LINE EYE ®

Fully supports the development, testing and maintenance of communications equipment and information systems to help you make the jump to IT.

Multi Protocol Analyzer
LINE EYE LE-7000

High-performance Portable Communications Analyzer Capable of Max.1.54Mbps On-line Monitoring, Simulation and BERT

**RS-232C/RS-422   3.6 MB Buffer Memory   Baud Rate Setting
64 MB Memory Card Interface   Backlit LCD   Error Simulation**

The industrial world's move to IT has made necessary communications and measurement equipment that enables users to quickly, easily and efficiently link to complicated high-speed networks. The LE-7000 is that kind of equipment having been built with the multiple protocol analysis technology and miniaturization developed with the long proven LINE EYE Series and high-speed user-set baud rate support*. It comes standard with all the functions of an expensive heavy-duty grade analyzer, but it is packed into a compact B5-sized 1 kg body and driven by battery power. You don't have to be a communications engineer to master the LE-7000.

The LE-7000 is a necessary tool for stepping into the IT age, as it can be used for everything from development and testing of communications systems and equipment to communications network maintenance.

∗Patented

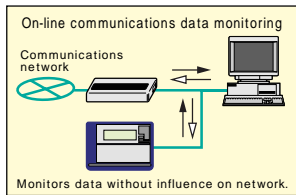## Greatly Improved Basic Performance

Supports Max. 1.544 Mbps Communications

With user-set baud rate support, the LE-7000 seamlessly covers the full span of communications speeds from low to a maximum 1.544 Mbps. Transmission and reception can be tested at both the standard baud rate of the target system and baud rates deliberately set higher or lower than that, giving you an easy means of margin testing for baud rate differential.

[Communications condition setup display example]

On-line communications data monitoring

Communications network

Monitors data without influence on network.

[Available communications speed (Unit: bps)]

Condition		Full-duplex	Half-duplex
Trigger function not used	Asynchronous	1.544M	1.544M
	Synchronous	1.000M or faster	1.544M or faster
Trigger function fully used	Asynchronous	1.480M	1.544M
	Synchronous	0.750M or faster	1.544M or faster

Supports RS-232C and RS-422/485

The LE-7000 comes standards with measurement interfaces for the RS-232C (V.24) and RS-422/485 (X.20/21) standards that are widely used in communications networks. By simply replacing the board in the measurement unit, you can adapt the LE-7000 to the communications standard of other hardware.

RS-232C
External trigger I/O
RS-422/485
LE-7000
OP-SB5C
Board replacement type
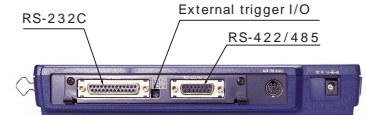
High-capacity 3.6 MB Capture Buffer

The LE-7000 incorporates a high-capacity memory to enable long measurements of high-speed communications. It can capture a max. 1.8 MB of transmission/reception data (*1). The buffer can also be partitioned into two areas, making it easier to compare captured data. And, your valuable data is safeguarded against misoperation with a protect feature and can be retained intact for over 2 years thanks to a built-in lithium battery.

* The amount of recordable transmission/reception data is reduced only by the amount of idle time or time stamps.

Upgraded Online Monitoring

Supports multiple protocols

As a standard feature, LINE EYE supports numerous communications standards from asynchronous to packet switching systems. Settings can be minutely tailored to test conditions, including bit transmission sequence and polarity, and NRZ/NRZI modulation format. Capture efficiency has also been greatly improved with user settings for omitting the 2nd and subsequent SYN codes in BSC, and selective recording of specific address frames in SDLC/HDLC. Moreover, LINE EYE supports analysis work from every direction with support for all kinds of data codes including hexadecimal, real-time data display and protocol translation display, and one-touch switching between interface signal line timing displays.
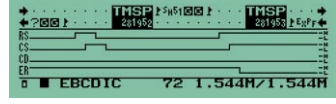
[Raw data display]

[Protocol translation display]

[Timing data display]

[Statistical analysis graph display]

Time Stamp and Idle Time Measurement

The date and time of transmission/reception are recorded on data frames in the least resolution of 10ms. Then, using an auto run-stop feature with which the user specifies measurement start and end times, measurements can be performed unmanned and the time of errors easily and comfortably checked later. LINE EYE can also measure the amount of idle time between communications frames in minimum increments of 1ms and closely monitor transmission/reception response and communications timeout status.

