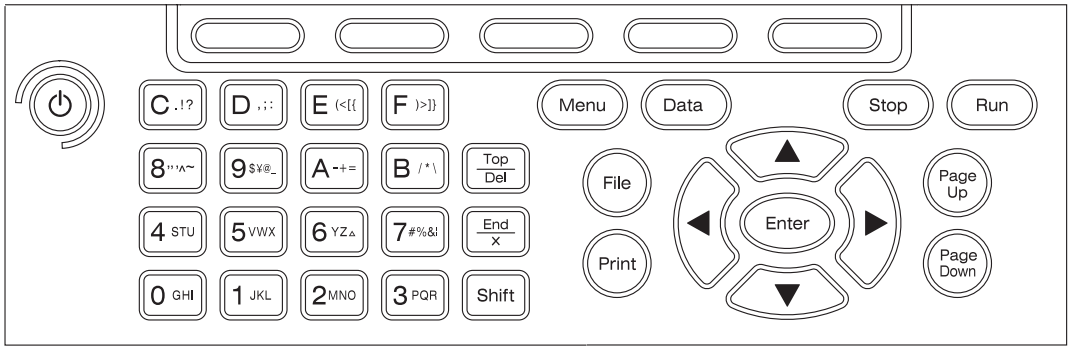
LINEEYE

MULTI PROTOCOL ANALYZER

LE-8200/LE-8200A

Users Manual



Instruction

Thank you for your purchase of LE-8200/LE-8200A.

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 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.

FIRMWARE

Download the firmware file for analyzer from our web site, and update your analyzer to the latest version by the included utility CD.

WEB SITE: https://www.lineeye.com

= = = Notice = = =

This product uses a battery.

LINEEYE does not charge the battery to be full because of the quality reasons.

Please do the full charge before starting the analyzer.

Please consider to recycle the disused battery.

When you throw away the battery, follow your city rules.

<Ver. 9 2020.08>

Safety Information

Read this first !!

This Safety Information includes the following important information in order to not only have you learn the right way to use the analyzer, but also prevent you from causing damage to people and property. Before using, please read the main contents after you understand the following 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 *1, and material damage *2 occurring.

*1 "injury" indicates injury, burn and electric shock, or the like which does not require hospitalization or the extended hospital visit.

*2 "material damage" indicates damage related to a house, a building, furniture, apparatus, livestock or a pet.

 Prohibition

 The necessary

⚠ Warning	
	• 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.
	• Stop using the analyzer when a liquid or foreign substance get into the analyzer. This may result in an electrick shock or fire. ➔ Immediately switch off the analyzer and unplug it.
	• 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.
	• Do not put the analyzer in fire ,place near the heater or place near the inflammable gas. This may result in a injury and fire due to overheating or explosion.
	• Stop using the analyzer should a liquid or foreign substance get into the analyzer. This may result in an electrick shock or fire.
	• Never plug or unplug the AC adapter in wet hands.
	• Do not subject the analyzer to extreme conditions.
	• Do not use AC adapter except for the one our company designated . This may cause of exothermic reaction and ignition and leak, troublean.
	• Do not use Battery adapter except for the one our company designated . This may cause of exothermic reaction and ignition and leak, troublean.
	• Do not touch the AC adapter of cables when out-breaking the thunder. This may result in an electric shock.

⚠Warning

• Do not leave the analyzer in the following conditions.

Strong magnetic field, static electricity or dusty place.

Temperature and humidity above the specification or where dew condensation appears.

Not flat, or shaking place.

Place with leaking water or electricity.

Place affected by direct sun or near the fire .

Please do not leave the analyzer in the car during the summer.

Remove the battery from the analyzer, when you throw away.

⚠Caution

●Please follow the instruction for the AC adaptor.

Use the AC adapter only under the condition of AC range 100V to 240V.

Do no use when it brakes.

Do not damage the AC adaptor or cable.

Do not place near the heater or put in the fire.

Do not disassemble, modify the AC adaptor or cable.

Do not curve the cable around the AC adaptor.

Do not exceed the rating of plug socket and wiring accessory (the octopus foot wiring).

Plug the AC adaptor correctly.

Take off the dust from the AC adaptor.

Unplug the AC adaptor when you are not using the analyzer.

Unplug the AC adaptor correctly.

Contents

Chapter 1 Before Using the Product

1.1 Guide to This Manual

Descriptions in this manual assume the following:

Screen Display Representation

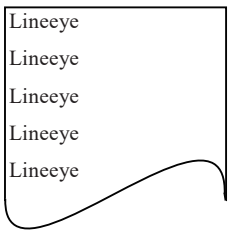
Printed representation of screen displays in this manual may not be the same as the actually displayed concerning the font and special symbols.

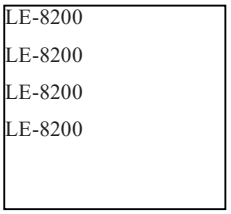
Descriptions of parts of the screen are enclosed in double quotation " ".

Flashing of the cursor or the like is not represented in this manual.

Pictures of the screen display may not be the same as the actually displayed concerning the color.

Printed representation of screen displays are something like below:





Representation of the Operating Procedure

Successive key operations may be represented by putting their symbols one after another.

e.g.) Press [Menu], then press [0] to make a selection. ->Press [Menu][0] to make a selection

Pressing two keys at the same time is expressed by combining their symbols with "+".

e.g.) Press [Shift] and [Print] at the same time. -> Press[Shift]+[Print] to make a selection.

Unpacking

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

■ Damage Check

The product has not been damaged during transit.

■ Standard Accessories

You have received all the standard accessories listed below.

□ Protocol Analyzer	1
□ Interface Sub-board A (attached to the analyzer)	1
□ Hand Strup (Already mounted)	1
□ Wide input AC Adapter (Model : 6A-181WP09)	1
□ DSUB 25pin Monitor cable (Model: LE-25M1)	1
□ AUX Cable (Model: LE2-8V)	1
□ Line State Sheet (JIS)	1
□ External signal I/O cable(LE-4TG)	1
□ Utility CD	1
□ Carrying bag (Model: LEB-01)	1
□ Registration card, Warranty	1
□ Instruction Manual (This book)	1

Please let us know if you find any damage to the product caused by transportation, or if there are accessories lacking.

Standard Set

■ Utility CD

This CD contains the following:

Manual folder	: Instruction manuals for analyzer and options.
Utility folder	: Utility programs.
	le8firm.exe : Program to transfer firmware of analyzer.
	LE-PC800G (light version): Limited function version of PC link software LE-PC800G (commercial version) for Windows.
Driver folder	: USB driver for analyzer.

1.3 Major Functions and Features

LE Series are handheld communication protocol analyzers. They are powerful tools for the development and inspection of communication systems devices, and for the diagnosis of communication networks.

Functions

This product comes standard with two interfaces for both RS-232C (V.24) and RS-422/485 (RS-530). It can be connected to various types of transmission lines by using optional interface sub-boards.

◆ On-line Monitoring

Monitors communication protocol or the transmission data on-line to check for existence of hindrance in the line or to analyze the communication.

◆ Simulating

Executes operating transmission of data as communication partner for tested devices/equipment.

◆ Bit Error Rate Test

Evaluates the quality of the data communication channel, including modems.

Features

- ◆High-Speed Communication (Max. 4Mbps)
- ◆Various monitor/analysis capabilities to multi-protocols
- ◆Program simulation as a standard function
- ◆Expandability to communicate through various interfaces

(X.20/21, RS-449, V.35, Current Loop, TTL, I2C, SPI, CAN, CAN FD, CXPI, LIN, FlexRay, LAN, USB)

- ◆AUTO SAVE function which can continuously save and record measured data into CF cards
- ◆Record data in the USB flash drive .(LE-8200A only)
- ◆Useful timing waveform measurement function at the time of timing trouble regarding bit unit
- ◆Generate waveform measured by the Timing waveform function.(LE-8200A only)
- ◆Battery-powered, light-weight (Approx. 1.1kg) and compact design for field application, 4 hours battery.

Optional Accessories

Optional accessories expands the use of analyzer.

Following "options" do not come as standard set.

◆Interface Sub-Board B

By exchanging an interface sub-board for another, various protocols can be corresponded to and measured.

- OP-SB84 For USB
- OP-SB85L For TTL/I2C/SPI
- OP-SB85C For Current Loop
- OP-SB87 For CAN/LIN
- OP-SB87FD For CAN/CAN FD / CXPI
- OP-SB89E For LAN(2ch) Ether CAT
- OP-SB89 For LAN (PoE)
- OP-SB89G For Gbit LAN (PoE)

◆Dedicated Cable

- LE-25TB Exchanging Dsub25 pin connector for terminal block
- LE-25Y15 Monitor cable for X.20/21
- LE-25Y37 Monitor cable for RS-449
- LE-25M34 Monitor cable for V.35
- LE-259M1 Monitor cable for Dsub 9 pin

◆Dedicated Firmware

- OP-FW12G Firmware for high-speed communication (HDLC)
- OP-FW12GA Firmware for high-speed communication (HDLC / SPI / PROFIBUS / ASYNC)

◆CF Card

It can be used for saving measured data and set-up conditions, and for continuously recording for a long time.

- CF-128GX 128GB CF Card
- CF-64GX 64GB CF Card
- CF-32GX 32GB CF Card
- CF-16GX 16GB CF Card
- CF-8GX 8GB CF Card
- CF-2GX 2GB CF Card

◆Compact Thermal Printer

- DPU-414-PA Portable, handy and battery-driven thermal printer.
-

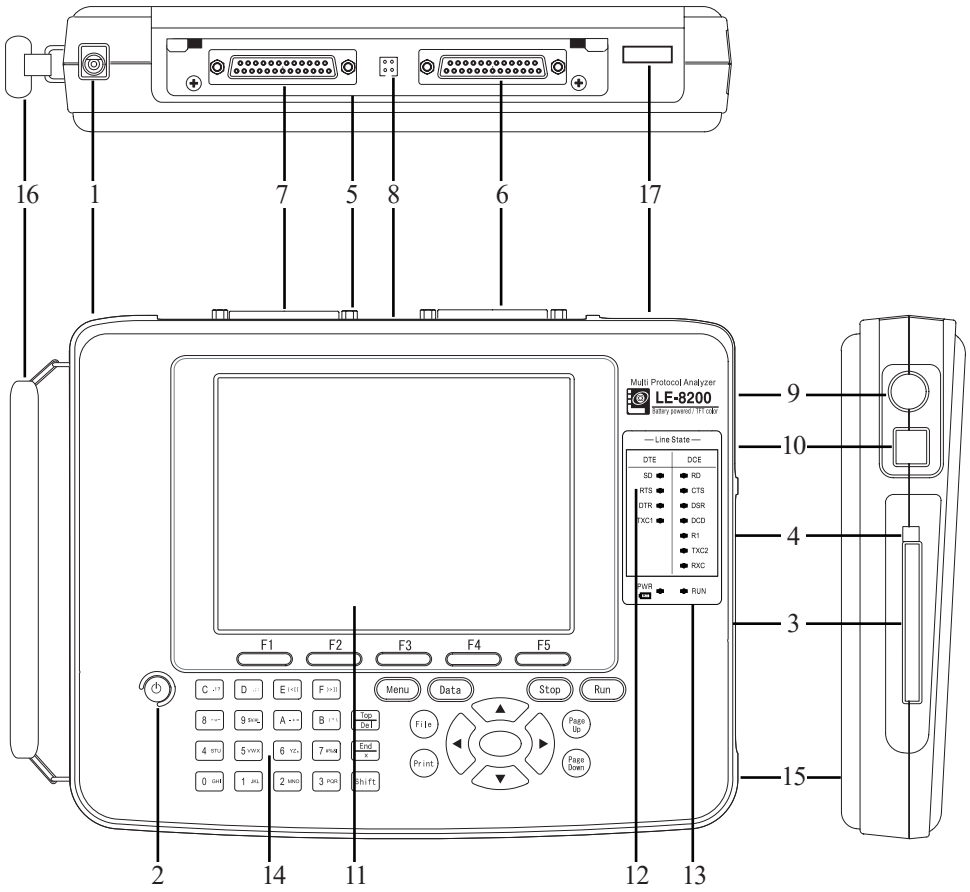
◆Software

- LE-PC800G Software for liking measurement between analyzers and a PC (for Windows).
  (For interface sub-boards, OP-SB85L, OP-SB85C and OP-SB85IR.)
- LE-PC87 Software for liking measurement between analyzers and a PC (for Windows). (Only for OP-SB87.)

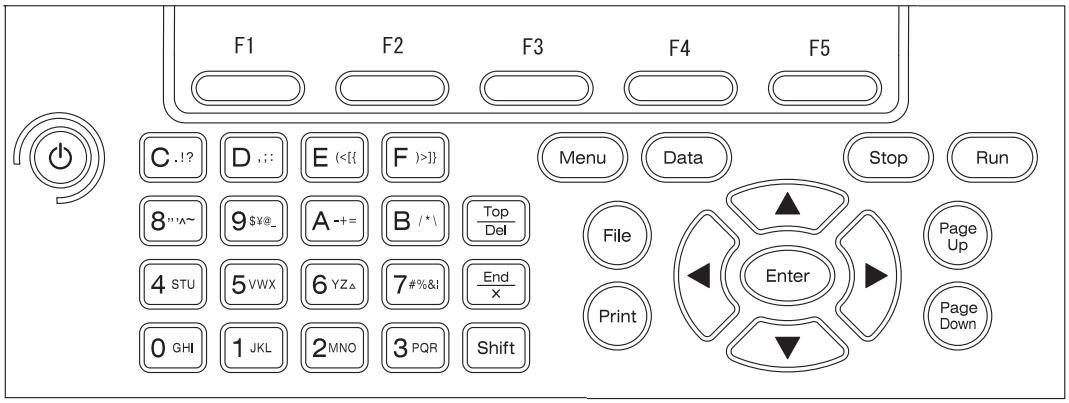
  LE-PC87FD Software for liking measurement between analyzers and a PC (for Windows). (Only for OP-SB87FD.)

1.4 Panel Information

General



Name		Functions
1	AC adapter plug	Connects the AC adapter, which serves as a battery charger.
2	Power Switch	Turn the power on/off
3	CF Card Slot	The inlet for a memory card.
4	CF Card Eject Button	Press to remove a memory card.
5	Interface Sub-Board	A sub-board equipped with RS-232C and RS-422/485(RS-530) interface.
6	RS-232C Port	Measurement port for RS-232C(V.24)
7	RS-530 Port	Measurement port for RS-422/485(RS-530)
8	External Signal I/O terminal	Connects the supplied external signal I/O cable.
9	AUX(RS-232C) Port	Used to input or output external equipped with RS-232C interface.
10	USB Port	USB when connecting to a USB port.
11	Liquid Crystal Display	Wide view angle and high contrast liquid crystal display TFT color LCD.
12	Line State LED	Indicates the logical status of RS-232C signal line.
13	Run State LED	Indicates the status of an analyzer's operation
14	Keypad	Press to enter commands and data.
15	Battery Cover	Open only when replacing the nickel-hydrogen battery.
16	Hand Strap	Use to hold the product.
17	USB Host Port	Use when using a USB flash drive .(Only for LE-8200A.)



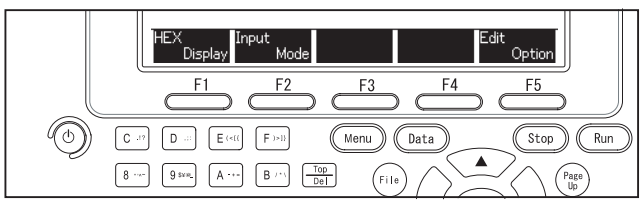
■ Explanation of Keypad

Key	Function
Power Switch	Turns ON/OFF the power of an analyzer. *Even you turn OFF the power while setting conditions, the conditions will be saved.
F1 - F5	Function Key
Run	Starts monitoring, measuring or testing operation.
Stop	Stops monitoring, measuring or testing operation. Interrupts printing.
Data	Display monitored/measured data.
Menu	Returns to the top menu for selecting functions and setting conditions. *By pressing [MENU], it returns to the sub menu screen under each setting of the sub menu.
Page Up	Goes to previous data. Moves the setting items upward.
Page Down	Goes to next data. Moves the setting items downward.
File	Open a list of file.
Print	Load the measured data to a printer.
▲▼	Scrolls the displayed data per one line. Moves the cursor.
◀ ▶	Scrolls the displayed data per one character. Moves the cursor.
Enter	Definite input for execution of function or a command.
0 - F	Enters the corresponding numerical value. Selects an item number or the data to be sent.
Top/Del	Displays the top section of data. Deletes the setting data indicated by the cursor(on setting).
End/X	Displays the bottom section of data. Enters data "don't care" and " mask".
Shift	For use of the expanded alternate function of each key.
Shift + Print	Print screen image or save to CF card or USB flash drive.
Shift + PageUp, PageDown	Adjust contrast. (PageUp: bright PageDown dark)
Shift + 0-F	Select a pre-set data for transmitting data.

■ Function Keys

There are five function keys under the LCD. (F1 --> F5)

Description of each function key will be appeared on the bottom of LCD. (Press [Shift] for more functions)



For example

F1 : Change display (HEX,CHAR)

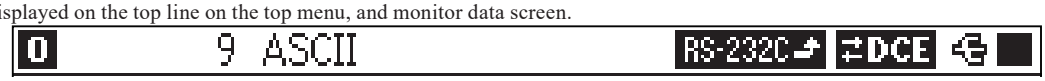
F2 : Change input mode

F3, 4 : None

F5 : Edit option

■ LCD Display

The LCD displays the measurement conditions, the monitored data and the measured results. The following information is displayed on the top line on the top menu, and monitor data screen.



(1) (2) (3) (4) (5) (6) (7)

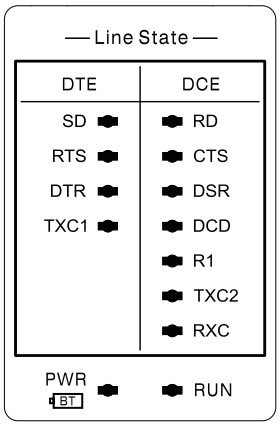
Position	Display	Meaning
(1)	0	A buffer memory is not divided.
	1	A buffer memory is divided into two parts, with former half (BUF1) is inserted.
	2	A buffer memory is divided into two parts, with the later half (BUF2) is in use.
(2)	0-*	Displays data position.
(3)	ex. ASCII	Displays data code
(4)	RS-232C	RS-232C port is in use.
	RS-530	RS-530 port is in use
(5)	Mon	You can use Monitor function
	DTE	You can use Simulation/BEAR function. Analyzer positions DTE.
	DCE	You can use Simulation/BEAR function. Analyzer positions DCE.
(6)		USB host port / USB device port are in use. Red circle appears when accessing to a USB flash drive .(KE-8200A only)
(7)		Memory card is inserted. Red circle appears when accessing to a USB flash drive .

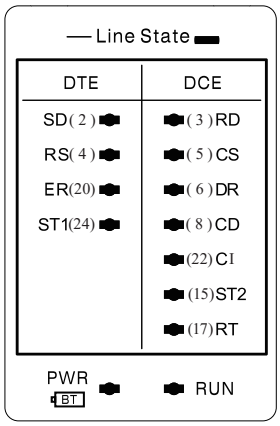
■ Line State LED (changeable)

Line State LEDs indicate the logical status (voltage level) of the INPUT/OUTPUT data on the signal lines connected to the measurement port in real time. There are two groups: DTE drive signal and DCE drive signal.

There are two kinds of line state sheets for RS-232C: World wide use and JIS (Japanese Industrial Standard)

10.2Ports





☜ Line state sheet for world wide use is already set in the analyzer. (left picture)

Can be used for RS-530

☜ Line state sheet for JIS (Japanese Industrial Standard) comes as standard set. (not set in the analyzer). (right picture)

Signal names and pin numbers are for RS-232C.

■ Line State in This Manual

Line state in this manual uses the world wide use (above left picture). (Line state in the analyzer as well)

10.2Ports

■ Changeable LED sheet

When you change the interface sub-board to the optional expansion kits, the meaning of line state of LED will be different. Please insert the another line state sheet which comes with the optional expansion kits.

■ Correspondences between signals and LEDs

The correspondences between signals and LEDs are shown in the following table;

Voltage Level on the Signal Lines		Two-Color LED	
RS-232C	RS-530	Red	Green
+3V≤VM	VA-VB>+0.2V	Light on	Light off
-3V<VM<+3V	VA-VB<+0.05V	Light off	Light off
VM<-3V		Light off	Light on

VM: Voltage of RS-232C VA: Voltage of RS-530[A]
VB: Voltage of RS-530[B]

■ LED Indicator

The run state LEDs indicate the operating status by lighting and light-out of the analyzer.

LED	Status
PWR(BT)	Green lighting : Power ON Green blinking : Battery warning (Batteries are almost dead) Red blinking : Recharging batteries Red lighting : The charge is completed Red high-speed blinking : Charging error (indicates the battery deterioration or disconnection)
RUN	Green lighting : Monitoring, Measuring test Red lighting : Running a timing wave monitor test

1.5 Power Supply and Battery

This analyzer can perform AC power operation by attached AC adapter, and battery drive by built-in rechargeable battery. The measurement conditions is backed up by the battery even if the power supply is OFF.

Attached AC Adapter

AC adapter which is universal AC input spec is attached.

Input :90VAC - 264VAC (Rating 100VAC - 240VAC), 50/60Hz

Output :9VDC±5%, 2.0Amax, Center Plus

Safety :PSE, UL, CUL, CCC, CE

NOTICE

- Certainly please use the AC adapter of the attachment.
- Please be aware of the polarity of AC adapter

  The AC adapter for our past analyzer (ex. : LE-7200,LE-3200,LE-2200,LE-1200) are Center Negative.

  Please do not use the AC adapter with Center Negative.

Our Past Analyzers

LE-8200 / LE-8200A

Recharging the Battery

The Nickel-Hydrogen battery is built into, and can perform the battery drive of about 4 hours (LINEEYE's set-up conditions) with the full charge.

1. Plug the attached AC adapter into an AC power outlet.
2. The battery is recharged by connecting the plug of AC adapter into the AC adapter jack of analyzer, and PWR LED will blink in red slowly.
3. The charge is completed when PWR LED lights in red.

- It will take about two and half hours to be full charge after turning off the power. It may take about more time while turning on the power.
- When you have low battery, PWR LED will be blinking green while turning on the power.
- If PWR LED is blinking green very fast, it means the battery is not being charged. It is caused by the snapping of the wires or battery degradation. Please have a new battery.
- Charge the battery under the environment of 5 ℃ - 40℃.
- Use the AC adapter which comes as the standard set.
- When you use the analyzer for long hours, please use it with AC adapter. (The analyzer may not run for four hours because of the degradation of the battery.)

■ Lithium Battery

The data of memory IC and timer IC is backed up for about 10 years by built-in Lithium battery even if the power supply is OFF.

■ Nickel-Hydrogen Battery

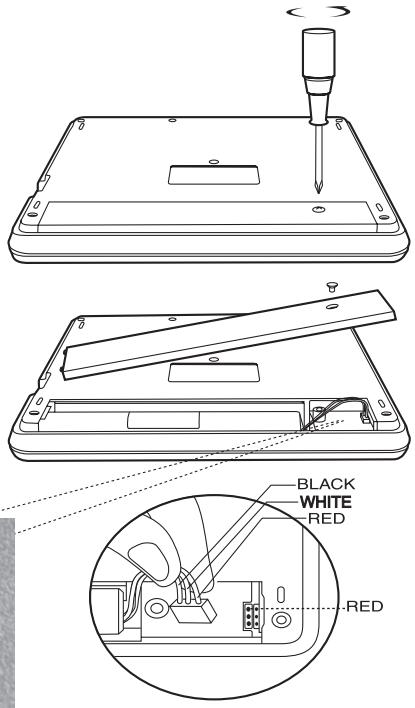
In a usual state of use, about 300 times charge and electric discharge use is possible, but if the battery can no longer drive your analyzer, or the service time after charging becomes extremely short, the battery must be replaced with a new one. (When you replace the batteries, turn OFF the power.)

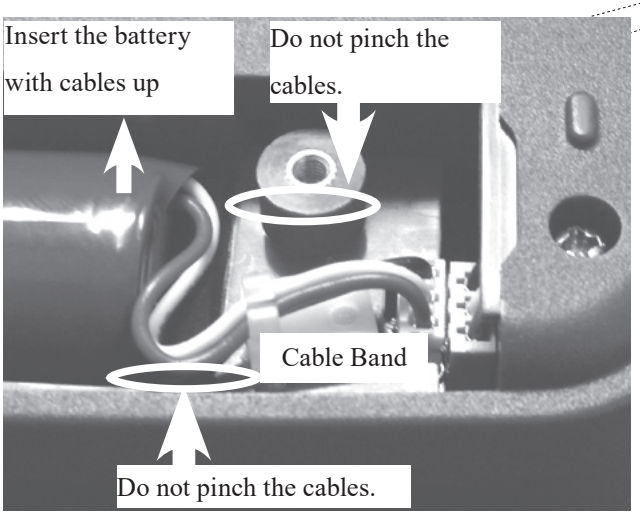
1. Remove the battery cover from the bottom of your analyzer. Disconnect the connector of the lead line on the battery and remove the battery.
2. Connect a new battery to the connector and set it in the battery holder. Put back the battery cover and tighten screws with great care so that the lead line is not pinched.

- If you are not going to use the analyzer for a long term, fill up the battery before finishing it. After that, try to charge the battery every 6 month.
- Purchase a new Nickel-Hydrogen battery (P-20S) from LINEEYE's distributor.
- New orders for batteries have to be paid even if it is still during warranty period because batteries are considered consumable parts.

⚠ NOTICE

When you insert a Nickel-Hydrogen battery in the analyzer, hold the cables together using the cable band. Please do not let cables out of the caver. It will damage the cables and cause a product breakdown.





1.6 Hand Strap

You are able to put and remove this hand strap.

Put on the hand strap

Hand strap is already set in the analyzer when you purchase.

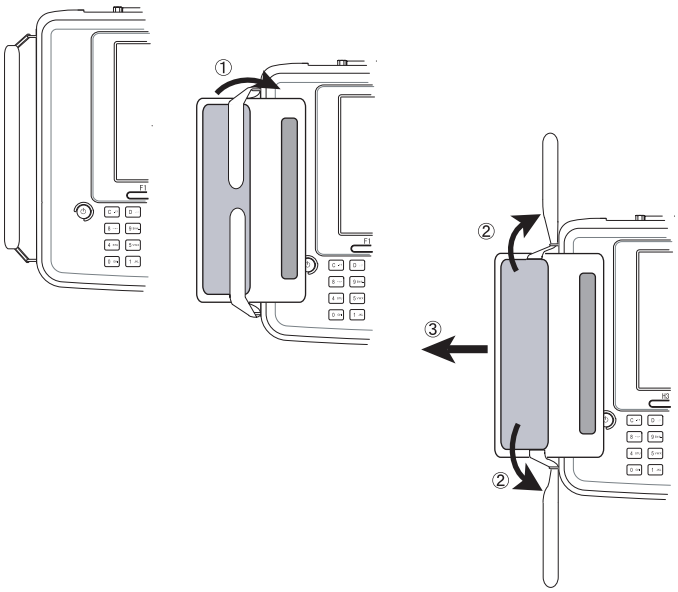
<Remove the hand strap>

1) Open the Velcro.

2) Remove the belt.

3) Remove the hand strap from the analyzer.

Reverse the process when putting on the hand strap.



⚠ NOTICE

Put each magic tapes of the belt in the hand strap for 3cm or more.

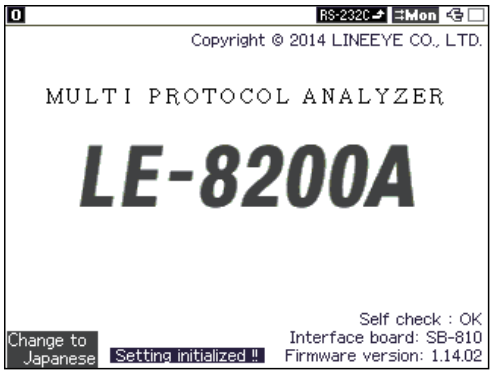
Chapter 2 Basic Operation and Set-Up

2.1 Power Source ON/OFF

Power Source ON

Turn on the power. (Press left side button.)

- Power on and self-check



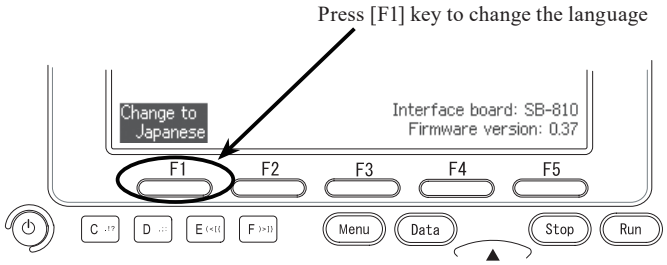
Your analyzer performs a self-check, including a memory and an internal circuit check. According to the results of those results, the following messages are displayed on the opening screen.
Normal : "Self check : OK"
Abnormal : "Self check : NG"

- If an abnormality is found, contact LINEEYE or the dealer that you purchased the product from.
- If the green light of PWR LED is blinking, it means there is not enough battery. Please use the AC adapter.

- Contrast

  If the contrast of the screen is too deep or too light, press [Shift]+[PageUp] or [PageDown].

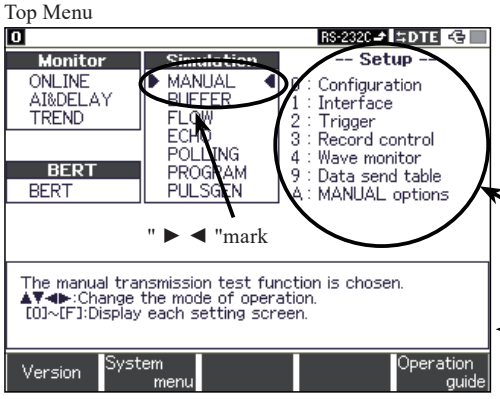
Language of Guide (Japanese/ English)



When you turn on the power, opening screen is appeared. Press [F1] to change the language of guide display. You can select Japanese or English. (default- English)

Selecting the Functions

- Top Menu



There are three main functions (Monitor, Simulation, BEAR) in this analyzer.

Select the function from top menu. You can go to the top menu by pressing [Menu] key, unless you are not measuring.

Set-up window

Sub Window

Guide Display (Sub Window)

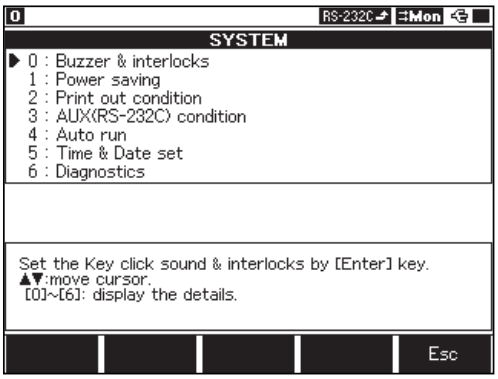
Guide display (sub window) may appear in some setting display.
Guide display explains setting items and tells the range of setting items etc.

- Guide display explains the item which is pointed by arrow (" ▶ ◀ ", [▶], [◀]) or cursor.

Version Information

You can check the version information from top menu -> [F1] "version".
Please check the version information when you need to upgrade the firmware etc.

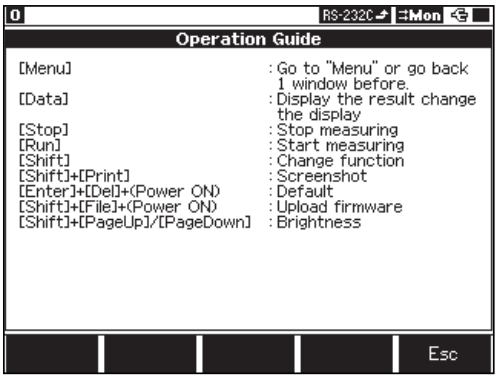
System Menu



From top menu, press [F2] "System menu". Move " ▶" to the appropriate setting number and press [Enter]. (or press the number key)

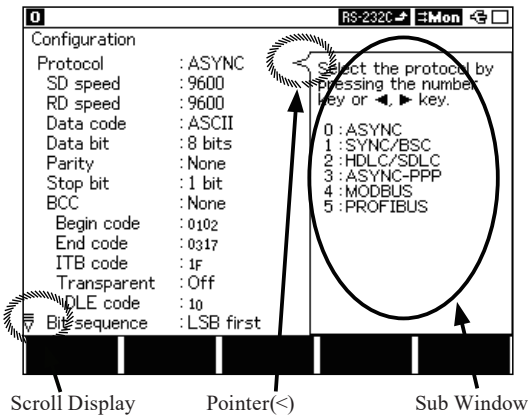
2.5 Environmental Setting

Operation Guide



Operation Guide appears by pushing top menu -> [F5] "operation guide".
It tells you the general purpose of each key.

■ Setting Change



The function which is selecting by "▶ ◀" is what you are selecting right now. (Press [Run] to start measuring.)You can move "▶ ◀" by pressing [▲], [▼], [◀], [▶] key.The items in the set-up window will be different if you select another function by "▶ ◀".

Setting Display (ex.: Configuration)

2.2 Interface Setup
Chapter 4 Simulation
Chapter 3 Monitor
Chapter 5 BERT

■ Functions and Items.

1). Select a function from Monitor, Simulation or BERT by "▶ ◀". Select an item in the set-up window by [0]-[F] key.

2). When you select an item (press [0]-[F] key), setting display will appear. There will be a list of setting items in the left and a sub window in the right. Move [▲], [▼] to go to another items.

An arrow will be displayed if you have more setting items in the left. bottom. Move [▲], [▼] to scroll the screen.

