LINEEYE

DATA LINE MONITOR
LE-110SA
LE-120SA

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

□	Line Monitor	1	
□	DB9 Monitor Cable (LE-009M2)	1	
□	Trigger Input/Output Cable (LE-4TG)	1	… only for LE-110SA
□	10pin External Input/Output Cable (LE-10ES1)	1	… only for LE-120SA
□	Micro USB Cable	1	
□	AA-sized NiMH batteries	2	(Battery installed)
□	Utility CD	1	
□	Carrying Bag	1	
□	Quick Start Guide (this booklet)	1	
□	Warranty, Registration Card	1	

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

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.
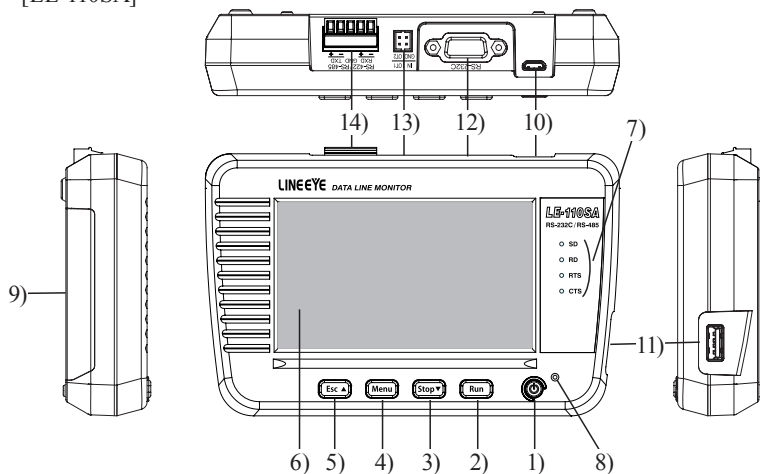
⚠ Warning

* Do not disassemble, modify or repair the line monitor.
  This may result in an injury, electric shock, and ignition.

* Turn off the power and unplug the line monitor immediately when emanating smoke or odor.
  Continuous use may result in an electric shock, burn and 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 put the line monitor in a fire or place near the heater.
  This may result in an injury, ignition and explosion.

* Do not use the batteries other than Ni-MH batteries or alkaline batteries.
  This may result in generation of heat, ignition, leaking and malfunction.

⚠ 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.
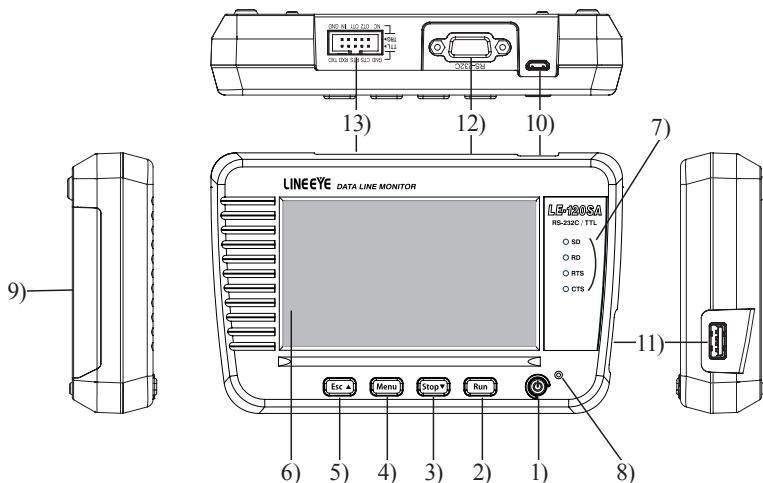 ・Devices controlled by the radio waves.

