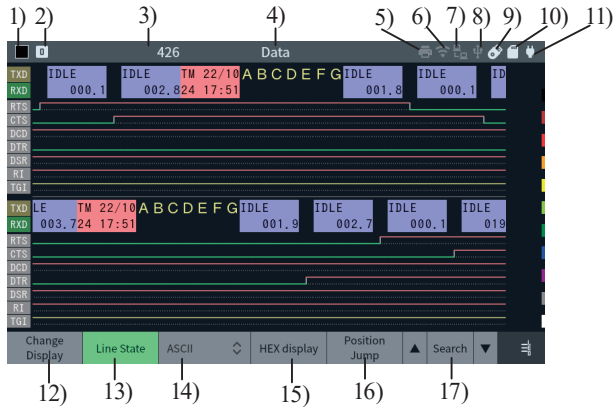
Monitor Function

Start and Stop measurement

Press [RUN] to start monitoring. Measured data is displayed at real time and recorded in the capture memory. Send (TXD) data and receive (RXD) data are displayed in two lines as a pair. The latest data is displayed on the left side of “

-  When TXD and RXD are generated at the same time, they are displayed on the same column.
-  Tap [Pause Display] to pause only the screen display.
-  It is able to stop measuring automatically by setting the trigger function and record control (full stop setting on capture memory).
-  Errors and breaks are displayed in unique characters.

Character	Description
	Parity Error (parity bit error).
	Framing Error (stop bit is “0”).
	Parity & Framing Error .
	Break (start bit, character bit, (parity bit), stop bit are all “0”).
	Abort (7bits or more of “1” is continuously detected).
	Short Frame (frame length is short).
	Block check code normal (BCC or FCS is abnormal)..
	Block check code abnormal (BCC or FCS is abnormal).
	HDLC starting flag pattern (7Eh) is detected.
	HDLC ending flag pattern (7Eh) is detected.
	Multi processor bit or acknowledge bit of I2C is “1”. (displayed in blue back). Displays the background in blue when the I3C is in NACK or Read and the T-bit is “0”
	I2C / I3C (re)start sequence is detected.
	I2C / I3C stop sequence is detected.
	When an I3C Target Reset pattern is detected
	When an I3C HDR Exit pattern is detected
	When an I3C HDR Restart pattern is detected
	Overrun Error
	Overload (Cannot save all data by auto save function).



1)	Measuring [●], Pause [■]
2)	Current available capture buffer.
3)	Measurement data position displayed at the top of the screen.
4)	Description of the current window.
5)	USB printer status (bright display when connecting)
6)	Wi-Fi status (bright display when IP address is acquired or access point is ready) Not displayed on the model that do not support Wi-Fi.
7)	Wired LAN status (bright display when IP address is obtained)
8)	USB device port status (bright color when connected. "usb" display when in super speed)
9)	USB host port status (bright color when recognizing, red when writing)
10)	SD card slot status (bright color when recognized, red when writing)
11)	Displays the remaining battery level. Displays "⬇️" when power is supplied from an external source.
12)	Switches the measurement data display mode each time you tap ^{*1}
13)	Display of control line
14)	Current data code. Tap to select
15)	Tap to switch between hexadecimal display and data code display
16)	Jump to specified location
17)	Start search operation

*1: Switches to the display enabled in the recording settings and communication protocol settings.

Scroll data by swiping on the screen.

Swipe in upward to look older data.

Swipe in downward to look newer data.

Press [SHIFT]+[▲] or [SHIFT]+[▼] to go to next/ previous page.

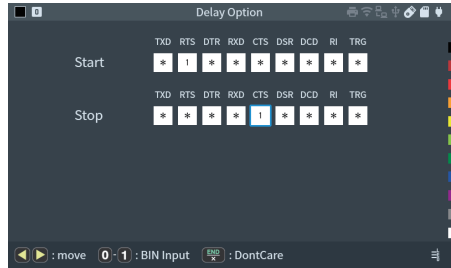
Do not remove the USB flash drive and SD card while measuring and displaying "under cleanup".

Signal Delay and Signal Voltage Measurement(Delay) / Statistical Analysis (TREND)

■ Signal delay & voltage measurement(Delay)

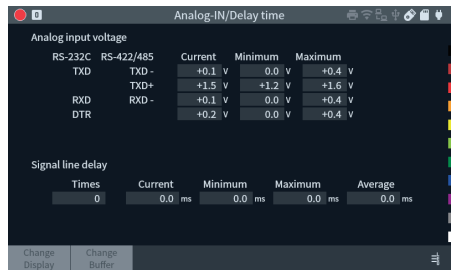
Tap “Mode” on the top menu screen, select “Delay”, and tap “Delay Opt.”
Not available in the high-speed mode.

Set the start/ stop conditions of delay time for target signals.



Press [RUN] to display the delay time and voltage (max./ min.).

- Use “Wave monitor” for delay time less than 0.1ms.



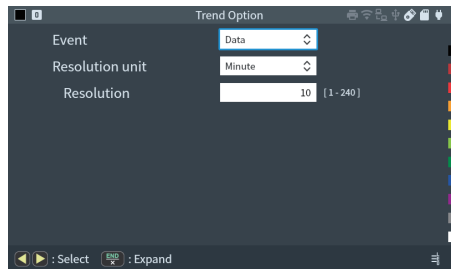
■ Statistic Function (Trend)

Tap “Mode” on the top menu screen, select “Trend”, and tap “Trend Opt.”
Not available in the high-speed mode.

EVENT :

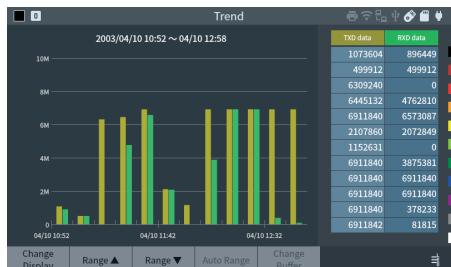
Select “Data”, “Frame” or “Trigger” to calculate.