Function / Items	Monitor			BERT	Simulation						
	ONILNE	AI&DELAY	TREND	BERT	MANUAL	BUFFER	FLOW	ECHO	POLLING	PROGRAM	PULSGEN
0:Configuration	●		●	●	●	●	●	●	●	●	●
1:Interface	●	●	●	●	●	●	●	●	●	●	●
2:Trigger	●		●		●					●	●
3:Record control	●	●	●	●	●	●	●	●	●	●	●
4:Wave monitor	●		●	●	●	●	●	●	●	●	●
5:Auto Configuration	●										
6:AI&DELAY options		●									
7:TREND options			●								
8:BERT options				●							
9:Data send table					●		●		●	●	
A:MANUAL options					●						
B:BUFFER options						●					
C:FLOW options							●				
D:ECHO options								●			
E:Polling options									●		
F:Program edit										●	
F:PULSGEN options											●

This is setting item utilized in each function (Monitor,BERT,Simulation).

Certainly according to the test object interface, set the measurement port([MENU] ->[1]"Interface").

Connection to the test object

Connect the port of the test object to that of the analyzer. Previously select the analyzers port at " Port" item of [1]" Interface".

2.3 Connection Method

Starting Measurement

Pressing [Run] executes the function selected.

The RUN LED is turned on. Then, data will be held in a capture buffer, displaying the screen of each function executed.

If you set "Capture Buffer Protect", "Auto Start/Stop" or "Logging function for a long time", the massage, "Write protect", "Auto run wait" or "Auto save file exists" will appear.

Press [F5] "Pause display" to stop displaying the data temporarily. Press [F5] again to start displaying the data.

2.5Environmental Setting 6.5Logging Function for a Long Time 6.6Automatic Start and Stop Function

Stopping measurement

To stop measurement, press [Stop]. After stopping measurement, the RUN LED will be turned off.

Use of Measured Data

Data held in a capture buffer comes in useful for retrieval function, print out, and report creation on your computer as analysis.

Chapter 6 Useful Functions Chapter 7 Printing Function Chapter 8 Saving and Loading Data

- Scroll

  [◀],[▲] [Page Up] Scrolls/Paging to forward (old data).

  [▶], [▼], [Page Down] Scrolls/Paging to backward (new data).

- Jump

  [Top/Del] Jumps to the front (the first position) of data which was saved in capture buffer.

  [End/×] Jumps to the back (the last position) of data which was saved in capture buffer.

- Retrieval

  Press [F5]" Find setup" to set the retrieval function.

6.10 Retrieval Function

Power Source OFF

Turn off the power. (Press left side button.) You may need to press 2-3 seconds.

When you turn off the power, measured data will not be saved (setting conditions will be saved). If you need to save your measured data, save in the CF card. (option)

In the case of turning off during measuring, preservation of data is not guaranteed.

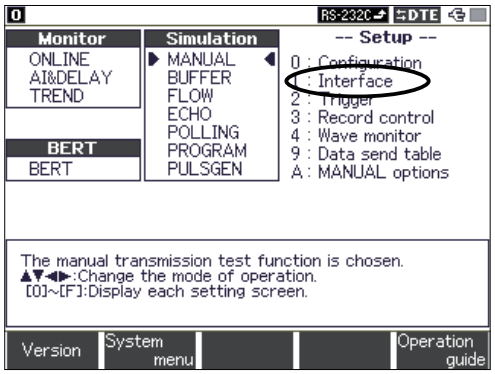
⚠Caution

When you cannot control the analyzer with key and cannot power it off by pressing Power key for some time, take off the battery cover and disconnect the battery connecter without AC adapter. Connect the battery connecter again and turn on the power.

1.5 Power Supply and Battery

A measurement port and its mode can be selected, and control of the control line can be set.

When a measurement port is selected, setting items varies depending on what expansion board is put on your analyzer (Here explains the attached sub-board).

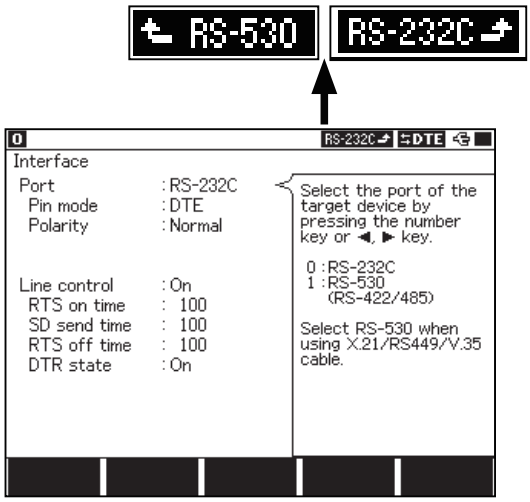


From top menu, press [1] "Interface" in the set-up window.

■ PORT (Selecting a Port to Measure)

Select "port" to be "0:RS-232C" or "1:RS-530(RS-422/485)".

When you select a port, "RS-232C" or "RS-530" will appear in the upper right of the screen.



Interface setting

Select "RS-530" when using X.21/RS-449/V.35 cables (option).

■ Pin mode (DTE/DCE Switch)

You can change the measurement port to be DTE and DCE from “Pin mode”menu.

When monitoring is executed, setting this is not necessary. Only when simulating is executed, setting this correctly is required.

Input/output of signals will change adjusting setting.

■ Polarity (Polarity Switch)

Signal polarity of SD/RD line data can be set. Select “0: Normal”or “1: Invert”.

e.g.) RS-232C

	Normal	Invert
Idle State	Mark	Space
Start Bit	Space	Mark
Character Bit (Logic 0)	Space	Mark
Character Bit (Logic 1)	Mark	Space
Parity Bit (Logic 0)	Space	Mark
Parity Bit (Logic 1)	Mark	Space
Stop Bit	Mark	Space

In "Invert", all the signal polarity of including the idle state of the line is inverted.

"NORMAL" is selected for the ordinary use.

■ V.35 mode (V.35 Setting, Select "Port" to be "RS-530")

In order to use V.35 monitoring function/simulation function, set “On".

A dedicated cable (LE-25M34) is required.

In order to use monitor/simulation function of RS-422/485 (RS-530), set "Off".

■ Driver control (Controlling Drivers)

When selecting "RS-530" port, select how to control the RS-485 driver IC.

Off :Always active

Manual :Manual control

Auto :Auto control

4.1 Preparation for Simulating

■ Half-duplex sim (Half-duplex simulation)

It can control the display of the result of Half-duplex simulation when selecting RS-530.

Off: It displays normally.

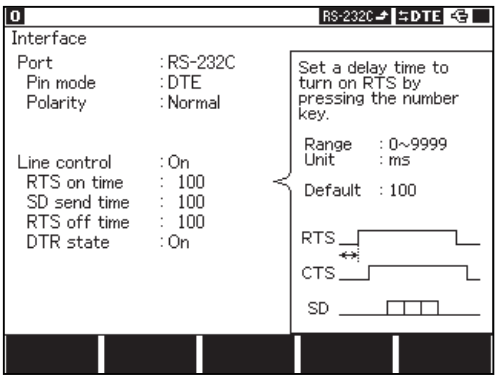
On: It displays the send data on the SD side and the received data on the RD side when it is DTE.

And it displays the send data on the RD side and the received data on the SD side when it is DCE.

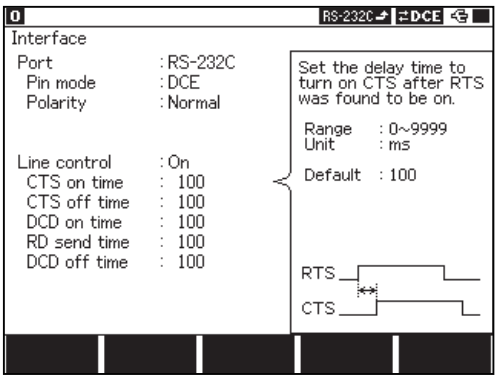
■ Line control (Controlling the Control Line)

While simulating, the control for control line can be set.

4.1 Preparation for Simulating



Pin mode is DTE



Pin mode is DCE

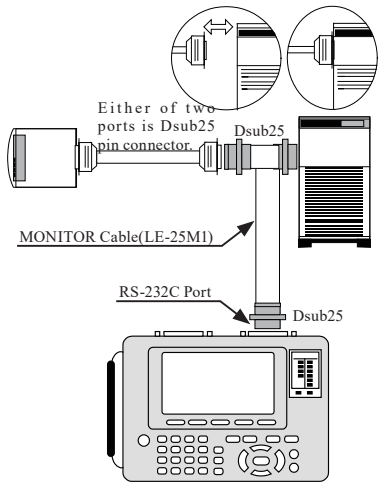
2.3 Connection Method

Connection in the RS-232C communication

On measuring the communication of RS-232C(V.24), select "RS-232C" of "Port" item in "Interface"setting screen.

2.2 Interface Setup

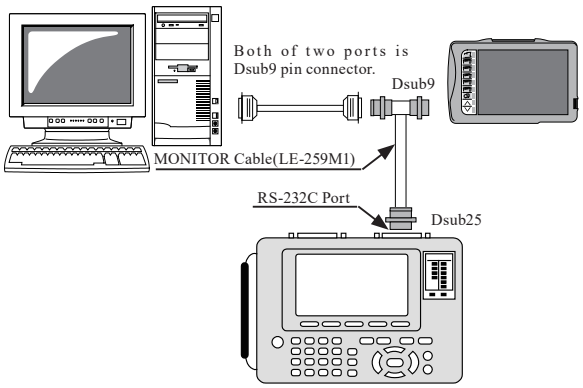
■ On monitoring test object



Connect the monitor cable of the attachment to the Dsub25 pin connector of the RS-232C cable in which communication data of the monitor object is flowing, in the form which is made to intervene the communication.

[Connection diagram of LE-25M1] (pin number) .

Dsub25pin male	Dsub25pin male	Dsub25pin female
(1)	(1)	(1)
(2)	(2)	(2)
(3)	(3)	(3)
(4)	(4)	(4)
.		
. (All connections of same pin numbers)		
.		
(24)	(24)	(24)
(25)	(25)	(25)



If both sides of RS-232C cable are Dsub9 pin connector, use the monitor cable for Dsub9 pin (LE-259M1).

Connection diagram of LE-259M1 () is pin number.

Dsub25pin male	Dsub9pin female	Dsub9pin male
(8)	(1)	(1)
(3)	(2)	(2)
(2)	(3)	(3)
(20)	(4)	(4)
(7)	(5)	(5)
(6)	(6)	(6)
(4)	(7)	(7)
(5)	(8)	(8)
(22)	(9)	(9)

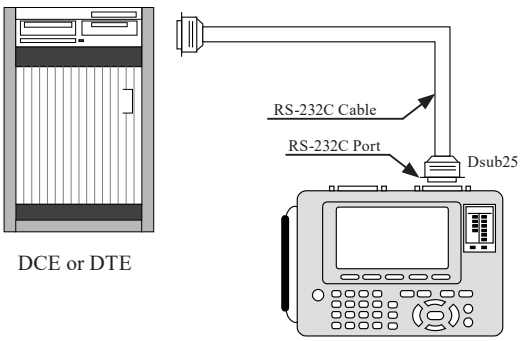
■ On transmitting and receiving (simulating) test data

Connect the analyzer to the test object equipment at the one-to-one.

According to the specification DTE or DCE of the test object equipment and that of RS-232C cable, connect the cable as follows

DTE equipment -----Straight connection cable -----This analyzer(DCE)
DCE equipment -----Straight connection cable -----This analyzer(DTE)
DTE equipment -----Cross connection cable -----This analyzer(DTE)
DCE equipment -----Cross connection cable -----This analyzer(DCE)

2.2 Interface Setup
10.2 Ports



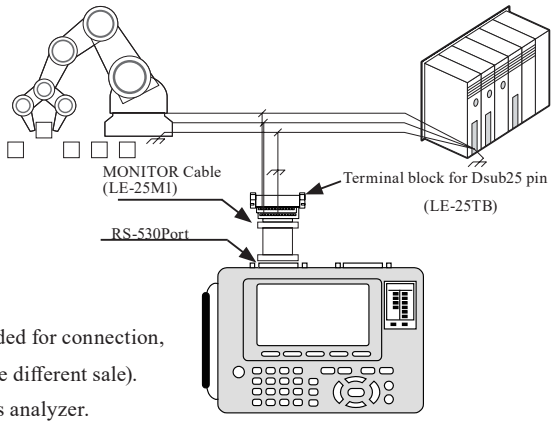
⚠ Caution	Do not connect the RS-232C device to the RS-530 port by mistake when measuring, because the standard of RS-530 connector is DSUB 25-pin connector as well as RS-232C. Especially, if the RS-232C device that allocated power supply of more than 6V to its undefined terminal is connected to the RS-530 port, it becomes the cause of malfunction, so please do not connect by any means.

Connection in the RS-422 or RS-485 communication

On measuring the communication of RS-422/485, select "RS-530" of "Port"item in "Interface"setting screen.

2.2 Interface Setup

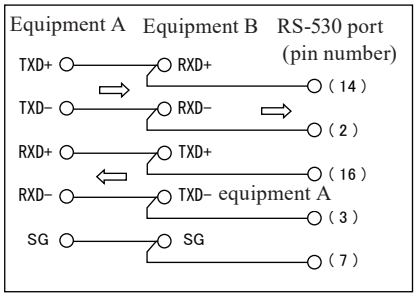
By confirming the signal constellation, when the object line of RS-422/485 is connected in the connector or the terminal block of the original specification, connect the appropriate cable in the equilibrious transmission pair line and the RS-530 port of this analyzer.



Prepare the cable with Dsub25 pin connector and lead lines added for connection, or the terminal block for Dsub25 pin connector LE-25TB on the different sale).

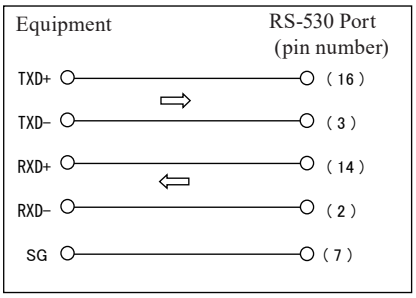
Connect SG of test object equipment to that of this analyzer.

■ On monitoring RS-422 communication between the equipment A and B



Sent data from Equipment A is measured on SD side, and Received data of that is measured on RD side.

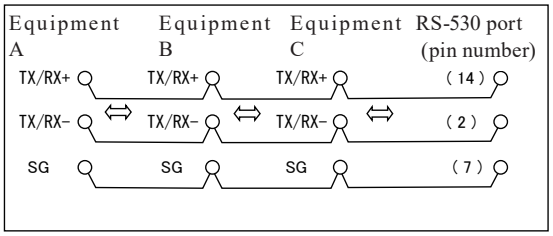
■ On testing(simulating) communication in the equipment of RS-422



Set RS-530 port of this analyzer to DTE mode.

Set the terminal resistance "On" between 3 and 16 pins of this analyzer.

■ On monitoring communication or testing (simulating) transmission / reception of RS-485



This analyzer is connected as one of the RS-485 nodes on RS-485 of the half communication.

When this analyzer is connected with the termination of the line(the left figure), you should set the termination resistance between 2-14 pins of RS-530 port "On," and that of equipment C "Off".

The sent and received data are measured on the side of SD in this analyzer

On connecting in other interfaces

To measure RS-530, X.20/21, V.35, RS-449, you should select "RS-530" from top menu -> [1]"Interface" ->"Port" in this analyzer, and use the exclusive cable.

On connecting in RS-530, you can use the cable of the attachment(LE-25M1).

If you measure TTL/I2C/IrDA/CAN/LIN/USB2.0 that needs the optional kits, read the instruction manuals.

10.1 Specifications of Function and Hardware

10.2 Ports

Input character:

■ Operation

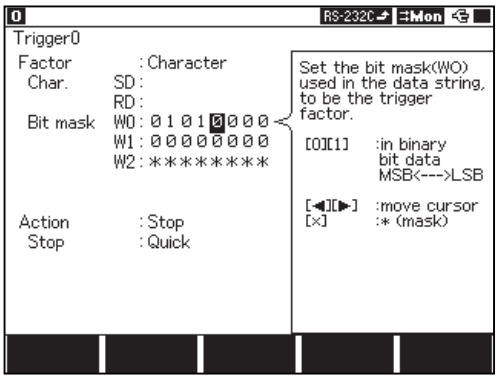
Move cursor to a place to input using [◀], [▶]. The input space is the place which the cursor is blinking at. When you input data in the middle of existing data, the characters are inserted. As inputting is continued, the cursor is automatically moved to next space. When you edit/correct the inputted data, move the cursor to the space to be corrected using [◀], [▶]. Press [Top/Del] to delete data.

An input is executed with HEX or character.

<Example>

• Binary Input (for Trigger)

Input data in [0], [1] or [×].



Example)

From top menu, move "▶ ◀" and find "2: Trigger" in the setup window.

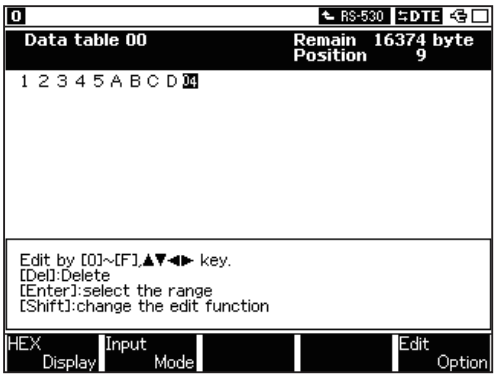
Press [2] to go to trigger setting window.

Press [0] (or move cursor to "0" and press [Enter]) and set the trigger condition "0" (Trigger 0). (left picture)

• HEX Input (edit data table)

From top menu, move "▶ ◀" and select "9: Data send table" in the setup window.

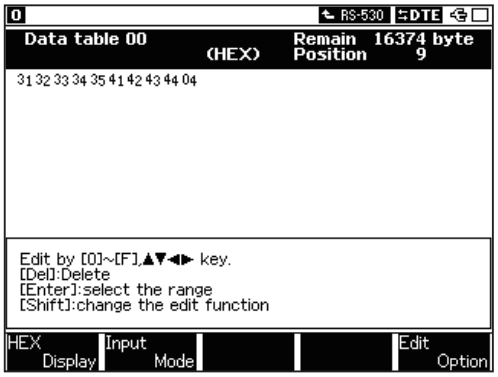
Push [0] (or move the cursor to "0" and push [Enter]), and go to the data table.



HEX input / CHAR display

You can input data in Hex and display them as characters. When you type data, it automatically changes to assigned data code which you set in the "Configuration".

e.g.) ASCII
Key Input [4] ⟶ [1]
Data Display ⟶ 04A (41)

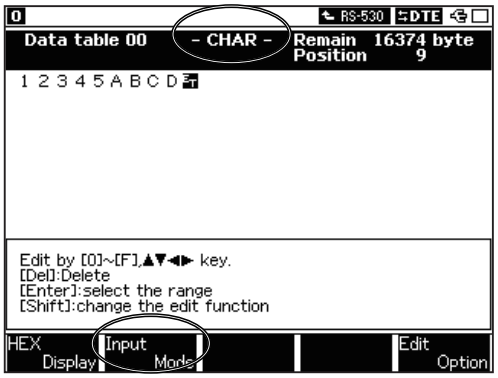


Push [F1] to change to HEX display.

HEX input / HEX display

● Character Input (when editing data table)

Push [F2]"Input Mode" and input data in characters default is HEX.



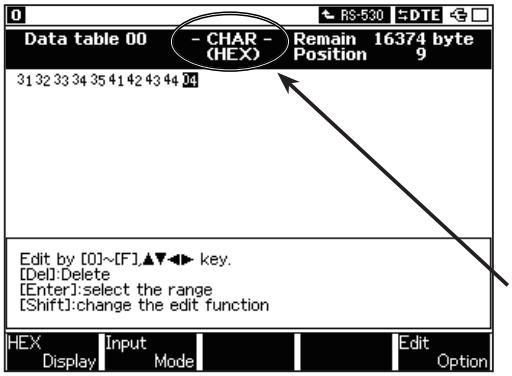
When you input data in characters, "-CHAR-" is displayed in the top of the screen.

Each key has a chaptal alphabet or some alphabets printed on the button.

e.g.)[0GHI]

→"0"→"G"→"H"→"I"→"g"→"h"→"i"

CHAR input / CHAR display



Press [F1] to change to HEX display.

Input mode (above).

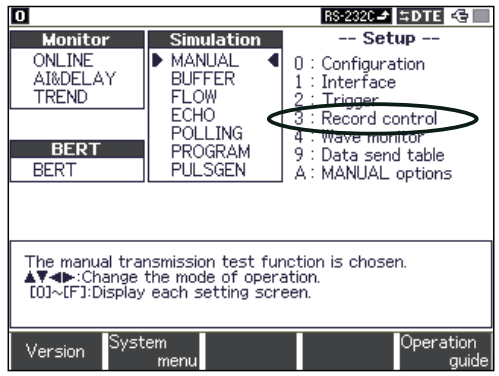
Display mode (bottom).

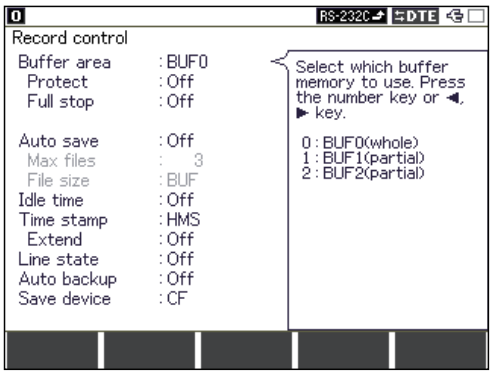
CHAR input / HEX display

2.5 Environmental Setting(Record control, System)

Set the environmental conditions("Record control" and "SYSTEM") required to operate your analyzer .

Record Control





Record Control

Select "Record control" from top menu → [3].

◆ Following conditions can be set in the "Record control".

Item	Description
Buffer area	Set whether or not divide the buffer memory
Protect	Protect data in the capture buffer and cannot overwrite.
Full stop	Set the ring buffer.
Auto save	Save monitored data in the memory card automatically.
Idle time	Measure and record the idle time.
Time stamp	Measure and record time when receiving the top of each frame.
Line state	Select whether or not measure the control lines.
Auto backup	Set Auto save function to save in the capture buffer when stopping the measurement.
Save device	Select a device to save a file of Auto save/ Trigger save / Auto backup.

- Set the condition of capture buffer from "Protect", "Full stop", "Auto save" and "Auto backup" for recording measured data. Target area is selected ad "Buffer area".
- Set the additional information to put in the data from "Idle time", "Time stamp" and "Line state". Measurement and recording data will correspond to the setting of additional information. These additional information cannot be edited/ erased after the measurement.

6.12Recording Function to Measure Additional Information

■ Buffer area (Buffer Partition)

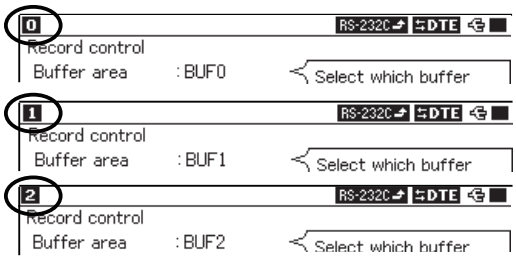
Whether a memory is used as one capture buffer or two capture buffers can be selected.

BUF 0:BUF0 can be used as one capture buffer.(100Mbyte)

BUF 1/2:When BUF1 or BUF2 is selected, the capture buffer is divided into two and then they are measured separately.

(50Mbyte each)

4 bytes will be consumed from memory every reception (not only SD and RD data but also attribute data like error information and so on will be recorded).



Buffer area will be displayed in the left top.

■ Protect (Buffer Protection)

This is function to prevent the data stored in the buffer memory from being inadvertently overwritten.

Off : Press [Run] for measuring again, or load the file data from a memory card. Then the old data in the capture buffer will be distinguished and the new data will substitute for it in the memory.

On : The data in the capture buffer will be protected from [Run] of operation or the loading a file of that that is not intended.

The write-protect can be set for each capture buffer partition.

■ Full stop (Ring Buffer Setting)

This function selects the operation when the capture buffer is full.

Off : Data will be overwritten from the beginning of capture buffer. In short, old data will be deleted.

On : The operation will stop as soon as a memory capacity, in capture buffer partition set on "Buffer area" function, is full.

■ Auto save (Logging Function for a Long Time)

This function saves data being measured onto a memory card.

Max files : :The number of files to be saved. (1 to 2048)

File size : File size. (Buffer size, 1, 2, 4, 8, 16, 32, 64 Mbyte)

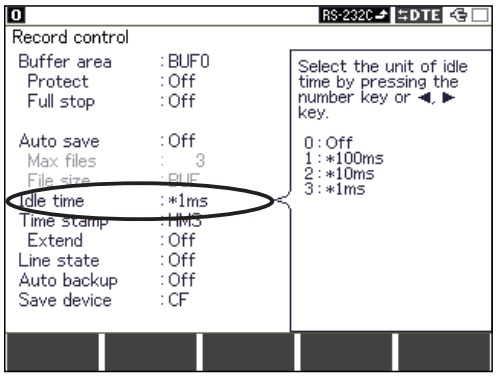
If selecting the file size, target area is selected at "Buffer area".

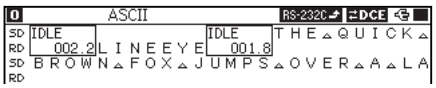
6.5 Logging Function for a Long Tim

■ Idle time (Idle Time Display Function)

The time, when SD and RD keep non-communication status and a changeless status of a signal line, is recorded in the capture buffer. It will be displayed with receipt data.

6.12 Recording Function to Measure Addition Information





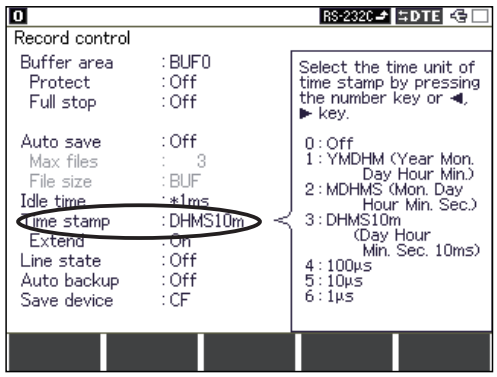
Measurement Display

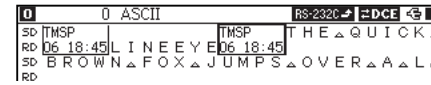
Time Resolution : 100ms (0 to 999.9S), 10ms (0 to 99.99S), 1ms (0 to 9.999S)

■ Time stamp (Time Stamp Function)

The time, when the head of characters of each frame running through the communication channel is received, is recorded in the capture buffer and displayed.

6.12Recording Function to Measure Additional Information





Measurement Display

Record setting : Off (no timestamp), YMDHM (year , month, day, hour, minute), MDHMS (month, day, hour, minute, second), DHMS10m(day, hour, minute,second,10ms), DHM , HMS , MS 10m , 100µs (Elapse time from beginning of measurement in 100µ), 10µs (Elapse time in 10µ), 1µs (Elapse time in 1µ).

■ Line state (Control line display selection)

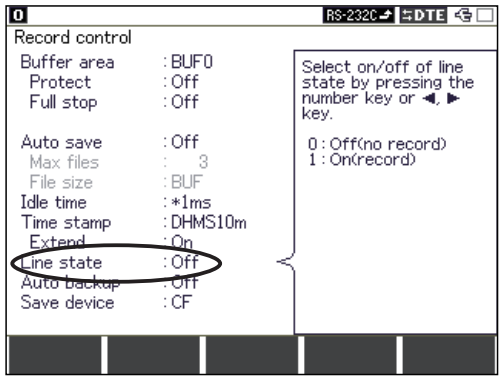
Select whether or not have line state display. It will be displayed in the Line state display.

Press [F3]: "Line state display" while measuring to display the line states along with the measurement data.

7 kinds of line state (RTS, CTS, DCD, DTR, DSR, RI, TRG) can be displayed.

"TRG" processes the external input and the control lines simultaneously by using the attached external signal I/O cable.

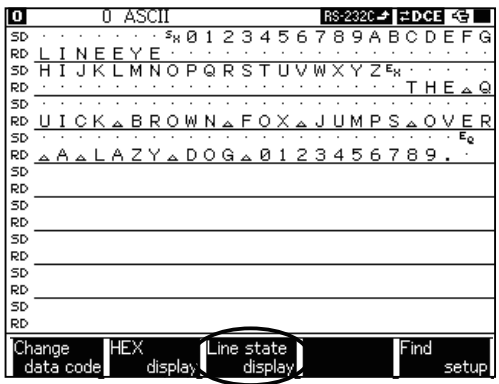
6.12Recording Function to Measure Additional Information



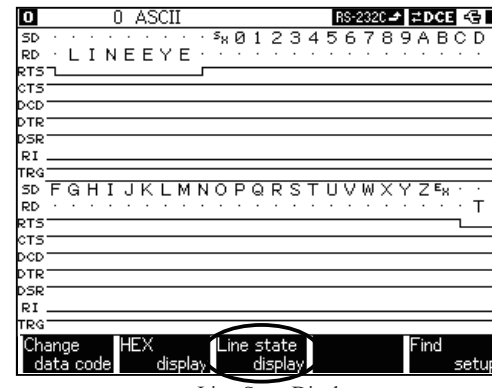
Display:

Off(Do not display line states)

On(Display line states)



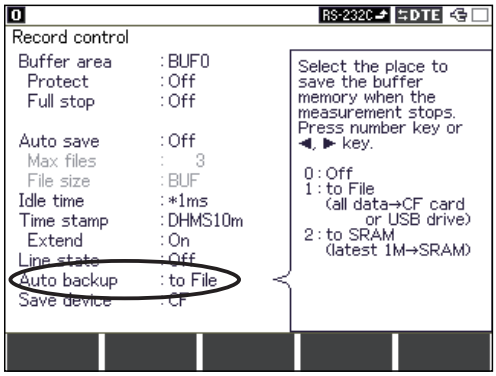
Measured Data Display

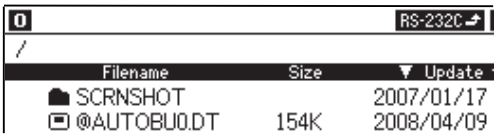


Line State Display

■ Auto backup

Automatically save the data in the capture buffer when you press [Stop] key.





Saved file(when "to File" is selected).

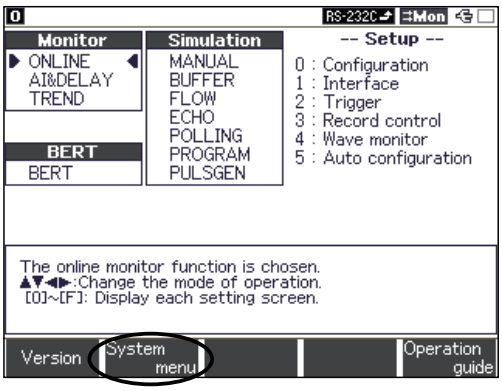
■ Save device (LE-8200A only)

Select "CF" card or "USB" flash drive to save Auto Save file, Trigger save file, or Auto back-up file.

Cannot use the USB flash drive when connecting LE-8200A and PC through the USB port.

System Menu

System menu allows the setting of date(time) and print out conditions etc.

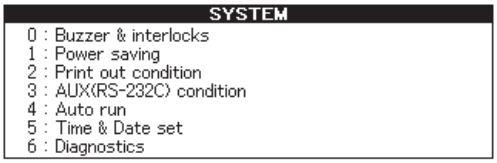


Go to "System menu" from top menu ➔ [F2]

System menu has following items.

Item		Description
0	Buzzer & Interlocks	On/off of buzzer, setting of [RUN] button, setting of operation when battery is low, and on/off of locks for simulation function and BURT function.
1	Power saving	Sets power saving functions.
2	Print out condition	Select printing conditions and an output port. Chapter 7 Printing Function
3	AUX (RS-232C) condition	Sets AUX(RS-232C) communication conditions. 6.13 Use of Data on your PC
4	Auto run	ON/OFF of the automatic start stop function. ON/OFF of automatic RUN for start and end time and the time power supply started . 6.6 Automatic Start and Stop Function
5	Time & Date set	Sets time and date.
6	Diagnostics	Executes diagnostics.

Press the item number (or move " ▶" to item number and press [Enter]) and go to each setting screen.



Buzzer & interlocks

Set ON/OFF of buzzer and ON/OFF of measuring when low battery.

■ Key click sound

On :Have key click sound

Off :No key click sound

Buzzer for trigger action can be set in the trigger function.

6.1 Trigger Function

■ Run key check

Start measuring by pressing [Run] once or twice (a message appears when pressing [Run] first time).

On : Need to press [Run] twice (a message appears when pressing [Run] first time)

Off : Need to press [Run] once (no message appears)

It may avoid accidentally starting measurement to overwrite the previous data.

■ BT RUN lock (Operation of while battery warning is active)

Even while battery warning is active, whether or not measuring operation can be selected.

On : Measurement is not possible during battery warning appearing.

Off : Measurement is possible even during battery warning appearing; However, connecting the AC adapter is required.

Stop : Measurement stops when battery warning appears.

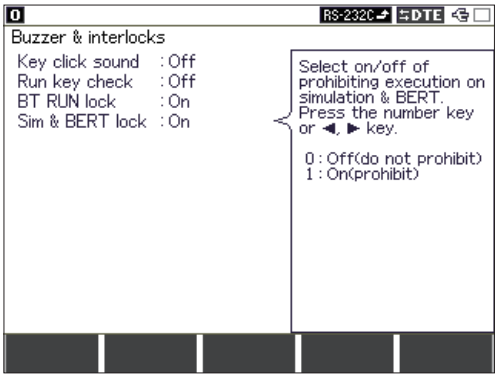
■ Sim & BURT lock (Permission of simulation function and BURT function)

Select permission of the simulation function and BURT function.

ON :Permit the simulation function and BURT function.