Nomenclature

[LE-110SA]

|	Name	Function
1)	Power Switch	Turn on / off the power
2)	[Run] key	Start monitoring / simulating
3)	[Stop] key	Stop monitoring / simulating
4)	[Menu] key	Display the top menu
5)	[Esc] key	Return to the previous display
6)	LCD	4.3 inch color LCD with touch panel
7)	Line State LED	Light in red when signal is active.
8)	Power LED	Light in green when turning on the power. Light in red: battery full charged. Blink in red: Still charging the battery.
9)	Battery Cover	Open when changing the batteries.
10)	USB Device Port	Micro-USB connector. Connect to the USB port of PC or USB battery charger.
11)	USB Host Port	Standard A USB connector. Connect to the USB flash drive.
12)	RS-232CPort	RS-232C measurement port.
13)	External Trigger Port	Input / output port for external trigger signals.
14)	RS-422 / 485 Port	RS-422 / RS-485 measurement port.

[LE-120SA]

|	Name	Function
1)	Power Switch	Turn on / off the power
2)	[Run] key	Start monitoring / simulating
3)	[Stop] key	Stop monitoring / simulating
4)	[Menu] key	Display the top menu
5)	[Esc] key	Return to the previous display
6)	LCD	4.3 inch color LCD with touch panel
7)	Line State LED	Light in red when signal is active.
8)	Power LED	Light in green when turning on the power. Light in red : battery full charged. Blink in red : Still charging the battery.
9)	Battery Cover	Open when changing the batteries.
10)	USB Device Port	Micro-USB connector. Connect to the USB port of PC or USB battery charger.
11)	USB Host Port	Standard A USB connector. Connect to the USB flash drive.
12)	RS-232CPort	RS-232C measurement port.
13)	TTL Port	TTL measurement port. Input/output port for external trigger signals.

Power and Battery

This line monitor drives by batteries or bus power from a USB port.

Micro USB cable

USBport

Micro USB cable

USB battery charger (not included)
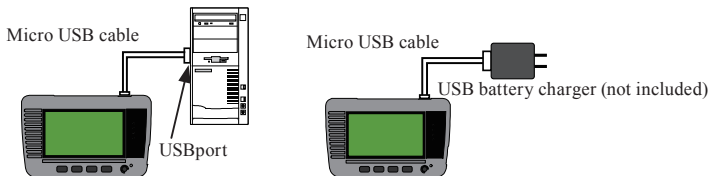
Open the battery cover and insert the attached Ni-MH batteries.
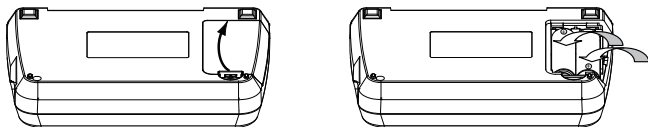
📄 Ni-MH batteries are used for time IC and memory IC.
To charge the Ni-MH batteries, use the battery charger for AA sized Ni-MH batteries.

> LINEEYE has confirmed it works with "BQ-CC23" or "BQCC55" of Panasonic, and "TNHC-34SMC" or "TNHC-34HBC" of Toshiba.

📄 The line monitor is able to charge the Ni-MH batteries by appropriate settings.
Do not insert the alkali batteries to charge.

⚠ Warning (when using the line monitor with batteries)

* Do not short the electrode of batteries.

  It may cause the generation of heat, ignition, explosion, leaking and malfunction.

* Use the batteries and battery charger which LINEEYE recommends.

  If not, it may cause the generation of heat, ignition, electric shock and malfunction.

* Do not leave the batteries near children.

* Do not charge the Alkali batteries.

  It may cause leaking, generation of heart, explosion and malfunction.

* Do not touch directly when leaking the batteries.

  It may result in serious injury, such as losing eyesight.

Operation

There are 5 keys and touch panels to control the line monitor.

Touch panels enable to select settings by soft touch or to scroll the display by swipe.

Basic operations are made by key operations. Pressing 2 keys simultaneously have the special functions.

