



OPTIONAL KIT
FOR MULTI PROTOCOL ANALYZER LE-8200A/LE-8200

CAN/LIN Communications Expansion Kit

OP-SB87

Instruction Manual

The 6th Edition

Instruction

Thank you for your purchase of OP-SB87.

To use it correctly, you are advised to read and understand this instruction manual thoroughly. Keep this together with the warranty. If you encounter any problems, you will find helpful information in this manual.

NOTICE

It is prohibited to reprint or duplicate any part of the whole of this instruction manual without prior permission from LINEEYE.

The content of this instruction manual and specifications of the products are subject to change without any notice.

This instruction manual has been designed and edited with great care to give you all necessary information. If you have any questions, feel free to direct your inquiries to LINEEYE.

LINEEYE makes no warranty or guarantee, either expressed or implied with respect to its quality, performance, merchantability, or fitness for a particular purpose. LINEEYE shall not be liable for direct, in-direct, special, incidental, or consequential damages resulting from any defect in the product. The warranty and remedies set forth above are exclusive and in lieu of all others.

USER LIMITATION

This product has been developed for the purpose of using as an analyzer only.

When you use this product with the following devices that are required to function with a high degree of reliability, safety and accuracy, use it under considering the safe design of the system in order to maintain reliability and safety for that system;

- *Devices that are directly related to transportation such as airplanes, trains, cars etc.

- *Devices for crime prevention and disaster privension.

- *Each kind of safety devices and so on.



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 no use for those purposes.






Safety Information



Read this first !!

Here, the important content has been described, for preventing the people who will use the object products and other people from being damaged and preventing damage of properties, and for using safely and correctly.

Before using, please read the main contents after you understand the following contents (symbols & marks).

-  **Warning** Should the device be used without following these symbols, there is a possibility of accidents, such as a death or a serious injury, occurring.
-  **Caution** Should the device be used without following these symbols, there is a possibility of accidents, such as a injury , and material damage occurring.

 Warning	
	<ul style="list-style-type: none">• Stop using the analyzer immediately when smoke or smells emanate from itself. Continuous use may result in an electric shock, a burn and/or fire.
	<ul style="list-style-type: none">• Stop using the analyzer should a liquid or foreign substance get into the analyzer. This may result in an electric shock or fire. → Immediately switch off the analyzer and unplug it.
	<ul style="list-style-type: none">• Do not disassemble, modify or repair analyzer. This may result in a injury, an electric shock, fire, explosion and/or a breakdown due to overheating.
	<ul style="list-style-type: none">• Do not put the analyzer in fire or heat them. This may result in a injury and fire due to overheating or explosion.

 Caution	
	<ul style="list-style-type: none">• Do not leave the analyzer in the following conditions. Strong magnetic field, static electricity or dusty place. Temperature and humidity above the specification. Condenscendingly place. Not flat, or shaking place. Place with leaking water or electricity. Place affected by direct sun or near the fire .

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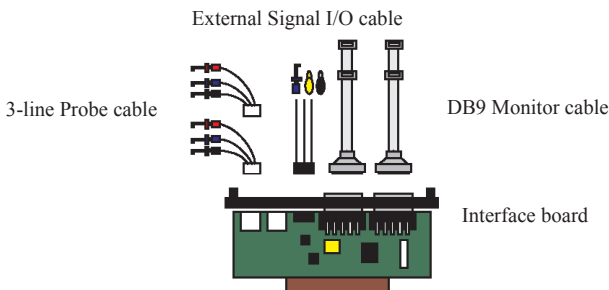
Chapter 1 Before Using the Product

1.1 Unpacking

 When you unpack the product, make sure of the following:

- The product has not been damaged during transportation.
 - You have received all the standard accessories listed below.
- | | |
|---|---|
| <input checked="" type="checkbox"/> Interface board | 1 |
| <input checked="" type="checkbox"/> DB9 Monitor cable (For monitoring CAN : LE-009M1) | 2 |
| <input checked="" type="checkbox"/> 3-line Probe cable (For monitoring LIN : LE-3LP) | 2 |
| <input checked="" type="checkbox"/> External Signal I/O cable | 1 |
| <input checked="" type="checkbox"/> Line State sheet | 1 |
| <input checked="" type="checkbox"/> Instruction manual (This book) | 1 |
| <input checked="" type="checkbox"/> Customer Registration card / Warranty | 1 |

 Please contact your LINEEYE distributors if you find any damage to the product caused by transportation, or if there are accessories lacking.



1.2 Overview

OP-SB87 is the expansion kit which makes it possible to measure CAN/LIN communication.

■ Monitor Function

Monitors CAN communications up to 1Mbps and LIN communications up to 26Kbps. This product supports to high speed CAN (ISO11898 conformity), low speed CAN (ISO11519-2 conformity) and LIN (ISO9141 conformity). Moreover, you can switch to high speed CAN, low speed CAN or LIN communications for the each port.

■ Simulation Function

Transmit the data frame and remote frame of CAN (standard format or expansion format) which is set by user by one touch press.

Performs master/slave simulation in the case of LIN.

Chapter 2 Basic Operation

2.1 Installation of Firmware

Firmware is already installed.

You can download the latest firmware, and software (Le8firm) for upgrading the firmware from our website.
(<http://www.lineeye.com>)

< Install the firmware to analyzer >

Connect the AUX(RS-232C) or USB port of analyzer and the serial port of your PC using an AUX cable (AUX cable comes with the product).

< Attention >

When the analyzer is connected to PC through USB cable, Windows requires the USB driver. The USB driver is stored in the CD-ROM which comes with the analyzer. Select "Install from a list or specific location", then execute installation of the driver following the wizard.

Configuration of analyzer :

- 1, Set AUX (RS-232C) condition as below.

Speed:115200/230400, Data bit:8, Parity:None, X-control:OFF

(Speed should be same setting in respect of that of PC .)

- 2, Turn off the power of analyzer. Turn on the power while pressing [Shift] and [File].

Setting of "Le8firm" :

- 1, Open the file of "Le8firm". Select the port which you use to connect analyzer.

In the case of selecting a serial port:

Select a COM port (COM1-COM9) or USB port which you use to connect analyzer.

Set the baudrate to be the same as setting of analyzer.

- 2, Select a serial port from "Method".

- 3, Click [Next].

- 4, Click [Select] and select the firmware.

- 5, Click [Next].

- 6, Click [Start]. "Complete" will appear on the window.

- 7, Click [Close].

- 8, Turn off the power of analyzer. Turn on the power again to update the firmware.

* For other models, please read the manual of each analyzer.

< Attention >

Do not turn off the power of analyzer while installing the firmware. It will cause the problems (cannot turn on the power) and need to send back the product to LINEEYE.

Automatic Choice of Firmware:

Once the firmware for CAN/LIN is installed, everytime you want to measure CAN/LIN communications, you only need to change the expansion board (OP-SB87) and turn on the power of analyzer (the appropriate firmware is automatically chosen).

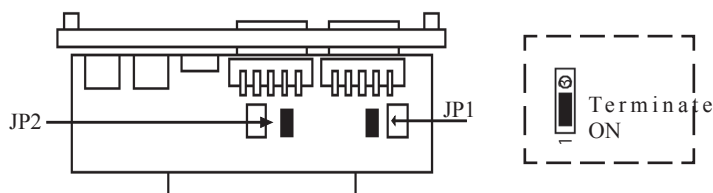
Setting the Terminator:

The jumper pin makes it possible to connect the terminator of the high speed CAN.

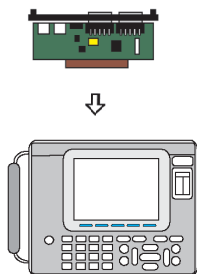
JP1 : Connects the terminator (120 Ohm) to CAN1 port. (factory setting)

JP2 : Connects the terminator (120 Ohm) to CAN2 port. (factory setting)

The low speed CAN is terminated at 4.7k Ohm.



Inserting the Interface Board



- (1). Turn off the analyzer.
- 2). Screw off the M3 screws on the expansion slot of the analyzer.
- 3). Take the board off pulling the handles of the interface board.
- 4). Insert the interface expansion board (OP-SB87) into the slot completely.
- 5). Screw it on using M3 screws.

Connection to the Target Devices

It is possible to use 2 measuring channels of CAN or LIN separately.

Connect Channel1(Ch1) to the port of CAN1 or LIN1, and Channel2(Ch2) to the port of CAN2 or LIN2, using the cables for CAN or LIN attached for the this product.