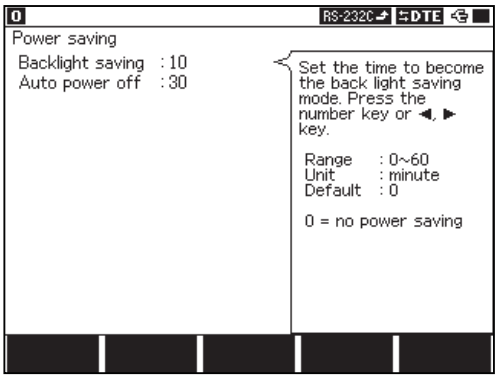
OFF :Prohibit the simulation function and BURT function.

This function is to avoid incorrect operation of the simulation function and BURT function which may affect the line.



Power Saving

Set the amount of time to turn off the backlight and the power.



Backlight saving:

Turn off the backlight if there is no key operation for setting time (0-60 minutes)

If you set "0" in the "Range", this function will not work.

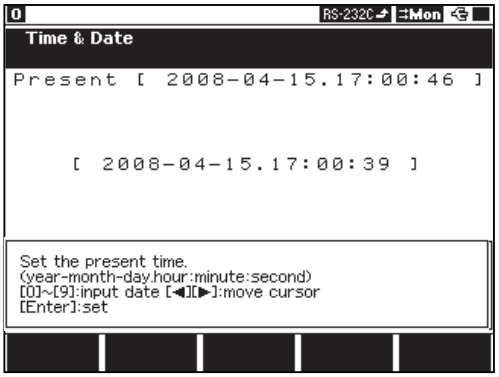
Auto power off:

Turn off the power if there is no key operation or communication from the target devices for setting time (0-60 minutes).

If you set "0" in the "Range", this function will not work.

Time & Date set (Setting Time and Date)

The following procedure should be followed in order to set the built-in clock.



1. The current time and the date are displayed in the first line on the screen.
2. Move the cursor to the flashing figure to be changed with[◀], [▶].
3. Input with [0] to [9].
4. The date is displayed as year/month/day, and time is displayed as hour: minute:second.
5. Press [Enter] to set the new value.

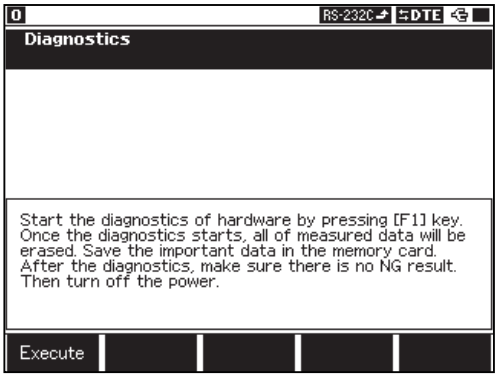
When you abort the clock setting, press not [Enter] but [Menu] in order to go back to the top menu screen.

When the Appointed Time Automatic Start and Stop Function is used, make sure the current time and the date are inputted correctly.

Diagnostics

To have the diagnostic, follow the description on the screen of analyzer .

Try this function if facing some problems, such as problems on measuring.



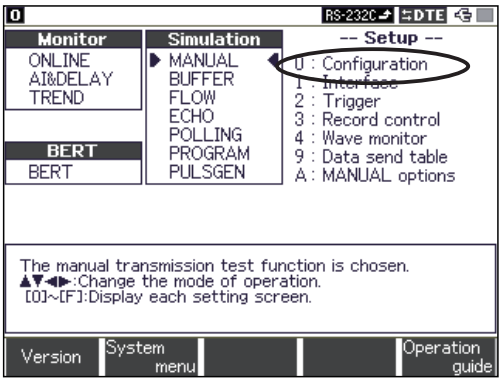
The diagnostics test following items. If the diagnostics complete testing without any problems, "======OK======" will be displayed on the bottom line of screen.

Result of diagnosis items:

HWCHK(123)	"HHL" will be displayed for the model of LE-8200. It indicates the hardware specification code for each model.
CF-CARD	If there is no card inserted in the analyzer, "NO-CARD" will be displayed. If there is a card inserted,"OK" and capacity of the memory card will be displayed.
LCD	"==" will be displayed. Users should check the color of LCDs by themselves.
Other items	"OK" or "NG" will be displayed as the results of diagnostics.

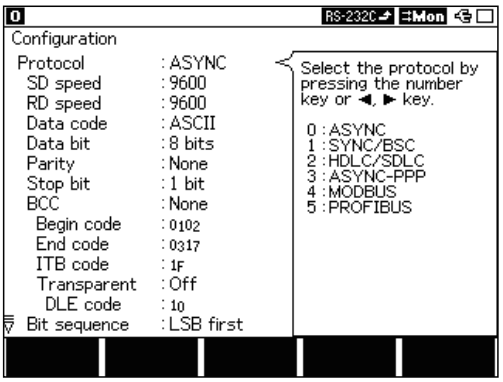
General Setting

Your analyzer needs to be set up adjusting communication conditions like communication channels, protocols for tested device, communication speed and so on.



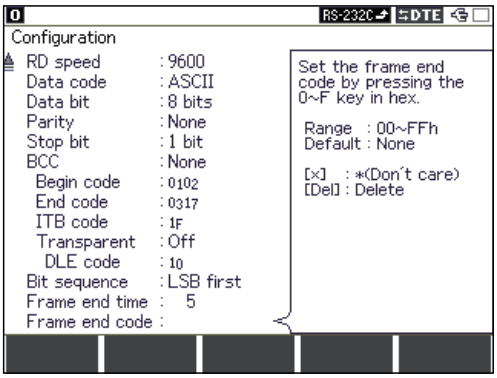
From top menu, move"▶ ◀" and select "0: Configuration".
Press [0] and display configuration setting screen.

■ Selecting and Changing the items



Move [▲] or [▼] and point the item you want to set.
Select the number showing in the subwindow by pressing 0-F key or [◀][▶] key.

- If you find [△][▽]in the left bottom, you have more items to set. Scroll by [▲][▼] key.
- MODBUS and PROFIBUS are supported from LE-8200 Ver.1.18 or later.
- The setting items needed for communication system appear after selecting "Protocol".
- IrDA, CAN and FlexRay (expansion kits) have different protocol settings. Please read the instruction manuals for expansion kits.



Configuration setting

Setting items depends on what protocol you measure.

You need to select a protocol first in the "Configuration".

There are four kinds of protocols. (The standard sub-board supports four protocols.)

"PROTOCOL"	Communication protocol of target device	Description
ASYNC	Asynchronous	Communications which uses start and stop bits. Ex.) PC COM port, UART communication
SYNC	Character-synchronous	Communications which uses 1 or 2 bytes of characters. Ex.) BSC, JCA procedure etc.
HDLC	Flag-synchronous transmission	Communications which uses flag bit patterns (7Eh). Ex.) HDLC, SDLC, X.25, LAPD
PPP	PPP (Asynchronous typed)	Asynchronous which uses flag characters (7Eh). Ex.) PPP communication used for WAN etc.
MODBUS	Asynchronous (RTU/ASCII)	Communications protocol for PLC published by Modicon
PROFIBUS	PROFIBUS-DP	Fieldbus communication for factory automation

Following is a table of protocols and setting items.

Item	Description	ASYNC	SYNC	HDLC	PPP	MODBOS	PROFIBUS
S-SPEED	Channel speed on the SD side	●	●	●	●		
R-SPEED	Channel speed on the RD side	●	●	●	●		
SPEED	Line speed					●	●
CODE	Display code	○	○	○	○		
CHAR BIT	Character bit length	●	●				
PARITY	Parity bit	●	●			●	
STOP BIT	Stop bit	○					
FCS	Frame check			○	○		
CLOCK	Communication clock		●	●			
IDLE MOD	Idle mode			○			
LEADING	The number of starting flag			○			
S-ADDR	SD side frame address			○			
R-ADDR	RD side frame address			○			
SYNC CHR	Synchronism settle character		●				
RST CHAR	Times of synchronism reset character repetitions		●				
REPEAT	Times of synchronism reset character repetitions		○				
SUPPRESS	Suppress character		○		○		
BCC	Block check	○	○				
BGN CHAR	BCC calculation start character	○	○				
END CHAR	BCC calculation end character	○	○				
ITB CHAR	ITB character	○	○				
TRANSPRT	Transparent mode	○	○				
DLE CHAR	Data Link Escape character	○	○				
SEQUENCE	Character bit transmission sequence	○	○				
FRM TIME	Frame end judgment time	○					
FRM END	Frame end character	○					
FORMAT	Transmission code setting		●	●			
FRAME	Frame translation setting			○			
PACKET	Packet translation setting			○			
Transmission	Transmission					●	

- ● is necessary to set.○ is needed to be set in some measuring conditions and test conditions.
- When communication conditions to measure are unknown, "Auto configuration" can be selected.
- Read each instruction manual for "IrDA", "I^2C", "SPI" and "BURST".
- Read "Instruction Manual for Additional Protocols" in the utility CD for "MODBUS" and "PROFIBUS".

<Setting Items>

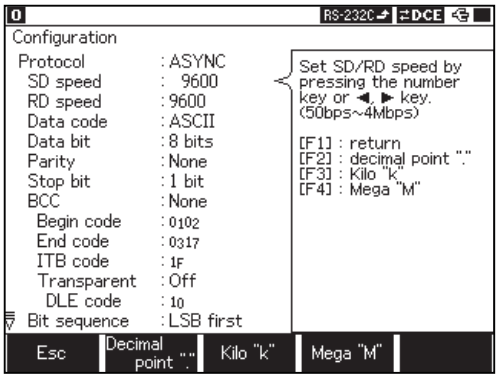
■ SD speed

Sets communication speed on the side of SD(transmission).

By pressing [F] or [F1], appointed communication speed can be set to four figures as effective numbers.

e.g. 123.4Kbps Input [1],[2],[3],[F2](" . "),[4],[F3]("k").

- Select speed by scrolling [◀] or [▶] key.
- Select a fixed speed by pressing [0] to [E] key.



- When the "SD speed" setting is changed, "RD speed" is set as the same values with "SD speed".
- Range 50~4.000Mbps

■ RD speed

Sets communication speed on the side of RD(reception).

9.2 Communication Clock

■ Speed

For MODBUS, select None, Odd, or Even.

■ Data code

Sets a display code. Shift-controlled code are displayed only when a shit-controlled button is pressed.

- Select from ASCII, EBCDIC, JIS7, JIS8, Baudot, Transcode, IPARS, EBCD, EBCDIK, HEX.

■ Data bit

Sets a data bit length. Only the bit length allowed for the display code may be set.

- HDLC/SLDC and ASYNC-PPP are fixed to be 8 bits.

■ Parity

Sets a parity bit and a multi-processor bit.

- MP(multi-processor) is used as communication adding 1 bit instead of parity bit.
- For MODBUS, select None, Odd, or Even.
- SYNC/BSC: When a character bit length is set as 6 or 8 bits, only Parity None can be set. When a character bit length is set as 5 or 7 bits, Parity None cannot be set.

■ Stop bit

Sets a stop bit length at the time of ASYNC. After being set, stop bit will be added to transmission data during simulating.

- For received data, checking a start bit will be executed after 1 bit without depending on the setting.

■ FCS

Sets if frame checking is executed through HDLC/SDLC and ASYNC-PPP. When "Off" is selected, frame will be not checked.

9.1 Calculation of Block Check

■ Clock

Selects a synchronism clock through SYNC/BSC and HDLC/SDLC.

■ Idle mode

Selects an idle state between frames through HDLC during simulating.

- Mark : Transmission line is a mark state when there is no communication.
- Flag : Transmission line is a flag data state when there is no communication.

■ Leading flag

The number of transmitted start flags can be varied within the range from 1 to 10 during HDLC simulation.

- Normally set "1".

example) Set

[Flag] [Flag] [Flag] [Data0] [Data1].....

9.2 Communication Clock

■ SD address

Sets a frame address (8 bits right after a flag) on the SD side through HDLC. To receive all the frames, set DON'T CARE " * ". When a specific address is set, only frames related to that address can be received.

- Use to receive a specific address only.

■ RD address

Sets a frame address on the RD side through HDLC like SD address.

■ Sync code

Sets a synchronism settle code through SYNC/BSC. When receiving this settle code, it starts capturing data. Higher bits than a bit length in "Data bit" are invalid.

Although parity bit is not displayed, synchronism is established by characters including parity.

- In the case of 7 bits EVEN, whichever "1616" or "9696" is set, synchronism is not established till it reaches "9696" to be received. (it is not established at the time of "1616".)
- Set "16 16"(Hex) for ASCII, and "32 32"(Hex) for EBCDIC.

■ Reset code

Sets a reset code through SYNC/BSC. When the setting reset code is received for set times of "reset repeat", synchronous is reset and stop capturing data.

- Synchronous is reset when setting either of "FF" or "7F" if 7 bits EVEN.
- Set "FF"(HEX) if non-communication mark state.

■ Reset repeat

Sets the number of times of a synchronism reset code through SYNC/BSC. When the set times of "reset codes" is continuously received, synchronous is reset.

- Normally use as "Reset code"="FF", "Repeat"=2(default).
- If "Data bit"="8", it will be the frame end after having Mark status (1) for more than 16 bits.

■ Supress code

When codes set in this section are monitored continuously, the second code and after ones are not stocked in the capture buffer.

Example)If setting "Sy":Sy Sy Sy Sy DLE

not be stocked

Sy DLE Sy DLE Sy

be stocked

■ BCC

Sets block check code through ASYNC and SYNC/BSC. When "None" is set, block check is not executed.

■ Begin code

Sets a calculation start code for block check. Higher bits than a bit length to "Data bit" are invalid.

■ End code

Sets a calculation end code for block check. Higher bits than a bit length to "Data bit" are invalid.

■ ITB code

Sets an ITB (intermediate-text-block) code to calculate block check. Higher bits than a bit length to "Data bit" are invalid.

9.1 Calculation of Block Check

■ Transparent

Select on/off of transparent mode when calculating block check.

- Sets "DLE code" to avoid these codes when calculating block check.

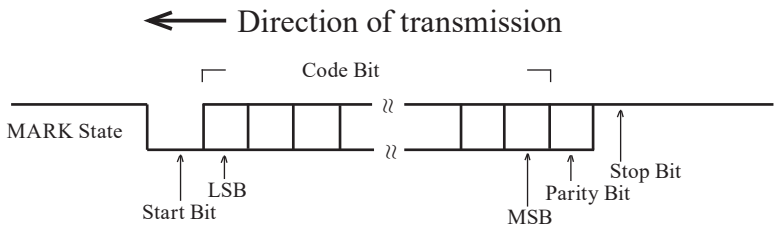
■ DLE code

Sets a DLE (data-link-escape) code for transparent mode.

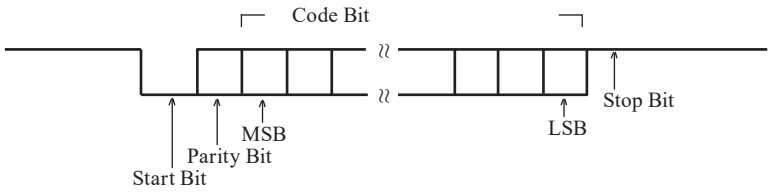
■ Bit sequence

Sets bit sequence.

<LSB first>



<MSB first>



- The above figure is an example of ASYNC with parity.
- In order to check normal protocols, "LSB first" needs to be set. (Except some protocols)

■ Frame end time

Sets the time of non-communication state which is judged as a frame end at between 1ms and 100ms when ASYNC.

- Add a time stamp on the top of next frame when receing a non-communication state for more than "frame end time". (Set "Time stamps" to be "On".)

6.12 Recording Function to Measure Additional Information

■ Frame end code

Sets end code of a frame for ASYNC.

- Add a time stamp on the top of next frame when receiving the character which you set in "frame end code". (Set "Time stamps" to be "On".)

6.12 Recording Function to Measure Additional Information

■ Format

Sets the line encoding format for SYNC/BSC and HDLC/SDLC.

- Select NRZ(Non Return to Zero), NRZI(Non Return to Zero Inversion), FM0 or FM1.

■ Frame

Sets translation specifications of frame level for HDLC/SDLC.

- Select SDLC(modulo 8), SDLCE(modulo 128), X.25(modulo 8), X.25E(modulo 128), or LAPD(Link Access Procedure on the D-channel).

6.9 Translation Function

■ Packet

Sets translation specifications of packet level for HDLC/SDLC.

- Select X.25 or LAPD.

6.9 Translation Function

■ Transmission

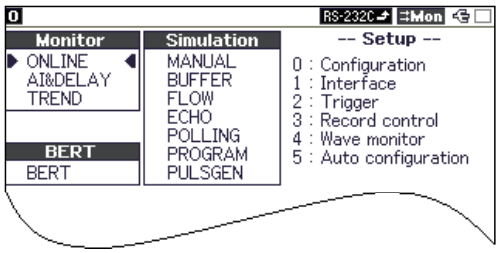
Select transmission type from RTU or ASCII for MODBUS.

Chapter 3 Monitor Function

The purpose of the monitor function is to record communication data into the capture buffer without impacting on a communication channel. Also, it is to display clearly each communications protocol. Not only communication data but also time stamp for data frame and idle time are recorded. As a result, error time and time out conditions are investigated. Moreover, the trigger function, which detects specific communication conditions, and filter function for specific address frame, which makes a memory effectively used, are included.

3.1 Online Monitor Function (ONLINE)

Setting



Move "▶ ◀"to "ONLINE" on the top menu.

Confituration (communication conditions) needs to be set in advance.

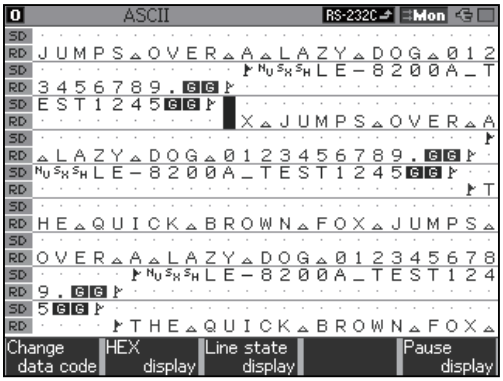
2.6 Communication Condition Setting

3.1 Online Monitor Function

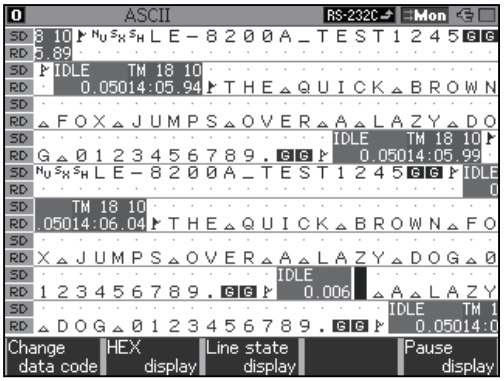
Chapter 6 Useful Functions

Operation

To start measurement, press [Run].And, the RUN LED is lit. Then, data will be stocked into the capture buffer with it displayed on the screen. At one set of two lines of transmission and reception data, nine sets of eighteen lines of it will be displayed in real time.



While [Run]



While [Run] (with idle time and time stamps)

"SD" Row Data inputted from RS-232C port Pin 2 (SD)

"RD" Row Data inputted from RS-232C port Pin 3 (RD)

When SD and RD are generated at the same time, they are displayed on the same column". ▌"is the mark to indicate the place which new data will be displayed at. And data on the left side of this mark is new one (displayed only during RUN).

■ Error Code and Special Code

Code	Name	Meaning
PE	Parity Error	Displayed when parity is incompatible.
FE	Framing Error	Displayed when stop bit is "0".
PF	Parity & Framing Error	Parity error and framing error are generated at the same time.
OE	Overrun Error	Displayed when your analyzer cannot process data.
SF	Short Frame	Displayed when the frame length is short through HDLC.
B	Break	Displayed when all of start bit, character bit,(parity bit), stop bit are "0".
A	Abort(*1)	Displayed when "1", 7 bits or more, is continuously detected through HDLC.
G	Block Check Code (Normal)	Displayed when BCC or FCS is normal.
E	Block Check Code (Abnormal)	Displayed when BCC or FCS is abnormal.
▶	SDLC/HDLC Flag	Displayed when flag pattern (7Eh) is detected.
nn	Multiprocessor Bit	Displayed in blue back when multiprocessor bit is "1". (*2)

*1 : On an RS-485 half-duplex line, if the line goes into a high-impedance state within 8 bit time after the completion of HDLC (NRZI) frame transmission,the line may go into the ABORT state. In an actual communication system, such an ABORT frame will be discarded and no error will occur.

*2 : The "nn" part is a hexadecimal representation of the data excluding multiprocessor bits.

Temporary Stop

When [F5]"Pause display" is pressed, the motion on the screen temporarily seems stopped while measurement has continued even after being pressed.

- The RUN LED remains lighting.
- Operations like capturing data, a trigger etc. are not influenced.
- During screen being stopped temporarily "▮▮ Pause" will be displayed at status bar on the top line of the screen.

In order to toggle this state, press [F5]"Pause display" again.

- "▮▮ Pause" will be not displayed at status bar on the top line of the screen.

Stop measuring

To stop measurement, press [Stop].

Measured data will be saved in the buffer area, which you select in "Record control".

Measured data will be erased if you do not set backing up setting.

2.5 Environmental Setting

[◀], [▲], [Page Up]	Scrolls/Paging to forward (old data).
[▶], [▼], [Page Down]	Scrolls/Paging to backward (new data).

Jump

[Top/Del]	Jumps to the front (the first position) of data which was saved in capture buffer.
[End/×]	Jumps to the back (the last position) of data which was saved in capture buffer.

Followings are the examples of On Line Monitor settings.

Example 1 : Monitor communications (On Line Monitor function)

Conditions of two target devices are following:

Port RS-232C

Protocol:ASYNC

Speed:9600bps

Data Code:ASCII

Data bit: bits

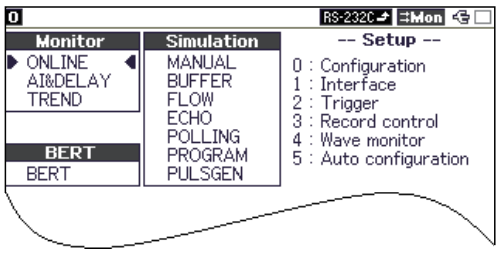
Refer to "2.2 Cable Connection" for detailed connection of target devices.

This example uses default value and only changes the necessary settings.

10.3 Soft Reset

1. On Line Monitor Function

Move "▶ ◀" to "ONLINE". ("ONLINE" is a basic of monitor function.)

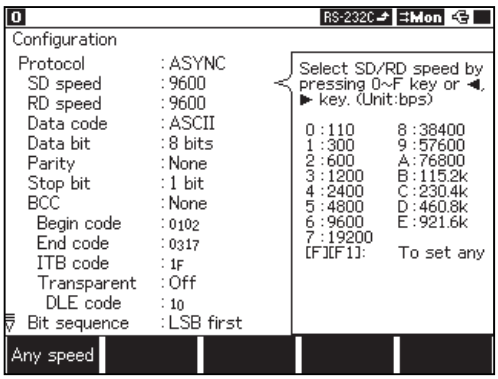


Five setting items are displayed in the setup menu.

Change the setting at "0: Configuration" and "1: Interface".

2. Configuration setting

From top menu, press [0]"Configuration".



Change "SD speed" to be "6: 9600bps". ("RD speed" is automatically set.)

Change the following settings.

Protocol :ASYNC

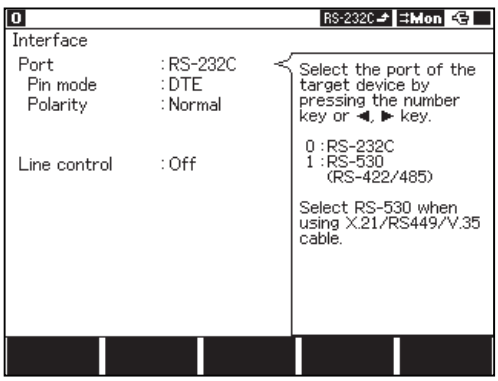
Data code :ASCII

Data bit :8 bits

Use the default value for other settings.

3. Interface

From top menu, press [1]"Interface".



Use the default value.

Port : RS-232C

Pin mode : DTE

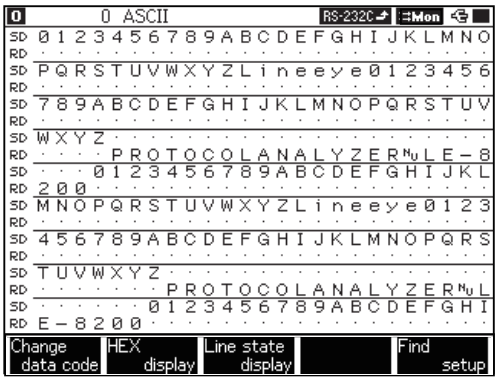
(You can use either "DTE" or "DCE" when monitoring.)

Polarity : Normal

Line control : Off

4. Monitor

Press [Run] to start monitoring.



Example 2 Monitor communications

Example 2 : Monitor communications (On Line Monitor Function)

Conditions of two target devices are following:

Port	: RS-232C
Protocol	: BSC
Speed	: 19200bps
Data Code	: EBCDIC
Time stamp	: On (unit: 100us)

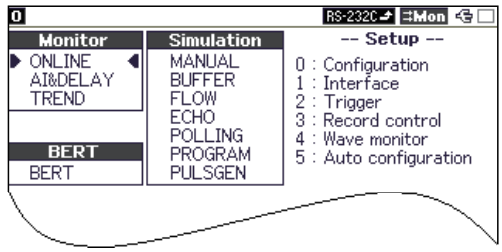
Refer to "2.3 Connection Method" for detailed connection of target devices.

This example uses default value and only changes the necessary settings.

10.3 Soft Reset

1. On Line Monitor function

Move "► ◄" to "ONLINE". ("ONLINE" is a basic of monitor function.)

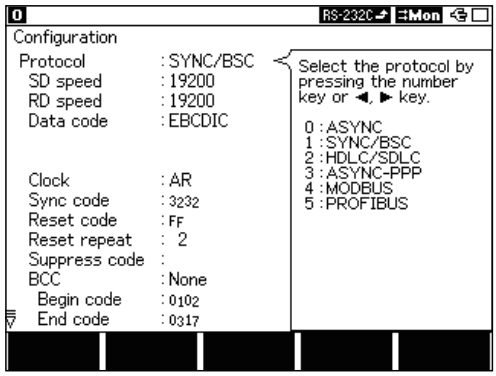


Five setting items are displayed in the setup menu.

Change the setting at
"0: Configuration" and "1: Interface".

2. Configuration

From top menu, press [0]"Configuration".



Set as following.

Protocol : SYNC/BSC

SD speed : 9200bps

Data code : EBCDIC

Clock : AR(automatic)

Normally select "ST1", "ST2" or "RT".
If you are not sure, select "AR".

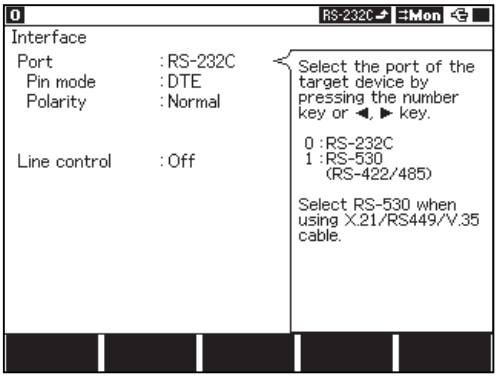
Sync code : 32 32

Reset repeat : 2

Use the default value for other settings

3. Interface

From top menu, press [1]"Interface".

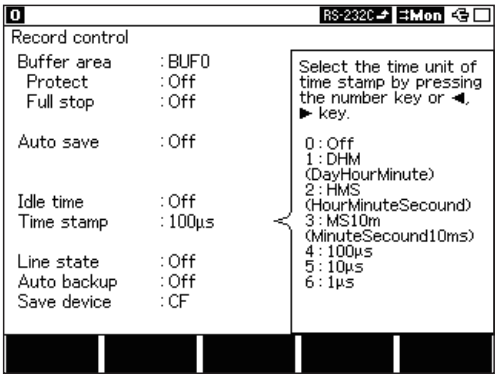


Use the default values.

Port : RS-232C
Pin mode : DTE
Polarity : Normal
Line control : Off

4. Record control

From top menu, press [3]"Record control".



Set as following.

Time stamp : 100µs

Use the default value for other settings

5. Monitor

Press [Run] to start monitoring.

Set as following.

Time stamp : 100µs

Use the default value for other settings

Example 3 : Monitor communications (On Line Monitor Function)

Conditions of two target devices are following:

Port	:RS-530
Protocol	:HDLC
Speed	:1Mbps
Data code	:ASCII
FCS	:FCS-16
Format	:NRZ
Clock	:AR
Idle time	:On

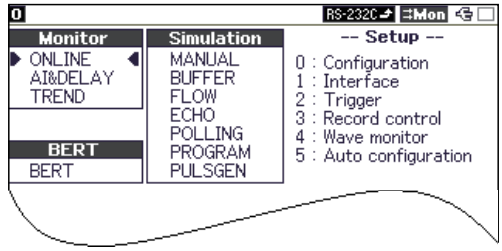
Refer to "2.3 Connection Method" for detailed connection of target devices.

This example uses default value and only changes the necessary settings.

10.3 Soft Reset

1. On Line Monitor

Move "► ◄" to "ONLINE". ("ONLINE" is a basic of monitor function.)

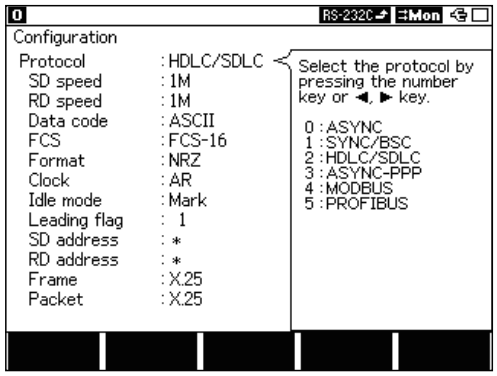


Five setting items are displayed in the setup menu.

Change the setting at "0: Configuration" and "1: Interface".

2. Configuration

From top menu, press [0]"Configuration".



Set as following.

Protocol :HDLC/SDLC

SD speed :1Mbps

Data code :ASCII

FCS :FCS-16

Select "FCS-16" for normal operation.

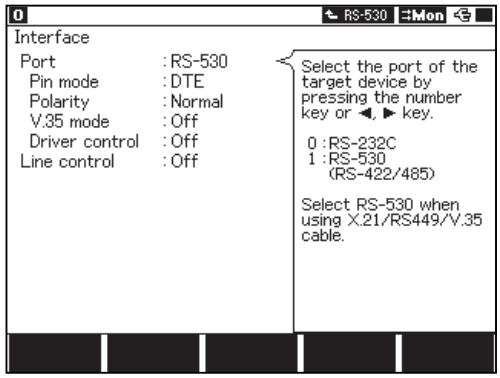
Clock :AR

Adjust the clock.

Use the default value for other settings.

3. Interface

From top menu, press [1]"Interface".



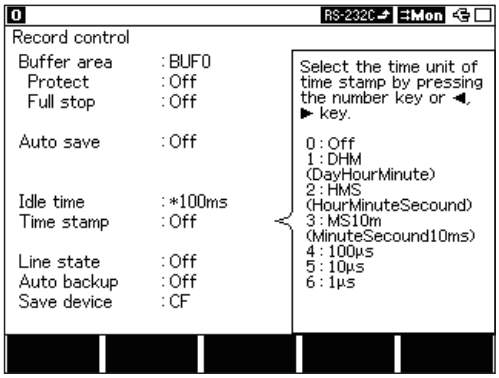
Set the as following.

Port : RS-530

Use the default values for other settings.

4. Record control

From top menu, press [3]"Record control".



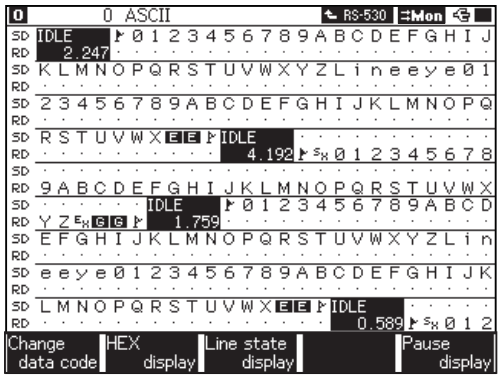
Set as following.

Idle time :100ms

Use the default value for other settings.

5. Monitor

Press [Run] to start monitoring.



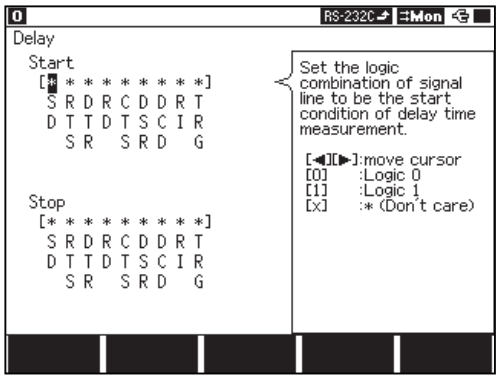
3.2 Analog Input Voltage and Delay Time (AI&DELAY)

Analog Input Voltage and Delay Time function allows you to measure the voltage of specific signal, and the delay time(Line delay) between specific changes of the interface signal state.

Function	
Analog Input Voltage (Voltage measurement)	Measures SD/RD/DTR signal of RS-232C and voltage (max/min/current) of EXT signal (external trigger "EXT IN"). Resolution is 0.1V. It can measure voltage of connecters even other voltage testers cannot measure.
Line Delay (Delay time measurement)	It is used to measure the time when occurring a specific state until occurring another state in the interface signal.

Setting

From top menu, move "▶◀" to "AI&DELAY", and press [Enter] (or press [6] "AI&DELAY options")



"Delay"Setting Display

Set starting/stopping conditions for delay time measurement.