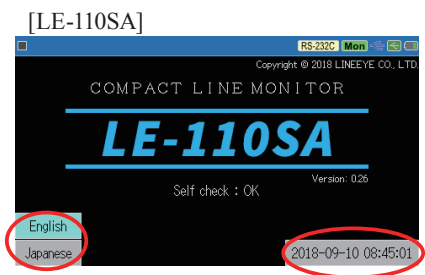| Operations	Function
[⏻]	Turn On/ Off the power of line monitor. Press longer when turning off.
[Run]	Start monitoring/ simulating
[Stop]	Stop monitoring/ simulating. Scroll data (forward).
[Menu]	Display the top menu.
[Esc]	Return to the previous display. Scroll data (backward). Stop displaying data while measuring.
[Menu]+[Esc]	Capture the screen image in the USB flash drive. (* 1)
[Menu]+[Run]	Make brighter the screen.
[Menu]+[Stop]	Make darker the screen.
[Esc]+Turn on the power	Initialize the settings. Clear all.
[Stop]+[Run]+Turn on the power	Start the firmware loader. (* 2)

*1 : Insert the USB flash drive into the USB host port.

*2 : To update the firmware, it is necessary to use the PC. → Refer to "PC link"
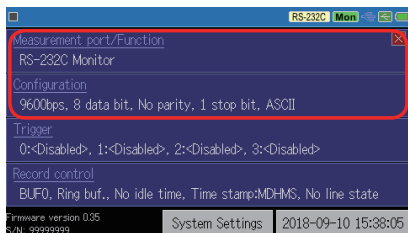
Initial Settings

Press [⏻] to turn on the power. Select the language and set date & time.

[LE-110SA]

* The top screen will be "LE-120SA" for the model of LE-120SA.

Press [Menu] key to set the initial settings.

Measurement port / Function : Select a measurement port of line monitor and a function.

Configuration : Select basic communication conditions.

Trigger : Select trigger factors and actions. Set the timer/counter for trigger function.

Record control : Set the capture buffer, time stamp, idle time and line state conditions.

System Settings : Select a mode for power saving, battery charging and so on.

Select "Measurement port / function" and "Configuration" according to the target interface.
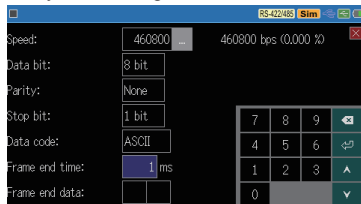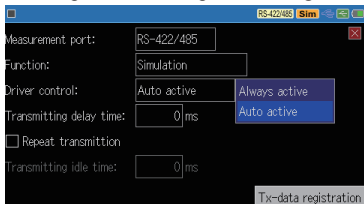
e.g.: Monitor RS-232C
    Speed: 38400bps, Data length: 8bit, Parity: Even, Stop: 1bit
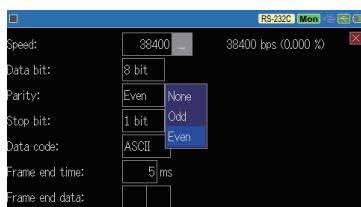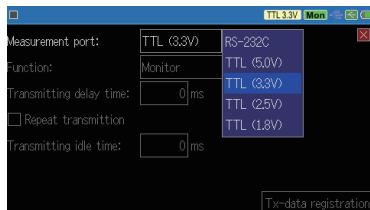

e.g.: Simulate RS-485 [LE-110SA]
    Speed: 460.8Kbps, Data length: 8bit, Parity: None, Stop: 1bit

*Register test data in the "Tx-data registration".
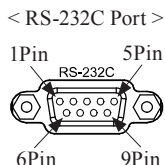
e.g.: Monitor TTL (UART 3.3V) [LE-120SA]
    Speed: 115.2Kbps, Data length: 8bit, Parity: None, Stop: 1bit
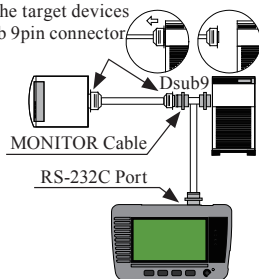
Connect to the Target Device

[Connect to RS-232C]
Connect the RS-232C connector of target device and the RS-232C port of line monitor, using included cable or appropriate cable.
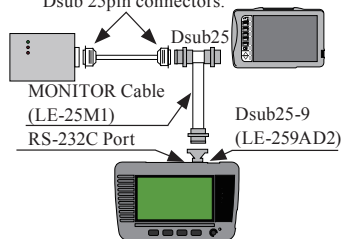
< RS-232C Port >

1Pin   5Pin
RS-232C

6Pin   9Pin

■ To monitor data

One of the target devices
has Dsub 9pin connector

Dsub9

MONITOR Cable

RS-232C Port

Connect the target devices and the line monitor using the included monitor cable (LE-009M2)

Both target devices have
Dsub 25pin connectors.