[Auto run setting example]

[Idle time/time stamp display]

Trigger Feature

The trigger feature lets you specify a communications event as the trigger condition and have measurement operations executed automatically when that condition is satisfied. Up to 4 pairs of conditions and operations can be set, which is helpful towards identifying frequent intermittent faults that occurs with communications systems. And, the operation of one trigger condition can be specified as the condition for another trigger, making it possible to analyze complicated operations based on sequential triggers.

[Trigger setup summary display]

[Trigger condition setup example]

[Trigger action setup example]

Real BERT Feature

As a standard feature, the LINE EYE comes with a ITU-T G.821-conforming BERT feature. It lets you evaluate communications quality and identify fault points on communications lines, including modem and terminal adapters, in loopback tests and comparison tests using a simulated random pattern up to 1.544Mbps. It provides capabilities comparable to purpose-specific hardware, such as bit error interrupts by key operation, long continuous measurement, as well as measurement results printout and electronic output.

[Display during BERT]

Measurement of error rate in communications line

Communications network

Loopback point

Compares/checks transmission pattern.
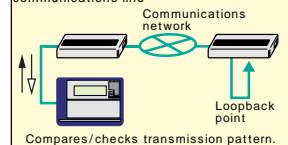
Proven Simulation Capabilities

(Enables Error Interrupt Simulation)

LINE EYE comes standard with simulation capabilities effective for communications system development and testing stages. It lets you switch its internal pin array between DTE/DCE in line with contact pin array specifications of the target equipment, so you can efficiently check transmission/reception exchanges. With a dedicated editor that enables copying, pasting, filling and capturing of 16 types (a total of 16K) of transmission data, data can be registered in transmission tables and used in the various modes. Part of the transmitted data can be saved as parity errors, which makes it possible to check response to erroneous data.

[Transmission table summary display]

Simulation of communications procedure

Test transmission data

Sends data according to procedure.

MANUAL mode

The MANUAL mode lets you send the data registered in transmission table which correspond to the "0" to "F" keys. The data can be sent with the press of a key. While checking replies from a unit under development with the LINE EYE's monitoring feature, you can easily and simply test the communications process. You can send the registered data in transmission table with "0" to "F" keys and the fixed registered data by a key combination of the SHIFT and "0" to "D" keys. You can also turn RS and ER 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.

PROGRAM mode

The PROGRAM mode flexibly simulates communications protocols by letting the user program operations with purpose-specific commands selected from menus. Sample programs are included as a standard feature, so the PROGRAM mode can be used right away.

[PROGRAM mode setup display example]

PROGRAM mode commands example

Command			Operation
SEND	CHR		Sends max. 8 data sets.
SEND	REG		Sends data registered in transmission table under specified REG No.
WAIT	CHR		Waits until receiving specified data (max. 8 data sets).
WAIT	FRM		Waits until receiving 1 frame.
WAIT	TM		Waits for specified amount of time.
GOTO	L		Jumps to specified label No.
CALL	L		Jumps to subroutine of specified label No.
IF	CHR	L	Branches if specified data in reception buffer.
IF	LN	L	Branches if interface line is specified logic.
SET	REG		Sets or increases/decreases value of specified REG No.
SET	TM		Controls specified timer and sets to specified value.
INT	TRG 0 L		Interrupts specified label when trigger 0 condition is satisfied.