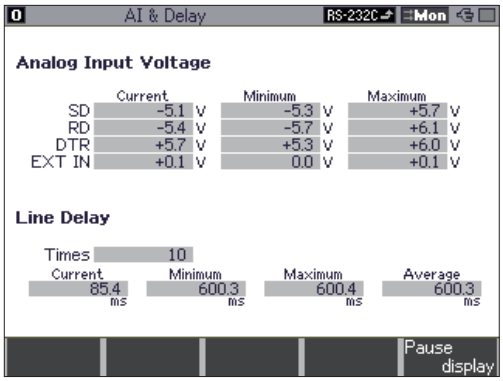
The following nine signal lines are needed to be set for both start and stop: SD, RD, RTS, CTS, DSR, DTR, DCD, RI, and TRG (external signal).

10.2 Ports

Select [1](ON), [0](OFF), or [X](dont care) moving a cursor with [▲], [▼], [◀], [▶]

- ON state : RS-232C voltage level is +3 or higher (space).
- OFF state : RS-232C voltage level is -3 or lower (mark or NC).

Action

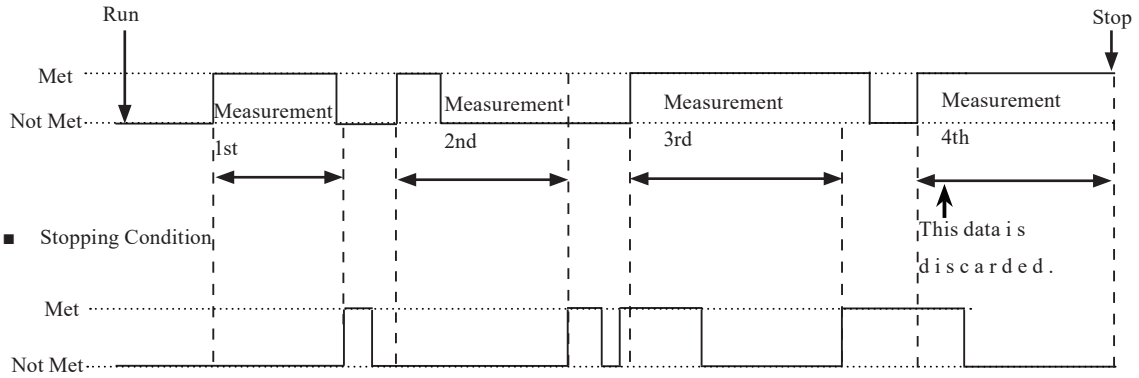


"AI&Delay"Measurement Display

To start measuring, press [RUN] while "▶ ◀" is selecting "AI&DELAY" on the top menu.

- Press [Stop] to stop measuring.

■ Starting Condition



It measures the time when having a start condition until having a stop condition. After start patterns are not met once, second and later timing operations will be started from the start patterns being met again. And then, once stop patterns are not met, they will be continued until the stop patterns are met.

It measures the Current, Minimum, Maximum, and Average time when having a start condition until having a stop condition. It also measures the Current, Minimum and Maximum voltage of each signal line(SD, RD, DTR, ExT).

Display

Contents displaying the measured results show values based on actual measurement, maximum, minimum, and average(only through "Line Delay") in real time.

- When data in "Current" item of "Line Delay" exceeds the range of value, the message, "Overflow," appears. The measuring operation continues even when "Overflow" is displayed. When the starting condition is satisfied subsequently, the measuring operation starts again with the counter cleared. In this operation, the maximum and the average value are not guaranteed.
- A resolution of the delay time function is 0.1mS. When the changed value returns to the original one between sampling points, measurement cannot be executed.

3.3 Statistical Analysis Function (TREND)

The statistical analysis function is capable of counting the occurrence of the events such as the number of characters and frames in a specific period, and displaying the result on graph to check how the occurrence of them changes over time. This function helps you to check the frequency of the use of a channel and the like.

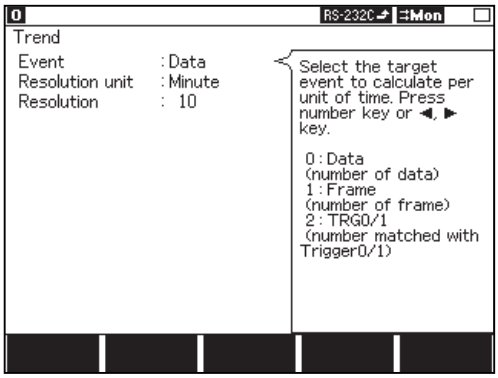
Setting

Move "▶ ◀"to "TREND" on the top menu screen. Press [Enter] (or press [7] "TREND options")

Configuration (communication conditions) needs to be set in advance.

2.5 Environmental Setting

■ Event



Select a target to calculate from [0]-[2].

[0]Data the number of monitored characters in SD and RD.

[1]Frame the number of monitored frames in SD and RD.

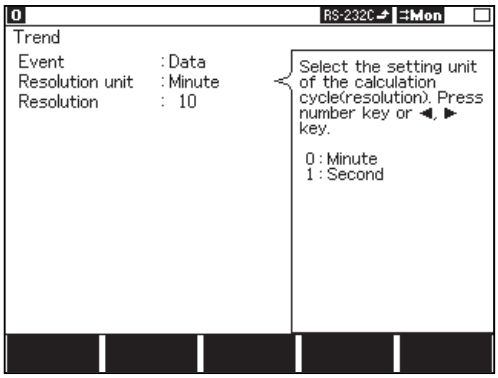
9.3 Frame

[2]TRG0/1 the number of the times which satisfies the trigger conditions being set in "Factor" of "Trigger 0" and "Trigger 1".

The "Action" function of "Trigger" does not operate.

6.1 Trigger Function

■ Resolution Unit/Resolution



Resolution Unit

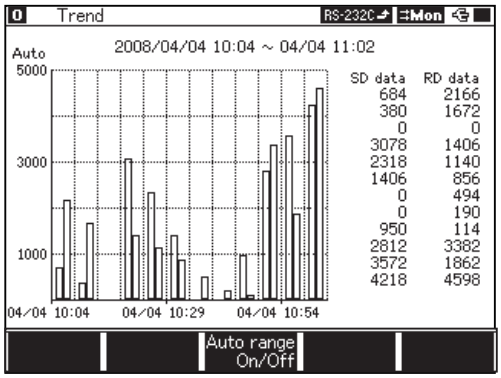
[0]Minute

[1]Second

Resolution

Set Resolution for statistical processing, at the range from 1 to 240 (sec. or min.) on a horizontal scale of a graph with [0]-[9] (or [◀], [▶]).

The statistical processing result of up to 2000 unit time can be recorded.



Move "▶ ◀" mark to "Trend" from top menu and press [Run]. Or press [Run] while displaying "Trend" setting screen.

The statistical processing screen will be displayed.

As unit time of statistical processing goes, the results of calculated value between unit time will be displayed on a bar graph.

■ Changing the range of a vertical scale

On/Off of auto range can be set by pressing [F3] "Auto range On/Off".

"Auto" will be displayed on the left top when "Auto range" is "On".

To change a resolution of a vertical scale, press [F1] "range up" or [F2] "range down".

■ Ending

After 2000 times statistics are done, measurement will end automatically.

To stop measurement halfway, press [Stop]. Last statistic is calculated value being measured till [Stop] is pressed. The "Auto Run" function allows measurement to be performed for a desired length of time.

Display

■ Screen Scroll

After finishing measurement, the graph can be scrolled with[◀],[▶],[Page Up],[Page Down].

[◀], [Page Up] :Scroll up to display the earlier statistic.

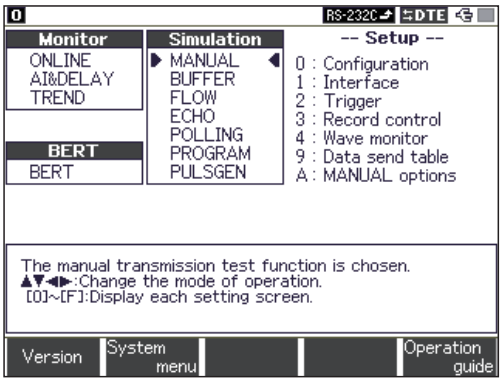
[▶], [Page Down] :Scroll down to display the latter statistic.

By pressing [Top/Del] or [End/X], the screen including the first or the last statistical data can be displayed respectively.

Chapter 4 Simulation Function

The simulation function is the tool that makes your analyzer operate as a device communicated by tested devices, and that executes a test for transmission and reception following protocols.

Even if communicated devices are not prepared at the first step in developing, the testing like real operation will be able to be executed. After checking communication procedure in our original "MANUAL mode," complicated communication procedure with conditional branches will be able to be tested by command-selected easy programming. A margin can be evaluated at staggered communication speed on purpose because appointed communication speed can be set. Moreover, error processing response can be checked with tested data which includes parity error data.



■ MANUAL Mode

Registered data of the transmission table corresponding to operation keys [0] to [F] is transmitted one touch every time each key is pressed. Communication procedure can be easily tested with the trigger function checking response from the developed devices through the monitor function. In addition, by pressing [Shift] and one key from [0] to [D] fixed data corresponding to each key can be transmitted. Also, pressing [Shift] and [E],[F] makes the signal line of RTS/CTS or DTR/DCD set ON/OFF.

■ BUFFER Mode

The transmission side or the reception side is selected from transmission/reception data stocked into a memory through the monitor function. And then, that data is transmitted as simulation data. It is useful to perform a reproducing test for data with the same communication state monitored in the field.

■ FLOW Mode

As a transmitter or a receiver, flow control like X-on/off flow control and control line handshake can be simulated. In the transmission mode, the number of transmission data for sixteen times can be displayed from a start to an interrupt request. On the other hand, in the reception mode, two things can be appointed. One is the number of reception data of until an interrupt request is submitted for transmitting. The other is time of until a start request is submitted for transmitting.

■ ECHO Mode

Reception data is turned back in your analyzer. It is used for testing a display terminal and a communications terminal.

■ POLLING Mode

The slave side or the master side based on polling communication procedure of multidrop (1:N connection) is simulated. In the slave mode, the number of frame reception times and an error is checked at the self-address. And then, appointed data is replied. In the master mode, polling messages are transmitted to 32 kinds of the slave addresses. And then, response data is checked in each slave address.

■ PROGRAM Mode

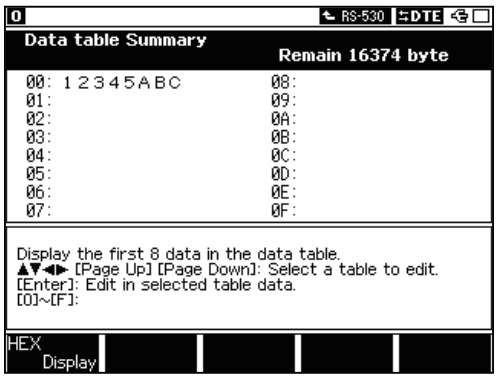
By programming for a dedicated command, communications protocol involved in the conditional judgment is flexibly simulated. There is the selectable menu for programming so it is easy to master this mode.

■ PULSEGEN Mode (LE-8200A only)

Generate the waveform measured by the Timing waveform function, Also it can edit the data and have various kinds of tests, such as sending at different timing.

Registration of Transmission Data(Data send table)

At the time of using the simulation function, transmitted data is registered.



Data tables

From top, select "9: Data send table" in the setup window.

Press [9] and go to data tables.

There are 160 transmission tables. (No.00-9F tables) It can be set up max. 16384 characters.

- The number of transmission table has been extended to 160 from V1.18.
- If there is data registered in a table, the first eight character is displayed.

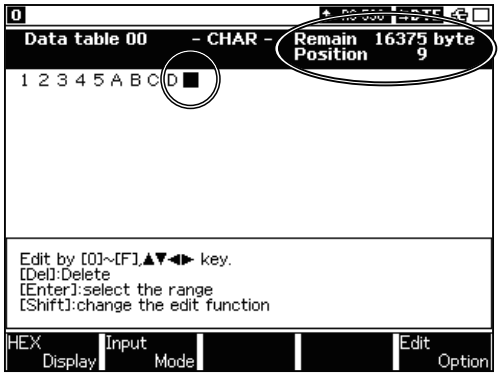
■ Data to be Registered

The characters, which are inputted and displayed, are treated as the code being set on a data code(Data code) of the configuration menu.

Parity bits, synchronism characters, reset characters and synchronism flags are added and transmitted automatically. Therefore, they need not to be included in registered data.

- The effective data needed to be set in the character bit length. Other bits at higher positions are ignored.

■ Method of Registration



You can switch the data table displays by [Page Up], [Page Down], [◀], or [▶].

Press the table number where you want to set the data .

- To go to a different table, press [Shift]+[◀]or [▶].

Registered data will be displayed on the screen. A cursor position is where "■" is blinking.

"Remain," which indicates the rest of buffer for transmission data, will appear on the upper right of the screen. And also, "Position," which indicates the cursor position, will appear below "Remain".

1.Data Entry

Move a cursor where you wish to enter data using [▲],[▼],[◀]or[▶]. A cursor position is the place which "■" is blinking at. To modify or add entered data, move the cursor to the position between characters and enter the characters. On the other hand, To delete it, move the cursor where you wish to delete it, and press [Top/Del]. Then, it will be deleted, and the characters after the deleted character will be moved forward. An input is executed in HEX or character.

2.4 Character Input

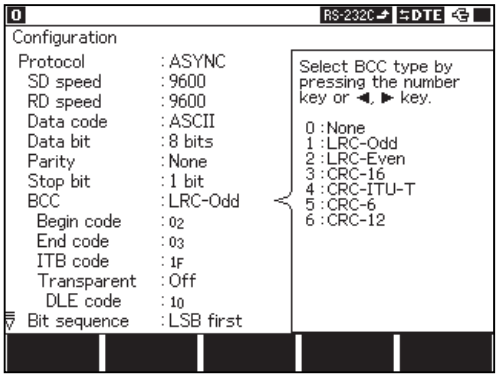
2.Addition of BCC, LRC, FCS

To set the others but "None" in "BCC" item or "FCS" item of the configuration, press [Shift]+[F1] after finishing inputting. Then, the calculation for BCC or FCS will be executed. Finally, BCC or FCS will be inserted. In the case of BCC, BCC will be inserted after "End code" because a calculation, which is between "Begin code" and "End code" that is set in the configuration, is executed.

- When using MODBUS and PROFIBUS, in order to add FCS automatically, it is necessary to input in the proper format of those protocols. For details, see the "Instruction Manual for Additional Protocols" on the CD.

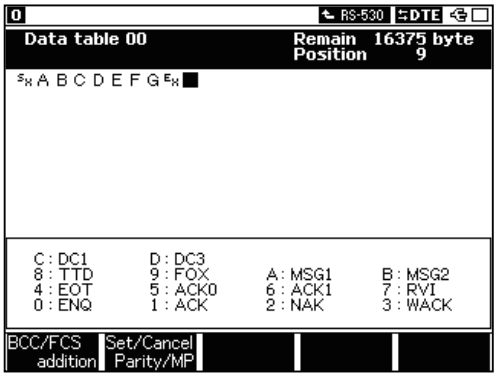
e.g.)

◆Configuration Setting (ASCII)



PBCC : Sets "LRC ODD"
Begin code : Sets "(02h)"
End code : Sets "(03h)"

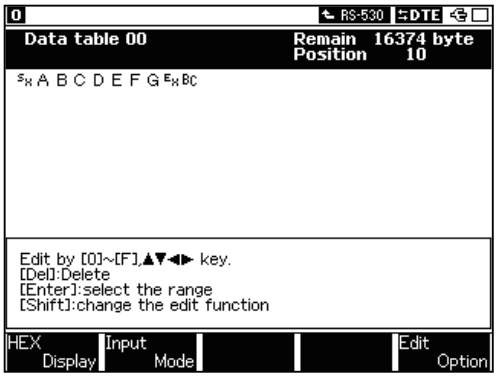
◆Registering Data in the Data Table



"$^{S}_{X}$ABCDEFG$^{E}_{X}$" is registered to TABLE No.00.

9.4 Data Code Table

◆Executing a Calculation of BCC



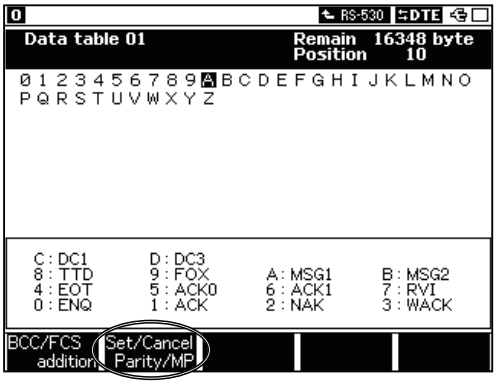
Press [Shift]+[F1]"BCC/FCS addition".

BCC is calculated between "(02h)" and "(03h)," and then BCC (BCh) is inserted behind "(03)" = "EX".

- In order to modify data which has been calculated as BCC (FCS), or the setting of BCC (FCS), press [Shift]+[F1] to recalculate. Then, recalculated BCC (FCS) will be overwritten and appear.
- BCC is always displayed in hexadecimal.

3.Parity Error and Multiprocessor Setting

At first, move a cursor where you want parity bit to be generated or where you want multiprocessor bit to be set to 1. And then, press [Shift]+[F2]. The setting will be completed.



e.g.) The setting of "A"
Move a cursor to "A" and press [Shift]+[F2]"Set/Cancel Parity/MP" .

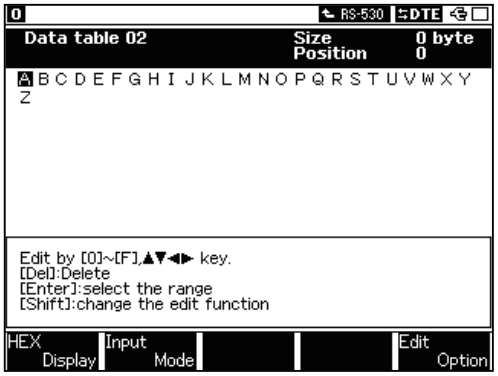
A highlighted "A" will be displayed.

After setting, highlighted characters will be displayed. In order to undo this, press [Shift]+[F2] again.

■ Inputting Altogether (Copy)

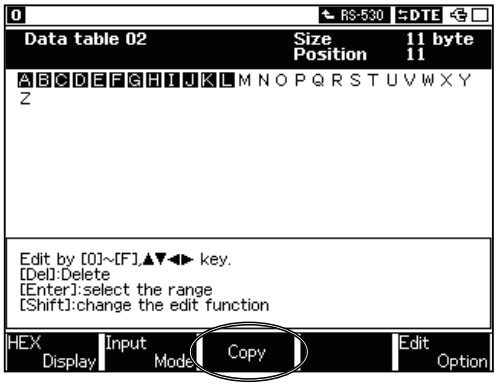
This is the function to input plural characters once or repeatedly by copy and paste.

eg) Copying characters from A to L, and inputting them altogether



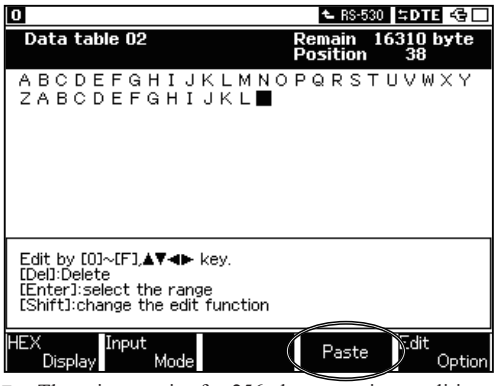
1.Select the first character that you want to copy with a cursor and press [Enter].
"Size" will appear on the upper right of the screen instead of "Remain". And then, as the cursor is moved with characters selected, the number of selected characters will be displayed next to "Size".

To reset the range of characters to copy, press [Enter] again.



2.Move the cursor from "A" toward "M" using a cursor key, selecting letters.

3.To register letters from "A" to "L," press [F3]. They are registered in an editing memory.



4.Press [F4] to paste.
Registered data will be inserted to the next part of the cursor position. Registered data will be inserted every time you press [F4].

There is capacity for 256 characters in an editing memory. When more than that is registered, 257th character and afterwards are truncated.

■ Deleting Altogether (cut)

This is the function to delete selected characters.

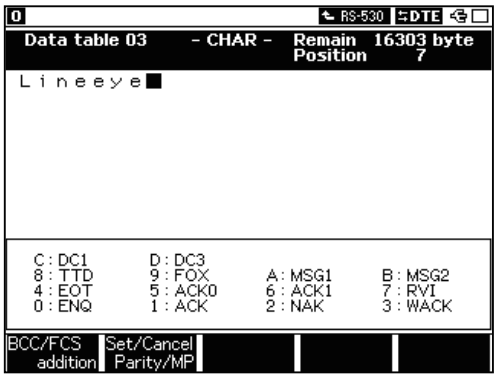
1.Select the first character that you want to cut with a cursor and press [Enter]. "Size" will appear on the upper right of the screen. And then, at the cursor is moved with characters selected, the number of selected characters will be displayed next to "SIZE".

2.After a cursor is moved where to be deleted, press [Top/Del]. The highlighted character string but last blinking character will be deleted. Deleted characters are registered in an editing memory. [F4] will help you to let them appear again.

(Up to 256 characters can be registered)

■ Fixed Transmission Data

Special characters like ENQ, ACK, etc. can be inputted. They are inputted in data code being set in the configuration.



[Shift]+[0]+[D] have assigned data.

[0]	:ENQ	[7] :RVI	
[1]	:ACK	[8] :TTD	
[2]	:NAK	[9] :‘ FOX ’ Message	*1
[3]	:WACK	[A] :‘ MSG1 ’ Message	*2
[4]	:EOT	[B] :‘ MSG2 ’ Message	*3
[5]	:ACK0	[C] : DC1(11H)	
[6]	:ACK1	[D] : DC3(13H)	

Table of fixed transmission data

*1 ‘FOX’ :THE QUICK BROWN FOX JUMPS OVER A LAZY DOG 0123456789.

*2 ‘MSG1’ :S_X0123456789ABCDEFGHIJKLMNOPQRSTUVWXYZE_X BCC

*3 ‘MSG2’ :0123456789ABCDEFGHIJKLMNOPQRSTUVWXYZ $C_R L_F$

◆The values (hexadecimal) corresponding to entries of the keys [Shift]+ one key from [0] to [B] vary depending on the setting for data code of the configuration.

◆Characters, which are not defined in the code table, are ignored.

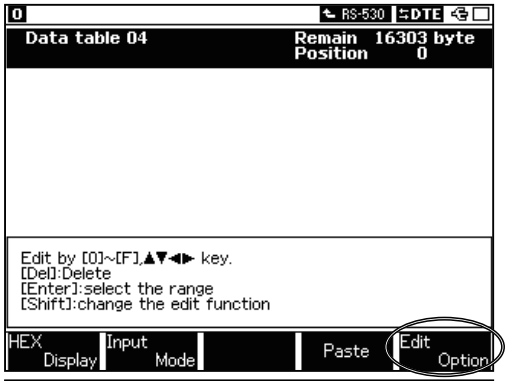
◆Entries with the key [Shift]+ one key from [0] to [8] cause the following values to be set depending on the setting of data code in the configuration.

	ASCII(JIS)	EBCDIC(EBCDIK)	Transcode	Others
ENQ	05	2D	2D	-
ACK	06	2E	3C	-
NAK	15	3D	3D	-
WACK	10•3B	105•6B	1F • 26	-
EOT	04	37	1E	-
ACK0	10•30	10 • 0	1F • 20	-
ACK1	10•31	10 • 61	1F • 23	-
RVI	10•3C	10 • 7C	1F • 32	-
TTD	02•05	02 • 2D	0A • 2D	-

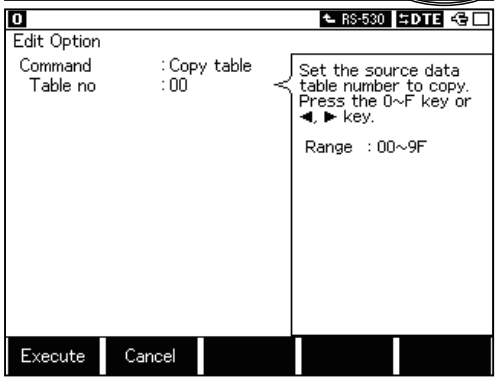
Display the contents of data table. Press [F5] to go to "Edit Option" setting.

■ Copying Table Data

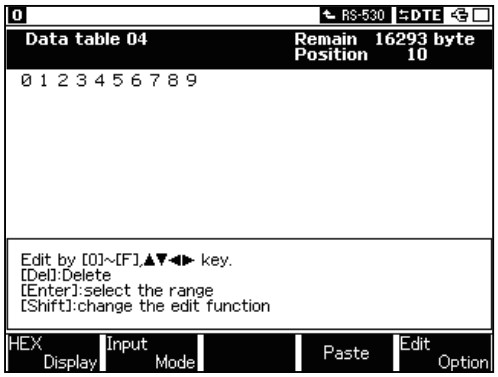
Copy the contents of one data table to another data table.



1. Display the data table where you want to paste. Press [F5] "Edit Option".

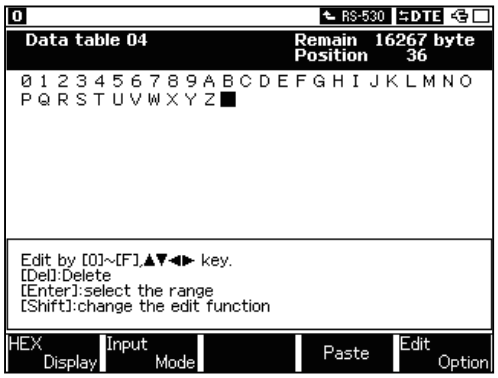


2. Select "Command" to be "Copy table".
Input table No. (00-9F) where you want to copy data.



3.Press [F1]"Execute".
Then, data of the selected table No. will be added to the previous part of a cursor position.

Press [F2]"Cancel" to go back to the data table.



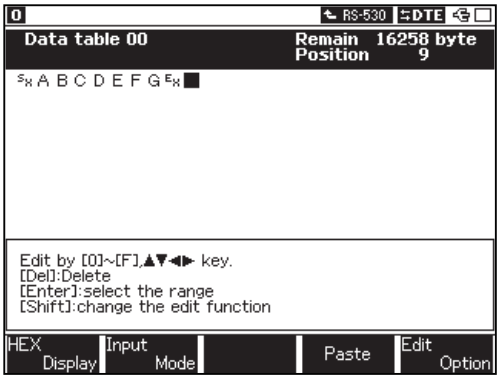
Above examples shows that TABLE04 data (A-Z) is inserted after the data of TABLE05 (0-9).

■ Copying Buffer (Copy buffer)

Copy the measured data which are saved in the capture buffer.

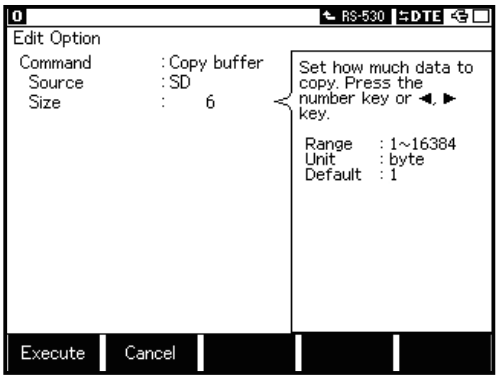
1. After measuring in "Monitor" or "Simulation" function, press "Stop" and display monitored data. (or press [Data] from top menu.) Move the cursor to the top of the character where you want to start copying data.

2. Go back to top menu and press [9] "Data send table".



3. Select the table number.

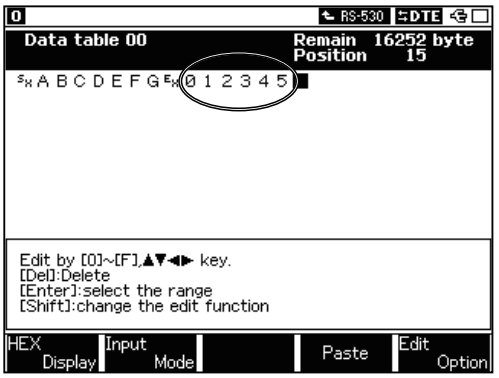
Move the cursor where you want to input data. Press [F5] "Edit Option".



4. Select "Command" to be "Copy buffer".

Select "Source" to be "SD" or "RD", where you have data to copy.

Select a number of data to copy. (1-16384 byte)

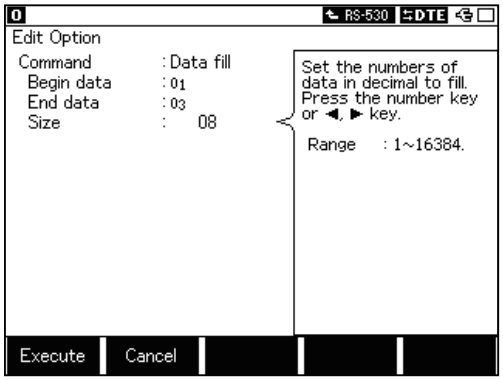


5. Press [F1] "Execute". The number of the characters appointed from that data will be inserted before the cursor position.

- "Idle time" and "Time stamp" will not be inserted.
- When transmission data table is full, operation will stop.
- Flag pattern will be ignored.

■ Data fill

Data from characters appointed in "Begin data" to ones appointed in "End data" can be inputted for the number of the characters inputted in "Size".

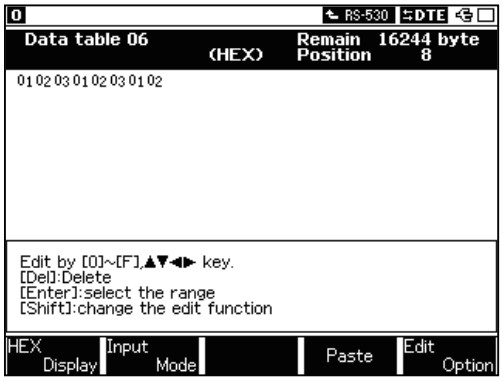


e.g.)

Begin data :01

End data:03

Size :08



Press [F1]"Execute". Then, the data will be inputted at a cursor position.

If "Begin data" < "End data", a character from "Begin data" toward "End data" will be inputted increasing one by one till the number of a character set in "Size" is filled.

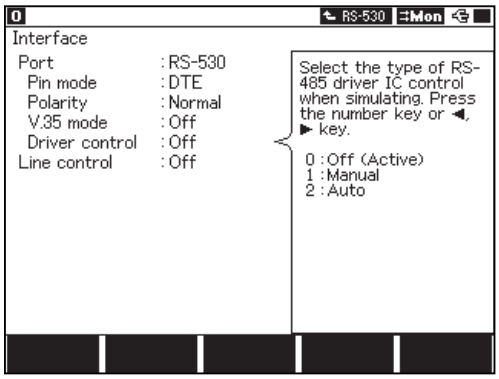
If "Begin data" > "End data", a character from "Begin data" toward "End data" will be inputted decreasing one by one till the number of a character set in "Size" is filled.

If "Begin data" = "End data", a common character set in both "Begin data" and "End data" will be inputted till the number of a character set in "Size" is filled.

When the transmission data table is full, operation will stop.

Driver Control [RS-422/485(RS-530)] (Driver control)

Select the method to control RS-422/485 transmission driver IC on RS-530 port when simulating on RS-530 port.



From top menu, select "1: Interface" in the setup window.

Press [1] and go to "Interface" setting screen.

Select "Port" to be "RS-530" first. Set the "Driver control" next.

2.2 Interface Setup

There is three options for "Driver control".

0: Off

1: Manual

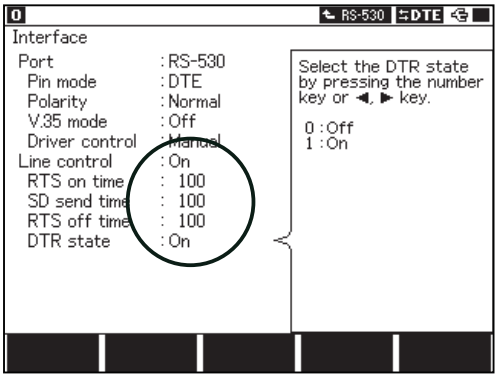
2: Auto

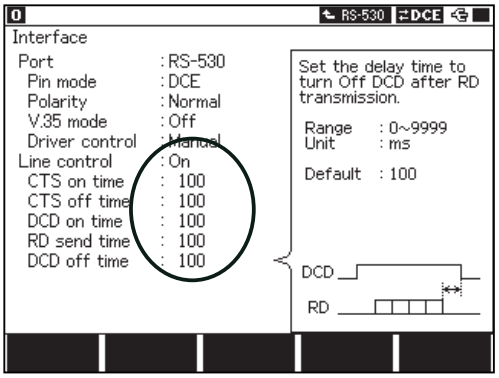
◆Off	:Select when testing RS-422, RS-530, X.20/21, RS-449 and V.35 in full duplex. Driver IC will always be in an enable state after starting test.
◆Manual	:Only when DTR (DTE) or DCD (DCE) is active, the driver will be in an enable state.

When "Line control" item is set "Off", the initial state of DTR(DTE) or DCD(DCE) at the start of simulation is as follows:

Simulation mode	Initial State of Driver
MANUAL Mode	High impedance state
FLOW Mode	Enable
ECHO Mode	Enable
POLLING Mode	Enable
BUFFER Mode	Enable
PROGRAM Mode	High impedance state

When "Line control" item is set to "On" and other settings are set, the driver will be controlled.





◆Auto : The driver automatically becomes active only while transmitting the test data, and the driver will automatically become non-active after about 1 to 3 bits is delayed after data transmission. However, because of the processing time, there is a delay of 400μ seconds at least.