Dsub25

MONITOR Cable
(LE-25M1)
RS-232C Port

Dsub25-9
(LE-259AD2)

Connect the target devices and the line monitor using the optional Dsub25-9pin adapter (LE-259AD2) and Dsub25pin monitor cable (LE-25M1).

■ To simulate data
Select "Simulate" mode and press [Run]. RS-232C port of line monitor will be DTE specification (equivalent to COM port). Check the DTE/DCE specification of target device and connect to the line monitor, using straight or cross cable.

RS-232C CABLE

RS-232C Port

Dsub9
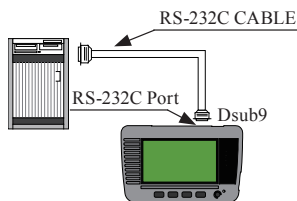
Target Device (DCE specification) --- Straight cable --- line monitor
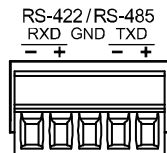Target Device (DTE specification) --- Cross cable   --- line monitor

[Connect to RS-422/RS-485] (LE-110SA)

Connect the signals of target device to the corresponded RS-422/485 port of line monitor.

< RS-422/485 Port >

RS-422 / RS-485

RXD GND TXD
− +   − +

📄 LINEEY recommends using the twisted pair cable. (Pair: TXD+/-, RXD+/-)

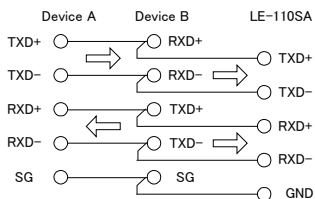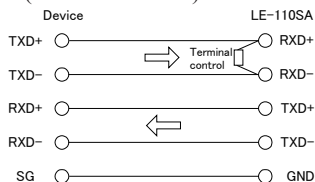📄 Need to have a terminal control (100 to 120Ω) if the line monitor becomes the terminal device.

＊ RS-422/485 port is the removal terminal. Remove it from the line monitor first to connect the signals, and then put it back to the line monitor.

■ RS-422 Full Duplex Communication
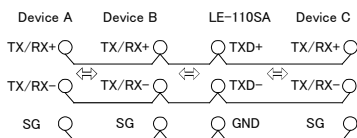
When monitoring between A and B

When simulating data (send/receive test)

RS-422 Half Duplex Communication

When monitoring/ simulating

[Connect to TTL interface] (LE-120SA)

Connect the TTL (UART) signals of target device to the corresponded TTL port of line monitor.

TTL Port

GND CTS RTS RXD TXD

TTL▶
TRG▶

NC OT2 OT1 IN GND

MIL box type 10pin cable [*1]			Cable color [*2]	
Signal name	Pin	Input/ output	LE-10ES1	LE-5LS
TXD TTL monitor input	1	I	Brown	Brown
RXD TTL monitor input	3	I	Orange	Red
RTS TTLmonitor input	5	I	Green	Orange
CTS TTLmonitor input	7	I	Purple	Yellow
Signal ground	9	-	White	Green
Signal ground	2	-	Red	
IN trigger input	4	I	Yellow	
OT1 trigger output 1	6	O	blue	
OT2 trigger output 2	8	O	Gray	
NC Not Connected	10	-	Black	

＊1：2 lines.2.54mm pitch. Equivalent to "HIF3FC-10PA-2.54DS(71)" of HIROSE Electric. CO., LTD.