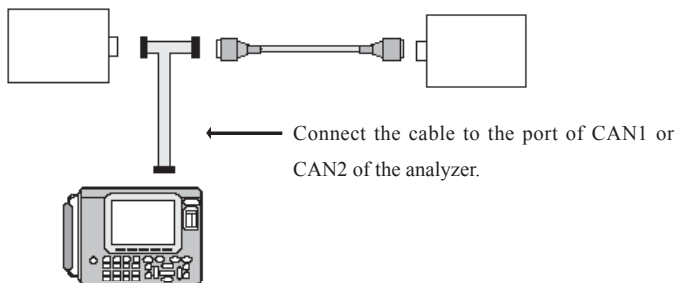
■ Online Monitor

Able to use CH1 (CAN or LIN) and CH2 (CAN or LIN) simultaneously.

■ Simulation

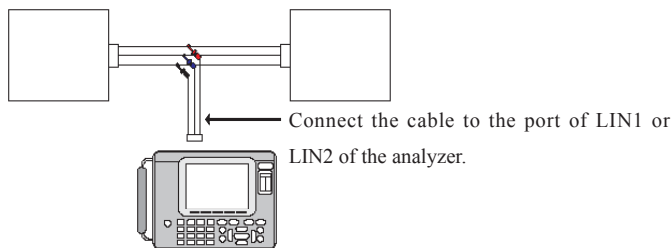
Use either CH1 or CH2 .

Use DB9 Monitor cable for CAN communication.



In the case of LIN communication, pick the target signal using the IC clips of 3 line probe cable. The correspondence of the lead wires and I/O signals is described at the following table.

Attention : 12V electric power can not be supplied from this analyzer.
Vbat must be supplied from the outside.



[Table of correspondence of the lead wires and I/O signals]

Color of the lead wire	Signal	Meaning
red	VBAT	Battery power supply (9-18V)
blue	LIN_BUS	LIN bus signal
black	GND	Ground

*Vbat must be connected in monitor or simulation.

External Signal I/O terminal

The analyzer has the external signal I/O terminals besides the interfaces of CAN and LIN.

They are for analog and digital input, and the trigger input-output.

■ Analog and Digital input (IN1 to 4)

Connect the terminals of the external signal I/O cable (IN1 to 4) to the target devices, the analyzer measures the voltage in the timing of CAN or LIN frame measured, and displays the in analog and digital.

Analog display : The analyzer measures the voltage in the timing of CAN or LIN frame measured, and displays the actual values on the "Analog" screen. (unit : V)

Digital display : The analyzer measures the voltage in the timing of CAN or LIN frame measured, and displays the values on the data screen in binary.

(1 : above 2.3V , 0 : under 1.0V)

📖 Refer to "Chapter 3 Explanation of Display" for more details.

■ Trigger input-output

The analyzer can set the input (TRG IN) and output(TRG OUT) for trigger.

📖 Refer to "Chapter 4 Trigger" for more details.

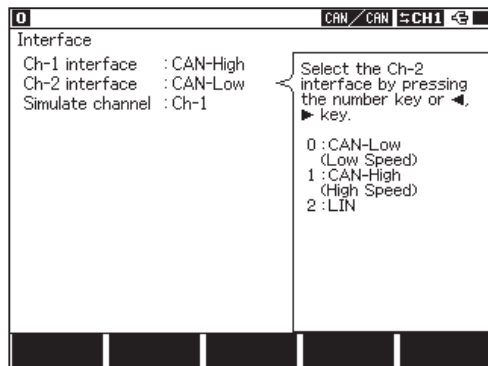
■ Pin arrangements

Pin arrangements are as follows.

TRG	TRG	IN2	IN4
IN	OUT		
GND	IN1	IN3	GND

2.2 Setting of Interface

Measuring ports need to be set for measuring CAN or LIN communications. Press "5: Interface" at the top menu.



- Ch1 interface/Ch2 interface
Select the interface for channel1 (Ch-1) and channel2 (Ch-2).

CAN-Low : Low speed
CAN communication
ISO11519-2 conformity

CAN-High : High speed
CAN communications
ISO11898 conformity

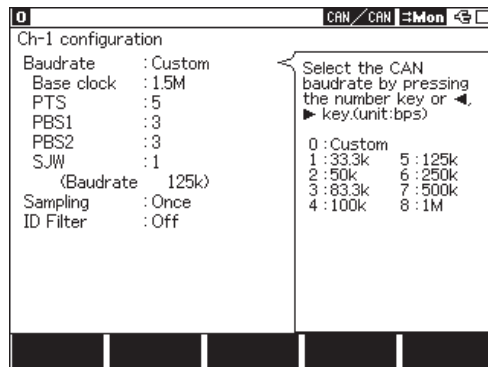
LIN : LIN communication
ISO91414 conformity

- Simulate channel
Select the channel for simulation.

2.3 Setting of Communication Condition

The setting of analyzer is required following the communication condition (protocol, communication speed etc.) of the target devices. Press [0] or [1] key at the top menu to display the configuration screen for setting.

Setting of CAN Communications



- Baudrate
Selects the communication speed.
The analyzer will start measuring following the bit timing which has been preset. The sampling point (a bit timing) is set at the position of 75% of a bit.
If you set "Baudrate" to "Custom", you can change a bit timing.

SS	PTS	PBS1	PSB2
1Tq	5Tq	3Tq ▲	3Tq

Sampling
Tq : Time counter (Time Quantum)

Base clock : Sets the standard clock (Frequency of Tq). (250kHz to 12MHz)

PTS : Sets the propagation time segment. (in decimal)

PBS1 : Sets the fase buffer segment1. (in decimal)

PBS2 : Sets the fase buffer segment2. (in decimal)

SJW : Sets the resynchronization jump width. (in decimal)

Communication speed (Baudrate) will automatically be determined based on those settings.
The setting range of PTS/PTS1/PTS2/SJW is related to the following.

PBS1 : If PTS < 2 3 to 8,	If PTS > 2 2 to 8
PBS2 : If PTS + PBS1 < 4 3 to PBS1,	If PTS + PBS1 > 4 2 to PBS1
SJW : If PBS2 < 3 1 to PBS2,	If PBS2 > 3 1 to 4

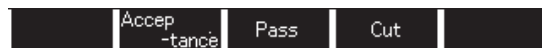
Make sure not to set and measure at more than 1Mbps for the combination of bit timing.

- Sampling : Sets the number of times to sample a bit (Once / 3 Times).
- ID Filter

Sets valid/invalid (On/Off) of the ID filter and selects its filter type.

- Off: All the filters will be invalid.
- Acceptance: The acceptance filter will be valid and it captures only the frames which corresponds with the ID set by bit unit.
- Pass: The pass filter will be valid and it captures only the frames which corresponds with the IDs (Max. 8) set in HEX.
- Cut: The cut filter will be valid and it does NOT capture the frames which corresponds with the IDs (Max. 8) set in HEX.
- Pass&Cut: The pass filter and the cut filter will be valid.
- All filter on: All the filters will be valid.

When you select any option other than "Off", [F2](Acceptance), [F3](Pass), [F4](Cut) will appear. Then configure the filter condition at the setting display.



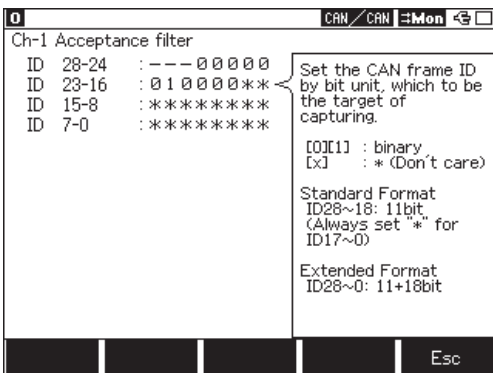
■ Acceptance filter

It captures corresponding ID frames by the hardware filter.

Input the number by bit unit ("0", "1", "*", and Don't care).

Set numbers from ID28 to ID18 (ID17 to ID0 should be Don't care) when it is standard format.

Set numbers from ID28 to ID0 when it is extended format.



Example) If you want to display the frames which have 010 for ID when it is standard format.

ID 28 to 24: ---00000
ID 23 to 16: 010000**
ID 15 to 8: *****
ID 7 to 0: *****

Note: 00400000h to 0043FFFFh will also be captured when extended formats are mixed with standard formats.