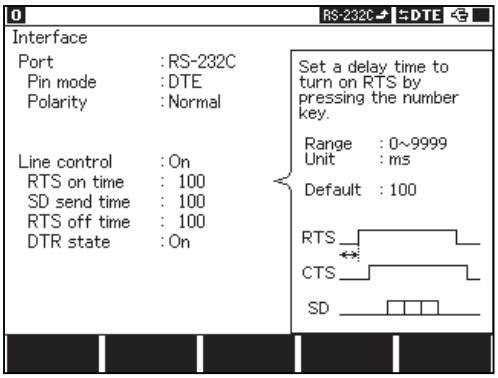
Controlling a Control Line(Line control)

The signal state of the following control lines can be set optionally: RTS,DTR,CTS and DCD.

2.2 Interface Setup

Specifications of Analyzer	Settable Signal Lines
DTE	RTS, DTR
DCE	CTS, DCD

■ DTE



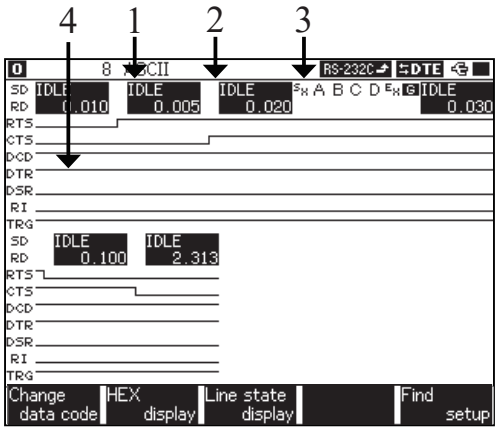
From top menu, press [1] "Interface". Select "Pin mode" to be "DTE". Select "Line control" to be "On".

When setting "OFF", controlling a control line is not executed.

Set the control lines.

Set "RTS On time" etc following the table below.

Items	Description
RTS On time	Time between the start of transmission operation and RTS "ON".
SD send time	Time between CTS "ON" and data transmission to the SD side.
RTS off time	Time between the end of data transmission to the SD side and RTS "OFF".
DTR state	Fixes the logic of the DTR signal. On: "H" Off: "L"



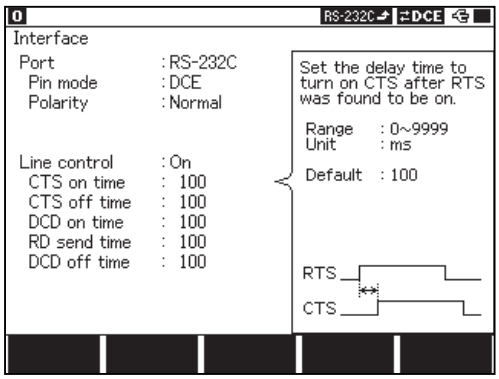
e.g.)
5 ms after turning on the RTS of this unit (DTE), the other device (DCE) turns on CTS. To start transmission 20 ms after CTS is turned ON, set the unit as follows.

1.RTS ON Time : 10ms
2.SD SEND Time : 20ms
3.RTS OFF Time : 30ms
4.DTR SW Setting : ON

☜From the top menu, go to "Record control" and set "Idle time" to be "1ms" and "Line state" to be "On". Start simulating (press [Run]) and set "Line control" (press [F3]) and transmit "S_XABCDE_XBCC" from the data table.

To measure/ record 10ms, you need to set "Idel time" to be less than 10ms.
CTS is required to set ON at the side of a communicated device (DCE).

■ DCE



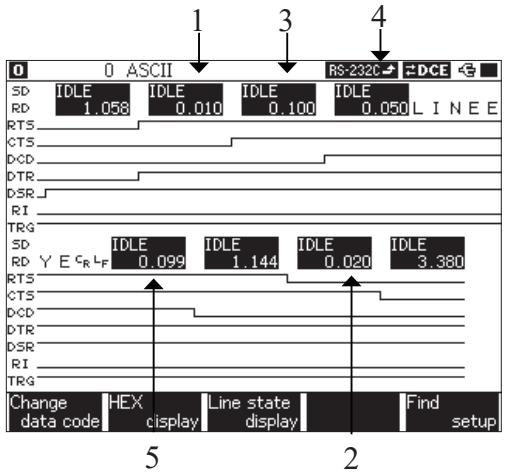
Press [1] "Interface" from top menu. Select "DCE" in "Pin mode". Select "On" in "Line control".

When setting "OFF", controlling a control line is not executed.

☜ Set the control lines.

Set "CTS on time" etc following the table below.

Items	Description
CTS on time	Time between RTS "ON" and CTS "ON".
CTS off time	Time between RTS "OFF" and CTS "OFF".
DCD on time	Time between the start of transmission operation and DCD "ON".
RD send time	Time between DCD "ON" and the start of data transmission to the RD side.
DCD off time	Time between the end of data transmission of the RD side and DCD "OFF".



e.g.)
If 10ms after RTS is switched on and CTS of this unit (DCE) is turned on to start transmission operation, set this unit as follows.

1. CTS on time :10ms
2. CTS off time :20ms
3. DCD on time :100ms
4. RD send time :50ms
5. DCD off time :100ms

☜From the top menu, go to "Record control" and set "Idle time" to be "1ms" and "Line state" to be "On". Start simulating (press [Run]) and set "Line control" (press [F3]) and transmit "LINEEYE$C_R L_F$" from the data table.

4.2 MANUAL Mode(MANUAL)

Data for the data table corresponding to each key will be transmitted by pressing a key.

The keys, [0] to [F] , correspond to the data table number.

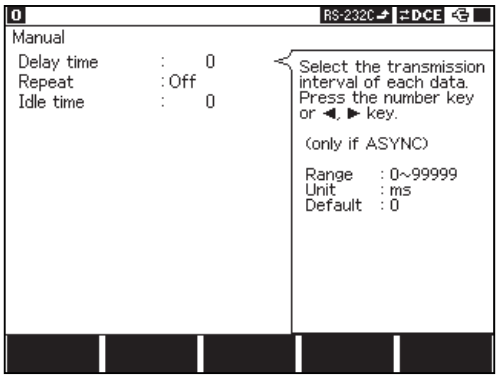
Setting

Move "▶ ◀" to "MANUAL".

Set the configuration (communication condition) in advance.

2.6 Communication Condition Setting

Press [A] "Manual options" or [Enter]. Display Manual setting display as following.



Set the following items below.

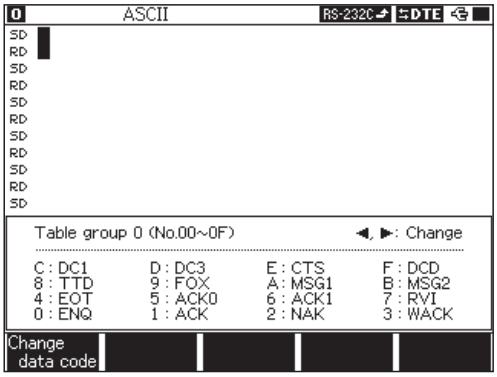
Items	Description	Range
Delay time	Space between characters	0-99999(msec), 1msec. Unit
Repeat	Repetitive transmission of frame	On (The transmission repeatedly.)/ Off : Stops after transmitting 1 frame of data
Idle time	Interval of repeat transmission	0-99999(msec), 1msec. Unit

Set "0" to "Delay time" through the others except for ASYNC and ASYNC (PPP).

1. From the top menu, move "▶ ◀" to "MANUAL". Pressing [Run] makes the following control lines active. Also, the data display will appear. After that, it will be in a wait state till the key corresponding to the transmission data table number is entered. Transmission data table has 10 groups. To switch the groups, use [Shift]+[◀] or [▶].

DTE Setting : RTS, DTR

DCE Setting : CTS, DSR, DCD



2.Enter the data table number (0 to F) with a key.

Entering it makes registered data corresponding to the data table transmitted. After that, every time the key is entered, corresponding data will be transmitted.

- By pressing the [0] - [F] key, the data which has the same tail number in the data table No. (x0 - xF) will be transmitted.
- When ON is set to "Repeat", data for the data table entered with a key will be transmitted continuously spacing for idle time.
- [Shift]+[0] to [D] can make fixed transmission data transmitted(The correspondence of key and data is displayed on the screen.).

C : DC1	D : DC3	E : RTS	F : DTR
8 : TTD	9 : FOX	A : MSG1	B : MSG2
4 : EOT	5 : ACK0	6 : ACK1	7 : RVI
0 : ENQ	1 : ACK	2 : NAK	3 : WACK

Output a break signal B by pressing [End.x] key for ASYNC protocol.

- When a key is pressed again during transmitting data, that data will be transmitted after first data is completely done.
- When data is not at all registered in the corresponding table, it will not be transmitted.
- Even when ON is set to "Repeat" and 0 is set to "Idle time," there may be some idle time generated cause of time of repeatedly transmitting(processing time of your analyzer).
- In the case of using RS-232C, the mode setting of the simulation port of your analyzer makes controllable control lines be as follows:
  - [Shift]+[E] : Turning RTS (CTS) signal on/off (Toggle Operation)
  - [Shift]+[F] : Turning DTR (DCD) signal on/off (Toggle Operation)

  These operation has no impact on transmission data.
- When controlling a control line is turned on at the time of setting DTE with your analyzer, CTS of thecommunicated device is required to set ON.
- Press [Top/Del] to stop transmitting repeatedly.

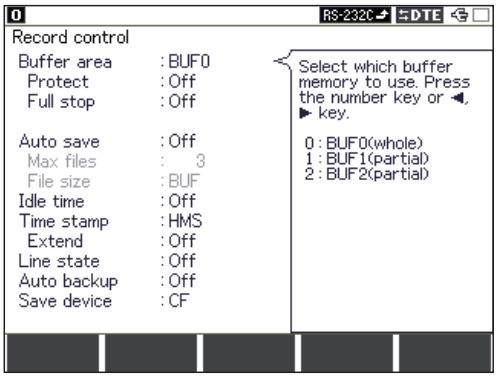
4.1 Preparation for Simulation Controlling a Control Line

4.3 Communication Reproducing Test(BUFFER)

Buffer simulation is the mode to send data of the SD/RD side out of data stocked as transmission data in the capture buffer.

Preparation

Communication data to be simulated is measured and recorded into divided buffer.



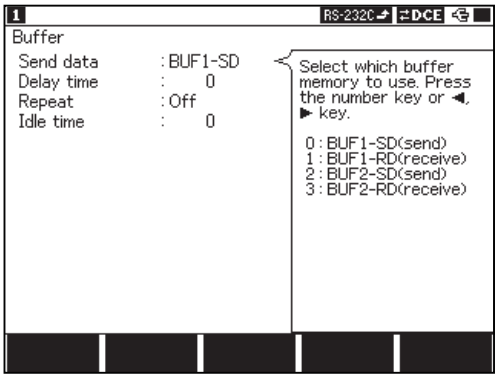
From top menu, press [3] "Record control".

Displays "Record control" screen as left picture.

Select "BUF1" or "BUF2" from the "Buffer area".

1. Start measurement.
   - Data will be recorded into one of the divided capture buffer.
2. End measurement.
3. Select another buffer from "Buffer area" in the "Record control" screen.
   - e.g. If "BUF 1" has been already used, "BUF 2" has to be set this time.
   - After finishing measurement, it is recommended that contents in buffer memory of the BUF(1 or 2) stocking data are prevented from overwriting the old memory by use of memory write protection function("Protect" of "Record control").

Setting



From top menu, move "▶ ◀" to "BUFFER".

- Set the configuration (communication condition) in advance.

2.6 Communication Condition Setting

Press [B] "BUFFER options" or [Enter], and go to "Buffer" screen.

- In this setting, SD or RD data in BUF 1 will become simulation data. And then, the simulation results will be recorded to BUF 2.

Set the following items below.

Items	Setting contents	Range of Selection
Send data	Transmission Data	BUF1-SD:SD side of monitor data for "BUF1"
		BUF1-RD:RD side of monitor data for "BUF1"
		BUF2-SD:SD side of monitor data for "BUF2"
		BUF2-RD:RD side of monitor data for "BUF2"
Delay time	Space time between characters	0 to 99999(msec) , 1ms unit
Repeat	Appointing repetitive transmission	On/Off
Idle time	Space time between frames	0 to 99999(msec) , 1ms unit

Idle time : Data in capture buffer is divided into frames. And space time at the time of transmitting is appointed.

9.3 Frame

- "Delay time" is effective only when "Protocol" of "Configuration" is "ASYNC".
- Frames generating abort through HDLC/SLDC will be transmitted after a flag is added to the position of abort. Abort itself is not transmitted.
- When one frame is over 4K characters, the frame will be divided (BCC is not added.).

1. Select "Buffer" in the top menu and press [Run]. Start simulation.

   Data in capture data, which is appointed in "Send data" item on the buffer setting screen , is transmitted by one frame unit.

   Also, simulation results are recorded to the other capture buffer.

2.Press [Stop].

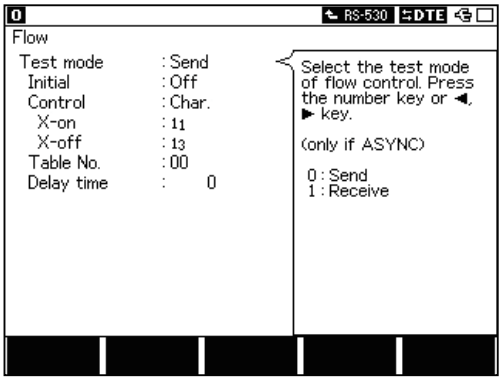
   Simulation will be stopped.

- Parity error and framing error themselves in the capture buffer cannot be outputted for simulation. At the time of errors, values are transmitted as normal data.
- BCC (FCS) is not recalculated. Therefore, when character bit length and parity are transmitted as recorded ones with the different setting, the correct codes of BCC (FCS) cannot be transmitted.
- Once synchronous characters of synchronous ("Protocol") and the SYNC mode are recorded in a memory, and then if they are changed and set, that motion is not guaranteed.
- Timing for data transmission will be set based on the setting value inputted in the "Delay time" and "Idle time" item on "BUFFER options" setting screen.
- If "Buffer are" is set to be "BUF0" on "Record control", the warning message will appear and simulation will not be started.

4.4 Flow Control Test(FLOW)

In the flow control test, your analyzer works as a transmitter or a receiver. It can transmit data following a control signal. Also, it can receive data returning a pseudo-control signal.(Control Signal : Control line handshake such as RTS, CTS, etc. or X-on/X-off code)

Setting



From top menu, move "▶ ◀" to "FLOW".

Set the configuration (communication condition) in advance.

2.6 Communication Condition Setting

Press [C] "FLOW options" or [Enter] and go to "Flow" screen (left picture).

Set the following items.

Item	Setting contents	Range of Selection	Remark
Test mode	Test motion mode	Send : Transmission mode (Reception test) Receive : Reception mode (Transmission test)	
Initial	Initial state of a control signal	On/Off	When "Control" is "Line," it indicates controlling state. When it is "Char". it indicates the line of controlling code state.
Control	Control signal selection	Char./Line	
X-on	Requesting code for transmission start	HEX 1byte	Only when "Char". is selected in "Control". *1
X-off	Requesting code for transmission interruption	HEX 1byte	
Watch	Monitoring control line	CTS/RTS DCD/DTR	Only when "Line" is selected in "Control".
Operate	Operating control line	RTS/CTS DTR/DCD	
Table No.	Transmission table No.	00~9F	Only when "Send" is set to "Test mode".
Delay time	Transmission character space	0 to 99999ms, 1ms unit	
On counter	The number of reception characters of until interruption request is transmitted from starting	1~999999	Only when "Receive" is set to "Test mode".
Off timer	Starting request for transmission + Response time	0 to 99999msec, 1ms unit	

*1 If the same codes are set in both X-on and X-off, normal motion is not guaranteed.

Flow control simulation is effective only when "Protocol" item of the configuration is "ASYNC".

2.6 Communication Condition Setting

•"Test mode:"

The motion mode is selected.

[0]"Send" Mode to match data with a control signal and to transmit it from your analyzer.

[1]"Receive" Mode to control a control signal while your analyzer receives data.

•"Initial"

The initial state of a control signal is set.

[0]"Off" Possible state for transmission.

[1]"On" Impossible state for transmission.

•"Control"

Character control or line control is set.

[0]"Char". Character control is executed.

"X-on" Requesting code for starting transmission is set.

"X-off" Requesting code for interrupting transmission is set.

[1]"Line" Line control is executed.

"Watch" Signal lines monitored by your analyzer are set.

"Operate" Signal lines operated by your analyzer are set.

•"Table No".

Transmission data table number, in which transmission data is registered, is set. At the time of "Send" mode, data in the table being set in "Table No". item will be transmitted repeatedly.

•"Delay time"

Space between characters of transmission data is set.

•"On counter"

The number of the characters, from reception starting to requesting for transmission interruption, is set.

•"Off timer"

Time space, from requesting from interrupting transmission to requesting for starting transmission, is set.

Motion

■ Send Mode

Character Control

1. Selecting "Flow" and pressing [Run] make both RTS (CTS) and DTR (DCD) active.
2. When On is set to "Initial" item, data will be transmitted soon. When setting Off, data will be transmitted after X-on is received.
3. After this, receiving X-off makes transmission interrupted, and doing X-on makes transmission restarted.

Line Control

1. After pressing , control lines such as RTS (CTS) and DTR (DCD), which are set in "Operate" item, are set active.
2. After this, if a control line (CTS or DCD) set in "Watch" item is non active, transmission will be interrupted.

If it is active, restarting for transmission will be repeated.

- During testing, the number of data transmitted from starting to interrupting data transmission will be displayed on the screen for sixteen times from starting the test. (When it is over 999999, the message "OVER" will appear there.)
- The number of data for sixteen times will be displayed on "Total" of the lower right of the screen.
- There might be +3 or -3 errors for counted data.
- [Data] can help the data display appear.

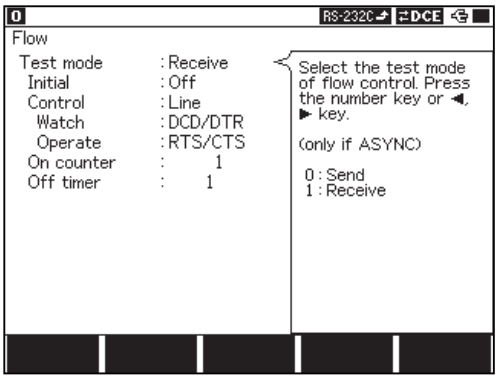
■ Receive Mode

• Character Control

1. After pressing [Run] , set active to both RTS (CTS) and DTR (DCD).
2. Only when Off is set in "Initial" item, X-off code will be transmitted after time set in "Off timer" passes.
3. After this, X-off code will be transmitted after data set in "On counter" is received. This motion will be repeated.

• Line Control

1. After pressing , when On is set to "Initial" item, a control line, RTS (CTS) or DTR (DCD), being set in "Operate" item will be active.
2. After this, RTS (CTS) or RTS (DCD) will be non active after data set in "On counter" is received. And RTS(CTS) or RTS DCD) will be active after time set in "Off timer" passes. Those motion will be repeated. Transmission / reception data will be displayed in real time during testing.



4.5 Echo Back Test(ECHO)

The echo back test is the function that makes received data repeatedly transmitted in your analyzer.

Setting

From top menu, move "▶ ◀" to "ECHO".

Set the configuration (communication condition) in advance.

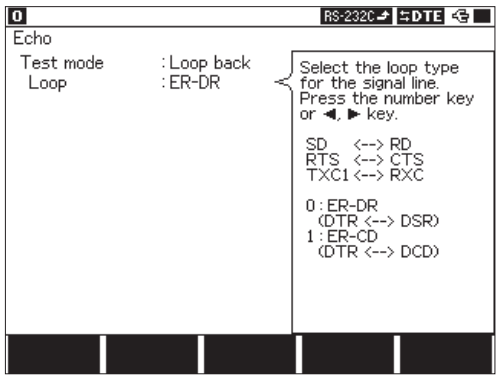
2.6 Communication Condition Setting

Press [D] "ECHO options" or [Enter] and go to "Echo" screen.

Select "Test mode" and set requirements for each mode.

Test mode	
Buffer (buffer echo)	Send back the received frames. (echo back by frames)
Char. (Char. echo)	Send back the received char. (echo back by char. only valid if ASYNC.)
Loop back	Loop back the signal by "DTR-DSR" or "DTR-DCD".

Test mode		Setting contents	Range
Buffer	Response	The delay time until sending back the received frames	0~99999(ms)
Char.	---	---	---
Loop back	Loop	SD<-->RD loop RS<-->CS loop ST1<-->RT loop	"ER-DR" or "ER-CD"
		"ER-DR" DTR-DSR loop "ER-CD" DTR-DCD loop	



Select the signal connection in "Loop"

Motion

1) Press [Run] while selecting "ECHO" in the top menu.

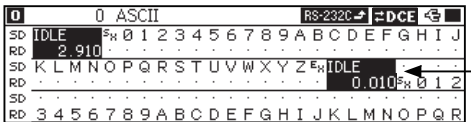
2) Works as following.

Test mode	Action
Buffer echo	When following conditions are satisfied, received data will be transmitted after passing the delay time.
Character echo	Send back the received data by char. unit.
Loop back	Repeat back the received data by bit unit. Sent back RS-CS and ST1-RT. Sent back DTR from DSR or DCD.

Condition for action of Character echo

SYNC MODE	Condition
ASYNC	If idle time which is set at "Frame end time" is generated, or if "Frame end code" is received.
SYNC/BSC	If synchronous release character is received
HDLC/SDLC	If quit flag is received

e.g.)Test mode: Buffer, Response: 10ms



4.6 Multi-Polling Test(POLLING)

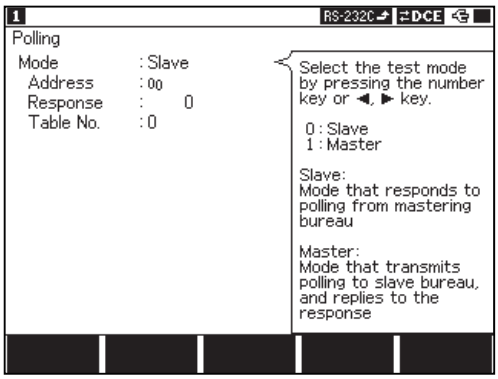
In the multi-polling test, your analyzer works as slave station or master station. And it tests if data corresponding to each situation is transmitted and received.

Setting

From top menu, move "▶ ◀" to "POLLING" on the top menu. Press [E]: POLLING options or [Enter].

Slave Mode

In the slave mode, your analyzer works as slave station. When self-station address is received , response message will be returned.



Multi Polling Test Setting Screen

☜ Set "Mode" to be "[0]: Slave".

Set the following items.

Item	Description	Range
Address	Station address	Within eight characters in HEX
Response	Delay time	0 to 99999ms 1ms unit
Table No.	Transmission table number	0~F

Address : Sets station address for your analyzer.

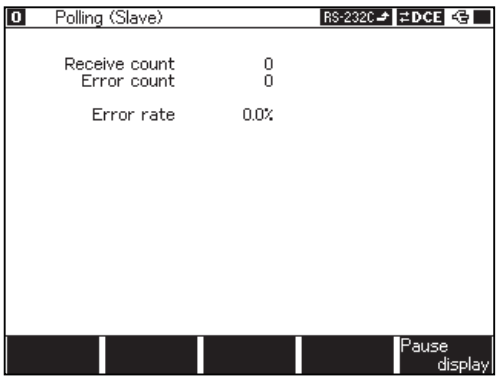
Response : Sets delay time from reception of a message to transmission of a response message.

Table No. :Sets the transmission data table number registering response message data.

- Response message data is required to set to the transmission data table corresponding to the number which is set in "Table No". in advance.
- The target of the transmission data table is group 0 (00 to 9F)

4.1 Preparation for Simulating

<Motion>



☜ Pressing [Run] activates the control lines RTS(CTS) and DTR(DCD), and enters the reception waiting state.

1. When a message is received, whether or not self-station address is included in received data is detected.
2. When it is not a message to self-station, reception for next new messages will be ready.
3. When it is a message to self-station, reception for that message will be completed. And then, response message will be returned after response time passes.
   - When a message to self-station is received, error check will be executed (Even if there are errors, only messages being set will be returned as response messages.).

Item	Description of Error Checking
ASYMC	Parity Error / Framing Error / BCC Error
SYNC	Parity Error / BCC Error
HDLC	FCS Error

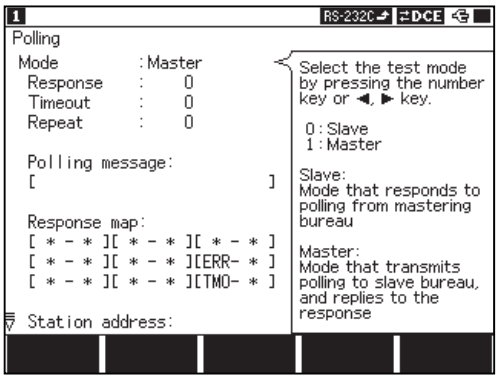
4. Processes No.1 to No.3 will be repeated again.

The following is displayed on the result screen: the number of messages transmitting to self-station, the number of error-generated times, and the rate of errors generated.

Receive count	The number of the received messages	0~99999
Error count	The number of the received messages including errors	0~99999
Error rate	The generating rate of the error messages	0.0~100%

Master Mode

In the master mode, your analyzer works as master station. And it transmits polling message to each station address, and checks data returned from its station address.



Select "Mode" to be "1:Master".

Set each condition.

Following is the description of "Response", "Timeout" and "Repeat".

Item	Description	Range	Remark
Response	Delay time	0 to 99999ms, 1ms unit	
Timeout	Time for timeout	0 to 99999ms, 1ms unit	*1
Repeat	The number of repeating times	0 to 99999 (times)	*2

Response : Sets delay time from reception of message from slave station to transmission of next response message.

Timeout : Sets waiting time for response from slave station.

Repeat : Sets the number of times to execute polling test.

*1If 0 is set in the Timeout field, time out will not be executed.

*2If 0 is set in the REPEAT field, polling will be continuously executed till the stop key is pressed.

Following is the description of "Polling message", "Response map" and "Station address".

- Polling message

Your analyzer (master station) will set polling message to transmit. Up to max. fifteen characters are settable. And slave station address will be added to the position where DON'T CARE "*" is entered with [X]. Slave station address is data, being registered later. In addition, it will be inserted to the "*" part in order of the minimum station number.

- Response map

Both of the following things are set in pairs: response of slave station for polling message and how your analyzer is operated by its response.

[*-*]=[A-B]

A : Sets transmission data table No. including response message from slave station. When DON'T CARE "*" is set with [X] , those pairs are ignored without being related to B's setting.

B : Sets transmission data table No. including message data transmitted by your analyzer when response message from slave station matches A's contents.

[ERR-*] : When communication errors are generated in response message from slave station, transmission data table No., including message data transmitted by your analyzer, will be set.

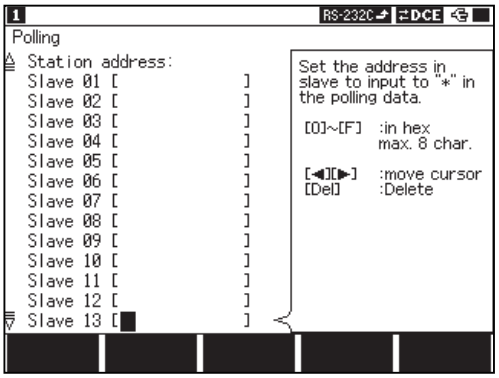
[TMO-*] : When waiting time for response (TIME OUT) from slave station is over, transmission data table No., registering message data transmitted by your analyzer, will be set.

In A, data registered in the transmission data table will be used as data compared with response message data received. In this time, from the first to the twenty third character of registered data will be effectively compared data.

In B, when DON'T CARE "*" is set in [ERR - *] and [TMO - *] with [X], polling will be executed to next slave station without transmitting anything.

In B, when a message is transmitted based on the settings of [ERR - *] and [TMO - *], your analyzer will be in a wait state for response from the same slave station.

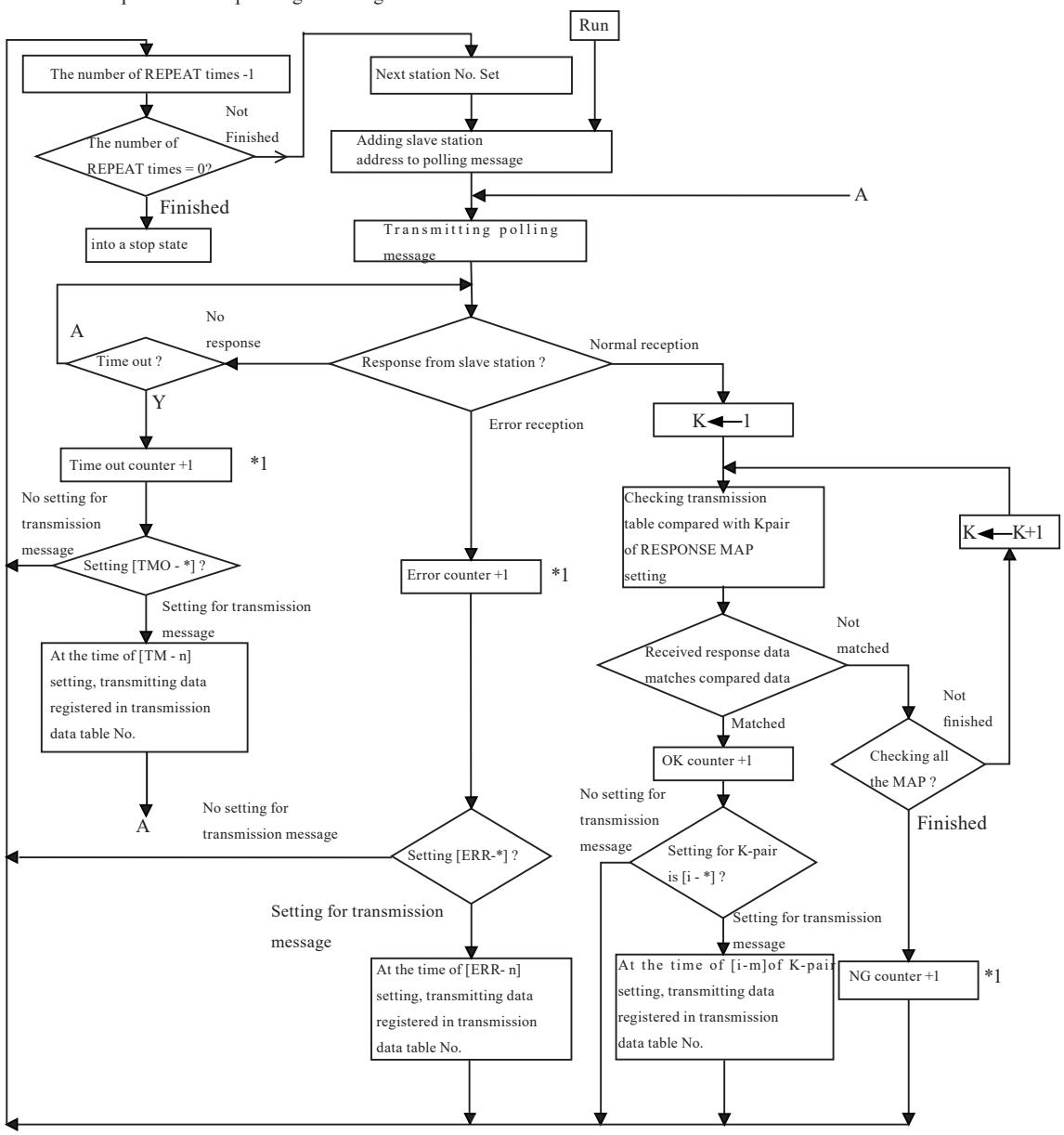
Scroll the screen and set the slave station addresses.



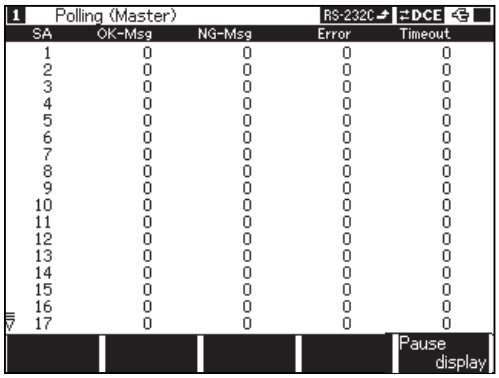
- Max. 32 kinds of station No. to set slave station address can be registered from 0 to 32.(Scroll by [▲][▼])
- Max. eight characters of slave station address are set in each station No. in a HEX input.
- Slave station address is inserted to polling message in order of the minimum station No. and it is used.
- When slave station address is unknown/non-registered station No., it will be ignored.

■ Motion

1. Pressing [Run] allows RTS and DTR of control lines active. And then, polling will be started.
2. It operates corresponding to setting conditions and slave station like below.



*1 It indicates count values that are displayed on the measuring result screen for master mode.



This is the result of Master mode.

Scroll by [▲][▼]

The measurement screen will display the following count condition every station No. ("SA").

Item	Count
OK-Msg	The number of received times for response message from slave station which matches compared data in RESPONSE Map.
NG-Msg	The number of received times for response message from slave station which does not match compared data in RESPONSE Map
Error	The number of received times for response message including communication errors.
Timeout	The number of time out-generated times

When communication errors are generated, the following conditions are checked based on communications protocol.

Item	Error Check
ASYMC	Parity Error, Framing Error, BCC Error
SYNC	Parity Error, BCC Error
HDLC	FCS Error

4.7 Program Simulation(PROGRAM)

In the program simulation function, a simple program is made because of command-selected programming system. And transmission/reception sequences through each protocol are flexibly simulated.

Outline

The following descriptions are provided exclusively for the program simulation.