＊2：Lead colors of attached cable (LE10ES1) and optional cable (LE-5LS).
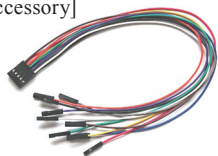
Use 10pins external input / output cable (LE-10ES1) if the signals of target device are long enough to connect.

Use optional 5lines probe cable (LE-5LS) to pinch the signal of target device.

TTL signal port (TXD, RXD, RTS, CTS) of LE-120SA is only for monitoring.
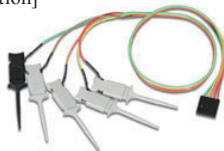
10pins external input/ output cable (LE-10ES1)   5lines probe cable (LE-5LS)

[accessory]   [Option]

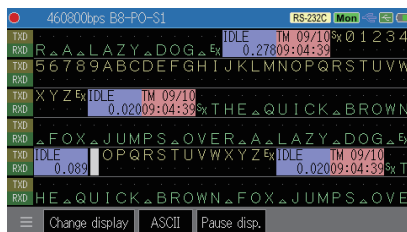length : 300mm   length : 360mm

Measurement Start and Stop

Press [Run] to start measuring.

[Monitoring]
The line monitor displays the communication data in real time and records data in the capture buffer.
Transmission (TXD) and receiving (RXD) data are displayed in two lines.

[Simulating]
Transmission data from the line monitor is displayed in TXD line, and reception data from the target device is displayed in RXD line. Pre-registered data in the transmission data and some fixed data (FOX message etc) can be transmitted.
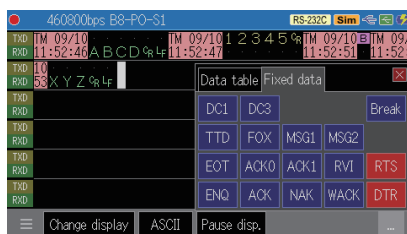
📄 Able to select the transmission data by pressing [Menu] or [...] displayed in the bottom.

📄 Register data from [Menu] → [Measurement port/ function] → "Simulation" → "Tx-data registration"

Special Code (errors and break)

special code	meaning
PE	Parity error
FE	Framing error
PF	Parity error and Framing error
B	Break (start bit, character bit, stop bit are all zero)

Press [Stop] to end measuring.
It is able to stop measurement automatically by setting the trigger or capture memory setting (full stop).
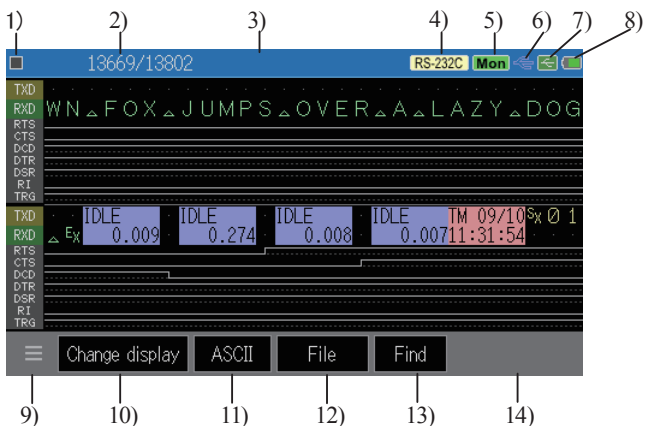
1)	Measuring [🔴] , Pause [⬛]
2)	Position of data/ all data. Able to input the position of data. Speed and character framing while measuring (e.g. B8-PO-S1)[*1]
3)	Other status
4)	Measuring (selected) interface.
5)	Selected Mode. [Mon]: Monitoring, [Sim]:Simulating
6)	Status of USB device mode (Green: Connected)
7)	Status of Host port (Green: Connected)[*2]
8)	Level of remained battery. [⚡] indicates "bus power"
9)	Display more items.
10)	Change displayed mode of measured data. Normal -> Line state -> Frame -> Normal
11)	Selected data code. Change data code.
12)	Save data. Select a file to read.
13)	Find specific data and errors
14)	Other operations.