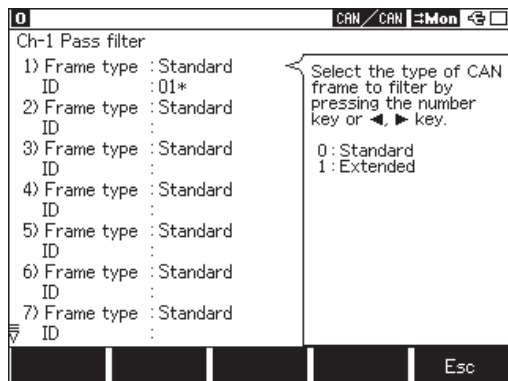
□ Pass filter

It captures corresponding ID frames by the software filter.

Select format type from "Standard" or "Extended" at Frame type, then input ID in HEX ("0" to "F", "*", Don't care). (You can set up to 8 pass filters.)

Set numbers from the scope of ID:0 to 7FFh when it is standard format.

Set numbers from the scope of ID:0 to 1FFFFFFh when it is extended format.



Example) If you want to capture frames which have 010h to 01Fh for its IDs when it is standard format.

1) Frame type: Standard
ID: 01*

Note: When the pass filter is valid and no ID has been input, all the ID frames will not be captured.

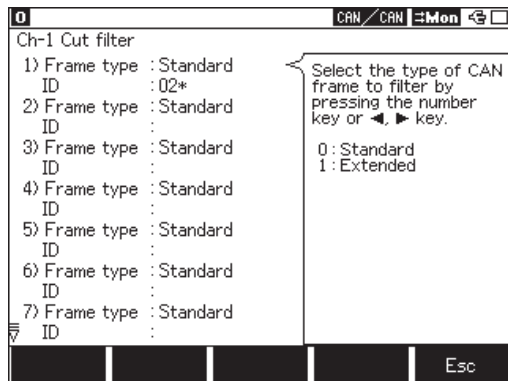
□ Cut filter

It does not capture corresponding ID frames by the software filter.

Select format type from "Standard" or "Extended" at Frame type, then input ID in HEX ("0" to "F", "*", Don't care). (You can set up to 8 filters.)

Set numbers from the scope of ID:0 to 7FFh when it is standard format.

Set numbers from the scope of ID:0 to 1FFFFFFh when it is extended format.



Example) If you will not capture frames which have 020h to 02Fh for its IDs when it is standard format.

1) Frame type: Standard
ID: 02*

Note: When the cut filter is valid and no ID has been input, all the ID frames will be captured.

Setting LIN Communication Condition

0 LIN / LIN CH1

Ch-1 configuration

Baudrate : 9600
 ID filter : --***
 Frame end : Time
 Frame end time: 6
 Checksum : Classic

Set the LIN baudrate by pressing the number key or ◀, ▶ key. (unit: bps)

0 : 2400
 1 : 9600
 2 : 19200

[F][F1]: To set any

Any speed

□ Baudrate :

Selects communication speed from 2400bps, 9600bps and 19200bps, or sets arbitrary speed (from 1600 to 26000bps).

□ ID filter:

Sets ID filter. Sets from 5 bits to 0 bit (excluding parity) of ID by 0, 1 and *(Don't care), and displays only matched ID.

e.g.)

--00000 ⇒ Displays only 00 of ID.

--00001 ⇒ Displays only 01 of ID.

--0000* ⇒ Displays only 00 and 01 of ID.

□ Frame end :

Sets whether the end of the message frame is performed at the detection of non-communication time "Time" which is more than the setting value of "Frame end time", or performed at setting value of data length "ID". Selects "ID" for normal use.

If "ID" is selected, press [F5] "ID setting". And then set DLC and the calculation method of checksum for each ID.

□ Frame end time :

It is displayed when the end of the message frame is set at "Time". Sets "Frame end time" by 1 to 99999ms. If there is no following data within the time which is set from the end of the data you monitored, it will be considered as the end of the message frame.

* It is supported on firmware Ver1.07 or above. Proper value will be set automatically after selecting the baud rate.

□ Checksum :

It is displayed when the message frame is set at "Time". Selects whether you perform the checksum calculation by Classic or Enhanced. It cannot be for each ID. Moreover, calculation from ID3C to 3F will be by Classic.

0 LIN / LIN CH1

Ch-1 Identifier Definition 00-0F

ID	DLC	Checksum	ID	DLC	Checksum
00	2	Classic	08	2	Classic
01	2	Classic	09	2	Classic
02	2	Classic	0A	2	Classic
03	2	Classic	0B	2	Classic
04	2	Classic	0C	2	Classic
05	2	Classic	0D	2	Classic
06	2	Classic	0E	2	Classic
07	2	Classic	0F	2	Classic

Move the cursor with ▲ or ▼, ◀ or ▶ key, and edit data length (DLC) and Checksum.
 [0]~[8]: data length, [C]: Classic, [E]: Enhanced

ID00-0F ID10-1F ID20-2F ID30-3F Classic/Enhanced

□ ID setting :

Change the screen by pressing [F5], and set data length (DLC: 0 to 8 bytes) of each frame and the checksum calculation (Classic, Enhanced) of ID00 to 3F.

2.4 Start and End of the Measuremen

- ONLINE: Online monitor function
 - ANALOG: Analog monitor function (*1)
 - MANUAL: Simulation function
- *1: Refer to “Chapter 3 Analog Monitor Function”.

Start measuring:

Press [Run].

The analyzer starts measuring, displays the data on the screen and saves in the capture buffer.

Stop measuring:

Press [Stop].

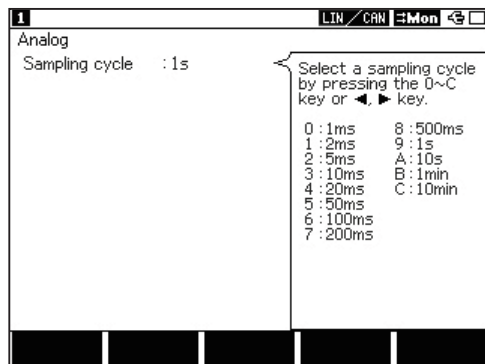
Chapter 3 Analog Monitor Function

Record four external signals (voltage) at specific cycle (1ms - 10min).

Record measured data since the last sampling, and analyze measured data corresponding to the external signals. (It is supported on firmware Ver1.07 or above)

3.1 Setting of Analog Monitor

Select "ANALOG" at the top menu, then select "7: Analog options".



Sampling cycle: Select sampling cycle (1ms – 10min).

Attention:

For Analog Monitor function, select time stamp either from "HMS" or "MS1ms". If the time stamp is set as "100us", "10us" or "1us", it will be changed to "MS1ms" automatically. When starting the measurement, Analog Data display will be appeared. If it has only analog data, other columns excepting "Time" and "I1234" will be blanks.