Packed with Easy to Use Handy Features

(Menu-based Simple Operation)

Functions are easily selected from menus. And, a large backlit LCD makes it easy to view measurement data at night and in dark places.

[Top menu display]

(High-capacity Memory Card Support)

Using the optional memory card lets you save up to 100 measurement results and parameter settings. The date and time that the data was saved as well as the file name can be recorded so that data can be used more effectively. And, you can continuously monitor and save a specified range of captured data on memory cards using the trigger feature.

[Function menu display example]

(Supports Continuous Format Printing)

You can specify a necessary range of measurement data and print out that data in continuous format using your printer. And, if the LE-7000 supports the escape code (*) of your printer, you can make hard copies of screen just as they appear on the display.

Printer-specific code: ESC/P24-81 or PC-PR201H

Hard copy
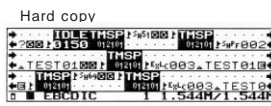
Translation printout (packet translation)

Data printout with line status

(Manipulate Data and Update System on PC)

Using the application provided standard with the LE-7000, you can upload and save measurement data as text files on a PC. And, the optional application LE-PC100 lets you save the data as bitmapped files on a PC, just as they appear on the monitor. Reports are then easily created with a general editor or word processing application. Moreover, the system comes with a ROM rewriting program. With it, you can download the latest version of software from our website to take advantage of the latest functions and features.
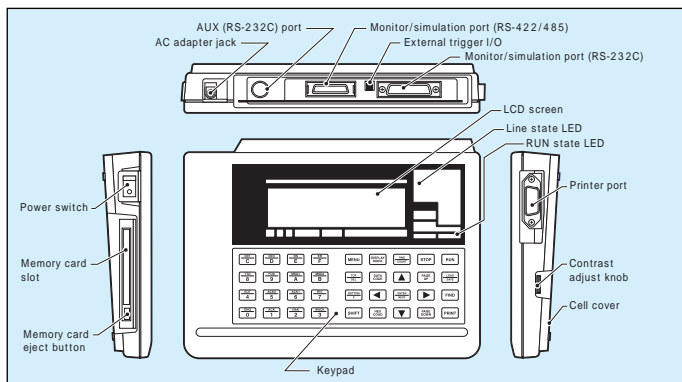
▤ Specifications

Interface	RS-232C (V.24), RS-422/485 (X.20/21) (Standard) 3V/5V TTL (Optional)
Protocol	Asynchronous: ASYNC Character synchronous: SYNC, BSC, (NRZ/NRZI) Bit-oriented synchronous: HDLC, SDLC, X.25 (NRZ/NRZI)
Data transmission speed	Max. 1.544Mbps in all protocols
Internal clock (bps)	110,1200,9600,19.2K,38.4K,57.6K,64K,115.2K,128K,230.4K,256K, 460.8K,512K,921.6K,1.5M,USER-set speed (4 significant digits: 50-1.544Mbps) (Can be set for transmission and reception independently.)
Data code	ACSII,EBCDIC,JIS7,JIS8,Baudot,Transcode,IPARS,EBCD,EBCDIK,HEX
Character framing	Asynchronous: Data bit (5/6/7/8) + parity bit (0/1) + stop bit (1/2) Character synchronous : Data bit +parity bit (total 6, 8 bits) Bit-oriented synchronous : Data bit +parity bit (total 8 bits)
Parity bit	None, odd, even, mark, space, MP (Multi-processor bit)
Bit transmission order	LSB first and MSB first, selectable
Polarity inversion	Normal and inverted, selectable
Error check function	Parity (odd, even, mark, space), framing, abort, short frame BCC LRC CRC-6 CRC-12 CRC-16 CRC-ITU-T

Memory capacity
 	
(Data returnable for more than 3 years)
	Capture memory for monitor: 3.6M bytes (1.8M characters)
	    One area or two divided areas, selectable
	    Ring buffer or fixed size buffer, selectable
	Simulation transmission data memory: 32K bytes (16K characters)
	    Divisible into a maximum of 16 types. Part of data can be registered as error data.