Trigger: The number of the events which satisfies the trigger conditions set in factor of “TRIGGER 0” and “TRIGGER 1” are counted.



Press [RUN] to start the statistic.

As unit time of statistical processing passes, the results of calculated value will be updated on a bar graph.



Simulation Function

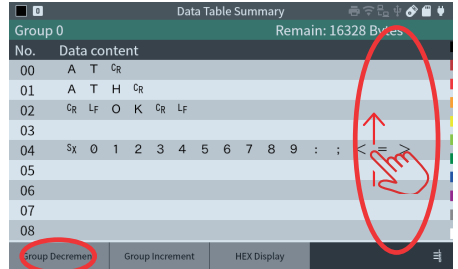
You can execute a communication test for a device in development by sending/receiving data by the analyzer depending on the selected mode.

In the high-speed mode, only Manual mode and PULSGEN mode are available.

Registration of Transmission Data

Select a function that uses test data transmission, such as Manual, from the top menu screen “Menu”, and tap “Send Table” to display the transmission data table screen.

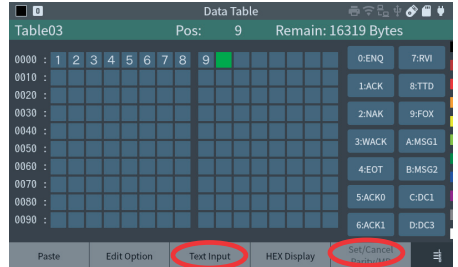
Up to 160 types of data can be registered in the 160 tables of 0 to 9 groups (each group has 16 tables). Touch the table and group to register the data in it.



Input the data to be transmitted in HEX by [0] to [F].

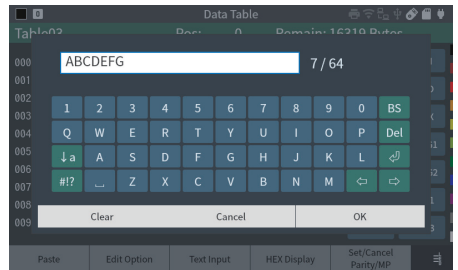
Copy and paste of the data are available by [ENTER], [▶], and [◀].

- Tap “Set/Cancel Parity/MP” to turn the data at the cursor position into a parity error or multiprocessor bit ON, and tap again to return to normal.

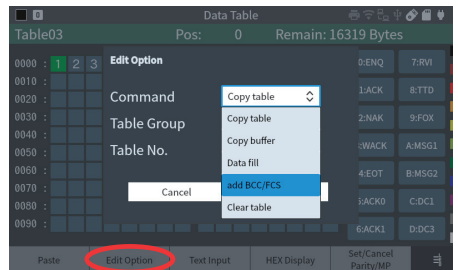


You can input text by touching “Text input”

Input it switching capital letters and symbols and then tap [ENTER] or, the character string you entered will be entered at the original cursor position.



By tapping “Edit Option”, you can execute a copy between tables, import from monitor data, etc. Select a command to execute it.



■ Start and Stop measurement

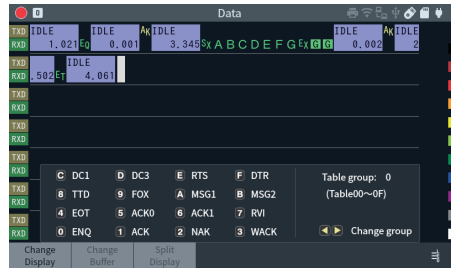
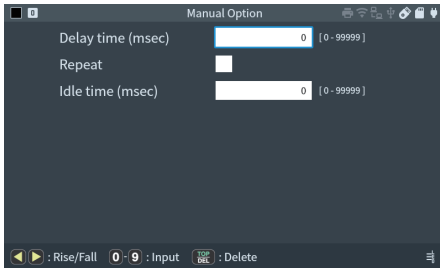
Touch [RUN] to start the specified test function and touch [STOP] to stop it.

- When the analyzer is set to DTE, The TXD line means the data is transmitted from the analyzer.
When the analyzer is set to DCE, the RXD line means the data is transmitted from the analyzer.

□ Manual Mode

Checking the data from the connected device on the display, you can transmit the preset data which you registered in advance by touching [0] to [F] or [SHIFT]+[0] to [SHIFT]+[D].

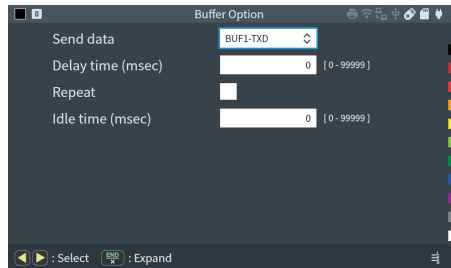
- While putting [SHIFT], the control guide for preset data is displayed.
- It can output break signal by [END/X].



- You can specify the interval of each data, on/off of repeated transmission, and the interval of data frame.

□ Buffer mode

From the transmission/reception data captured in the memory by the monitor function, the data of the transmission side or the reception side set in advance is transmitted as it is. This mode is useful for reproduction tests using the same data as the communication status monitored on-site.

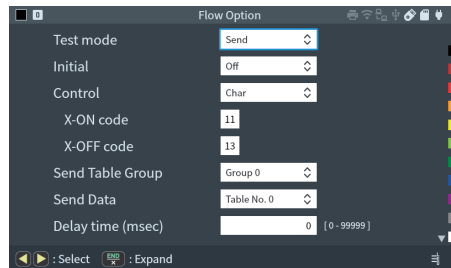


□ Flow Mode

This unit becomes the transmission side or reception side, and stats the simulation of flow control using X-ON/OFF and control lines.