* 1： [B: Data length], [P: Parity (E: Even, O: Odd, N: None)], [S: Stop bit]

* 2： It becomes in red while accessing to the USB flash drive.

Swipe down the display to see backward (old) data.

Swipe up the display to see forward (new) data.

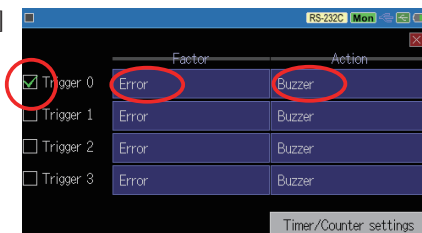📄 Swipe quickly to scroll data fast. It is able to type any numbers in (2), to check data in different positions.
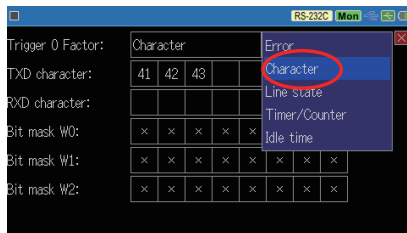
Useful Functions

■ Trigger Function
Trigger function is for starting a specific action upon occurrence of a specific event as a trigger.

e.g.: Stop measuring when transmitting "41h, 42h, 43h" in the TXD line.

Press [Menu] → [Trigger] → Mark on "Trigger0".

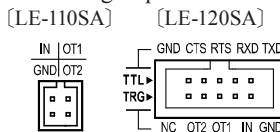Select "Factor" → "Character" and input "41h, 42h, 43h" in the TXD character.

Press [Esc] and select "Stop measurement" as trigger action.
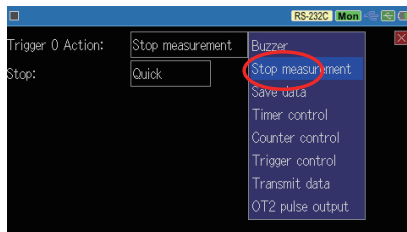
e.g.: Output a pulse to the external device when receiving a specific error.

〔LE-110SA〕 〔LE-120SA〕

Trigger Factor : Error
Trigger Action : OT2 pulse output

Output a low pulse for about 1ms in the external trigger terminal "OT2".

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■ Auto Configuration

Auto configuration function estimates the communication conditions of target device. It is useful if knowing nothing about the target conditions.

Press [☰] and select "Auto configuration". Measurement will start after setting the communication conditions (speed, data length, parity).
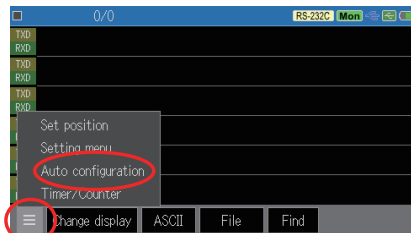
📄 To have the right communication
conditions, following conditions are necessary.
- ・Several data are found in the communication lines.
- ・There is not any error in the communication lines.
- ・Data includes "101" or "010" of bit pattern.

■ Auto Backup

Measurement data will be erased when turning off the power of line monitor. Auto backup function saves data of capture buffer in the USB flash drive.

Press [Menu] → [Record control] → [Auto backup]
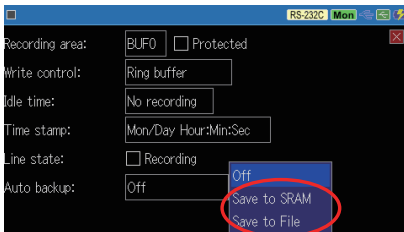
Save in SRAM   Save newest 30K byte data in the inner SRAM. Saved data will be loaded automatically when turning on the power of line monitor.

Save in file   Save all data in the USB flash drive named as "@AUTOBUn. DAT).

     📄 To load the data into the line monitor, you need to select it from the USB flash drive.

PC link

With PC link software, it is able to control the line monitor from a PC (remote control), update a firmware and so on. Install a USB driver before connecting the line monitor and a PC.

■ USB driver

Install a USB driver from attached CD ("Driver" folder) or LINEEYE webpage.