Chapter 4 Explanation of Display

LCD Display

Display	Meaning																				
Time	Displays the time when the frame is received at the unit selected at "Record control". (e.g. : When "MS1ms" is selected and displays 042:16:898, that means frame was received at 42 minutes and 16.898 seconds.)																				
Time	Displays the difference of time stamps compared to the previous time stamp. (does not display the difference of time stamps compared to the beginning of time stamp.) "Time" and "Time" can be changed by pressing [F5].																				
Ch	Displays the channel received. (1:CH1, 2:CH2)																				
(Br-Sy-)ID	At the time of CAN, displays the ID of the frame received. At the time of LIN, displays the bit number of "Syncbreakno", and the values of "Syncfield" and "Identifier" in hex. (*1)																				
Type	Displays a type of the frame received. <table border="1"> <tr> <td>DATA</td><td>Data frame of CAN</td></tr> <tr> <td>REM</td><td>Remove frame of CAN</td></tr> <tr> <td>ERR</td><td>Error frame of CAN</td></tr> <tr> <td>FRM</td><td>Frame of LIN</td></tr> <tr> <td>ILL</td><td>Frame which is out of LIN standard (*2)</td></tr> </table>	DATA	Data frame of CAN	REM	Remove frame of CAN	ERR	Error frame of CAN	FRM	Frame of LIN	ILL	Frame which is out of LIN standard (*2)										
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REM	Remove frame of CAN																				
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FRM	Frame of LIN																				
ILL	Frame which is out of LIN standard (*2)																				
DL	At the time of CAN, displays the contents of data length code in decimal. For LIN, data length set on the Configuration ID setting is displayed. (Does not display anything if frame end is set as "Time".)																				
St	Displays whether the condition of the frame is normal or abnormal. <table border="1"> <tr> <td>G</td><td>Normal Frame</td></tr> <tr> <td>B</td><td>SynchBreak error of LIN (When Dominant is 10bit)</td></tr> <tr> <td>S</td><td>SynchField error of LIN (At the times other than "55h")</td></tr> <tr> <td>P</td><td>Parity error of LIN</td></tr> <tr> <td>L</td><td>Data length error of LIN</td></tr> <tr> <td>R</td><td>When the data of the Response of LIN is less than 1byte</td></tr> <tr> <td>C</td><td>CRC error of CAN / Checksum error of LIN</td></tr> <tr> <td>A</td><td>ACK error of CAN</td></tr> <tr> <td>E</td><td>Error frame of CAN</td></tr> <tr> <td>F</td><td>Form Error of CAN (When CRC or ACK delimiter is 0) (*3)</td></tr> </table>	G	Normal Frame	B	SynchBreak error of LIN (When Dominant is 10bit)	S	SynchField error of LIN (At the times other than "55h")	P	Parity error of LIN	L	Data length error of LIN	R	When the data of the Response of LIN is less than 1byte	C	CRC error of CAN / Checksum error of LIN	A	ACK error of CAN	E	Error frame of CAN	F	Form Error of CAN (When CRC or ACK delimiter is 0) (*3)
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F	Form Error of CAN (When CRC or ACK delimiter is 0) (*3)																				
Data	Displays the contents of the data field in hex.																				
I1234	Displays the status of the external input in binary. (0=Low, 1=High)																				
FC	Displays the contents of CRC in CAN, or the contents of checksum in LIN. By pressing [F3], "I1234" and "FC" are changed.																				

Other display

FE	Framing error (When the stop bit is Dominant.) (*4)
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*1: By pressing [F2]"RAW", the data presentation with the parity and that of without it are changed.

*2: In case that the part of the header (SynchBreak, SynchField, Identifier) is not normal, the frame is treated as illegal. When the data of the frame which is not LIN frame is captured before Break, it is displayed at DATA part.

*3: Support if OP-SB87 firmware is Ver1.05 or above.

*4: By pressing [F2]"RAW", the framing error display and the data display are changed.

*5: Maximum timestamp is described as following, and it returns to zero.

Unit	Maximum	Meaning	Time	Available Function
1usec	134.217.727	134S/217.727msec	Relative time	ONLIN / MANUAL
10usec	1342.177.27	1342S/177.27msec	Relative time	ONLIN / MANUAL
100usec	13421.772.7	13421S/772.7msec	Relative time	ONLIN / MANUAL
MS1m	59:59:999	59M/59S/999msec	Absolute time	ONLIN / ANALOG / MANUAL
HMS	23:59:59	23H/59M/59S	Absolute time	ONLIN / ANALOG / MANUAL

Line State LED

On the Line State Sheet	LED	Bus Level	Meaning
DATA	ON	Dominant	Turns on the light corresponding to the bus level of CAN/LIN.
	OFF	Recessive	
BPW	ON	About 10V	Inputs (9V-18V) from 9pin for CAN interface, or LIN Vbat (9V-18V)
	OFF	Under 3V	
IN1-IN4	ON	Above 2.3V	External Input (-15V ~ +15V)
	OFF	Under 1.0V	

The type of screen display is changed by pressing [Data].

< Data display screen >

CAN →

LIN →

153 (RAW)										CAN/LIN CH1					
Time	Ch	Br-Sy	ID	Type	DL	St	Data				I1234				
009.597.517	1		123	DAT	5		30	31	32	33	34	0000			
009.617.760	2	13-55-BF	FRM									0000			
009.623.020	2	13-55-50	FRM				41	42				0000			
009.697.520	1		123	DAT	5		30	31	32	33	34	0000			
009.729.277	2	13-55-73	FRM				41	42	43	44	45	46	47	45	0000
009.797.521	1		123	DAT	5		30	31	32	33	34	0000			
009.798.027	2	13-55-50	FRM				41	42				0000			
009.897.524	1		123	DAT	5		30	31	32	33	34	0000			
009.917.773	2	13-55-BF	FRM									0000			
009.929.284	2	13-55-73	FRM				41	42	43	44	45	46	47	45	0000
009.997.526	1		123	DAT	5		30	31	32	33	34	0000			
010.029.284	2	13-55-73	FRM				41	42	43	44	45	46	47	45	0000
010.048.027	2	13-55-50	FRM				41	42				0000			
010.073.027	2	13-55-50	FRM				41	42				0000			

Change time display
RAW
Change FC/I1234
Find setup

1 ↑

2 ↑

3 ↑

The frames of CAN or LIN are displayed in the order of measured time.

◆ Color code

Ch1: Yellow

Ch2: Green

* It is displayed in white color if there is only analog data.

153										CAN/LIN		CH1			
Time	Ch	(Br-Sy->ID	Type	DL	St	Data						I1234			
000.068.240	1	123	DAT	5		30	31	32	33	34	0000				
000.020.243	2	13-55-3F	FRM								0000				
000.005.260	2	13-55-10	FRM			41	42						0000		
000.074.500	1	123	DAT	5		30	31	32	33	34	0000				
000.031.757	2	13-55-33	FRM			41	42	43	44	45	46	47	45	0000	

153 (RAW)										CAN/LIN CH1		
Time	Ch	Br-Sy	ID	Type	DL	St	Data				I1234	
009.597.517	1		123	DAT	5		30	31	32	33	34	0000
009.617.760	2	13-55-BF	FRM									0000
009.623.020	2	13-55-50	FRM				41	42				0000
009.697.520	1		123	DAT	5		30	31	32	33	34	0000

◆ Change of display

1 [F1]key : Change of Time display

"Time"(the elapsed time from the measurement start) and "OTime"(the elapsed time from the previous frame) are changed by pressing [F1].

2 [F2]key : RAW

Whether ID presentation of LIN with the parity or without the parity, and the display of framing error in HEX or not in HEX are changed by pressing [F2].

153							CAN / LIN	CH1	FC
Time	Ch (Br-Sy->ID)	Type	DL	St	Data				FC
009.597.517	1	123	DAT	5	30 31 32 33 34				1A 65
009.617.760	2	13-55-3F	FRM	R					
009.623.020	2	13-55-10	FRM	R	41 42				7C
009.697.520	1	123	DAT	5	30 31 32 33 34				1A 65

133							CAN / LIN	C 11	I1234
Time	Ch (Br-Sy->ID)	Type	DL	St	Data				I1234
014.835.920	1	234	REM	5					0111
014.842.825	2	13-55-33	FRM	8	41 42 43 44 45 46 47 48				1111
014.886.085	1	123	DAT	5	30 31 32 33 34				0111
014.892.838	2	13-55-33	FRM	8	41 42 43 44 45 46 47 48				1111

FC: Displays the contents of CRC in CAN, or the contents of checksum in LIN.

I1234: Displays the status of the external input in binary. (I1234=IN1 to 4 0=Low, 1=High)

< Analog display screen >

380					CAN / CAN	Mon	CH1
Time	Analog ch1	Analog ch2	Analog ch3	Analog ch4			
022.793.007	+11.0	+2.3	+11.9	+2.3			
022.843.007	+10.9	+2.4	+11.9	+2.4			
022.886.263	+11.0	+2.3	+11.9	+2.3			
022.893.007	+11.0	+2.2	+11.9	+2.3			
022.943.013	+11.0	+2.4	+11.9	+2.3			
022.961.096	+10.9	+2.3	+11.9	+2.4			
022.986.264	+11.0	+2.3	+11.9	+2.3			
022.993.013	+11.0	+2.4	+11.9	+2.4			
023.043.013	+11.0	+2.4	+11.9	+2.3			
023.086.267	+11.0	+2.3	+11.9	+2.4			
023.093.013	+11.0	+2.3	+11.9	+2.4			
023.143.013	+11.0	+2.4	+11.9	+2.3			
023.186.268	+7.4	+2.3	+11.9	+2.4			
023.193.013	+11.0	+2.3	+11.9	+2.3			

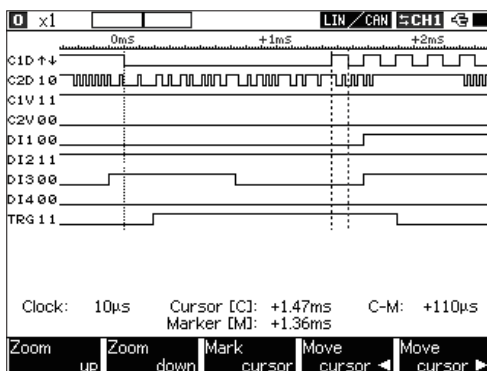
The measured voltage values of signals from IN1 to 4 are displayed in the order of received time. (unit : V).