◆Number of Program	Four kinds of the programs can be made.
◆Program Steps	A program up to 512 instruction steps can be made.
◆Number of Command	There are 47 kinds of the commands with the combination of commands and sub-commands. Moreover, the destination linked with the command can be labeled. Therefore, modifying a program can be easily executed.
◆Register	16 registers, "REG 0" to "REG F", are provided for processing numerical data in the rage of 0 to 999999.You can check the current value while the program is running on the timer counter screen.
◆Timer	There are four kinds of timers: "TM 0" and "TM 3". They are provided to measure time in a range of 0 to 999999 in a resolution based on the timer counter setting. Measured time is used in a programming to process timeout by means of the timer. Besides these timers, a timer whose purpose is exclusively to control the program halt within a limit of 9.999 sec (with fixed unit of 1msec) is provided for use with the WAIT TM command.
◆Counter	There are four kinds of counters: "CT 0" and "CT 3". They are provided for counting in a range of 0 to 999999. Counted value is used in a program to process the factor judgment by means of a command which compares it with the preset value of the counter.
◆Frame Buffer	A buffer memory exclusively used for recording data received in the unit of a frame (max. 4096 bytes) for a program simulation.

What is Frame Buffer

"Frame buffer" is a dedicated memory for the program simulation function, which is different from the capture buffer to record data for transmitters/receivers. For example, executing the WAIT FRM command makes the frame buffer initialized. After one frame of data is recorded in the capture buffer, it will be captured from the capture buffer to the frame buffer. The IF TBL command makes data in this frame buffer compared with one in the transmission data table. In addition, there are the following two ways to capture data into the frame buffer:

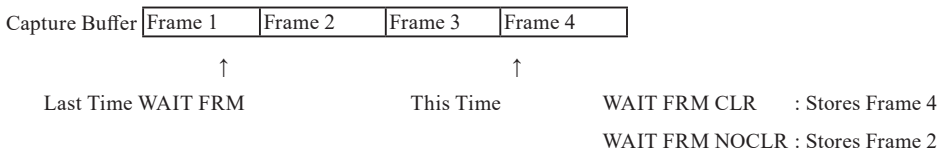
WAIT FRM CLR

After the WAIT FRM CLR command is executed, the frame buffer stores the frame recorded initially in the capture buffer. When the command is executed in the way of receiving a frame, the frame buffer will store the next frame after receiving the former.

WAIT FRM NOCLR

The frame buffer finds a frame which is coming after the frame stored last time by the WAIT FRM CLR/NOCLR command. And then, the frame buffer will store that frame.

<ex.>



The WAIT FRM CLR command is used to store a frame received after this command is executed.

The WAIT FRM NOCLR command is used to store a serial frame recorded by the WAIT FRM command last time.

9.3 Frame

- When one frame exceeds 4096 characters, storing stops at that moment.
  (Data from 4096 characters to the end of the frame will not be stored.)
- The following is also stored in the frame buffer: flags in the HDLC SLDC mode, and synchronous establishment character and synchronous release character in the SYNC mode.

■ Relation with Trigger Function

The following commands are related to the trigger condition being set for "Factor" of the trigger function. When those commands are used in a program, set the trigger condition beforehand.

INT TRG 0 :	Monitors if the condition set in "Factor" of the trigger No. 0 is satisfied even in the way of execution of the other program. If it is satisfied, it branched to the specified label number.
WAIT TRG n:	Waits until the condition set in the "Factor" of the trigger number n is satisfied.
IF TRG n:	Branches to the specified label number when the condition set in "Factor" of the trigger number n is satisfied.

Enabled/disabled setting for the trigger function and "Action" is ignored.

6.1 Trigger Function

Program Input

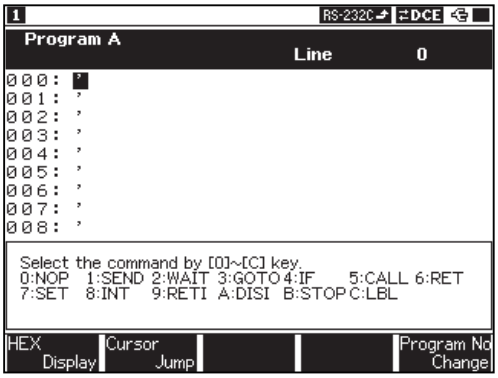
■ Setting

From top menu, move "▶ ◀" to "PROGRAM".Press [F]: "Program edit" or [Enter].

Display "Program" setting screen as follow.

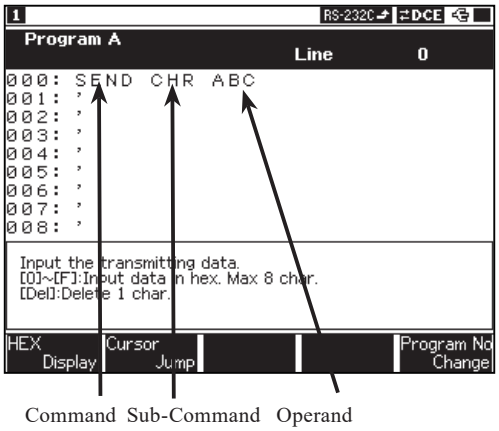
Set the configuration (communication condition) in advance.

2.6 Communication Condition Setting



Program setting (press [F5] to change to Program B-D)

●Composition of Command Language



One command language consists of three fields: "Command Field," "Sub-Command Field," and "Operand Field".

■ Input Method

1. Go to "PROGRAM"

From top menu, move "▶ ◀" to "PROGRAM".

Select [F]: "Program edit" or [Enter].

When you open this screen at the first time, you will find " ' " (NOP command=invalid) in each line.

2. Selection of Program

Up to four programs can be made. Go to Program A-D by pressing [F5]. Selected program number will be displayed in the left top. (Program A-D)

3. Programming

The blinking cursor indicates the line to input a program.(Normaly, you input from 000)

◆Command Field

Select command number from sub-window (bottom).

◆Sub-Command Field

After the command is entered, the cursor moves to the sub-command entry field. The sub-commands will be displayed in the sub-window. Select command number from sub-window.

◆Operand Field

After the sub-command is entered, the cursor moves to the operand entry field. The operands will be displayed in the sub-window. Select or input the operand in the sub-window. After entering all of required portion in each command, the cursor moves to the command field of the next line automatically.

◆Moving of the Line Cursor

Jump to the first line	:[Shift]+[Top/Del]
Jump to the final line	:[Shift]+[End/X]
Jump to a desired line number	: Press [F2]"Cursor Jump" and "Jumpline" will be displayed in the right top. Enter the destination line number by pressing the numerical keys and press [Enter].

◆HEX Display

Press [F1] to display the operands in HEX.

■ Modifying a Program

◆Modification of Command

1.Deleting Lines Move a cursor to the command field. And press [Top/Del] to delete the command in the line numbers. The commands in the following lines are advanced.

2.Inserting Lines Press the numerical key in the sub window to select a desired command at displayed contents. When the corrected command is entered , the following line numbers are moved down.

Entry operation causes the command in the last line (line No.511) to be deleted.

◆Copy & Paste

Select the range of data to copy by [Enter]. Copy by [F3] and paste by [F4].

◆Modification of a Sub-Command and an Operand

Move the cursor to the sub-command field. And then, enter a new sub-command. Old data will be overwritten. Modification of an operand is the same.

◆Deleting an Entire Program

The entire program will be deletedy by [Shift]+[F2].

Once the entire program is deleted, you can never undo it again.

■ Notice on Programming

The commands have the following differences in timing and the effect of the execution.

◆Data Transmission and Next Command

When the SEND command (the data transmission command) is executed, the program control proceeds to execute the next command before the data transmission is completed. Therefore, when the response to transmission data is stored in the frame buffer by means of the WAIT FRM command (one frame receive waiting command) or the like, the WAIR FRM command is placed next to the SEND command.

ex.)

```
SEND TBL 0
WAIT FRM CLR
```

In the case of the following commands that can be executed only after the data transmission is completed, they will not be executed because of a program wait state till data transmission is completed: the new SEND, the SET LM, the STOP command, etc.

◆Interruption during a Wait State

Your analyzer is in a wait state because of the execution of the WAIT command (the program execution waiting command). Also, the trigger condition is satisfied and the program control is branched by the INT (the trigger interrupt command). In this situation, when "Don't Care" is set for the destination of the return by RETI (the trigger interrupting and returning command), the command set after the WAIT command will be executed. Therefore, when the program control is branched in a wait state by the WAIT FRM command, the command will not be executed. In addition, the frame buffer may be emptied.

◆Setting of Several INT Commands

When several INT commands (the trigger interrupt command) are placed in a program with different branching destinations, the program control branches to last INT command executed before the trigger conditions are satisfied.

◆Setting "LINE" for the Trigger Condition of the INT Command

If the INT command (the trigger interrupt command) is used with "LINE" being set for the trigger condition, the program control branches to the specified destination when the combination of logical values of control lines changes from disagreement to agreement after the INT command is executed. Therefore, if agreement is already obtained when the INT command is executed, the program control is not branched until the agreement is lost and then obtained again.

6.1 Trigger Function

■ Saving a Program

The prepared program is saved in the backup memory even if the power is turned off.
If you have made more than one program and want to save them, use a memory card (option) in the file mode and save them as files named "xxxxx.SU".

Chapter 8 Saving and Loading Data

Four programs (A to D) are loaded or saved collectively. Especially, when they are loaded, all the programs will be overwritten.

■ Printing a Program List

◆In order to print the entire program list from line No. 0 to No.511:

Connect the printer by an cable and set the settings of analyzer and printer.
Press [Print] on the program entry screen.

If there are more than three consecutive NOP commands, only the first three lines are printed.

◆In order to print a part of a program displayed on the screen:

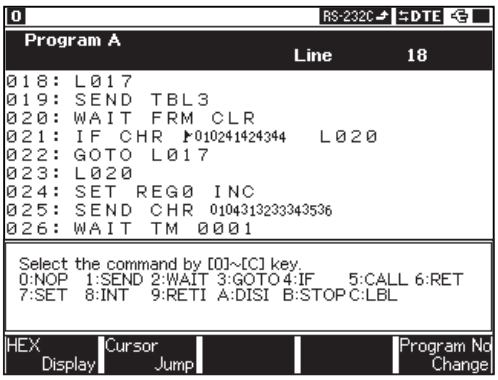
Press [Shift]+[Print].

7.1 Hard Copy Printing

Starting and Ending a Simulation

<Start>

■ Selecting a Kind of Running Program



Program edit

From top menu, move ▶ ◀" to "PROGRAM". Press [F] "Program edit" or [Enter].

Set the configuration (communication condition) in advance.

2.6 Communication Condition Setting

1. Press [F5] and choose a program from A-D.
2. Press [Run].
3. Program commands are executed sequentially starting with line No. 000. In order to check the current value of timer/counter and register, press [Data].

If [Run] is pressed without selecting any programs, a program simulation or an entered program, which is operated before, will be selected.

When the execution reaches last line (line No. 511), it will stop at the moment.

The length of the interval between the executions of two commands varies depending on the amount of data transmitted/received in the period and communication speed.

<End>

Press [Stop].

A running program will stop. Also, when the STOP command is executed, it will stop.

No	Command	Operation
0	NOP	No Operation.
1	SEND CHR □□□□□□□□	Data communications up to 8 characters.
	SEND TBL □	Data communications of the specified transmission data table.
	SEND REG □	Data communications of the transmission data table specified by a register value.
	SEND BUF	Transmits data in the frame buffer.
	SEND KEY	Transmits data in the transmission data table corresponding to keystroke.
	SEND DA □□+REG □	Transmits data of the data array specified by additional value of preset value of the data array number and the value specified by register number.
	SEND BRK	Transmit a break signal (for only ASYNC)
	SEND FRM	Transmits a X.25 frame.
2	WAIT CHR □□□□□□□□	Waits for the particular character string of up to 8 characters to be received
	WAIT FRM (CLR/NOCLR)	Waits for a frame to be received.
	WAIT TRG □	Waits for a specified trigger condition to be specified.
	WAIT TM □□□□□□	Waits for a specified period of time.
	WAIT KEY	Waits until one of the keys from 0 to F is pressed.
	WAIT LN □ = □	Waits until the logical values of the control lines meet with the setting.
	WAIT MLT	Executes multiple WAIT commands. If one WAIT command is satisfied, all WAIT commands will be released.
3	GOTO L□□□	Jumps to a specified label number.
4	IF CHR □□□□□□□□ L□□□	Branches to a specified label number if the particular character string is included in the frame buffer.
	IF TRG □ L□□□	Branches to a specified label number if the trigger conditions are satisfied.
	IF TM □ L□□□	Branches to a specified label number if the timer exceeds the setting value.
	IF CT □ L□□□	Branches to a specified label number if the counter exceeds the setting value.
	IF LN □ = □ L□□□	Branches to a specified label number if the logic values of control lines meet with the setting.
	IF REG□□□□□□□□ L□□□	Branches to a specified label number if the inequality relation between registers is satisfied, or register value is matched with the constant value.
	IF TBL□ L□□□	Branches to a specified label number if it is satisfied with data of table specified by the table number.
	IF DA □□+REG □ L□□□	Branches to a specified label number if data in the frame buffer is satisfied with data in the data array specified by the additional value, which is the sum of the designated value of a data array number, and the value designated in the register number.
	IF FT □□□□ L □□□	Branches to a specified label number if a frame stored in the reception frame buffer is matched with the specified type.
5	CALL L□□□	Jumps to a subroutine marked with a specified label number.
6	RET	Returns from the subroutine.
7	SET REG □□□□□□□	Sets a value to register, or increments or decrements the register.
	SET LN □ = □	Sets a value of the control line.
	SET TM □ □□□□□□	Sets a value to the timer, or controls the start, the stop or the restart of the program.
	SET CT □ □□□□□□	Sets a value to the counter, or increments or resets the counter.
	SET BZ	Sets the buzzer.
	SET OUT	Outputs a pulse to the trigger out terminal.
	SET DA □□□□□□□□□□	Sets data to the data array.
	SET DV □□ REG□□	Sets the specified number of characters on contents in register as a character string to the data array.
	SET MOD(8/128)	Sets a frame modulo for X.25 program simulation.
	SET AD □□□	Sets the address field of a frame transmitted by SEND FRM command.
	SET VS □□□	Sets or changes the value of V(S) state valuable.
	SET VR □□□	Sets or changes the value of V(R) state valuable.
	SET PF □	Sets the P/F bit value of a frame transmitted by SEND FRM command.
	SET DP □□□	Sets or changes the data pointer.
8	INT TRG 0 L□□□	Jumps to the subroutine marked by the specified label number when the condition of trigger 0 is satisfied.
9	RETI L□□□	Returns from subroutine started by the INT command.
A	DISI TRG 0	Disables an interruption.
B	STOP	Stops the running of simulation operation.
C	L□□□	Enters a label number in a range from 0 to 999 in decimal notation.

■ NOP Command (Invalid Command)

The NOP command, which is displayed as "," is the command that has no impact on the program execution.

NOP

<Entering>

Cursor Position	Enter & Operation
Command Field	0
Sub-Command Field	-
Operand Field	-

<Operation>

- When the program is running, the NOP command is ignored and the instruction of the next line number is executed.

■ SEND Command (Data Transmission Command)

The SEND command is used to transmit data from your analyzer.

1)SEND CHR □□□□□□□□ (Character Line Transmission Command)

<Entering>

Cursor Position	Enter & Operation
Command Field	1
Sub-Command Field	0
Operand Field	Enter a string of up to 8 characters in hexadecimal code. To enter a string of less than 8 characters,finish the entry by pressing [▼] and proceed to the next line.

<Operation>

- The character string which is set in the operand field is transmitted. Use this command to transmit a short character string such as the communication control character.
- Data is transmitted as follows, depending on SYNC MODE.

Protocol	Contents of Data Transmission
ASYNC	If the character string for transmission includes BCC calculation start and stop characters, the BCC code is inserted and transmitted automatically.
SYNC/BSC	The SYNC code and the Reset code are automatically inserted to data and transmitted. In addition, if the character string for transmission includes BCC calculation start and stop characters, the BCC code is added automatically.
HDLC	The flag and the BCC code are automatically inserted to data, and are transmitted.
PPP	If transmission data forms a frame, the FCS code is automatically inserted and transmitted.

2) SEND TBL □ (Data Table Transmission Command)

<Entering>

Cursor Position	Enter & Operation
Command Field	1
Sub-Command Field	1
Operand Field	Enter a data table number with the key, 00 to 9F.

<Operation>

- Data, which is in the transmission data table on the number being set in the operand field, is transmitted. Use this command to send multi character strings.

3)SEND REG □ (Register-Specified Data Table Transmission Command)

<Entering>

Cursor Position	Enter & Operation
Command Field	1
Sub-Command Field	2
Operand Field	Enter a register number with the key, 0 to F.

<Operation>

- The transmission data table number from 0 to F is specified with the register value being set in the operand field. And data with that number will be transmitted.
- When the register value is over 16, the transmission data table, with the remainder divided it by 16, is specified. And if data without setting any data table is specified, any data is not transmitted. Then, the next instruction will be executed.

4) SEND BUF (Frame Buffer Data Transmission Command)

<Entering>

Cursor Position	Enter & Operation
Command Field	1
Sub-Command Field	3
Operand Field	-

<Operation>

- Data stored in the frame buffer is transmitted.
- If no data is stored in the frame buffer, the next instruction is executed without sending any data. Before it is executed, the WAIT FRM command is required to execute in order to store data in the frame buffer.

  Parity error, framing error, break and abort error cannot be transmitted.

5) SEND KEY(Key-Specified Data Table Transmission Command)

<Entering>

Cursor Position	Enter & Operation
Command Field	1
Sub-Command Field	4
Operand Field	Enter a table group number from 0 to 9

<Operation>

Data in the transmission data table is transmitted when a key corresponding to the table umber is pressed (Data tables are numbered from [0] to [F].). If a data table without setting any data is specified, any data is not transmitted. And the next instruction is executed.

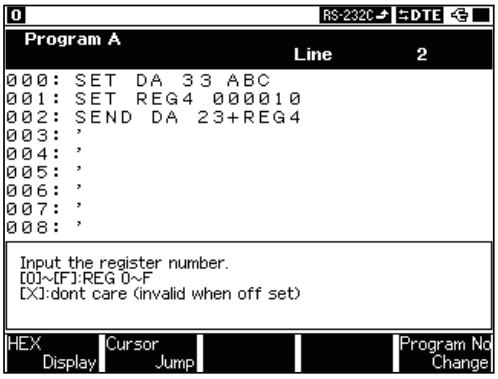
6) SEND DA□□ + REG*(Data Array Transmission Command)

<Entering>

Cursor Position	Enter & Operation
Command Field	1
Sub-Command Field	5
Operand Field	Enter two digits of a data array number with the key, 0 to 9
	Enter a data array number with the key, 0 to F. * (Don't Care) allows the offset specification to be invalid.

<Operation>

- The Data array is set for the data array number in the operand field. And register value, which is set for the register number, is added as an offset value to that data array. After that, that value is as a data array number. And corresponding data of data array will be transmitted. If the result of the addition includes three digits, its last two digits are as data array numbers and corresponding data of data array is transmitted.
- When "*" is set for a register number, data of the data array specified by the data array number is transmitted.
- If the "SEND DA XX" command is entered continuously, data registered in the data array is connected and transmitted. In this case, the size of transmission data is up to 1Kbytes. When it exceeds 1Kbytes, the excess of data will be omitted.
- If no data is registered in the data array set to the data array number, any data is not transmitted. And the next command is executed.
- Transmission data depends on the selection which is made on the configuration menu as the "SEND CHR" command.
- Data which is sent continuously is considered to be one frame. (In the case of "SEND CHR", each data is considered to be one frame)



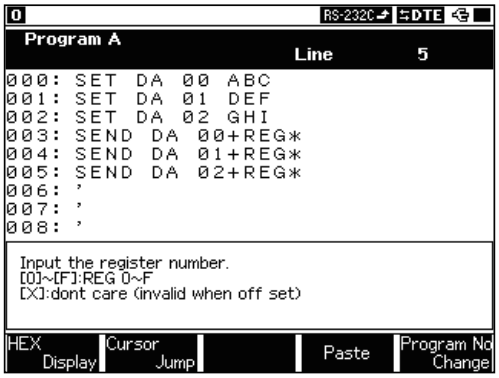
ex.)

Transmitting the contents (ABC) of DA33

1.Set ABC to DA33.

2.Set 10 to REG4.

3.DA number is REG4 value plus 23 (=33).Therefore, data ABC is transmitted.



ex.)

Connecting data from DA00 to DA02 and transmitting it (ABCDEFGHI)

1.Set ABC to DA00.

2.Set DEF to DA01.

3.Set GHI to DA02.

4.The "SEND DA XX" command is entered continuously. Therefore, data registered in the DA numbers from 00 to 02 are connected. And it (ABCDEFGHI) is transmitted.

7)SEND BRK (send break signal command)

<Input>

Cursor Position	Enter & Operation
Command Field	1
Sub-Command Field	6
Operand Field	-

<Operation>

- Send a break signal if protocol is set as "ASYNC".
- If there is any data transmission, it will start sending the break signal after completing the data transmission. When it starts sending the break signal, it will start another commands before completing the SEND BRK command.

8). SEND FRM □□□□□ TBL □ (transmit X.25 frame)

<Input>

Cursor Position	Enter & Operation
Command Field	1
Sub-Command Field	6
Operand Field	Select the frame type with the key, 0 to 9
	Enter a data table number with the key, 00 to 9F. Invalid the selection by "X".

<Operation>

- This command is available only the protocol is set to "HDLC".
- The value set in the SET AD command is used in the address field of transmission frame. Control field is constructed by frame type, V(S) state variable (set in SET VS command), V(R) state variable (set in SET VR command), and transmission P/F value (set in SET PF command). Data filed is set in the specified data table. If inputting " * " in the data table number, a frame without data field will be transmitted.
- FCS is automatically added if FCS (except FCS: None) is set in the configuration. Thus, you do not have to include the FCS in the data table.
- If there is any data transmission, it will start sending the frame after completing the data transmission. When it starts sending the frame, it will start another commands before completing the SEND FRM command.
- If selecting "INFO" as the frame type, it will increment the V(S) state variable. (Upper bit will be masked according to the modulo.)

■ WAIT Command (Command to Halt Program Execution)

The WAIT command is used to halt the execution of a program until the particular conditions are satisfied.

If the "INT TRG" command interrupts this command, a wait state is canceled.

1) WAIT CHR □□□□□□□□ (Command to Wait for Character Reception)

<Entering>

Cursor Position	Enter & Operation
Command Field	2
Sub-Command Field	0
Operand Field	Enter a string of up to 8 characters in hexadecimal code. To enter the string of lessthan8characters, finish theentrybypressing6and proceed to the next line. Additionally, "Don't Care" (*) and a flag ([Shift] + [F]) are acceptable.

<Operation>

- Your analyzer halts the program control until the specific character string, which is previously set in the operand field, is received.
- When "Don't Care" is set, your analyzer halts the program control until some character is received (This command does not use frame buffer.).

2) WAIT FRM CLR / WAIT FRM NOCLR (Command to Wait for Reception of a Frame)

<Entering>

Cursor Position	Enter & Operation
Command Field	2
Sub-Command Field	1
Operand Field	Select CLR/NOCLR with the key 0 or 1.

<Operation>

- Your analyzer halts the program control until one frame of data is received.
- This command stores received data in frame buffer. And the IF command allows you to check it in frame buffer.
- Data stored in the frame buffer remains unchanged until this command is executed again.
- Please refer to the definition of "frame buffer" in the beginning of this chapter.
- Change the following special register, after saving the received data in the reception frame buffer.

DL : Set the number of data in one frame. Unique data, such as the flag, break and abort are not counted as data. On the other hand, BCC and FCS are counted. If WAIT command is interrupted before receiving one frame, "0" will be set.

If the protocol is set as : Set the number of data in one frame. Unique data, such as the flag, break and abort are not counted as data. On the other hand, BCC and FCS are counted. If WAIT command is interrupted before receiving one frame, "0" will be set. HDLC" and the frame data without an error is captured in the reception frame buffer, following special registers will be changed.

AD : Value of address filed in the frame will be set.
NS : Value of N(S) in the control field will be set. If there is no N(S) value, nothing will be changed.
NR : Value of N(R) in the control field will be set. If there is no N(R) value, nothing will be changed.
PF : Value of P/F in the control filed of frame will be set.

If the received frame is INFO type, frame address field is "01H" or "03H", and N(S) field value is same as V(R) state variable, it increments (plus one) the V(R) state variable. (Upper bit will be masked according to the modulo setting.)
Data pointer value will be changed according to the above command. If the protocol is "HDLC", and frame data without an error is captured in the reception frame buffer, the offset value (value of top of data in the data field of a frame) will be set. Otherwise, "0" will be set.

3)WAIT TRG □ (Command to Wait for Satisfaction of Trigger Conditions)

<Entering>

Cursor Position	Enter & Operation
Command Field	2
Sub-Command Field	2
Operand Field	Enter a trigger number with the key, 1 to 3 (Trigger 0 is not selectable).

<Operation>

- Your analyzer halts the program control until the condition, which is set for the trigger FACTOR specified in the operand field, is satisfied.
- Valid and invalid conditions for the specified trigger and the contents being set for ACTION are all ignored.

WAIT TRG detects the turning point from unsatisfied to satisfied condition. When it branches by "INT TRG command," monitoring a trigger is not executed.

4)WAIT TM □□□□□□ (Command to Wait for Designated Time)

<Entering>

Cursor Position	Enter & Operation
Command Field	2
Sub-Command Field	3
Operand Field	Enter waiting time in six digits decimal figures with the key, 0 to 9.

<Operation>

- Your analyzer halts the program control for setting time specified in the operand field in the unit of 1msec.

5) WAIT KEY (Command to Wait for Key Stroke)

<Entering>

Cursor Position	Enter & Operation
Command Field	2
Sub-Command Field	4
Operand Field	-

<Operation>

- Your analyzer halts the program control until one of the numerical keys from [0] to [F] is pressed. Whatever key is pressed down, the result is the same.
- Value of the key number (0 to 15) will be set in the special register "KY" if there is any key operation.
- "999999" will be set in the special register "KY" if WAIT command is interrupted before it completes.

6)WAITLN □ = □ (Command to Wait for Meeting Control Lines)

<Entering>

Cursor Position	Enter & Operation
Command Field	2
Sub-Command Field	5
Operand Field	Enter the control line with the key, 0 to 7.
	Enter the logic value with the key 0 or 1.

<Operation>

- Program control waits until the logic values of the control lines meet with the setting.

7) WAIT MLT command

<Entering>

Cursor Position	Enter & Operation
Command Field	2
Sub-Command Field	6
Operand Field	-

<Operation>

- Execute multiple WAIT commands at the same time. When one of the WAIT command is satisfied, all WAIT commands are released.
- Write WAIT commands (except WAIT MLT command). The command ends when receiving Non-WAIT commands such as NOP commands, or another WAIT MLT command.
- Please read following instruction when setting more than one WAIT commands.

WAIT CHR	Able to set six commands with combination with WAIT TRG command.
WAIT FRM	Able to set only one command.
WAIT TRG	Able to set six commands with combination with WAIT CHR command. Cannot set more than one commands with same trigger number.
WAIT TM	Able to set only one command.
WAIT KEY	Able to set only one command.
WAIT LN	Able to set only one command for one control line and for one external input.

If WAIT commands exceeds above limitation, the exceeded WAIT commands will not be executed.

When one WAIT condition is satisfied, the following numbers which corresponding to WAIT commands will be set in the special register "ST".

100-105	1st to 6th WAIT CHR commands.
200	WAIT FRM command
301-307	WAIT TRG1 - WAIT TRG 7 commands.
400	WAIT TM command
500	WAIT KEY command
600	WAIT LN RTS command
601	WAIT LN CTS command
602	WAIT LN DSR command
603	WAIT LN DCD command
604	WAIT LN DTR command
606	WAIT LN RI command
607	WAIT LN TRG command

- If more than one WAIT commands are satisfied at the same time, earlier command on the program will be executed first.
- ”0"will be set in the special register "ST" if the WAIT command is interrupted before it completes.

■ GOTO Command (Designated Label Number Branch Command)

The GOTO command branches the program control unconditionally to designated label number.

1) GOTO L □□□

<Entering>

Cursor Position	Enter & Operation
Command Field	3
Sub-Command Field	-
Operand Field	Enter a label number in three digits decimal figures with the key, 0 to 9.

<Operation>

• Program control waits until the logic values of the control lines meet with the setting.

■ IF Command (Conditional Comparison Branch Control)

The IF command branches the program control to the designated label number if the particular conditions are satisfied. Or, it processes the next instruction if they are not satisfied.

1)IF CHR□□□□□□□□L□□□ (Received Character Comparison Command)

*WAIT FRM command stores received data in frame buffer and it allows IF comand to check data.

<Entering>

Cursor Position	Enter & Operation
Command Field	4
Sub-Command Field	0
Operand Field	Enter a character string of up to 8 characters in hexadecimal code. To enter a string of less than 8 characters, finish the entry by pressing6and move a cursor to the label entry section. Additionally, "Don't Care" (*) and a flag ([Shift] + [F]) are acceptable.
	Enter a label number in three digits decimal figures with the key, 0 to 9.

<Operation>

•Data in the frame buffer is searched. And if the character string specified in the operand field is found, the program command branches to the designated label number line.

2)IF TRG□L□□□(Judgment Command to Check Satisfaction of Trigger Conditions)

<Entering>

Cursor Position	Enter & Operation
Command Field	4
Sub-Command Field	1
Operand Field	Enter a trigger number with the key, 1 to 7 (Trigger 0 is not selectable.).
	Enter a label number in three digits decimal figures with the key, 0 to 9.

<Operation>

•The program control branches to the designated number if the conditions for the FACTOR of the trigger specified in the operand field are satisfied.

•The program control branches depending on the setting of the trigger event as follows.

Factor	Judgment Contents
Timer/Count	Does not perform anything. The next command is executed unconditionally.
Character, Error	Data in the frame buffer is checked to see if the conditions are satisfied.
Line	The conditions are checked to see if it is satisfied when the command is executed.
Idle time	The conditions are checked to see if it is the condition value or over when the command is executed.

Valid and invalid condition for the specified trigger and contents being set for "Action" are all ignored.

3)IF TM□ L□□□ (Judgment Command on Timer)

<Entering>

Cursor Position	Enter & Operation
Command Field	4
Sub-Command Field	2
Operand Field	Enter a timer number with the key from 0 to 3.
	Enter a label number in three digit decimal figures with the key, 0 to 9.

<Operation>

• The program control branches to the designated label number if the measurement value of the timer specified in the operand field is over the preset value.

4)IF CT□ L□□□ (Judgment Command on Counter)

<Entering>

Cursor Position	Enter & Operation
Command Field	4
Sub-Command Field	3
Operand Field	Enter a counter number with the key from 0 to 3.
	Enter a label number in three digit decimal figures with the key, 0 to 9.

<Operation>

- The program control branches to the designated label number if the measurement value of the counter specified in the operand field is over the preset value.

5) IF LN□ = □ L□□□ (Judgment Command on Control Line)

<Entering>

Cursor Position	Enter & Operation
Command Field	4
Sub-Command Field	4
Operand Field	Enter a control line with the key, 0 to 6.
	Enter the logic with the key 0 or 1.
	Enter a label number in three digit decimal figures with the key, 0 to 9.

<Operation>

- The program control branches to the designated label number if the logic of the control lines specified in the operand field meets with the setting.

6)IF REG□□□□□□□□ L□□□ (Judgment Command on Register Value)

<Entering>

Cursor Position	Enter & Operation
Command Field	4
Sub-Command Field	5
Operand Field	Enter a register number with the key, 0 to F.
	Enter all size of relation with the key, 0 to 5.
	Enter six digits in decimal figures with the key, 0-9. Or select "A" for comparing between the registers.
	Enter the label number in three digits decimal figures with the key, 0 to 9.

<Operation>

- The program control branches to the designated label, if the register number or inequality relation between registers of operand filed is satisfied.

  If you want to compare the contents of a register with a constant value, execute this command after storing the constant value in another register by using the SET command.

7)IF TBL□ L□□□ (Judgment Command on Data Table Comparison)

<Entering>

Cursor Position	Enter & Operation
Command Field	4
Sub-Command Field	6
Operand Field	Enter a data table number with the key, 00 to 9F.
	Enter a label number in three digits decimal figures with the key, 0 to 9.

<Operation>

- The program control branches to the designated label number if data satisfied up to 23 characters from the top of data, which is registered in the specified data table in the operand field, is detected in the frame buffer.
- Parity bit is not a object to be compared.

8)IF DA□□+REG□ L□□□ (Judgment Command on Data Array Comparison)

<Entering>

Cursor Position	Enter & Operation
Command Field	4
Sub-Command Field	7
Operand Field	Enter a data array number with the key, 0 to F.[* (Don't Care) allows the offset to be invalid.]
	Enter a label number in three digits decimal figures with the key, 0 to 9.

<Operation>

- The program control branches to the designated label number if data, satisfied with data being set in the specified data array in the operand field, is detected in the frame buffer.
- The method of designating a data array number is the same as that of "SEND DA Command".

9)FT L (Judgment Command on Reception Frame Buffer)

<Entering>

Cursor Position	Enter & Operation
Command Field	4
Sub-Command Field	8
Operand Field	Select a frame type with the key, 0 to 9.
	Enter a label number in three digits decimal figures with the key, 0 to 9.

<Operation>

- The program control branches to the designated label number, if the frame is matched with the specified type in the reception frame buffer.
  (Specify "INFO", "RR", "RNR", "REJ", "DM", "SABM", "DISC", "UA", or "FRMR".)
- In spite of selecting type, the condition will not be satisfied, if any of the WAIT FRM commands has not been executed, or the WAIT FRM command is interrupted before it completes.

■ CALL Command (Subroutine Call Command)

The CALL command is used to call a subroutine.