When “Send test” is set, it can display the data of transmission between the start of transmission and the interruption request for 16 times.

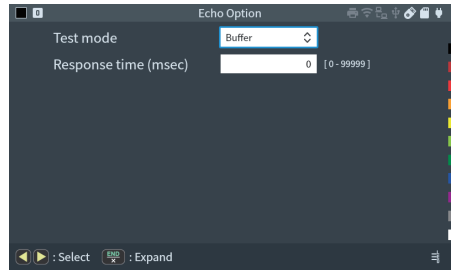
In “Receive test”, you can specify the number of reception data until the transmission interruption request is issued and the time until the restart request of transmission is sent.



□ Echo Mode

Received data will be returned inside the analyzer and returned to the sender. This mode is used for testing of devices such as display terminals and communication terminals.

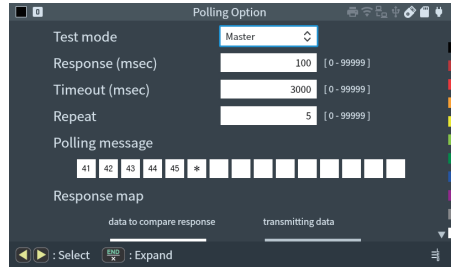
When “Loop back” is set, data can be returned in bit units.



□ Polling Mode

When the master mode is set, polling messages are sent to 32 types of slave address stations, and the returned data is checked and displayed for each slave station.

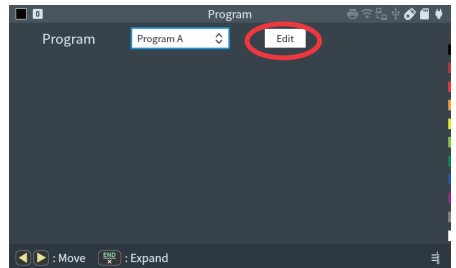
When the slave mode is set, the specified data is responded to the polling of the own station address, and the number of times and the presence/absence of an error are checked and displayed.



□ Program Mode

You can easily test a communication protocol that involves condition judgment using a test program created using dedicated commands.

You can register four types of test programs A to D in advance by touching “Edit”.



● Contents of setting example

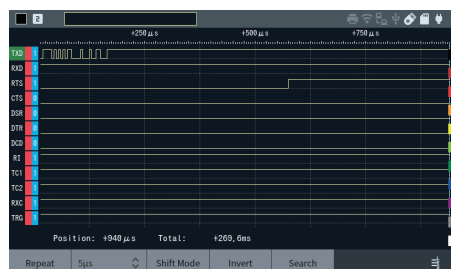
- 000 : Label 000
- 001 : Waits for new received frame
- 002 : Transmits data of table 08
- 003 : Branches to label 000 when receiving N, G, CR, LF
- 004 : Increments the register 0
- 005 : Branches to label 000



□ PULSGEN mode

This function transmits the timing waveform data of the communication line measured by the timing waveform measurement function. As the waveform data to be sent can be edited on the screen, you can execute a test of various timings different from the standards.

→ [Timing Waveform Measurement Function] (P23)



BERT (Bit Error Rate Test) Function

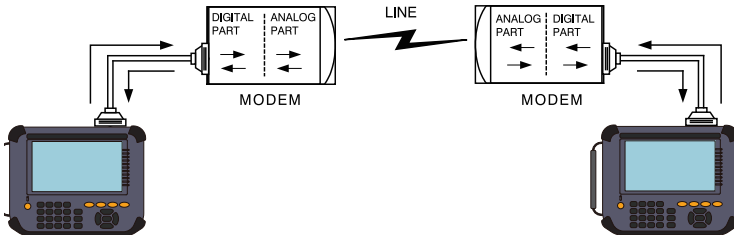
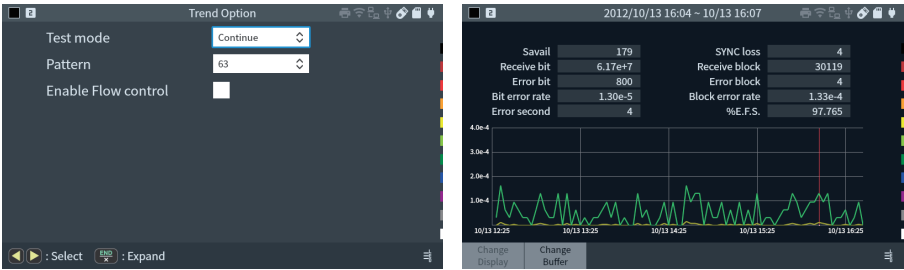
Measurement Start and Stop

Select the test mode, test pattern, and on/off of RTS-CTS flow control in advance.

Not available in the high-speed mode.

By pressing [RUN] it starts transmission of the specified test pattern and compares the received data with the test pattern. Then it measures the bit error rate etc. in compliance with ITU-T G.821 and displays them on the screen. It stops measurement by [STOP]

- ☰ The BERT function is not available in the high-speed mode.
- ☰ Set the synchronization method (ASYNC or SYNC/BSC) and the communication speed at the “protocol” and “speed” in the configuration. For the other items, only the data bit and stop bit settings are valid for ASYNC, and only the clock settings is valid for SYNC/BSC.