Ch1: Yellow

Ch2: Green

* It is displayed in white color if there is only analog data.

< Logic analyzer display screen >



The condition of each signal is displayed in the digital waveform.

C1D: Data bus of Ch1

C2D: Data bus of Ch2

C1V: General-purpose input of Ch1 (*1)

C2V: General-purpose input of Ch2 (*1)

DI1: General-purpose input (*2)

DI2: General-purpose input (*2)

DI3: General-purpose input (*2)

DI4: General-purpose input (*2)

TRG: External trigger input (*2)

For the logic analyzer display, set "Wavemonitor" to "On" at "Wavemonitor" setting screen before measuring.

*1 : Dsub 9-pin (At the time of CAN measurement) / Vbat of 3-pin connector (At the time of LIN measurement)

*2 : 8-pin connector (IN1, IN2, IN3, IN4, TRG IN)

Chapter 5 Trigger

When a specific factor (Factor) is detected during measurement operation, specific operation (Action) can be performed. At the top menu, press [2] “Trigger” to select the trigger.

Validate or invalidate each trigger by pressing [F1] and [F2]. (The trigger is valid when check box has a check mark.)

□ Factor

Factor	Content
Error	Executes the trigger by an error of the communication. Break : Considers as an error when Dominant of Break field is 10bit (LIN). Sync : Considers as an error when the value of Sync field is other than 55(h) (LIN). Parity : Parity Error (LIN) Checksum : Checksum Error (CAN/LIN) Framing : Framing Error (when the stop bit is Dominant) (LIN).
Data	Executes the trigger when the specific data frame is received. Sets the reception channel (Target), ID (*1), and the contents of the data. (Settable for Don't care and a bit mask.)
Remote	Executes the trigger when the specific remote frame of CAN is received. Sets the reception channel and ID.
Time/Count	Executes the trigger when the timer or the counter reaches the value being set.
TRG IN	Executes the trigger by the input condition of TRG IN. (It is an inside and they are +5V and a 12Kohm pull-up.)
External	Executes the trigger by the logical condition of external trigger inputs (from IN1 to 4). (Settable for Don't care , 1 and 0.)

*1 : Set ID filter from an upper bit. In the case of CAN, set ID from ID28 to ID18 at the time of Standard Format. (Make sure you set *(Don't care) from ID17 to ID0.) Moreover, in the case of LIN, set ID from ID26 to ID21. (Make sure you set *(Don't care) from ID20 to ID0.)

(ID28(P1) and ID27(P0) are settable as well.)

(e.g.)

CAN Standard Format ID023

ID 28-24	-	-	-	0	0	0	0	0
ID 23-16	1	0	0	0	1	1	*	*
ID 15-8	*	*	*	*	*	*	*	*
ID 7-0	*	*	*	*	*	*	*	*

CAN Expansion Format ID00000023

ID 28-24	-	-	-	0	0	0	0	0
ID 23-16	0	0	0	0	0	0	0	0
ID 15-8	0	0	0	0	0	0	0	0
ID 7-0	0	0	1	0	0	0	1	1

LIN ID23

ID 28-24	-	-	-	*	*	1	0	0
ID 23-16	0	1	1	*	*	*	*	*
ID 15-8	*	*	*	*	*	*	*	*
ID 7-0	*	*	*	*	*	*	*	*

□ Action

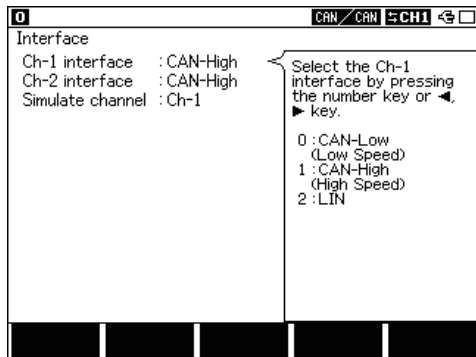
Action	Content
Buzzer	Sounds the buzzer.
Stop	Stops the measurement. Quick : Stops the measurement immediately. Before : Capture more data which exists before the trigger condition is satisfied. Center : Capture the same amount of data in before and after the trigger condition is satisfied. After : Capture more data which exists after the trigger condition is satisfied.
Save	Saves the data of before and after the trigger specified by the Offset.
Timer	Controls the timer. Start : Starts the timer. Stop : Stops the timer. Restart : Clears and restarts the timer.
Counter	Controls the counter. Increment : Adds 1 to the counter. Clear : Sets 0 for the counter.
Trigger Switch	Controls another trigger state. Disable : Sets invalid for another the trigger. Enable : Sets valid for another the trigger. Change : Changes invalid or valid of the trigger state. Disable <--> Enable
Send	Executes the control of the data which is set on CAN data table. Sets the transmission data table for control , the contents of the control (Transmit or Stop), and the time (Response) from the occurrence of the trigger to the control.
TRG OUT	Outputs the low pulse(about 1msec) to the external trigger terminal. (It is an inside and they are +5V and a 12Kohm pull-up.)

Chapter 6 Simulation

6.1 CAN Simulation

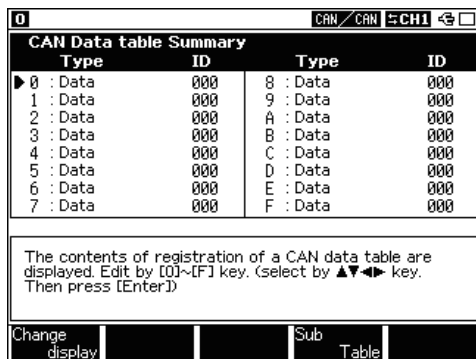
Register the transmission data in the simulation data tables, and then send them by pressing [0]-[F] keys, which correspond to the tables.

6.1.1 Preparation



At the top menu, press [5]"Interface" and select the simulation channel that you use CAN-High or CAN-Low as interface.

(Only one channel is available for simulation.)

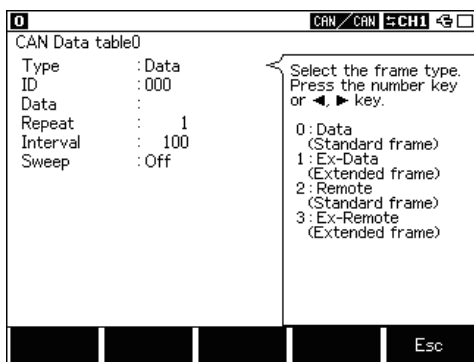


At the top menu, press [9]"Data send table" and select the data table number ([0] to [F]) to register the transmission data. Up to 16 tables can be registered as main tables.

[Display Change]: Switch the screen to display TYPE and ID.

[Sub Table]: Switch the screen to display summary of sub tables.

6.1.2 Registration of the transmit data



- Type :Sets the type of the frame.
 - Data(the data frame of the standard format)
 - Ex-Data(the data frame of the expansion format)
 - Remote(the remote frame of the standard format)
 - Ex-Remote(the remote frame of the expansion format)
- ID: Sets 11bit (Standard format) or 29bit (Expansion format) of ID in HEX.
- Data: Sets data in the data field up to 8 data in HEX when selecting the data frame.
- DLC: Sets the number of byte of data for request in decimal when selecting the remote frame.
- Repeat: Sets the number of times to repeat transmission of the frame. When 0 is set, repeats transmission.
- Interval: Sets the interval of time when transmitting repeatedly from 1 to 99999ms .
- Sweep: Selects On or Off of the sweep (changes continuously).
 - When it is set at On, then set the parameter which is necessary to for sweep.

- ♦Endian: Sets the storing order (Little, Big) of data for sweep.

(e.g.) Setting 0123h



- ♦Size: Selects the size of data you let sweep from 8bit or 16bit.
The lower 8 and 16bit of data being swept are set, and the upper of that is ignored.
(e.g) For SIZE: 8, if data being swept is 256 (100h), 00h is set.