CALL L□□□

<Entering>

Cursor Position	Enter & Operation
Command Field	5
Sub-Command Field	-
Operand Field	Enter a label number in three digits decimal figures with the key, 0 to 9.

<Operation>

The program control branches to the subroutine that is marked with the label number specified in the operand field. The subroutine can be nested up to 100 folds.

■ RET Command (Command to Return from Subroutine)

The RET command is used to return from the subroutine to the main routine.

RET

<Entering>

Cursor Position	Enter & Operation
Command Field	6
Sub-Command Field	-
Operand Field	-

<Operation>

- The program control returns from the subroutine to the main routine. This command must be set to the end of the subroutine.

■ SET Command (Device Setting Command)

The SET command is used to control timers, counters, and registers and to preset values for them. Also, it is used to preset the logical values of the control lines, and to control the buzzer and external trigger output.

1)SET REG□□□□□□□ (Register Preset Command)

<Entering>

Cursor Position	Enter & Operation
Command Field	7
Sub-Command Field	0
Operand Field	Enter a register number with the key, 0 to F.
	Enter six digits in decimal figures with the key, 0-9. Or select "A" for increment, "B" for decrement, "C" for copying the value between registers, and "D" for setting the special register value in the register.
	C: Enter a register number with the key, 0 to F to copy the value between register. D: Select the special register value with the key, 0 to 7 to set the special register.

<Operation>

• The content of the register specified in the operand field is changed.

Register Preset Value	Setting Condition
Six Digits Decimal Figures	The preset value is entered in the register.
A	1 is added to the register contents.
B	1 is subtracted from the register contents.
C	Copy the value between the register.
D	Set the value of special register in the register.

When the program starts, all the registers will be set 000.

Following values can be checked if using the special register.

ST	Value of the WAIT command, which releases the WAIT MLT command.
KY	Value of [0] to [F] keys (0 to 15), which are inputted while executing the WAIT KEY command.
DL	The number of frames, which are captured in the receptions frame buffer by WAIT FRM command. Unique data such as flag, break and abort are not counted as data. BCC and FCS are counted.
DT	Data of the frame captured in the reception frame buffer by WAIT FRM command. Specify the position by data pointer "DP"(SET DP command). If it exceeds the number of frame data with captured data pointer, the value of DT will be "0".
AD	Value of address field of the frame captured in the reception frame buffer by WAIT FRM command.
NS	Value of N(S) field of the frame captured in the reception frame buffer by WAIT FRM command.
NR	Value of N(R) field of the frame captured in the reception frame buffer by WAIT FRM command.
PF	Value of P/F field of the frame captured in the reception frame buffer by WAIT FRM command.

2)SET LN□ = □(Control Line Logic Setting Command)

<Entering>

Cursor Position	Enter & Operation
Command Field	7
Sub-Command Field	1
Operand Field	Enter a control line with the key, 0 to 5.
	Enter the logic with the key 0 or 1.

<Operation>

•The control line specified in the operand field is set to the specified state.

•The relation between the control line and the values set in the operand field is as follows.

Value	Control Line	Value	Control Line
0	RTS	3	DCD
1	CTS	4	DTR
2	DSR	5	RI

The control line is set to mark state ("0") when the program starts.

The settable control line is subject to the condition of DTE/DCE of your analyzer.

When the control of the control line is ON, the condition of each line is changed without being related to this command: RTS, DTR, CTS and DCD.

Set "line control" to be "OFF" for normal operation.

3)SET TM□□□□□□□(Timer Control Command)

<Entering>

Cursor Position	Enter & Operation
Command Field	7
Sub-Command Field	2
Operand Field	Enter a timer number with the key from 0 to 3.
	Enter a preset value of the timer in six digits decimal figures with the key,0 to 9. Or, specify start, stop, and restart with the key, A to C.

<Operation>

•The preset value, which is compared with measurement value, is set to the timer specified in the operand field. Moreover, the timer operation is controlled.

Preset Timer Value	Setting Condition
Six Digits Decimal Figures	Set a preset value.
A	Starts the timer (START).
B	Stops the timer (STOP).
C	Restarts the timer [clear to 0 and start] (RESTART).

The preset timer value and the initial value will be the preset condition on the timer/counter setting screen of the top menu.

4)SET CT □□□□□□□(Counter Control Command)

<Entering>

Cursor Position	Enter & Operation
Command Field	7
Sub-Command Field	3
Operand Field	Enter a counter number with the key from 0 to 3.
	Enter a preset value of the counter in six digits decimal figures with the key, 0 to 9. Or, specify start, stop, and restart with the key, A to C.

<Operation>

•The preset value, which is compared with measurement value, is set to the counter specified in he operand field. Moreover, the counter operation is controlled.

Register Counter Value	Setting Condition
Six Digits Decimal Figures	Sets the present counter value.
A	(INC)Adds 1 to the counter.
B	(RESET)clear the counter to 0

The preset counter value and the initial value will be the preset condition on the timer/counter setting screen of the top menu

5)SET BZ(Buzzer Control Command)

<Entering>

Cursor Position	Enter & Operation
Command Field	7
Sub-Command Field	4
Operand Field	-

<Operation>

•Buzzer sounds.

6)SET OUT(Trigger Out Output Command)

<Entering>

Cursor Position	Enter & Operation
Command Field	7
Sub-Command Field	5
Operand Field	-

<Operation>

•The output pulse is delivered to the trigger out terminals (L level output for about 1mS).

Even if this command is executed again during outputting the pulse, the pulse (H ➔ L) will not be output.

7)SET DA □□□□□□□□□□(Data Array Setting Command)

<Entering>

Cursor Position	Enter & Operation
Command Field	7
Sub-Command Field	6
Operand Field	Enter two digits data array number with the key, 0 to 9.
	Enter a string of up to eight characters in hexadecimal code. To enter a string of less than eight characters, finish the entry by pressing ▲ and proceed to the next line.

<Operation>

•The specified character strings are set to the data array of the designated number.

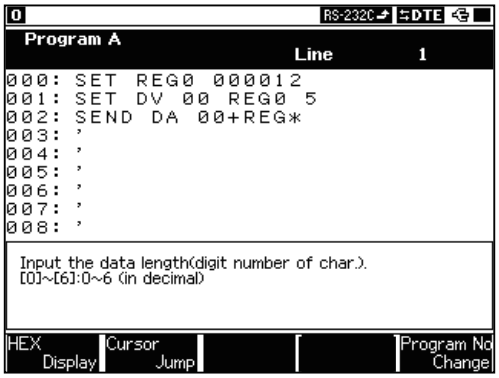
8)SET DV □□ REG □□(Data Array Setting Command)

<Entering>

Cursor Position	Enter & Operation
Command Field	7
Sub-Command Field	7
Operand Field	Enter two digits data array number with the key, 0 to 9. Input a registered number with the key, 0 to F.
	Enter the digit number of a character with the key, 0 to 6.

<Operation>

•The content of the specified register is set as a character string to the data array for the digit number of the specified character.



e.g.)
Transmitting REG0 value 12 as a character string of five digits.
1.Change 12 into a character string of five digits.
2.And set it to DA00.
3.Transmit DA00 (00012).

9)SET MOD □□□

<Entering>

Cursor Position	Enter & Operation
Command Field	7
Sub-Command Field	8
Operand Field	Select the modulo of X.25 frame. ("0"for modulo8 and "1"for modulo128.)

<Operation>

•Initial setting is modulo8.

10)SET AD □□H / SET AD REG □

<Entering>

Cursor Position	Enter & Operation
Command Field	7
Sub-Command Field	9
Operand Field	Enter two digits in HEX with the key, 0 to 9. Or press [SHIFT+0] to set the register.
	When setting the register by [SHIFT+0], input the register number with the key, 0 to F.

<Operation>

- Set the value of address field of the transmission frame by SEND FRM command.

SET AD nnH	Set the constant value specified in the address.
SET AD REGm	Set the register value specified in the address. If the register value is above 256, it will be divided by 256 and left value will be set.

11)SET VS □□□ / SET VS REG □

<Entering>

Cursor Position	Enter & Operation
Command Field	7
Sub-Command Field	A
Operand Field	Enter three digits (000-127) in decimal figures with the key, 0 to 9. Or select "A" for increment, "B" for decrement, "C" for setting the value of register.
	Enter the register number with the key, 0 to F to set the value of register.

<Operation>

- Set or change the value of V(S) state variable.

SET VS vvv:	Set the specified constant value in the V(S) state variable.
SET VS INC	Increment (plus 1) the value of V(S) state variable.
SET VS DEC	Decrement (minus 1) the value of V(S) state variable.
SET VS REGn:	Set the specified register value in the V(S) state variable.

- Upper bit of V(S) state variable will be masked according to the modulo setting.
- V(S) state variable will be used as the N(S) field value of a frame transmitted by SEND FRM command.

12)SET VR □□□ / SET VR REG □

<Entering>

Cursor Position	Enter & Operation
Command Field	7
Sub-Command Field	B
Operand Field	Enter three digits (000-127) in decimal figures with the key, 0 to 9. Or select "A" for increment, "B" for decrement, "C" for setting the value of register.
	Enter the register number with the key, 0 to F to set the register value.

<Operation>

- Set or change the value of V(R) state variable.

SET VR vvv:	Set the specified constant value in the V(R) state variable.
SET VR INC	Increment (plus 1) the value of V(R) state variable.
SET VR DEC	Decrement (minus 1) the value of V(R) state variable.
SET VR REGn:	Set the specified register value in the V(R) state variable.

- Upper bit of V(R) state variable will be masked according to the modulo setting.
- V(R) state variable will be used as the N(R) field value of a frame transmitted by SEND FRM command.

13)SET PF □

<Entering>

Cursor Position	Enter & Operation
Command Field	7
Sub-Command Field	C
Operand Field	Enter 0 or 1

<Operation>

- Set the value of P/F bit of a frame transmitted by SEND FRM command.

14)SET DP □□□□ / SET DP REG □

<Entering>

Cursor Position	Enter & Operation
Command Field	7
Sub-Command Field	D
Operand Field	Enter four digits (000-4095) in decimal figures with the key, 0 to 9. Or select "A"for increment, "B"for decrement, "C"for setting the value of register.
	Enter the register number with the key, 0 to F to set the value of register.

<Operation>

- Set or change the value of V(R) state variable.

SET DP vvv: Set the constant value specified in the data pointer.
SET DP INC Increment (plus 1) the data pointer. If the original value is 4095, the value will not be changed.
SET DP DEC Decrement (minus 1) the data pointer. If the original value is 0, the value will not be changed.
SET DP REGn: Set the register value specified in the data pointer.
If the register value is more than 4096, 4095 will be set.

- Data pointer "DP" is for positioning the data specified by special register. Data on the top of frame (except the unique data such as a flag) is the offset value "0". INT Command (Trigger Interrupt Command)

The INT command monitors whether or not the conditions of trigger 0 are satisfied while the program is running. And when the conditions are satisfied, the program control branches to the designated label number.

■ INT Command

1) INT TRG0 L□□□

<Entering>

Cursor Position	Enter & Operation
Command Field	8
Sub-Command Field	-
Operand Field	Enter a label number in three digits decimal figures with the key, 0 to 9.

<Operation>

- On executing this command, the conditions of trigger 0 are monitored to check if they are satisfied while the program is running. When the conditions are satisfied, the command during operating is completed. Then, the program control branches to the designated label number specified in the operand field. However, if your analyzer has been in a wait state by the WAIT command, this state will be cancelled by the INT command. Moreover, the WAIT command branches as an inoperative command during operating.
- Trigger conditions are not monitored while the destination subroutine of the branches is being executed. Monitoring is resumed when the RETI command returns the program control from the subroutine to the main routine. The following two things are all ignored. One is the valid and invalid condition for the specified trigger. The other is the content being set for "Action".

■ RETI Command (Trigger Interrupt Reset Command)

The RETI command returns the program control to the main routine from a subroutine which the program control is branched to by the INT command.

1)RETI L□□□

<Entering>

Cursor Position	Enter & Operation
Command Field	9
Sub-Command Field	-
Operand Field	Enter a label number in three digits decimal figures with the key, 0 to 9.Or, enter "Don't Care" with the r(*) key.

<Operation>

- The program control returns to the main routine from a subroutine which the program control is branched to by the INT command. If the label number of three digits decimal figures is entered in the operand field, the main routine is restarted at the instruction marked with the label number. If "Don't Care" is entered in the operand field, the main routine is restarted at the instruction next to that which is being executed before branching by the INT command.

■ DISI Command (Trigger Interrupt Disable Command)

The DISI command disables branching when trigger conditions are satisfied after executing the INT command.

1) DISI TRGO

<Entering>

Cursor Position	Enter & Operation
Command Field	A
Sub-Command Field	-
Operand Field	-

<Operation>

The branch of programs on satisfaction of trigger conditions is disabled.

To enable branching, execute the INT command again.

■ STOP Command (Program Quitting Command)

The STOP command stops a running program.

1) STOP

<Entering>

Cursor Position	Enter & Operation
Command Field	B
Sub-Command Field	-
Operand Field	-

<Operation>

• The program simulating operation is stopped. And then, your analyzer will be in an off-line state.

■ LBL Command (Command to Define Label)

The LBL command defines the destination of a branch command.

1) L□□□

<Entering>

Cursor Position	Enter & Operation
Command Field	C
Sub-Command Field	-
Operand Field	Enter a label number in three digits decimal figures with the key, 0 to 9.

<Operation>

• The LBL command defines a branch destination of the following commands: GOTO, IF, CALL,INT and RETI.

• The LBL command has no effect on the operation as the NOP command.

■ Sample Program

The program shown below transmits data in the data table 0. If the AK characters are received, it is transmitted again. If an error is received, data in the data table 1 is transmitted. And then, the program will stop. On the other hand, if no response is received within three seconds, data in the data table 2 is transmitted. After that, the program will stop.

```
SET TMO 003000          .....   Sets three seconds to timeout.
INT TRGO L004           .....    Executes the INT command (Monitoring timeout)
L001
SET TMO RSTART          .....   Restarts timer 0.
SEND TBL0               .....   Transmits data in the data table 0.
WAIT FRM CLR            .....   Waits for receiving a signal of one frame.
SET TMO STOP            .....   Stops timer 0.
IF TRG1 L003            .....    Judges errors.
IF CHR AK L002          .....    Judges AK characters.
GOTO L001               .....   Branches to retransmission process.
,
L002
STOP                    .....   Stops the program.
L003
SEND TBL01              .....    Transmits data in the data table 01.
GOTO L002               .....   Ends the program to branch.
,
,
L004
SEND TBL02              .....   Transmits data in the data table 02.
RETI L002               .....   Branches to the end of the program.
```

Setting of Trigger 0	FACTOR : TM/CT
	POINT : TM0
Setting of Trigger 1	FACTOR : ERROR

4.8 Pulse Generator Mode (PULSGEN) (LE-8200A only)

Generate the waveform measured by the Timing waveform function. Also, it can edit the data and have various kinds of tests, such as sending at different timing.

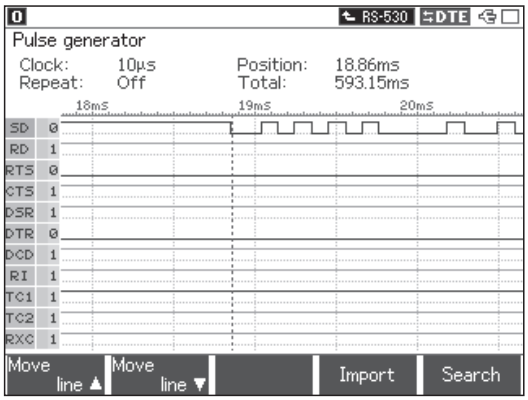
Preparation

Measure and record the waveform using the Timing waveform function, which you would like to generate later.

Capture waveform

Move a cursor to “PULSGEN”. Press “F” or “PULSGEN options”.

Press [Shift]+[F4](Import) to edit the waveform.



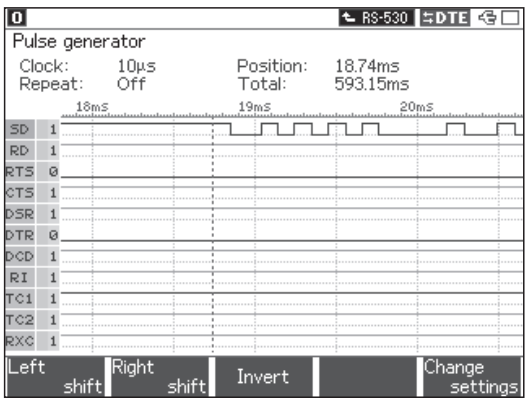
- Signals, which can be edited, will be surrounded by green circle.
- Signals can be edited by pressing [Shift]+[F1](upward) or [Shift]+[F2](downward).
- Scroll data by [Page Up] or [Page Down] key.

Edit waveform

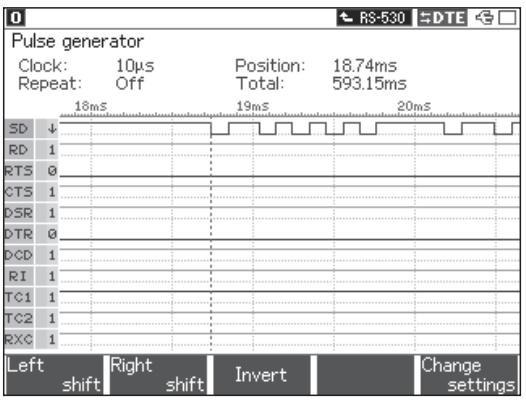
1). Inversion

Move the cursor by [▶] , [◀] .

Press [F3](invert) to invert the logical status of the signals. The target signals are the ones shown after the cursor.



Before inversion



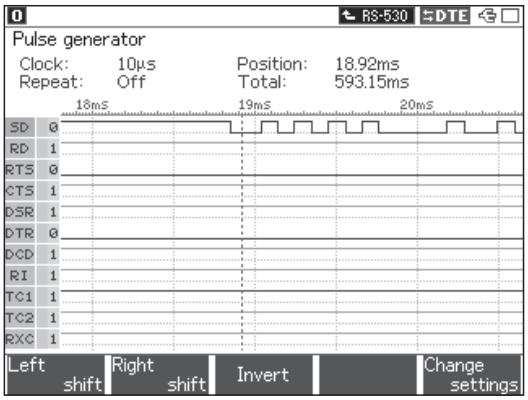
After inversion

Target signals are the ones shown on the screen.

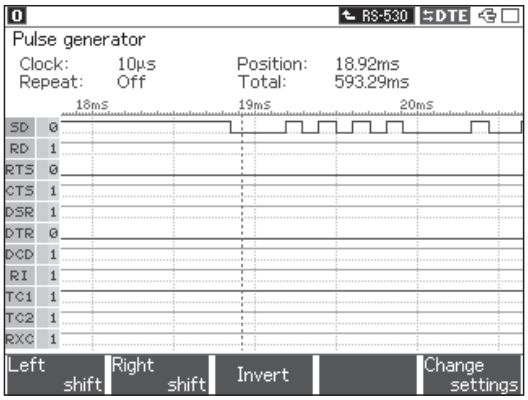
2). Insertion

Move the cursor by [▶] , [◀] .

Press [F2](shift right) to insert the same signals on the right side.



Before insertion

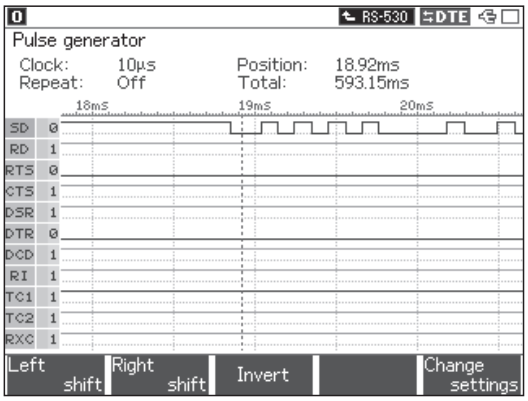


After insertion

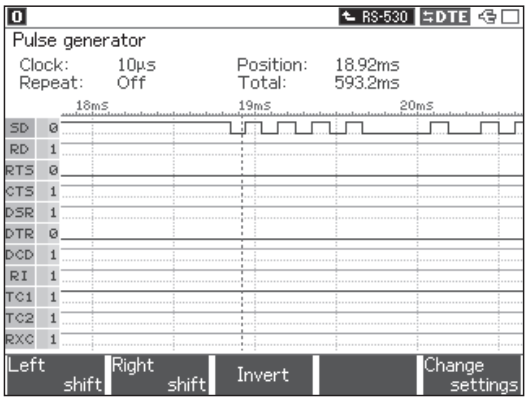
3). Deletion

Move the cursor by [▶] , [◀] .

Press [F1](shift left) to delete the signal on the right side of the cursor and shit others to the left.



Before deletion



After deletion

4). Search

Press [Shift]+[F5](search).

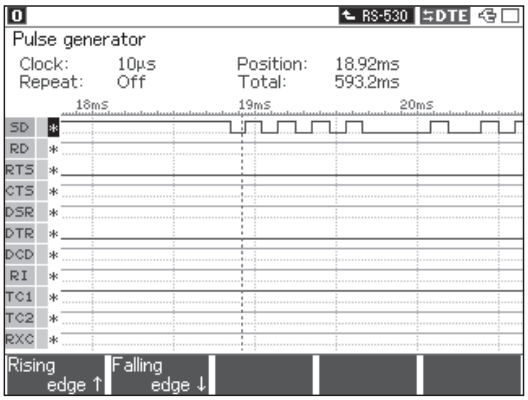
When pressing [F1](rising edge), "↑" mark will be appeared on the side of target signal name.

When pressing [F2](falling edge), "↓"mark will be appeared on the side of target signal name.

Target signal will be found by pressing [▶] or [◀] keys.

Change the target signals by pressing [▲] or [▼] keys.

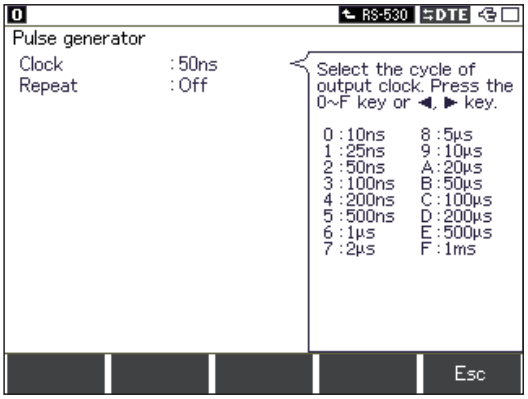
Press [Shift]+[F5] again to go back to the normal mode.

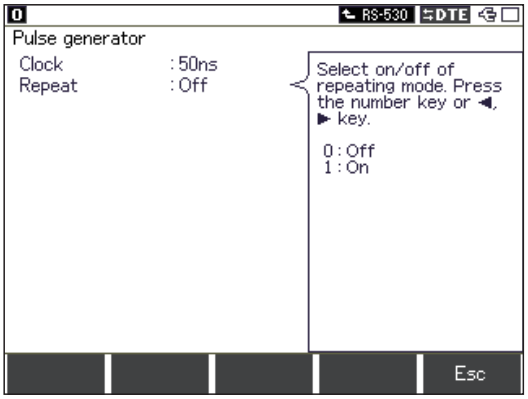


Setting

Press [F5](setting).

Select the clock to output the waveform. Select “Repeat: On” to send waveform repeatedly.





Operation

Press [Run] to output the waveform according to the clock setting.

The waveform will not be affected by the configuration (communication conditions).

Chapter 5 Bit Error Rate Test (BERT) Function

The analyzer has the ability to send the test pattern and to compare the received data to the test pattern. This makes it possible to evaluate quality of a data communication line, including modems, and to locate the point of trouble in the data communication line by means of loop-back test or end-to end communication test.

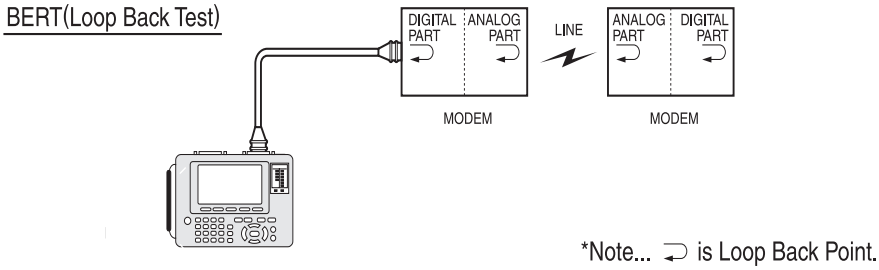
This feature functions only when the protocol is set at “ASYNC” or “SYNC”

2.6 Communication Condition Setting

Cable Connection

■ Connection for loop-back test

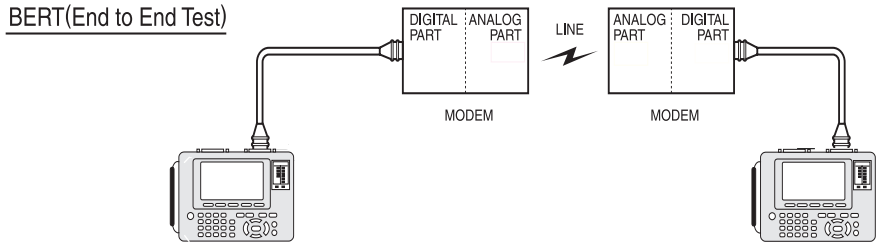
In the loop-back test, the test pattern data sent from the analyzer is sent back at each node of the communication channel. This enables an evaluation of the round-trip path over the communication channel via the node (loop-back point), and locates a trouble point by testing while changing the loop-back point.



The loop-back point can be usually set and changed in a modem by using the self-test function of the normal modem. (Consult the instruction manual of the modem you use.)

■ Connection for end-to-end test

In an end-to-end test, the communication channel is tested by connecting the analyzer to a device which has the BERT function equivalent to that of the analyzer, and the same test patterns are sent from both sides. This allows testing of the send and the receive lines independently.



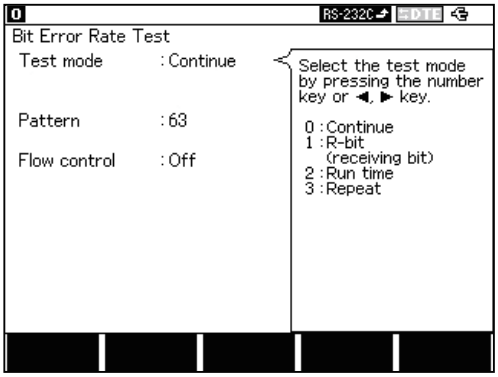
Setting

From top menu, move "▶ ◀" to "BERT".

Press [8]: BERT options or [Enter].

Set the configuration (communication condition) in advance.

2.6 Communication Condition Setting



BERT options

1. Set according to the table below.

Item	Meaning	Range
Test mode	Test mode	Continue/R-bit/Run time/Repeat
Pattern	Test pattern	63/511/2047/PN15/PN20/PN23/Mark/Space/Alt DBL-Alt/1in4/1in8/1in16/3in24
Flow control	RTS-CTS Flow control	Off/On

2. "Test mode"

Item	Name	Description
0	Continue	Continuous measurement
1	R-bit	Continues the test until the number of effective received bits exceeds the designated value.
2	Run time	Continues the test until the measurement time exceeds the designated value. (The elapse of time after synchronization has been established.)
3	Repeat	Measures BERT measurement of the specific time repeatedly.

◆ When R-BIT is selected, "Count" is displayed under "Test mode" to select the designated value of the number of effective received bits.

In the "Count", select a bit number (1.0E-9) from the sub-window.

◆ When "Run time" is selected, "Second" is displayed under "Test mode" to select the designated value of the measurement time.

In the "Second", select the measurement time with second unit by the numerical keys. (Max. 99999999sec)

◆ When selecting "Repeat", "Resolution" which can select the measurement time of 1 time is displayed under "Test Mode".

Can specify the specific unit time up to 2000 times at "Repeat".

3. Select a transmitting test pattern data at "Pattern".

Setting	Name	Description
0	63	2^6-1 (Random code generated by generation polynomial X^6+X+1)
1	511	2^9-1 (Random code generated by generation polynomial X^9+X^4+1)
2	2047	2^{11}-1 (Random code generated by generation polynomial $X^{11}+X^2+1$)
3	PN15	2^{15}-1 (Random code generated by generation polynomial $X^{15}+X+1$)
4	PN20	2^{20}-1 (Random code generated by generation polynomial $X^{20}+X^{17}+1$)
5	PN23	2^{23}-1 (Random code generated by generation polynomial $X^{23}+X^5+1$)
6	Mark	ALL 1
7	Space	ALL 0
8	Alt	10..
9	DBL-Alt	0011..
A	1 in 4	1000..
B	1 in 8	10000000..
C	1 in 16	1000000000000000..
D	3 in 24	0100010000000000000000100..

4. Set RTS-CTS flow control at "Flow control".

On: When the analyzer is in DTE mode, it transmits the data while CTS is active, and stops transmitting while non-active. When the analyzer is in DCE mode, it monitors RTS.

Off: Data transmission is always available.

■ Relation with the setting of "Protocol" of "Configuration".

The communication speed and transmission format(asynchronous synchronous) are determined by the setting of the "PROTOCOL" of "Configuration".

2.6 Communication Condition Setting

• In the Case of ASYNC

Item	Relevance
SD-Speed	Transmission speed of test pattern
RD-Speed	Receiving speed of a test pattern
Data bit	Character bits length of test pattern data
Stop bit	Stop bits length of transmission test pattern data
Other setting items	Irrelevant

Test pattern is divided to the designated value with Data bit and a start bit and a stop bit are added to each unit. The added start bit and stop bit are not measured.

• In the Case of SYNC/BSC

Item	Relevance
SD-Speed	Transmission speed of a test pattern
RD-Speed	Receiving speed of a test pattern
Clock	Transmission clock
Other setting items	Irrelevant

5.1 Starting and Ending Measurement

Start

Press [Run] to display the BERT results screen after the results of the previous measurement cleared, and new measurement starts.

■ Transmission Transmission of the test pattern starts from the SD side when DTE is set or from the RD side when DCE is set. The following signals are turned on simultaneously when the transmission starts.
When DTE is set : RTS, DTR
When DCE is set : CTS, DSR, DCD

It is possible to stop updating the result display by pressing [F5] during measurement. However, at the time of "Repeat" measurement, only the number of measurement unit time displayed at the lower part of the screen is updated.

■ Receiving "Sync. search" is displayed until the initial pattern is detected and synchronized. "Sync. search" disappears and measurement starts.

Every time [0] is pressed during a measurement operation (transmission of test pattern), a test pattern including one error bit is sent. Every time [1] is pressed, a test pattern including five errors is sent.

End

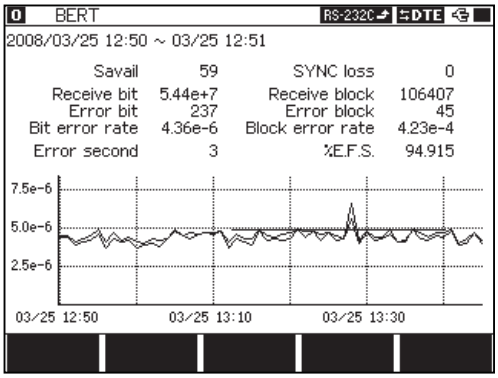
Press [F4] or [Stop] to stop the measurement.

When "TEST MODE" is set to "R-bit," "Run time," "Repeat," the measurement is automatically stopped by satisfying each measurement continuing condition.

RUN LED will be still turned on when you press [F4](stop test) or conditions are satisfied by the test mode of R-bit, Run time, or Repeat. RUN LED will be turned off when pressing [Stop] key. When the operation is stopped by the use of auto-run function, the transmission of the test pattern is stopped and RUN LED also will be turned off.

2.5 Environmental Setting

When you press [F4](stop test), you can start the test again by pressing [F3](run test).



Result of test (only valid when Repeat function)

Name	Description	Measured Range	Note
Savail	Effective period after synchronization is first established	0~9999999(sec)	1
Receive bit	Number of received bits while synchronization is maintained	0~9999999~9.99E9	1
Error bit	Number of bit errors occurred	0~9999999~9.99E9	
Bit error rate	Bit error rate	0.00E-0~9.99E-9	
Sync loss	Number of deviations from synchronization	0~9999	2
Receive block	Number of received blocks while synchronization is maintained	0~9999999~9.99E9	3
Error block	Number of blocks which included bit errors	0~9999999~9.99E9	3
Block error rate	Block error rate	0.00E-0~9.99E-9	3
Error second	Time when bit errors were detected during Savail	0~9999999(sec)	
%E.F.S	Normal operation rate(%)	0.000~100.000(%)	4

1. Establishment of synchronization : Success in receiving 32 consecutive bits of normal data
2. SYNC LOSS : Occurrence of at least 200 error bits among 512 consecutive bits
3. 1 BLOCK LENGTH : Number of bits in one cycle of test pattern
4. %E,F,S : (Savail)-(E-Sec)
   (Savail)

■ When selecting "Repeat", the number of measurement unit time is displayed at the lower part of the screen. After the measurement is finished, the data can be scrolled and displayed. Also, after pressing [F] to input the number key, the specific data can be displayed by pressing [Enter].

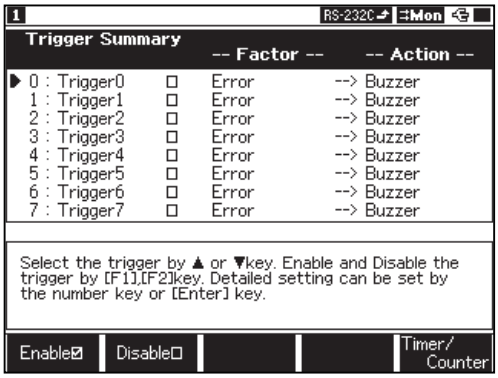
■ When selecting "Repeat", it is possible to print continuously in the table format and to capture data to the PC in TEXT at a format. One measurement is shown by one line. From the data displayed on the present screen, the data of every 60 lines per specific 1 page of print is printed.