On-line monitor function	Handles half-duplex and full-duplex communications. Idle time display (max. 999.9 s: resolution: 1ms, 10ms, 100ms), Time stamp display(Records and displays time in day/hour/minute, hour/minute/second or minute/second/10ms basis.) Capture display pause, bit shift display in SYNC and jump to the specified screen enabled.
Protocol translation display	HDLC (LAPB, LAPD) translation, ITU-T X.25 (frame, packet) translation, BSC translation
Interface signal status display function	LED SD T RD R RS C CS I ER DR CD SQD CI ST1 ST2 RT S LCD : States of the following interface signals can be displayed in waveform, together with data. Four signals selectable from RS (C), CS(I), ER, DR, CD, SQD, CI and external input
Data retrieval function	Retrieves data conforming to the condition from memory and displays/counts them. Retrieval condition : Preset characters (*don't care* and bit masking assignable; up to 8 characters), idle time not less than preset value, time stamp data (*don't care* and bit masking assignable), error (parity, framing, BCC, break/abort, short frame individually assignable) and trigger point
Monitor condition automatic setting function	Measurement conditions such as protocol, transmission speed (max. 230.4Kbps), data code, synchronous character and BCC check can be set.
Auto run/stop function	Start and stop time of various measurement tests can be specified.

Delay time measurement	Measures and displays the time between interface signal line changes (0.1 ms resolution).
Timer/counter	Interval timer: 2 kinds (Max. 999999; resolution 100ms, 10ms and 1ms, selectable) Universal counter: 2 kinds (Max. 999999), Counter for SD/RD characters (Max. 4294967295)
Statistical analysis function	Statistics (no. of exchanged characters, no. of frames, no. of satisfied trigger conditions) are collected and displayed in graphs on 10 minutes/1 hour/4 hours basis.
Trigger function	Four pairs of *condition* and *action* to be taken when the condition is satisfied can be set. Trigger condition : Preset character (*don't care* and bit masking assignable: up to 8 characters), idle time not less than preset value, preset time stamp (*don't care* assignable), error (MP and error type individually assignable), timer/counter value matching, logical status of interface signal line, and external trigger input Trigger action : Stop measurement test (offset assignable), enable trigger condition, timer control (start/stop/restart), counter control (count/clear), buzzer, external signal output, save monitor data onto memory card, send preset characters (for manual simulation)
Bit error rate test (BERT) function	Error rate measurement test in accordance with ITU-T recommendation G.821. (DTE/DCE pin assignments selectable) Pattern: 2^6-1,2^9-1,2^{11}-1, mark, space (error bit insertion enabled with key operation) Measurement range: Bit error counting, block error counting (0 - 9999999 – 9.99E9), bit error rate, block error rate, SYNC loss frequency, Savail (operating time), %EFS (normal operation rate)
Simulation functions	Transmission test for all kinds of data including error data (DTE/DCE pin assignments selectable). Can preset change in interface signal line and transmission timing.
Manual test	View communications on display and send data assigned to keys by key operation. Send data when events are established using trigger feature.
Buffer transmission test	Select and resend SD or RD side data captured in memory during monitoring.
Program simulation	Supports multiple protocols using command-based simulation: Commands: 36: Steps: Max. 512 × 4 set; Transmission data string: Max. 16 KB; Controls communications lines using commands.
Display	Monochrome LCD with back-light (Max. 30 characters x 8 lines)
Memory card interface	Accommodates 16MB/64MB flash memory card: Used to save/load setting condition and simulation data/programs (up to 100 files).
External serial interface (AUX port)	RS-232C (mini DIN 8-pin): Used to input/output setting condition and monitor data from/to external devices, and to update the system ROM.
Printer interface	Centronics standard (14-pin non-phenol type) or RS-232C (mini DIN 8-pin), selectable; Hard copy and printing monitor data on continuous format
Power supply	AC adapter :9 VDC, 1.4A (100 VA± 10%, 50/60Hz, 28VA) Self-contained Ni-Cd cell :4 hours of continuous operation possible (with back-light off), charge:15 hours
Dimensions/weight	39 (H) × 240 (W) × 180 (D) mm, approx. 1kg
Environmental requirement	Working temperature range: 0 to 40 : Storage temperature range: -10 to 50 :Humidity : 90%RH or below (no condensation)
Accessories	Interface sub-board A (RS-232C/RS-422, 485): 1 (already mounted); Cables (RS-232C/V.24 monitor, X.20/21 monitor, external signal I/O, serial AUX): 1 each; ; AC adapter: 1: carrying bag: 1; PC software FD: 1; Instruction manual: 1; Warranty (with customer card): 1