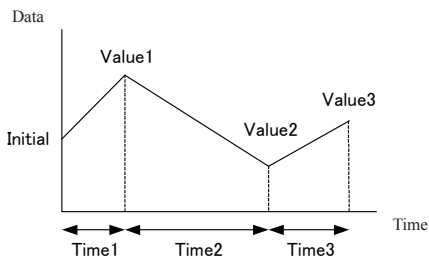
- ♦Position: Sets the position of the data field to insert data you let sweep.



At the time of Size: 16 Position: 2, sweeps the highlighted parts of data.
The data set in the Data clause is transmitted excluding the data you let sweep.
Set in the range of the number of data which has been set in the Data clause(MAX 8 bites).

- ♦Initial: Sets the initial value of the data you let sweep in a decimal number (-32768 to 65535).
- ♦Time1: Sets the time you let change from an initial value to the following target value (VALUE1).
(0 to 999999ms)
- ♦Value1: Sets the first target value(Value1) in a decimal number.
- ♦Time2: Sets the time you let change from Value1 to the second target value (Value2).
(0 to 999999ms)
- ♦Value2: Sets the second target value(Value2) in a decimal number.
- ♦Time3: Sets the time you let change from Value2 to the third target value (Value3).
(0 to 999999ms)
- ♦Value3: Sets the third target value(Value3) in a decimal number.

The relation between a target value and the time is as following.



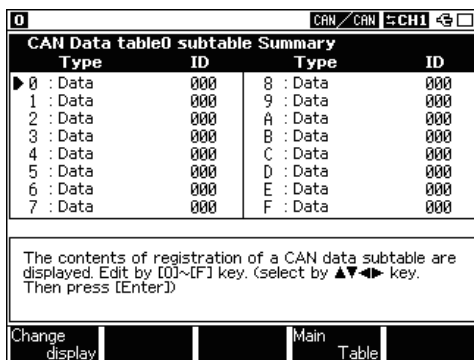
6.1.3 Sub table for CAN data (firmware Ver1.09 or above)

There are 16 tables (Table 0-F) in the CAN simulation tables as main tables, and sub tables follow the main tables described below.

Main Table	Sub Table				
Table 0	Table 0-0	Table 0-1	...	Table 0-F	Table 0 Group
Table 1	Table 1-0	Table 1-1	...	Table 1-F	Table 1 Group
:	:	:	:	:	:
Table F	Table F-0	Table F-1	...	Table F-F	Table F Group

Pressing the keys, which correspond to the main tables, also sends the sub tables up to 16 kinds after sending the main table. Configurations of sub tables include “on/off”(valid/invalid sub tables) and “delay” settings beside the same configurations with main tables. The defaults of sub tables are all “off”. If sub tables are unnecessary, use the main tables only.

To set the sub tables, select the main table number in the CAN Data table Summary, and then press [F4]. (or [Shift]+[0]to[F] key)



Select the sub table number ([0]to[F]) from the “CAN Data tableX subtable Summary” display.

[Change display]: Switch the “CAN Data tableX subtable Summary” to display Data, Type&ID or Use&Delay.

[Main table]: Return to the main table summary.

At the summary display;

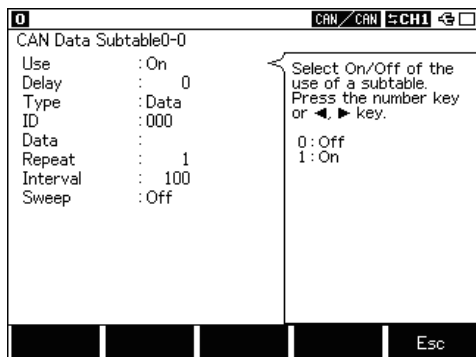
[Shift]+[F3]: Copy the data table in the inner memory.

(Copied data in the inner memory will be erased when turning off the power.)

[Shift]+[F4]: Paste the data table.

(When copying from main table to sub table; the setting will be “Use: On” and “Delay: 0”.

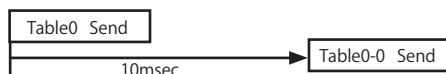
(When copying from sub table to main table; the setting of “Use” and “Delay” will be ignored.



Use: Set "On" to use the sub table.

Delay: Set the delay time (msec) to send the first frame.

For example, Delay: 10



For mode details, refer to the "6.1.2 Register transmission data".

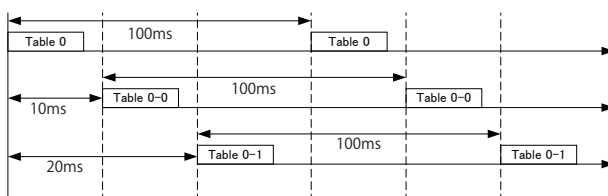
<Example of sub table>

Send Table 0, Table 0-0, Table 0-1 at specified cycle.

	Table 0	Table 0-0	Table 0-1
Use	-	On	On
Delay	-	10	20
Type	Data	Data	Data
ID	001	002	003
Data	00	01	02
Repeat	0	0	0
Interval	100	100	100
Sweep	Off	Off	Off

(Settings of Table 0-2 to 0-F are all off.)

Image of transmission timing.



0						CAN/CAN	CH1
Time	Ch (Br-Sy)	ID	Type	DL	St	Data	I1234
--:--:--	1	001	DAT	1	00		1100
00:00:010	1	002	DAT	1	01		1100
00:00:010	1	003	DAT	1	02		1100
00:00:080	1	001	DAT	1	00		1100
00:00:010	1	002	DAT	1	01		1100
00:00:010	1	003	DAT	1	02		1100
00:00:080	1	001	DAT	1	00		1100
00:00:010	1	002	DAT	1	01		1100
00:00:010	1	003	DAT	1	02		1100
00:00:080	1	001	DAT	1	00		1100
00:00:010	1	002	DAT	1	01		1100
00:00:010	1	003	DAT	1	02		1100
00:00:080	1	001	DAT	1	00		1100
00:00:010	1	002	DAT	1	01		1100

<Notice of CAN simulation>

When receiving frame from other device, the analyzer replies ACK while CAN simulation. However, the analyzer does not reply ACK when transmitting frames or no ACK reply from other node on the CAN bus. Also, it does not reply ACK when configurations of time in the multiple tables are duplicated.

The smaller table number will send data first, if duplicating the delay time with other tables.

6.1.4 Start and Stop Simulation

■ Start measuring

1. Press [Run].
2. Transmit frames by pressing the [0] to [F] keys corresponding to the transmission table.
(Transmit the sub table if it is valid.)

Press another numeral key during transmitting the frames repeatedly to transmit another frame.

3. Press the same key again while pressing [Shift] to stop the transmission.

(It stops transmitting the sub tables as well.)

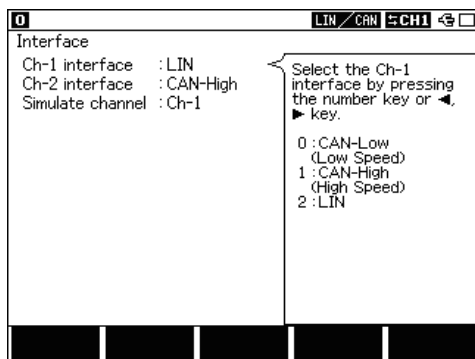
■ Stop measuring

Press [Stop].

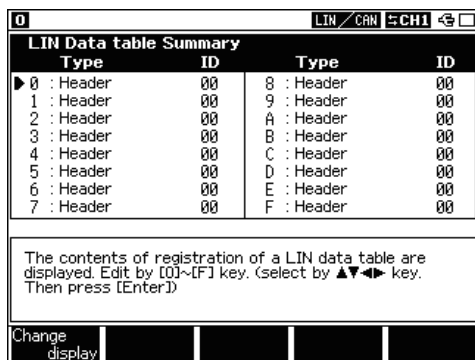
6.2 LIN Simulation

Register data in the data table and transmit it as Master or Slave simulation setting.

6.2.1 Preparation

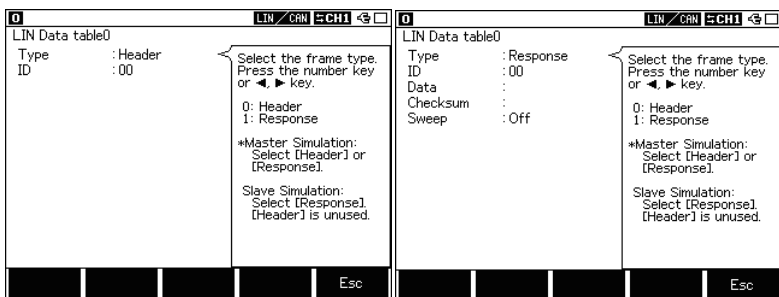


At the top menu, press [5]"Interface" and set the simulation channel that you use as LIN as interface.