Execute "setup.exe" before connection the line monitor and a PC.
* Refer to the instruction manual in the utility CD.

■ PC link software

PC link software enables to control line monitor from a PC (remote control) and convert data into text format in the PC. The light (limited) version of PC link software is available from LINEEYE webpage. Decompose the file and execute "setup.exe".
* Refer to the "on-line help" for operation of PC link software.

[Example of text conversion]

```
*==============[2018-09-17 13:09:36]=*
* Model    : LE-110SA                *
* Version  : 1.00                    *
* Serial No.: 3Y899999               *
* Start time: 2018-09-17 13:07:43    *
* Stop time : 2018-09-17 13:07:51    *
*------------------------------------*
* MONITOR DATA                       *
* PROTOCOL: ASYNC                    *
* S-SPEED : 460.8k  R-SPEED : 460.8k *
* CODE    : ASCII   CHAR BIT: 8      *
* PARITY  : EVEN    STOP BIT: 1      *
* BCC     : NONE                     *
* IDLE TM : 1ms     TM STAMP: DHMS10 *
*              PRINT CODE : ASCII    *
*====================================*

SD:[ IDLE ][T 1713]54484520515549434B2042524F574E20464F5820
   [ 2648 ][074658]T H E   Q U I C K   B R O W N   F O X
RD:                - - - - - - - - - - - - - - - - - - - -

SD:4A554D5053204F5645522041204C415A5920444F472030313233343
5
      J U M P S   O V E R   A   L A Z Y   D O G   0 1 2 3 4 5
RD: - - - - - - - - - - - - - - - - - - - - - - - - - -

SD:363738392E[ IDLE ][T 1713] - - - - - - - - - - - - - -
   6 7 8 9 .[ 0010 ][074660]
RD: - - - - -                   02303132333435363738394142434 4
                                SX 0 1 2 3 4 5 6 7 8 9 A B C D
```

■ Update Firmware

The latest firmware will be available in the LINEEYE webpage.
http://www.lineeye.co.jp/html/download_update.html
Download the firmware first, then transfer it to the line monitor using the transferring software "le8firm.exe" in the utility CD ("Utility" folder).

Specifications of Function and Hardware

Item	LE-110SA	LE-120SA
Interface	RS-232C,RS-422/485	RS-232C,TTL
Signal level	None	1.8V,2.5V,3.3V,5V
Protocol	ASYNC	ASYNC, UART
Capture memory	16Mbyte (4000Kdata). Able to divide in two.	
Speed(bps)	50, 75, 150, 300, 600, 1200, 2400, 4800, 9600, 12800, 14400, 19200, 28800, 38400, 57600, 115200, 230400, 460800, and user defined speed[*1]	
Monitor function	Display in real time and record the send/receive data, idle time, time stamp, and line status.	
Simulation function[*2]	Send test data, ON/OFF of RTS/DTR	Send test data, ON/OFF of RTS/DTR[*3]
External trigger	1 input and 2 outputs	
Line stateLED	Logical state display of SD(TXD), RD(RXD), RTS, and CTS	
LCD	4.3 inch TFT color display (480x272dot) 28 characters x 6lines.	
Touch screen	Capacitive touch screen	
USB2.0 device port	Micro B connector. Connected to PC or USB charger.	
USB2.0 host port	Standard A connector. For USB flash drive.[*4]	
Power	USB bus power 5V/500mA, two AA Ni-HM batteries, or two AA alkaline batteries	
Drive time[*5]	AA sized Ni-HM batteries: about 5 hours AA sized alkaline batteries: about 2 hours	
Temperature & humidity	0 - 40 degrees Celcius (-10 to 50 degrees Celcius for storage), 85%RH	
Size & weight	158mm x 100mm x 31mm, 300g(including batteries)	

* 1 : User defined speed might have a margin of error.

* 2 : Only DTE mode is available.

* 3 : Only RS-232C. The TTL port is only for monitoring.

* 4 : Not all the USB flash drives are supported.

* 5 : Under the normal operation.

LINEEYE CO., LTD.