Item	Contents	Range of measurement
Savail	Effective time since the first synchronization was established	0 ~ 9999999(sec)
Receive bit	Number of received bits during synchronization establishment	0 ~ 9999999 ~ 9.99E9
Error bit	Number of bit errors	0 ~ 9999999 ~ 9.99E9
Bit error rate	Bit error rate	0.00E-0 ~ 9.99E-9
Sync loss	Number of loss of synchronization	0 ~ 9999
Receive block	Number of received blocks during synchronization establishment	0 ~ 9999999 ~ 9.99E9
Error block	Number of blocks with bit errors	0 ~ 9999999 ~ 9.99E9
Block error rate	Block error rate	0.00E-0 ~ 9.99E-9
Error second	Time when bit error was detected during Savail	0 ~ 9999
%E.F.S.	Errored second rate (%)	0.000 ~ 100.000(%)

Useful Functions

■ Trigger Function

By this function it executes a special measurement processing (“Action”) triggered by specific conditions (“Factor”) such as the occurrence of a communication error during the measurement or reception of the specified data.

There is a difference in trigger function between the normal mode and the high-speed mode.

Normal mode:

[Factor]

Error	Communication error, break, multiprocessor bit on
Character	Communication data of up to 8 characters
Line state	Logic state of interface signal line and external trigger input
Timer/Counter	Timer/Counter value match
Idle time	Idle time exceeding the specified time

[Action]

Buzzer	Buzzer sound
Stop measurement	Stops the measurement/test (offset to stop can be specified.)
Save data	Save data before and after the trigger to the storage device
Timer control	Start/stop/restart of the timer 0/1 for trigger
Counter control	Count up/clear of the counter 0/1 for trigger
Trigger control	Enables/disables/inverts the state of trigger condition
Transmit data	Transmits the specified character string (in MANUAL simulation)
OT2 pulse output	Outputs an L pulse of about 1 ms to external trigger terminal OT2

High-speed mode:

[Factor]

TXD character	String match detection on TxD side
RXD character	String match detection on RxD side
Error	Error detection
TRG IN	External trigger input (TRG IN) level “0” detected

[Action]

Measurement stop	Measurement/test stop (offset number until the stop can be specified)
OT2 pulse output	L pulse output for approx. 1ms to external trigger terminal OT2

For the operation in high-speed mode a common setting is applied for all trigger settings.

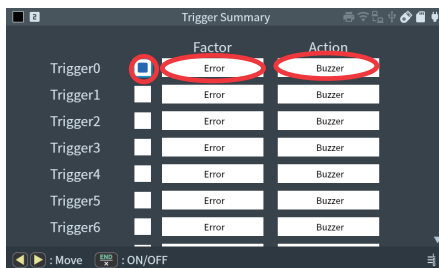
■ Trigger setting

After selecting the measurement mode from the top menu screen “Menu”, tap “Trigger” to display the current trigger settings.

Shortcut key [MENU],[2]

■ Use the checkbox to enable/disable the trigger. OR conditions are used when multiple checks are made.

Tap the factor or action to change to set it.



The comparison value of the timer/counter used in the trigger function can be set by tapping “Setting change” in the timer/counter. The timer/counter function cannot be used in high-speed mode.

- These timers and counters are cleared at the start of measurement and the timers turn to be stopped status.

Setting example 1:

To notify an external measuring instrument that a block check error has occurred:

Turn on the check mark of the trigger to be used and touch the trigger factor. Select “Error” on the trigger factor setting and check the BCC error.

Press [ESC] to return to the trigger setting screen, then touch the corresponding trigger action and select “OT2 pulse output”. With this setting, when a BCC error is detected, it outputs an L pulse of about 1 ms to the external trigger output terminal OT2.

Observe the OT2 signal by connecting measurement device such as an oscilloscope.

- Regardless of the trigger action setting, it outputs an L pulse of about 1 ms to the external trigger output terminal OT1 when any trigger factor matches

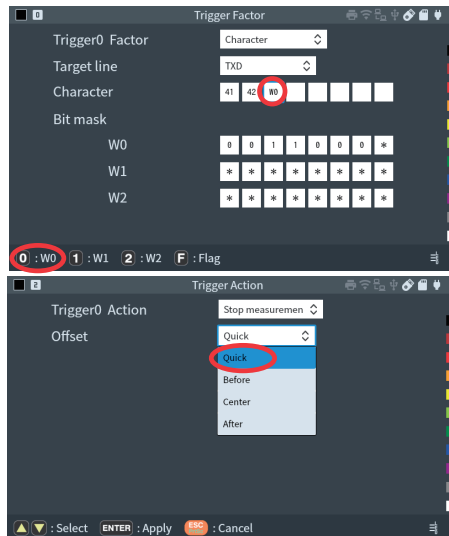
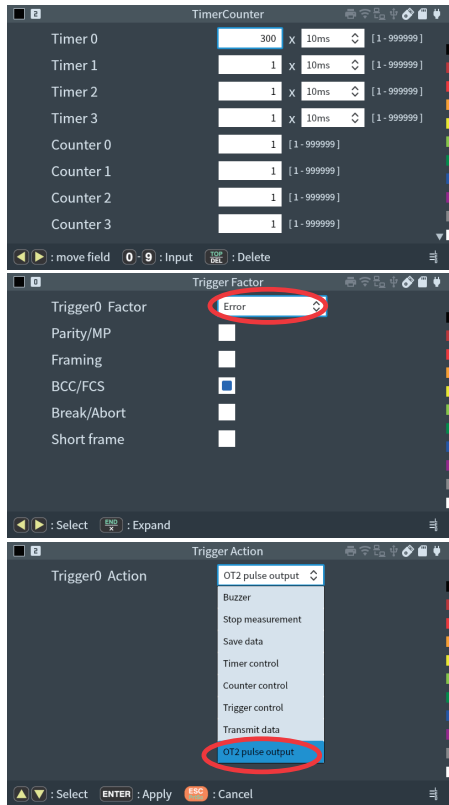
Setting example 2

To stop the measurement immediately when receiving the character string of 41h, 42h, 30h or 41h, 42h, 31h on the transmitting side:

Check the trigger factor shown on the right picture. For the third byte of the character string to be detected we use the bit mask W0 to set bit 0 to don't care (X).