*1 : Optional memory cards cannot be used as expandable buffer. *2: PC software is DOS program.

▤ Controls, Indicators, Connectors

AUX (RS-232C) port
AC adapter jack
Monitor/simulation port (RS-422/485)
External trigger I/O
Monitor/simulation port (RS-232C)

LCD screen
Line state LED
RUN state LED

Power switch

Printer port

Memory card slot

Contrast adjust knob
Cell cover

Memory card eject button

Keypad

Standard Accessories

Interface sub-board A
:(for RS-232C/RS-422, 485)
:1 (already mounted)
Cables (RS-232C/V.24 monitor, X.20/21 monitor, external signal I/O, serial AUX) : 1 each
AC adapter : 1
Carrying bag : 1
PC software : 1
Instruction manual : 1
Warranty (with customer card) : 1

▤ Optional Interface Board

Interface expansion board B   Model: OP-SB5C

Name, dimensions, weight	Expansion board dedicated to LE-7000 (with TTL probe pod) 78 (W) x 92 (D) x 22 (H) mm, 240g
Interface	TTL (3V/5V signal) (Can be set from LE-7000.) RS-232C (Same as that of LE-7000 standard)
Protocol	Asynchronous, synchronous (external clock possible)
TTL electrical specifications	Input high/low level threshold — Approx. 2V/1V
	Input hysteresis voltage — Approx. 1V
	Input impedance — 100k (0V Vin 5V
	Max. input withstand voltage — ± 25V
	Output high level voltage — Approx. 5.0V and 3.0V, selectable
	Output low level voltage — Approx. 0V
TTL probe signal	SD RD RS CS SD_CLK RD_CLK EX_IN TRG_IN TRG_OUT
Cable length	Probe cable: 800 mm, probe pod lead: 170 mm

OP-SB5C
Interface sub-board B
(TTL/RS-232C)

64MB Memory card
MC-64MA

Compact thermal printer
DPU-414-CA

▤ Optional Accessories

Name	Model No.	Remarks
Current loop adapter	OP-1B	To be used with OP-SB5C
Memory card	MC-16MA	Capacity: 16MB
	MC-64MA	Capacity: 64MB
Compact thermal printer	DPU-414-CA	Dedicated AC adapter, cable and paper included
AUX cable 1	LE2-8C	Mini DIN 8-pin – DSUB 25-pin connector attached, 1.5m, for DTE
AUX cable 2	LE2-8M	Mini DIN 8-pin – DSUB 25-pin connector attached, 1.5m, for DCE
AUX cable 3	LE2-8V	Mini DIN 8-pin – DSUB 9-pin connector attached, 2.5m, for DTE
PC software	LE-PC100	Windows® 2000/Me/98/95 application: Enables data to be saved in text or BMP format: AUX cable 3 included.
Monitor cable 5	LE-259M1	Y cable, 1.5 m, DSUB 9-pin (male/female: 1 each) - DSUB 25-pin connector attached.

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