At the top menu, press [9]"Data send table" and select the data table number [0] to [F] in the "LIN Data table Summary display". Up to 16 kinds of tables can be registered.

6.2.2 Register transmission table



- Type : Selects whether you send the header or the response of the frame .
As it is different with combination of a simulation mode and a type,
please look at the following table.

	Simulation Mode	
Type	Master	Slave
Header	Transmits only Header (Receives Response)	No transmission
Response	Transmits Header and Response	Transmits only Response

(The message with “*” mark is the setting for simulation mode.)

- ID : Sets ID (excluding Parity) which is transmitted at the time of the master simulation in HEX.
Sets ID (excluding Parity) which is responded at the time of the slave simulation in HEX as well.

< Attention >

At the time of a slave simulation, when ID of the table data has been set repeatedly, data with a small table number is transmitted.

- Data : Sets data up to 8 data in HEX.
- Checksum : Sets the checksum in HEX.
If it is not inputting, it is automatically calculated and transmitted, by the checksum calculation method which has been set in Configuration at the time of transmission. Moreover, by pressing [F1] , you can set the value calculated by the checksum calculation method which has been set in Configuration.
- Sweep : Selects On or Off of the sweep (changes continuously).
In the case of LIN, Sweep is started when ID is matched.
To learn more about Sweep, please read "5.1 CAN Simulation".

6.2.3 LIN Simulation mode

At the top menu, press [A] "LIN simulate" to set the configuration of Master or Slave mode.

LIN / CAN [CH1] [←] [→]	
LIN Simulation	
Mode : Master	Select the simulation mode. Press the number key or ◀ ▶ key. 0 : Master 1 : Slave Master Simulation: (F11) register the transmission table data in the schedule. Slave Simulation: Table data is transmitted at the request from master.
Synch ID space : 0	
Respons space : 0	
Inter-byte space : 0	
Frame Interval : 200	
Schedule repeat : 1	
Schedule : On	
Schedule [] [] [] [] [] [] [] [] [] []	

LIN / CAN [CH1] [←] [→]	
LIN Simulation	
Mode : Slave	Select the simulation mode. Press the number key or ◀ ▶ key. 0 : Master 1 : Slave Master Simulation: (F11) register the transmission table data in the schedule. Slave Simulation: Table data is transmitted at the request from master.
Inter-byte space : 0	
Schedule [] [] [] [] [] [] [] [] [] []	

□ Mode :

Selects a mode (Master, Slave).

□ Synch ID Space : (Master mode only)

When the master mode is selected, sets the Synch ID space (interval between SYNCH field and ID field) from 0 to 99 bit.

□ Respons Space : (Master mode only)

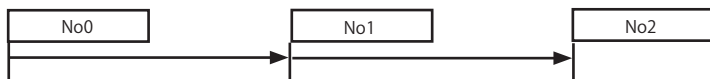
When the master mode is selected, sets the response space (interval between Header and Response) from 0 to 99 bit.

□ Inter-Byte Space :

Sets the inter-byte space (interval of each data of response) from 0 to 99.

□ Frame Interval : (Master mode only)

Sets the interval of transmitting the frame on the schedule from 3 to 99999ms.
Set the longer value than length of the frame.



□ Schedule repeat : (Master mode only)

Sets the repetition frequency of schedule (data from No.0 to F) from 0 to 99999. When 0 is set, transmits repeatedly.

□ Schedule : (Master mode only)

Select On or Off of the schedule transmit function.

On : Transmits the LIN frame set at the schedule table in the number order of the schedule.

Off : Transmits the registered LIN frame by pressing the key ([0] to [F]) corresponding to the table number.

The schedule table is set by [F1].

6.2.4 Schedule table (Master mode only)

Schedule Table		ErrorOption		
No	TableNo	Parity	Break	Synch
No0	Table0	<input type="checkbox"/>	—	—
No1	Table1	<input type="checkbox"/>	—	—
No2	-None-	<input type="checkbox"/>	—	—
No3	-None-	<input type="checkbox"/>	—	—
No4	-None-	<input type="checkbox"/>	—	—
No5	-None-	<input type="checkbox"/>	—	—
No6	-None-	<input type="checkbox"/>	—	—
No7	-None-	<input type="checkbox"/>	—	—

Select the schedule number with ▲ or ▼ key, and set the transmission table. Cursor is moved by the ◀ or ▶ key and the error setting is possible.
[0]~[F] : TableNo, [Del] : delete

Table Edit Enable ☒ Disable ☐ Esc

< Schedule table >

□ Table No :

Selects the LIN data table by [0] to [F] key in which the transmit data is registered.
Press [F1] "Table Edit" to edit the setting.

□ Parity :

Press [F2] when transmitting the parity error.
The value of the error which reversed the parity value is transmitted.
Press [F3] to add the normal parity to the transmit data.

□ Break :

When you transmit such as the error of Break field, the number of the bit is set within 0 ~ 99 bit.
It becomes 13 bit when you set nothing.
(Attention: Set the bit number, and it will be the break signal of max. 6ms.)

□ Synch :

When you transmit such as the error of Synch field, data is set in HEX.
It becomes 55 (h) when you set nothing.

[Esc] Return to the former screen.

For example; Master Simulation.

Transmits data of 2 bytes (41h, 42h) to the slave node (ID=02), then transmits the header of ID=03.

0		LIN / CAN		CHI			
LIN Data table0							
Type	:	Response					
ID	:	02					
Data	:	4142					
Checksum	:						
Sweep	:	Off					
<div>Select the frame type. Press the number key or ◀, ▶ key. 0: Header 1: Response *Master Simulation: Select [Header] or [Response]. Slave Simulation: Select [Response]. [Header] is unused.</div>							
						Esc	

(1)

Sets 2 bytes of data (41h,42h) in the LIN data table0 to transmit to the slave node (ID = 02).

Type : Response

ID : 02

Data : 41, 42

0		LIN / LIN		CHI			
LIN Data table1							
Type	:	Header					
ID	:	03					
<div>Set the frame ID (Parity is excluded). Press 0~F key or ◀, ▶ key. Range : 00~3Fh *Master Simulation: Transmission ID. Slave Simulation: Response ID.</div>							
						Esc	

(2)

Set LIN Data table1 to transmit the Header (ID=03).

Type: Header

ID: 03

0		LIN / CAN		CHI			
LIN Simulation							
Mode	:	Master					
Synch ID space	:	0					
Respons space	:	0					
Inter-byte space	:	0					
Frame Interval	:	200					
Schedule repeat	:	1					
Schedule	:	On					
<div>Select the simulation mode. Press the number key or ◀, ▶ key. 0: Master 1: Slave Master Simulation: If 1: register the transmission table data in the schedule. Slave Simulation: Table data is transmitted at the request from master.</div>							
Schedule							

(3)

Select Master mode in the LIN simulation setting.

Schedule Table				
No	TableNo	Parity	ErrorOption	
			Break	Synch
No0	Table0	<input type="checkbox"/>	—	—
No1	Table1	<input type="checkbox"/>	—	—
No2	-None-	<input type="checkbox"/>	—	—
No3	-None-	<input type="checkbox"/>	—	—
No4	-None-	<input type="checkbox"/>	—	—
No5	-None-	<input type="checkbox"/>	—	—
No6	-None-	<input type="checkbox"/>	—	—
No7	-None-	<input type="checkbox"/>	—	—

Select the schedule number with ▲ or ▼ key, and set the transmission table. Cursor is moved by the ◀ or ▶ key and the error setting is possible.
[0]~[F] : TableNo, [Del] : delete

Table Edit Enable ☒ Disable ☐ Esc

(4)

Press [Schedule] and register the table number as following.

No.0: Table 0

No.1: Table 1

Transmit data by [Run] key, if the schedule setting is On.

Transmit data table by [0] to [F] key corresponded to the data table, if the schedule setting is Off.

●Slave mode

Transmits data of 2bytes (43h, 44h) when ID from the master is 03.

There is not the schedule table for Slave mode.