Press [ESC] to return to the trigger setting screen and touch the corresponding trigger action. Select “Stop measurement” on the trigger action setting screen.

- You can select “stop measurement immediately” or “stop after receiving data” by “Stop”.



■ Timing Waveform Measurement Function

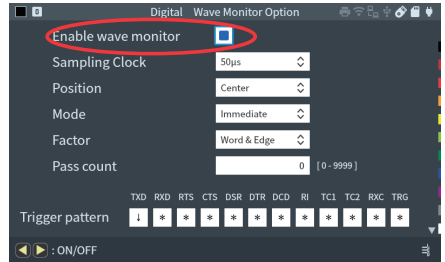
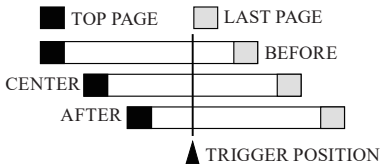
This function periodically records the logical state of the communication line and displays the timing waveform like a logic analyzer.

After selecting the measurement mode from the top menu screen “Menu”, tap “Wave Opt.”

Shortcut key [MENU],[4]

Mark on the box of Enable wave monitor and configure the sampling clock (5ns to 1ms), trigger position, and trigger pattern.

(Trigger position in memory)

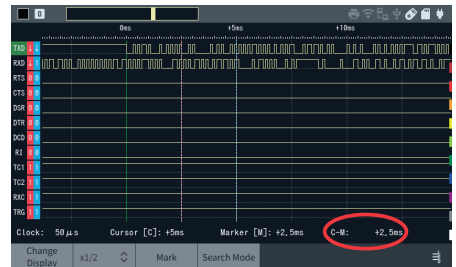
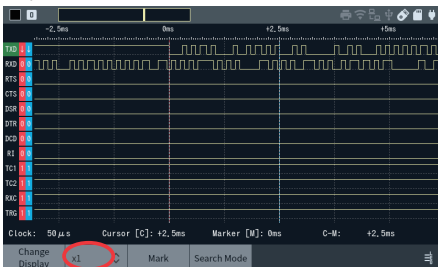


- 📖 Set the sampling clock to approximately 5 times the communication speed as a guide.
- 📖 “↓” and “↑” can also be entered by [SHIFT] + [0] or [SHIFT] + [1].

When measurement is started by [RUN], the status of the communication line is recorded in the waveform recording memory at the specified cycle while normal operation is executed.

After the measurement is stopped, press “Change display” for several times to switch to the following screen.

Touch the magnification to zoom in and out, and swipe left or right to scroll to the part you want to see.



- 📖 The green vertical line is the trigger point. Cursor C (dotted blue line) and Marker M (dotted red line) overlap the trigger point at first.

○ Time measurement between two points

The time between the cursor and the marker is displayed at “C-M”.

The cursor can be moved with [▶],[◀] and becomes a marker with [ENTER].

○ Search waveform

Tap “Search Mode”, enter 0, 1, rising and falling states of the waveform you want to search, and with [▶],[◀] the cursor moves to the first matching waveform in that direction. Tap “Search Mode” again to exit the search mode.

Save and Load of the Data

An SD/SDHC card or USB flash drive can be used as a storage device, and measurement data and setting data can be saved to it.

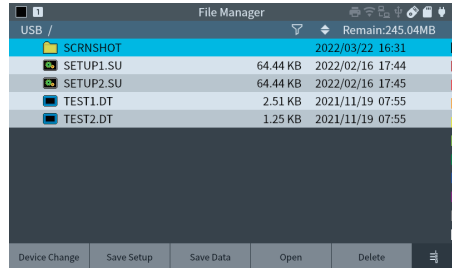
Tap “File Manager” to go to the file management screen.

(If the printer management screen appears, tap “File Manager” again.)

Shortcut key [MENU],[A]

Storage device has to be formatted as “FAT32”.

Touch “Device Change” to change the storage device (SD card or USB memory). Press [▲] to change the order of files, and [▽] to use the filter function (display only selected file type). Double click the folder to display the contents of files.



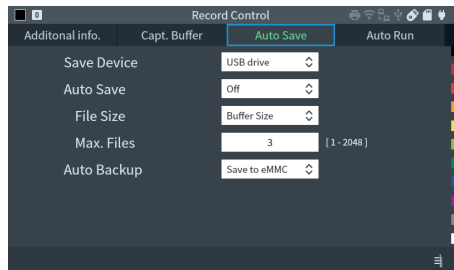
File output

Measurement data can be output to txt or csv files.

If you tap [SHIFT]+“Export” on the file management screen, a dialog will appear, so select an output method and output.

Auto Save

Auto save function saves measured log files in the SD card or USB memory automatically while it continues measuring. It is useful to find a problem which rarely happens. Touch “Record Control” at top menu and set “Auto Save” settings.



Save Device

Select the storage device to save data.

Insert the SD card or USB memory into the analyzer.

Auto save:

Restart Continuous ring recording up to the maximum number of files.

Max-stop Saves up to the maximum number of files and stops measurement.

Append Continuous ring recording from the continuation of the existing auto save file.

☰ The files saved by auto save function will be deleted if selecting other than “Append”.

☰ Set the inner memory to be the ring buffer.

→ Set “Record Control” at top menu, go to “Capt. Buffer” -> “Write Control”.

File size :

Set the size of the communication log file to be automatically saved.

Max. Files :

Set the maximum number of files to be recorded.

- 📄 The communication log file name is # XXXXXXXX.DT (XXXXXXX is a sequential number that increases by 1 from 0000000)

When you start the measurement by [RUN], a confirmation message for overwriting the file will be displayed. Tap [RUN] or “Continue” to start measurement. If you do not want to lose the communication log file and want to save it to another device, press [STOP] and save it to a PC or other device

If the battery is insufficiently charged and the power is turned off during auto save, it may cause file corruption or damage to the storage device. Use the AC adapter and start measurement with the battery fully charged.

■ Auto back-up function

Captured data will be deleted when it turns off the power of analyzer.

As a factory setting, measured data (latest 16M byte of data) will be saved in the inner eMMC automatically.

To save all measured data or to delete all data, change the setting of Auto back-up.

Auto Backup :

- | | |
|--------------|---|
| Off | No automatic backup. |
| Save to eMMC | Save about 16 Mbytes of the latest data into internal eMMC. |
| Save to File | Save all the measurement data to the storage device |

■ Printout function

You can print the measurement data or print a hard copy (the screen display image).

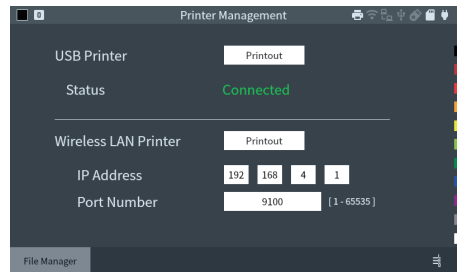
Tap “File Manager” to move to the printer management screen.

(If the file management screen is displayed, tap “Device Change” several times.)

Operate on the printer management screen to print the measurement data.

When you tap the print of the connection method you want to output, a dialog will appear, so specify any number and output.

For hard copy printing, select “USB printer” or “WLAN printer” for “Screen shot save to” on the Display/Power tab, and press [SHIFT]+[ESC] on any screen.



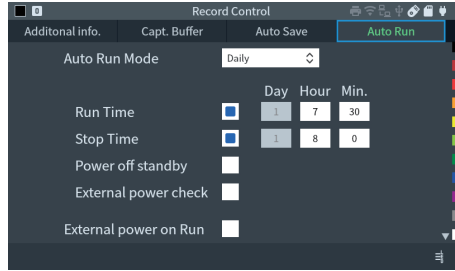
■ Auto Run Function

By specifying the date and time for the start and end of measurement, it automatically executes measurement for the specified period.

Touch “Record Control” at top menu and go to “Auto Run”.

Auto Run Mode :

Select the repeat conditions for automatic measurement. The checkbox enables/disables the item.



Set the automatic measurement period for “Run time” and “Stop time”

With the settings on this screen, measurement starts at 7:30 every day and ends automatically at 8:00.

📖 If you want to start the measurement in conjunction with the power on of the target line, check “External power on Run”.

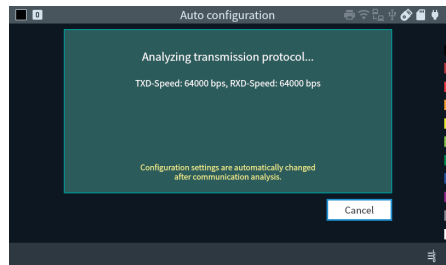
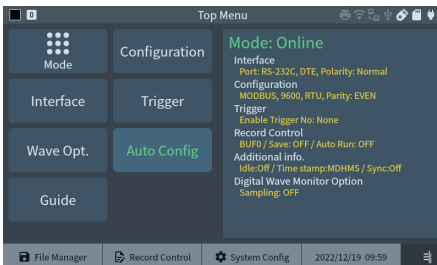
■ Communication Condition Auto Setting Function

The monitor processing of the analyzer estimates the communication conditions of unknown communication lines for measurement.

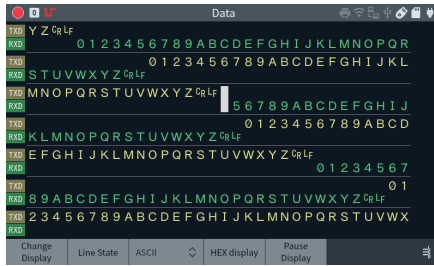
Connect a monitor cable, etc., to the measurement port according to the target line, and set the “Measurement port” correctly on the “Measurement port” setting screen.

📖 “Measurement port” is not automatically set.

Select “Online” from the top menu and tap “Auto Config” to start analyzing the communication conditions.



Once the communication conditions are determined, the current communication condition settings are automatically changed to the determined communication conditions and measurement starts.



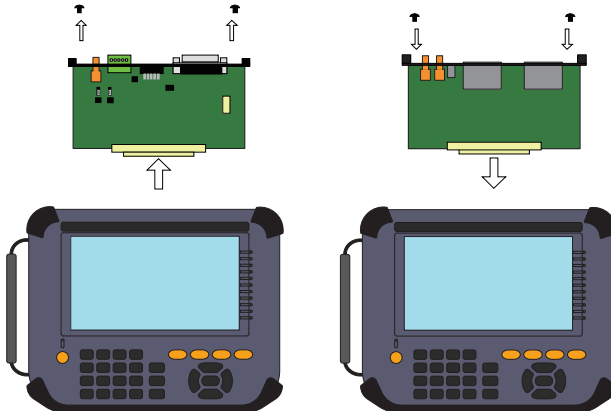
- ☐ If you tap “Cancel” or press [ESC] before measurement starts, the communication condition analysis process will be canceled and the current communication condition settings will not be changed.
- ☐ The following conditions are required for the line to be measured in order to judge the communication conditions correctly.
 - Communication speed is 1.544Mbps or less.
 - Protocols are ASYNC, SYNC/BSC, or HDLC/SDLC.
 - On the line communication data without error is flowing at a certain frequency.
 - On the line communication data including bit patterns of ‘101’ or ‘010’ is flowing.