LIN Data table0	
Type	: Response
ID	: 03
Data	: 4344
Checksum	:
Sweep	: Off

Select the frame type.
Press the number key or ◀, ▶ key.
0: Header
1: Response

*Master Simulation:
Select [Header] or [Response].

Slave Simulation:
Select [Response].
[Header] is unused.

Esc

Set items as follows:

Type: Response

ID: 03

Data: 43, 44

Transmit data when receiving a request from Master after pressing [Run] key.

6.2.5 Start and Stop LIN Simulation

■Start measuring

Notice: Cannot supply 12V from your analyzer. Please make sure you supply external Vbat.

<Master Simulation>

1. Press [Run].
2. When the schedule is “On”, it transmits data in the order from a small number of the schedule number for the number of time, which has set on “Repeat”.

When the schedule is “Off”, it transmits data by pressing [0] to [F] key corresponding to the schedule table.

<Slave Simulation>

1. Press [Run].
2. Transmit the data table when it receives a request of transmission from the master and also matches ID set at the LIN table data. (Data does not transmit without a request from the master.)

<Wake-Up>

Transmit “80h” as a wake-up signal by pressing [End/x] key and transmit dominant for 0.25usec or more (*) by pressing [Top/Del] key while simulation.

* It is supported on firmware Ver1.07 or above. Dominant time stands for a total of 0.25usec or more per a bit as a communication speed.

■Stop measuring

Press [Stop].

Chapter 7 Use of Data

7.1 Finding Data

Using the FIND function make it possible to search for specific data.

Displays the measured data and press [F5]"Find setup". Then press [F5] for forward search or press [Shift]+[F5] for backward search. (At the data display screen, press [E] for forward search or press [F] for backward search.

Factor

Item	Meaning
Trigger	Searches for data which matches the trigger condition.
Error	Searches for the error . (Break, Sync, Parity,Checksum, Framing) At "Traget", search channels (Selectable of Both , Ch-1 , Ch-2).
Data	Searches for the specific data frame. Able to set a reception channel, ID, and the contents of a data field. (*1) (Settable for Don't care and a bit mask)
Remote	Searches for the specific remote frame of CAN. Able to set a reception channel and ID. (Settable for Don't care and a bit mask)
Time stamp	Searches for a time stamp. (*2) Able to specify the range of time for search (Min time , Max time).
External	Searches for logic conditions of external input(IN1 ~ 4).

*1: Checksum cannot be searched for LIN. To learn more about setting of ID, read "Chapter 4 Trigger".

*2: It is available only when time stamp resolution is set as "HMS" or "MS1ms" in the "Record Control".

Action

Item	Meaning
Display	Displays data which matches the search condition at the head of LCD.
Count	Displays the number of times which matches the search condition.

7.2 Printing Data

Recorded data and the setting contents can be printed as the following format.

<e.g. Printing Result of Measurement>

```
*=[LE-8200]=====[2008-09-01 16:17:07]=*
*  CH1 PROTOCOL: CAN                      *
*    BAUDRATE:250k                        *
*  CH2 PROTOCOL: LIN                      *
*    BAUDRATE:9600                        *
*=====*

---TM-----CH-----ID--TYPE--DLC-ST-----DATA-----FC--|1234
024.586.298  1      123 DAT   5  G  3031323334      651A 1111
024.686.301  1      123 DAT   5  G  3031323334      651A 0111
024.693.020  2 13-55-33 FRM      4142434445464745 DC  1111
024.711.763  2 13-55-10 FRM      4142      7C  1111
024.736.134  1      234 REM   5  G      CA1C 1111
024.786.303  1      123 DAT   5  G  3031323334      651A 1111
024.868.026  2 13-55-33 FRM      4142434445464745 DC  1111
024.886.306  1      123 DAT   5  G  3031323334      651A 1111
```

<e.g. Printing Result of CAN Transmission Table>

```
*=[LE-8200]=====[2008-08-02 15:57:02]=*
* CAN DATA TABLE                      *
*=====*

--TYPE-----ID--DATA/DLC-----REPEAT-INTERV-ENDIAN-SIZE-POS
0:DATA      010 4142434445464748      1  100
1:EXDATA    12345678 3132333435363738      0  10 LITTLE 16  2
   V0= 182 T1= 10000 V1= 19998 T2= 20000 V2= 32100 T3= 30000 V3= 108
2:REMOTE     321 DLC=2      1  100
3:EXREMOTE  12345678 DLC=0      0  100
4:DATA       000      1  100
5:DATA       000      1  100
6:DATA       000      1  100
7:DATA       000      1  100
8:DATA       000      1  100
9:DATA       000      1  100
A:DATA       000      1  100
```

<e.g. Printing Result of LIN Transmission Table>

```

*=[LE-8200]=====[2008-08-01 15:10:57]=*
* LIN DATA TABLE *
*=====*

--TYPE-----ID--DATA/DLC-----C--ENDIAN-SIZE-POS
0:HEADER      00
1:RESPONSE    01  0102              03 LITTLE  8  0
    V0=  0 T1= 1000 V1=  15 T2= 1000 V2=  0 T3= 1000 V3=  15
2:RESPONSE    3C  0000000000000000 FF
3:RESPONSE    03  0102              LITTLE 16  0
    V0=  0 T1=999999 V1= 65535 T2=999999 V2=-32768 T3=999999 V3= 65535
4:HEADER      00
5:HEADER      00
6:HEADER      00
7:HEADER      00

```

Chapter 8 Specification

Item	Content
Interface of Measurement	CAN : ISO11898 conformity / ISO11519-2 conformity (selectable with relay) (Dsub9pin connector × 2) LIN : ISO9141conformity (3 line probe cable × 2)
Transceiver	CAN : TJA1050 / 1054 equivalent LIN : TJA1021 equivalent
Measurement Channel No.	2 channels(both CAN, both LIN, or one CAN and one LIN)
Protocol	CAN : Ver. 2.0 B LIN : Rev. 1.1 / 1.2 / 1.3 / 2.0 / 2.1
Communication Speed	CAN : Max. 1Mbps LIN : Max. 26Kbps (*1)
Monitor Function	ID filter and time stamp (Resolution: 1s (*1), 1ms, 100us, 10us, 1us) are available for each channel. CAN : Supports the Standard and Expand format. The bit timing can be set. LIN : The communication speed can be set.
Simulation Function	The data which was registered in advance can be sent by pressing the key. (Sending data continuously is available while the part of data is changing automatically.) CAN : By using the trigger function, the response for receiving the specific frame is available. LIN : Master and Slave mode are available. Sending the schedule is available in the master mode.
Trigger Function	Condition : Specified Data (up to 8 characters can be specified), Specified Remote Frame, Error, Value of Timer and Counter, External Trigger Input Action : Measurement Stop, Saving to a Memory Card, Timer Control, Counter Control, Sending the specified data, Buzzer, Validation or Invaliddation of trigger condition.
External Signal Input	It is possible to display the condition of the external signal input of 4 channels in real time by lightning the LEDs. Saves it as the digital and the analog value with the measured data. The signal voltage can be measured continuously. (The measurement range : from -15 to +15 %)

Dsub9pin connector

*1: Firmware version 1.07 or above.

Pin Number	Signal Name	Meaning
1	--	
2	CAN Low	Bus signal of CAN (low)
3	SG	Signal ground
4	--	
5	FG	Frame ground
6	--	
7	CAN High	Bus signal of CAN (high)
8	--	
9	IN	General-purpose input (*2)

*2: When this pin is used as the external power pin, the power condition of this analyzer can be checked through it's LEDs(ER LED to Ch1, DR LED to Ch2) .

Header 3 pin connector

Probe Cable	Signal Name	Meaning
Lead wire of red	Vbat	9-18V
Lead wire of blue	LIN_Bus	Bus signal of LIN
Lead wire of black	SG	Signal ground

< Attention >

Do not input the voltage over 24V in this analyzer.

Header 8 pin connector

External I/O cable	Signal Name	Meaning
Lead wire of black	GND	Signal ground
Lead wire of brown	TRG IN	External trigger input
Lead wire of red	TRG OUT	External trigger output
Lead wire of orange	IN1	General-purpose input1
Lead wire of orange	IN2	General-purpose input2
Lead wire of orange	IN3	General-purpose input3
Lead wire of orange	IN4	General-purpose input4
Lead wire of black	GND	Signal ground

There is a registration page on our web site.

(<http://www.lineeye.com>)

Please register your product for further support.

We will provide you the firmware update
information and sales information etc.

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