Measurable Interface Expansion

By using the option for measurement expansion, you can expand the communication target to be measured.

■ Exchange the board

Remove the standard interface sub board and replace it with the optional interface sub board.



■ Firmware

The firmware that corresponds to the installed interface sub-board will start automatically. If the version of firmware installed on the main unit is old and does not correspond to the expansion option sub-board, the unit will start in firmware update mode, so please update to the latest firmware.

→ [How to update the firmware] (P30)

PC Link Function

By using the optional PC link software LE-PC800X, you can perform remote monitoring and convert measurement data into text files on your PC. Connect this unit to your PC via LAN, USB, or Wi-Fi.

■ USB connection

Connect the PC and the USB device port of this analyzer with a USB cable.

■ LAN connection

Connect the LAN environment of the PC and the LAN port of the analyzer with a LAN cable. Configure the wired LAN connection in the system settings of this analyzer.

■ For Wi-Fi connection

At the system setting of the analyzer select the station mode or the access point mode and set the SSID and password required for Wi-Fi connection.

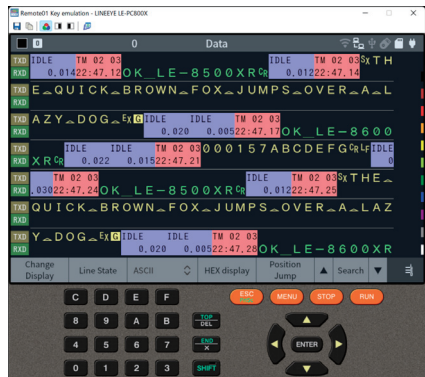
☒ Check with your network administrator about the network settings.

■ Installing the PC Link Software LE-PC800X Lite Version

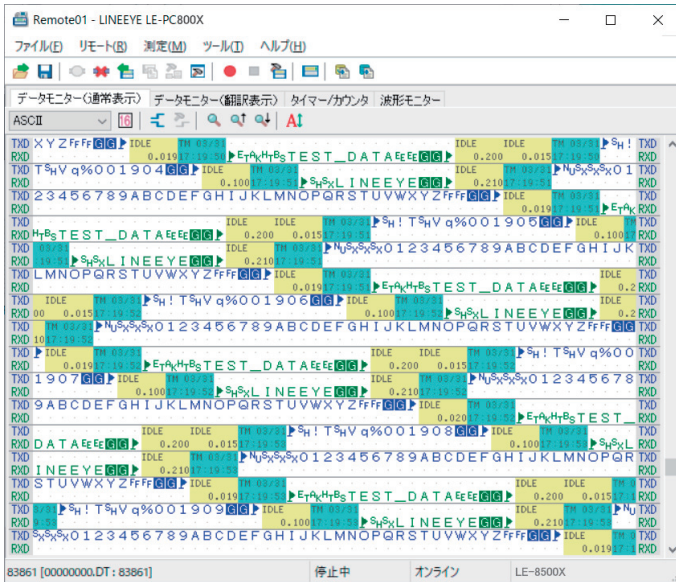
The “LE-PC800X Lite Version,” which has some limited functionality, can be downloaded free of charge from the LINEEYE website. Unzip the downloaded file and run setup.exe in the folder to install.

→ For instructions on how to use the software, refer to the PC Link Software's online help.

[Example of Key emulation Screen]



[Example of Remote Monitor Screen]



[Example of text conversion]

```

*****[2022-09-31 19:21:51]=*
* Model : LE-8500X *
* Version : 1.00 *
* Extension : Standard *
* Serial No.: 99999999 *
* Start time: 2022-09-31 17:08:17 *
* Stop time: 2022-09-31 17:16:11 *
*****
* MONITOR DATA *
* PROTOCOL: HDLC *
* S-SPEED: 1M R-SPEED: 1M *
* CODE: ASCII FCS: FCS16 *
* FORMAT: NRZ CLOCK: ST1 *
* S-ADDR: * R-ADDR: *
* IDLE TM: 1ms TM STAMP: MDHMS *
* PRINT CODE: ASCII *
*****
SD: [ IDLE ] [T 0331] 7E00020202303132333435363738394142434445464748494A4B4C4D4E4F505152535455565758595AFF5F5657E [ IDLE ] [T 0122 ] [170817] "NUSXSXSX 0 1 2 3 4 5 6 7 8 9 A B C D E F G H I J K L M N O P Q R S T U V W X Y Z {}" [ IDLE ] [T 0331]
SD: [ IDLE ] [T 0331] ----- [ IDLE ] [T 0331] 7E01215401567125303031353434A1077E [ IDLE ] [T 0200 ] [170817] " [ 0200 ] [ 0015 ] [170817] "SH! TSHV q % O 0 1 5 4 4 {}" [ IDLE ] [T 0331]
SD: [ IDLE ] [T 0331] ----- [ IDLE ] [T 0331] 7E00020202303132333435363738394142434445464748494A4B4C4D4E4F5051525354555657E [ IDLE ] [T 0210 ] [170818] "NUSXSXSX 0 1 2 3 4 5 6 7 8 9 A B C D E F G H I J K L M I" [ IDLE ] [T 0331]
SD: [ IDLE ] [T 0331] ----- [ IDLE ] [T 0331] 7E010240494E454550456C507E [ IDLE ] [T 0331] "SHSXL INEEYE {}" [ IDLE ] [T 0331]
SD: 4F506152535455665758595AFF5F56667E [ IDLE ] [T 0331] ----- [ IDLE ] [T 0331]

```

How to update the firmware

For this analyzer updating the firmware and recovering by writing back the entire system are available.

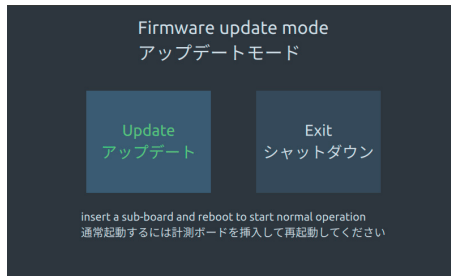
The latest firmware file and system recovery file can be downloaded from the LINEEYE website.

https://www.lineeye.co.jp/html/download_update.html

Download it to an easy-to-find folder on your PC, unzip it, and check the firmware file (extension: FW3) or system recovery file (extension: FWR).

The downloaded file can be written to the analyzer by the following method.

- 1) Copy the firmware file or system recovery file to a storage device (USB memory or SDHC card). Normally you would use a firmware file.
- 2) From “System Settings” → “Version” tap “Update” to restart the analyzer.
- 3) After rebooting, the boot logo will be displayed and then the firmware update mode screen will appear.



- 4) Insert the storage device where you copied the firmware file or system recovery file into the analyzer.
- 5) On the firmware update mode screen, tap “Update”.
- 6) Select Firmware File or System Recovery File.
- 7) In the case of system recovery files, a message will be displayed warning that the settings will be initialized.
- 8) It display the message when the firmware update or system recovery is completed. Tap “OK” to reboot.
- 9) To check the updated firmware version, go to “System Settings” → “Version” .

Specifications

Item	LE-8500X-RT / LE-8500XR-RT
Interface	RS-232C, RS-530,RS-422/RS-485, TTL(1.8V,2.5V,3.3V,5Vlevel)
Protocol	ASYN, ASYN-PPP, Character SYNC/BSC, HDLC/SDLC/X.25, CC-LINK, Modbus, PROFIBUS, I2C, I3C ^{*1} , SPI, Burst
Measurement expansion option ^{*2}	Dedicated cable: X.20/21, RS-449, V.35 SB-GE2: LAN (GbE), PoE SB-FE2: LAN (zero latency, EtherCAT compatible), PoE SB-TIE: Single-pair Ethernet, PoDL SB-C2AN: CAN, CAN FD, analog measurement
Capture memory	1GB. Able to divide it in two.
Max. speed ^{*3}	Full-duplex: 10Mbps Half-duplex: 20Mbps SPI:30Mbps ^{*4}
Communication speed setting	Normal Mode: 50bps to 12Mbps In high-speed mode: 50bps to 20Mbps (30Mbps for only SPI) Can be set by 4 significant digits separately for transmission and reception (error: ±0.01%)
Data format	NRZ, NRZI, FM0, FMI, Manchester0, Manchester1
Data code	ASCII,EBCDIC,JIS, Baudot, Transcode, IPARS, EBCD, EBCDIK, HEX
Measurement function	Monitor function, Simulation function, BERT function
External trigger	LVTTL input 1, Open collector output 2
Signal voltage measurement	± 12V input range, 0.1V resolution ^{*5}
CSV Conversion	Measurement data can be converted and saved to a CSV format file.
TXT Conversion	Measurement data can be converted and saved to a TXT format file.
Auto save Function	Monitored data is automatically saved as a log file in the USB memory/SDHC while it keeps monitoring. ^{*6}
Useful Function	Time synchronized function from PPS of GNSS signal or external PPS signal . Auto back-up function. Auto RUN/STOP function. Power on run function
Logic analyzer function	1KHz to 200MHz, maximum 4096 sampling
LCD display	7 inch TFT color display (480x272dot) with capacitive touch panel
LED	11 LEDs for the line state and 1 LED for the power
LAN Port	RJ45 connector for PC connection. 1000BASE-T Ethernet: IEEE 802.3
USB device port	Type-C connector for PC connection. Super Speed supported.
USB host port	Standard A connector for USB memory. Super Speed supported.
SD card slot	For standard size of SD/SDHC memory card. Compliant with SD association standard.
PPS signal I/O terminal	Uses the external trigger I/O terminal
GPS Antenna Connector	SMA(female) connector
Wi-Fi interface ^{*7}	IEEE802.11b/g/n. Frequency range: 2412MHz : 2484 MHz • Transmission power 802.11b: +18.5dBm 802.11g: +18.0dBm 802.11n: +17.0dBm
Printout function	Measurement data can be output to printer.Screen image can be output to printer.
Power	Attached AC adapter. Lithium-ion rechargeable battery (model : P-26LW2) Battery drive time: 4 hours ^{*8}
Temperature	In operation : 0 ~ 40°C In storage : -20 ~ 50°C
Humidity	20 ~ 85%RH (no condensation)
Standard	CE (class A)
Dimensions (W×D×H) ,Weight	234(W)×186(D)×44(H) mm, Approx. 990g

- * 1 : Requires system version 1.15 or later. For monitor function only. It can measure SDR communication data and detect Target Reset, HDR Exit, and HDR Restart patterns.
- * 2 : Optional measurement board or optional cable is required depending on the target.
- * 3 : The maximum measurable speed is limited by the selected interface and protocol. When measuring a line with an effective transfer rate of 5Mbps or higher, it is supported by switching the analyzer to the high-speed mode.
- * 4 : Maximum 15Mbps for the slave mode simulation.
- * 5 : TXD/TXD-, ,TXD+,TXD/RXD-, and DTE of RS232C,RS-422/485 and 4 communication lines of can be measured.
- * 6 : 4 All frames may not be recorded in the storage because of the high traffic line or low performance of the external storage.
- * 7 : For LE-8500XR-RT only. For PC connection.
- * 8 : According to our test conditions assuming a normal usage situation.

For any technical issues

Read "FAQ" in our website or email us.

<https://www.lineeye.com/html/contactus.html>

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