Chapter 7 Printing Function

6.1 Trigger Function(Trigger)

Trigger Function is to start a specific action upon occurrence of a specific event as the trigger. In the normal monitor operation, a perplexing flow of data is analyzed on the basis of occurrence of the specific event.

Setting



From top menu, select [2]: "Trigger".

Enable or disable each trigger by [F1], [F2].

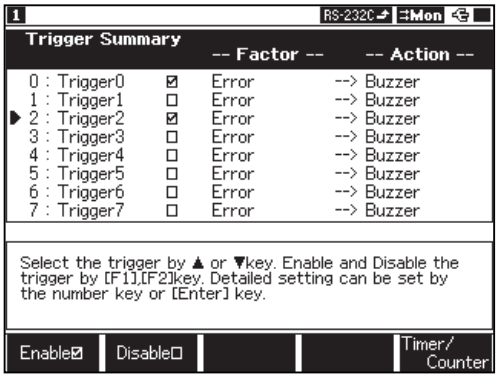
To change the trigger setting, press the numerical key or move the pointer and press [Enter].

Up to 8 triggers can be set. FACTOR and ACTION may be set for each trigger independently.

■ Setting a trigger enable/disable

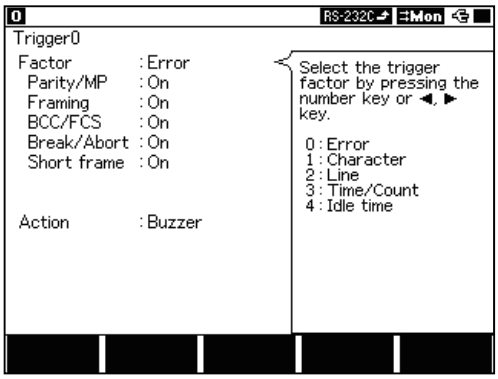
Enable and disable the trigger by pressing [F1] or [F2].

ex.) if you want to enable the trigger 0 and 2, move the pointer to 0 and 2, then press [F1].



	Trigger
1.[F1]	" ☑ " ENABLE
2.[F2]	" ☐"DISABLE

Factor

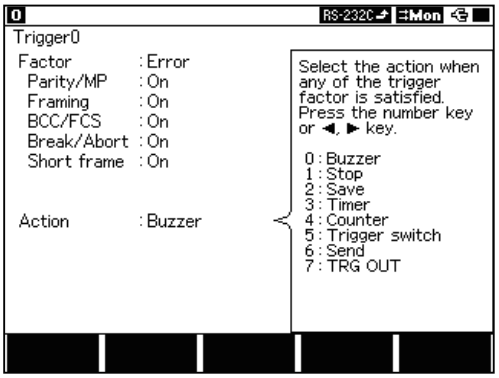


Go to the trigger setting screen.

Select a trigger factor at "Factor". A list of "Factor" is shown in the sub-window. Press the numerical key or [◀], [▶].

☜ There are five factors.

Action

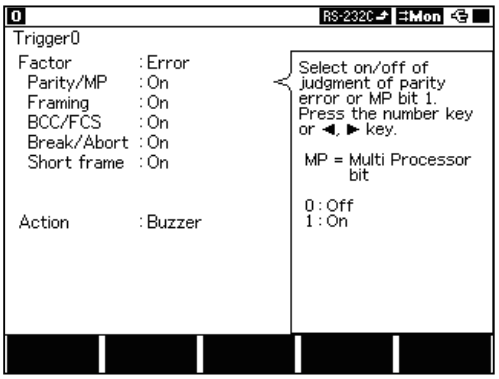


Select a trigger action at "Action". A list of "Action" is shown in the sub-window. Press the numerical key or [◀], [▶].

☜ There are eight actions.

Factor(detail)

■ Error

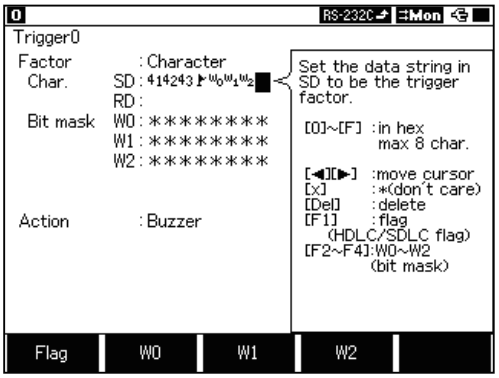


"Action" takes place by the generation of an error.
Parity/MP and BCC/FCS are effective only when "None" has not been selected in the configuration.

Parity/MP Parity error MP bit =1
Framing Framing error
BCC/FCS Block check code error
Break/Abort Break/Abort
Short frame Short frame

* When I2C is measured using OP-SB85L, if Parity/MP of Error is set to On, the acknowledge bit of I2C '1' will be the trigger factor.

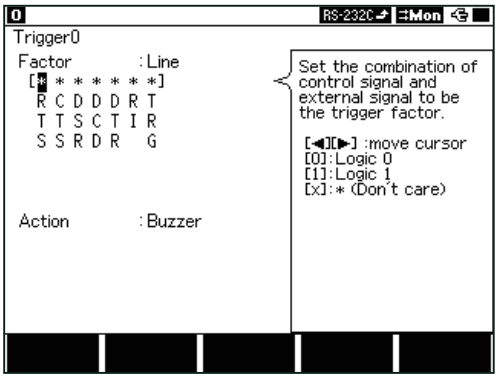
■ Character



"Action" takes place by the generation of a specific characters. Up to 8 characters can be set for each of SD or RD sides separately. X(Don't care), bit mask (from [F2] to [F4] :up to 3 kinds) and flag ([F1]) of SDLC/HDLC can also be set.

- If you set char. trigger both in SD and RD, trigger in RD will be invalid.
- Use the bit mask when setting logic state for a specific bit.

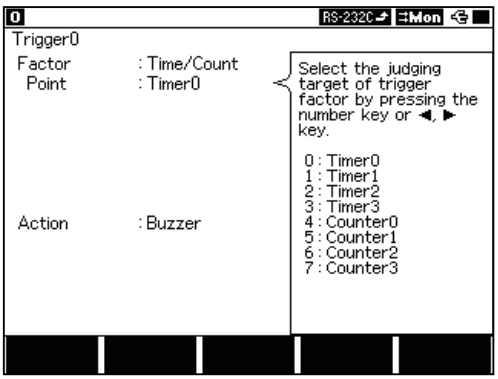
■ Line



"ACTION" takes place by a status of each signal line. Set the conditions with 1(H), 0(L) or X(Don't care) for the 7 lines : RTS, CTS, DSR,DTR, DCD, RI and TRG. The status judgment on 1, or 0 is displayed in the same way as the line state display.

- If you set "0" or "1" in more than two lines, the trigger will only be satisfied by AND condition. Also the trigger is satisfied when invalid condition becomes valid condition.

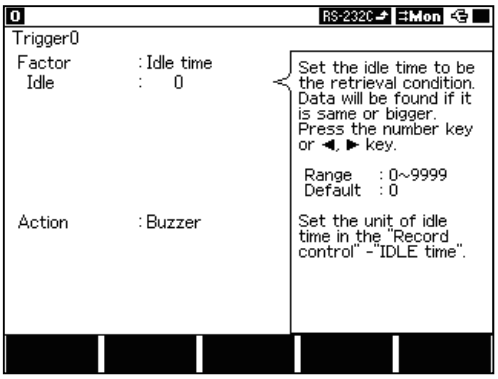
■ Timer/Count



"Action" takes place when the timer or the counter reaches a preset value. Specify which timer (Timer0-3) or counter (Counter0-3) is to be used.

6.2 Timer/Counter Function

■ Idle Time

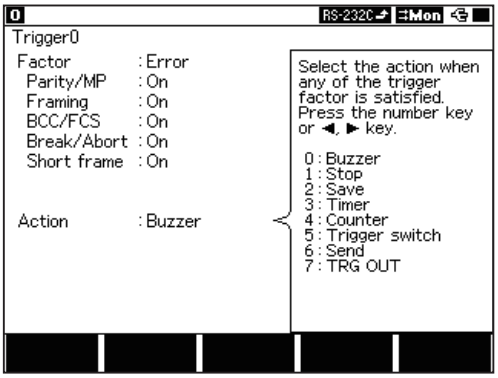


"Action" takes place when the idle time reaches a present value.

If you set the same trigger condition in other trigger number, the lower trigger number will act first and then bigger trigger number will act.

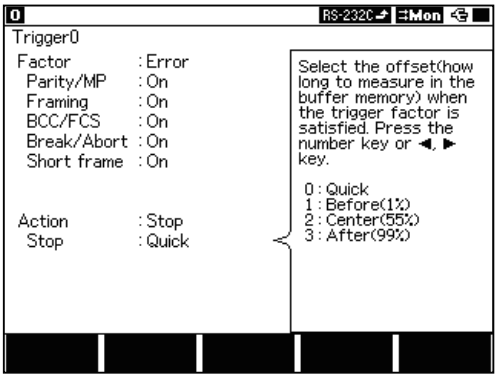
Action(Detail)

■ Buzzer



Buzzer sounds for about 0.3 seconds.

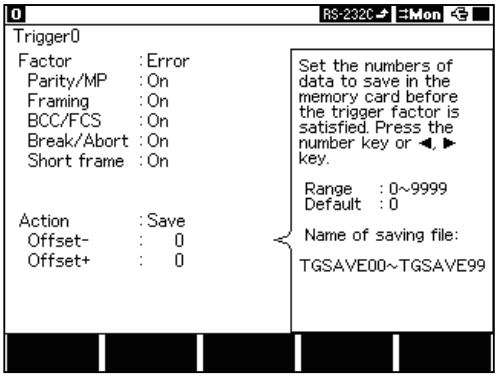
■ Stop



Measurement stops automatically. Delay time from the occurrence of the trigger to the stop of measurement can be set at "Stop".

Quick	Stops the measurement immediately as trigger occurs.
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



Save some data which exists before/after the trigger satisfaction. Set the amount of data (max.9999) to save by setting OFFSET (+)(-). OFFSET + means after the trigger and OFFSET - means before the trigger.

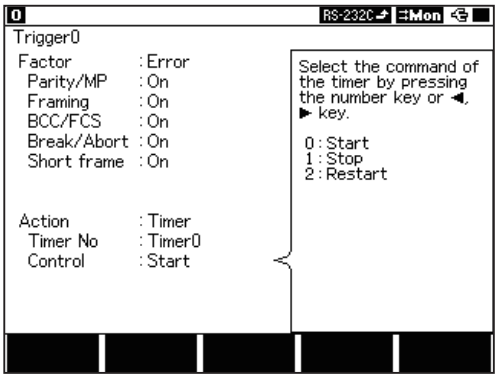
- It saves as a file when capturing data set in OFFSET (+)(-).
- "SAVE" action does not work while processing previous "SAVE" function.
- "SAVE" process will not be completed if stopping the measurement.

Display by [LOAD/SAVE] after the measurement.

The name of trigger saved file is "TGSAVEnn.DT".

- "nn" means number which is added automatically from 00 to 99 and is in the order of trigger saved.
- If the file name is over 99 in "SAVE" ACTION, the name is overwritten as 00.
- When you press [RUN], the file name will start from 00.

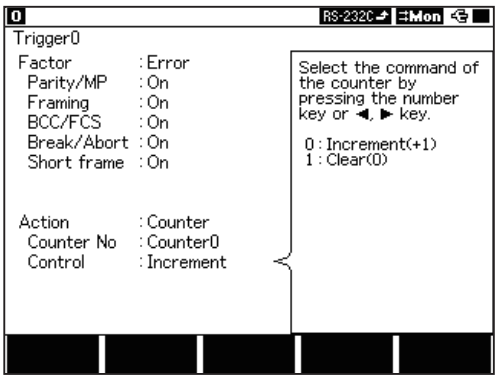
■ Timer



The timer is controlled. Specify the timer number to be controlled and the type of control (Start, Stop, Restart).

6.2 Timer / Counter Function

■ Counter

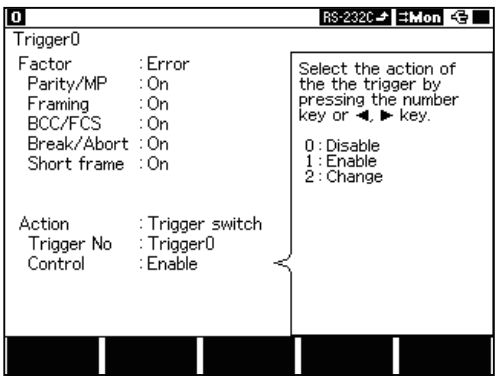


The counter is controlled.

Specify the counter number to be controlled and the type of control(Increment, Clear).

6.2 Timer / Counter Function

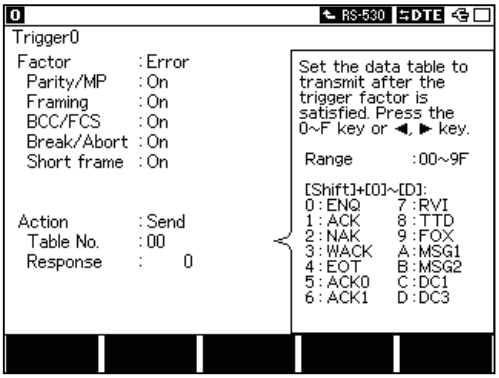
■ Trigger Switch



The status of other trigger is set when trigger event is occurred.

Disable	(ineffective)
Enable	(effective)
Change	(Disable⟶Enable/Enable⟶Disable)

■ Send



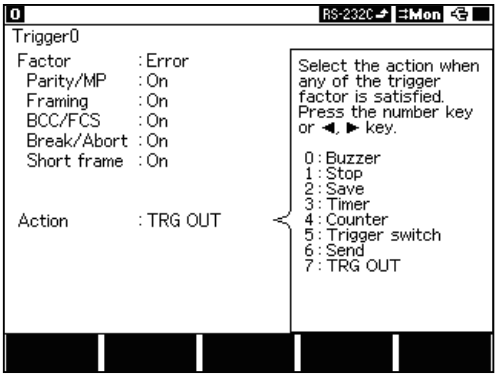
Send the data table which you have registered. Select "Table No".

Registered data table	Set the transmission data in the appropriate table number.
Fixed data table	Please refer to "4.1 Preparation for simulating".

Delay from the occurrence of a trigger before the start of data transmission (response time) can be set in the range of 0 to 99.99 sec at "Response".

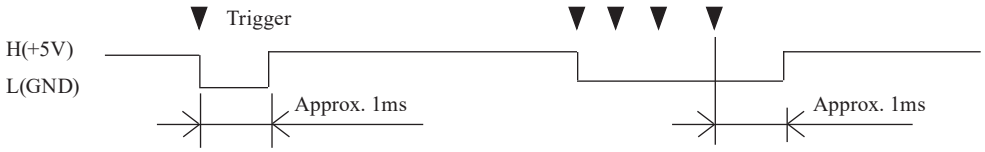
"Send" ACTION does not operate in the monitor mode but operates only in the simulation mode.

■ TRG OUT



The pulse is outputted from the external signal I/O terminal (TRGOUT terminal).

When new triggers occur during the trigger pulse output, the signal level will be HIGH level after approximately 1ms from the last trigger.



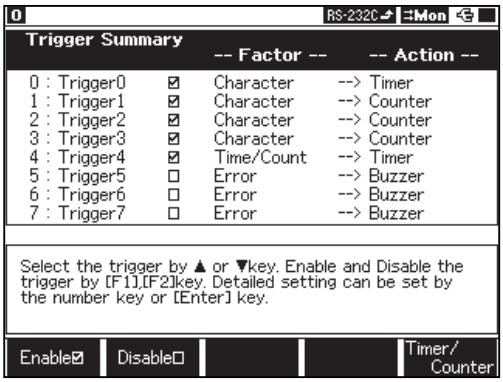
6.2Timer/Counter Function

- The Timer Function, in conjunction with the trigger function, measures the elapse of time since a "specific factor" occurred.
- The Counter Function counts the number of occurrences of a "specific factor".

The timer/counter function, which is controlled by the trigger function, makes more complicated analysis possible by using with the trigger function. Counter0 to Counter3 are general purpose counter. It operates by the control information from the trigger "Action" and counts up the factors specified as the trigger "Factor".

It will move to "Timer/Counter" screen, by pressing [Data] key while measuring.

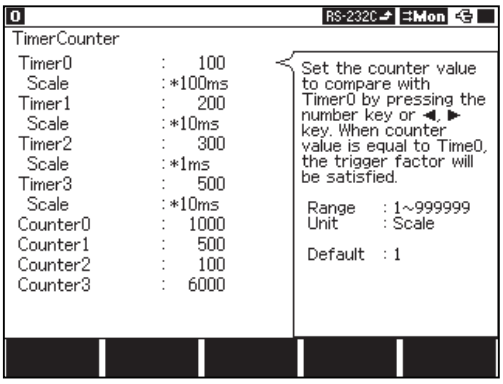
Setting



From the top menu, move "▶ ◀" and find "2 : Trigger" in the setup window.

Press [2] "Trigger".

And then press [F5] "Timer/Counter".



Set Timer 0-3 and Counter 0-3.

Timer Operation

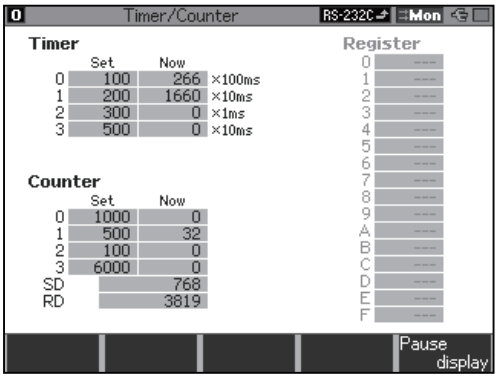
1. Clears the timer to 0 and stops as soon as measurement starts.
2. Starts, stops or restarts by the control information of trigger.
3. When the number of "Set" matches the number of "Now" in the "Timer"(refer to "Display" below), it will send this matched information to trigger.
4. Restarts counting from 0, in the case of an overflow of "Now".
5. Restarts counting from 0, in the case of an overflow of measured value.

6.1 Trigger function (Trigger)

Counter Operation

1. Clears the counter to 0 as soon as measurement starts.
2. Is incremented or cleared as a result of the control condition of the trigger.
3. When the number of "Set" matches the number of "Now" in the "Counter" (refer to "Display" below), it will send this matched information to trigger.
4. Restarts counting from 0, in the case of an overflow of "Now".

6.1 Trigger function (Trigger)



Timer/ Counter Display

Preset and current values of the timers and counters can be checked by pressing [Data] even during measurement([Run]). (Can change to the Timer/ Counter Display.)

"Register 0-F" displays the register value used in the program simulation.

6.3 Timing Waveform Measurement Function(Wave monitor)

The function is to measure the timing of data as a logic analyzer through a communication channel.

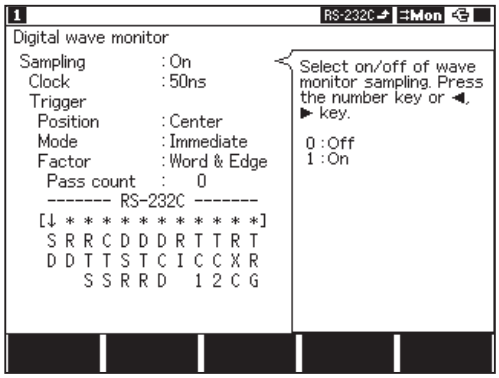
Timing of communication line is displayed by waveform in time resolution of max. 10n sec.

Setting

From the top menu, move "▶ ◀" and find "4: Wave monitor" in the setup window.

Press [4] and go to "Digital wave monitor" screen.

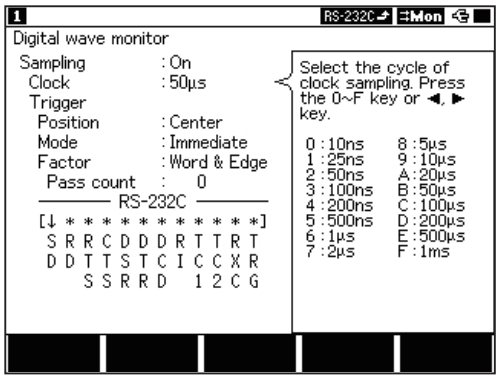
■ Sampling



"Digital wave monitor" screen

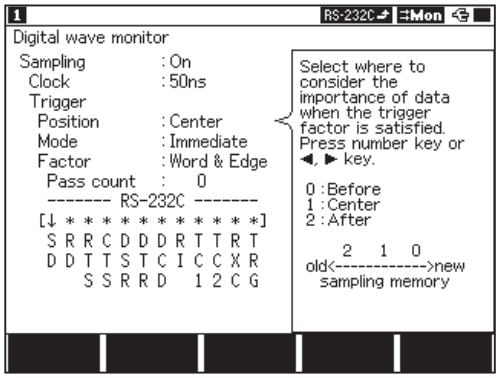
Select on/off of digital wave monitor measurement.

■ Clock



Set Sampling Clock by [0] to [F].

■ Position(Trigger Position)

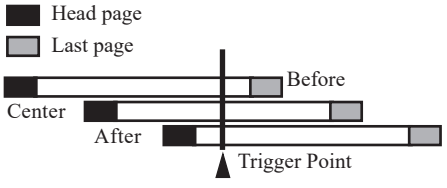


Set the posittion of trigger in the timing waveform measurement sampling memory (For 4K sampling).

Before : Stops the measurement after capturing some data following the trigger.

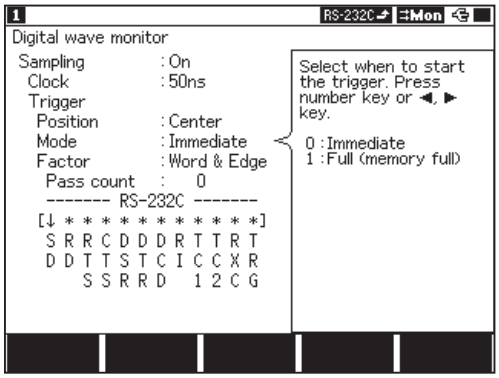
Center : Stops the measurement so that the same amount of data is captured in before and after the trigger.

After : Stops the measurement after capturing in a large amount of data after the trigger.



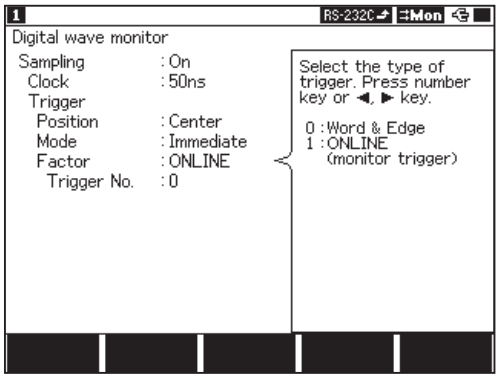
■ Mode(Trigger Mode)

Select a trigger mode.



Immediate	Trigger can be satisfied soon after measurement starts
Full	Trigger can be satisfied after 4K byte measurement. (Trigger will not be satisfied while measuring 4K byte.)

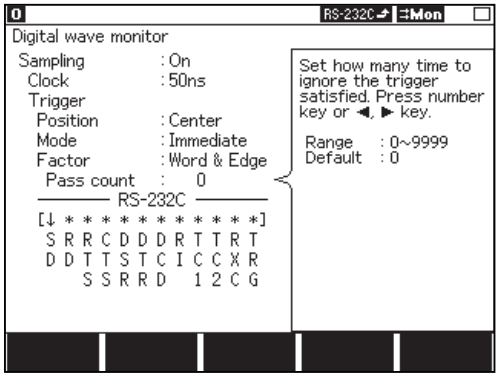
■ Factor(Trigger Factor)



Set the trigger condition.

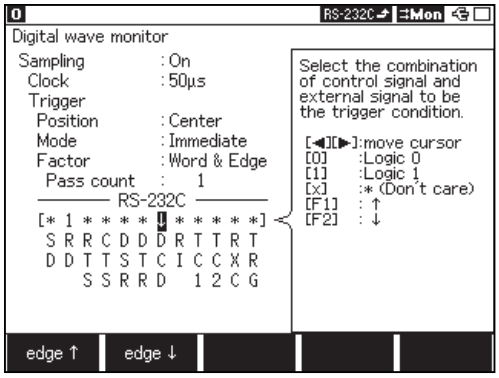
Word & Edge	Logic state or edge of signal will be the trigger condition.
Online	Trigger condition can be set at "Trigger". 0-7 trigger conditions can be set. Can specify the complicated situation by setting some combined triggers.

•Word & Edge : Logic state or edge of signal can be a trigger condition.



Set how many time to ignore the satisfied triggers at "Pass count".

Range : 0-9999



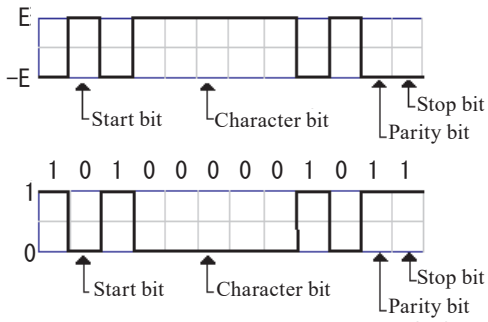
Select a signal line of the measurement port to be the trigger condition.

Be sure to set (↑)(rising edge) or (↓)(falling edge).

Select a signal line and condition.

[0]	:0
[1]	:1
[End/×]	: * (Don't care.)
[F1]	:↑
[F2]	:↓

Reference



Waveform of RS-232C ("A" = 41h)

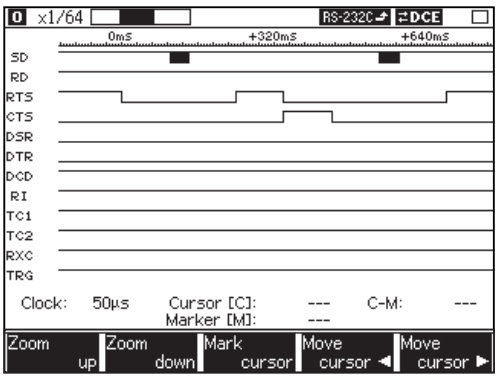
Waveform of "Digital Wave monitor (Press [Data] after the measurement.)

Operation

1. Press [Run] after you set the settings.
2. Press [Stop] to stop measurement.

Display

■ Digital wave monitor



Press [Data] key for some times to display "Digital wave monitor" screen.

Scroll by [◀] or [▶] key.

To scroll faster, press for a while.

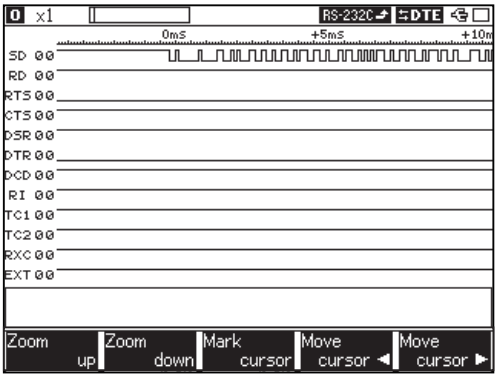
Move next page or previous page by [Page/Up] or [Page/Down] key.

In the left bottom of the screen, clock value will be displayed.

■ Function keys

Key (function)	Description
[F1] (zoom up)	Time unit becomes short. 1×2×5×10
[F2] (zoom down)	Time unit becomes long. 1 1/2 ×1/4 ×1/8 ×1/16 ×1/32 ×1/64
[F3] (mark cursor)	Mark a cursor line.
[F4], [F5] (move cursor)	Move the cursor. (to move faster, press for a while)
[Shift] + [F1], [F2] (move line)	Move to other data line.
[Shift] + [F5] (search)	Search data.

■ Enlarge/ Reduce the screen



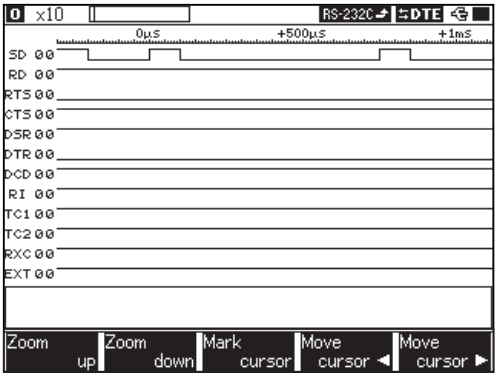
X 1

[F1](Zoom up) : Enlarge the screen.

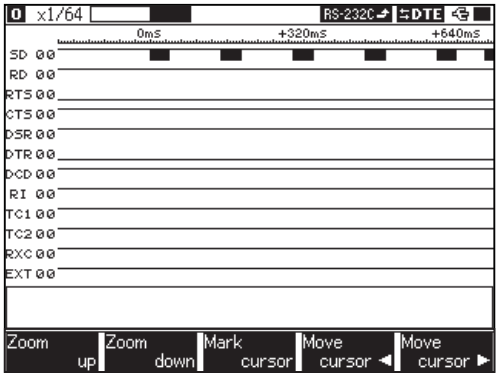
1 → ×2 → ×5 → ×10

[F2](Zoom down) : Reduce the screen.

1 → ×1/2 → ×1/4 → ×1/8 → ×1/16 → ×1/32 → ×1/64



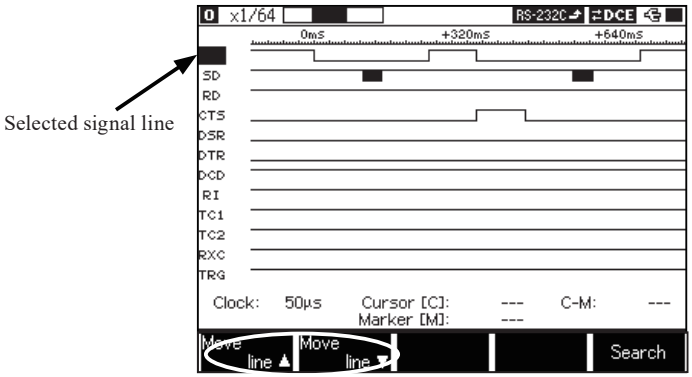
X 10



1/64

■ Change the display order of signal line

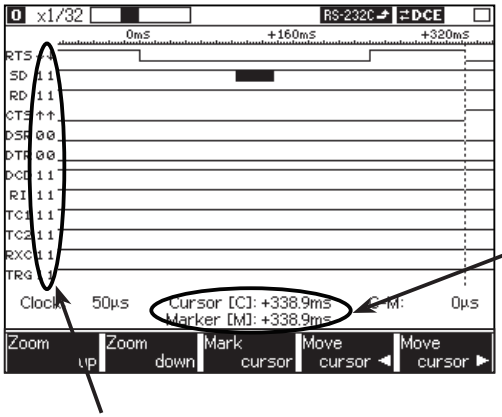
Press [Shift] + [F1] or [F2]"Move line" to change the display order of signal line. (Selected line will be highlighted as green)



Wave Monitor Screen

■ Measurement time for two points

e.g.) Measurement time from falling until next falling of RTS can be measured. (trigger condition "RTS↓").



1) Move the cursor to falling position of RTS. (move the cursor by [F4] and [F5]).
Mark the cursor line by [F3].

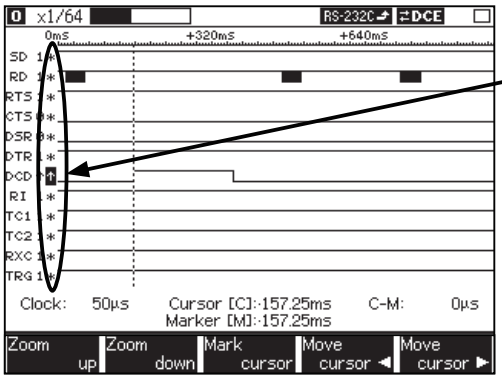
2) Move the cursor to next falling position of RTS. Mark the cursor line by [F3].

3) Time between two points will be displayed.

Line state of cursor position will be displayed.

■ Timing Search

[Shift]+[F5] "Search : Search the condition of signal line.



The search mode will be set by pressing [Shift]+[F5].

Move the green arrow by[▲] or [▼].

Input the condition.
↑:[F1] (rising edge)
↓:[F2] (falling edge)

Search by [F4], [F5].

Stop the search mode by [Shift]+[F5].

6.4 Communication Condition Auto Setting Function (Auto configuration)

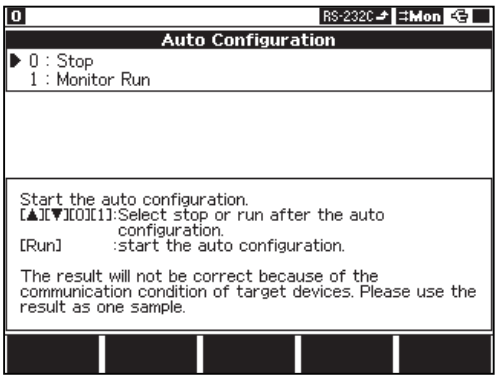
AUTO-configuration is a function that automatically determines the conditions of communication through a communication channel.

> This Auto configuration will not be correct because the communication condition of target devices varies. Please use the result as one example of setting.

Setting

From top menu, move "▶◀" to "ONLINE".

Press [5]"Auto configuration. "



Select the action when the auto configuration finishes by "▶" mark.

[0]: Display the result of auto configuration.
You need to set the communication condition by yourself.

[1]: Communication condition will be set automatically and start monitoring.

Motion

[Run] Starts an analysis to determine the monitor conditions.

> The analysis continues until all the necessary items to be set are determined. "***" on the screen indicates that the analysis is in progress, and "???" indicates that is in standby ready to run again.

[Stop] Interrupts the process of analysis.

> The analyzer returns to the auto-configuration screen regardless of the setting.

Upon the end of the analysis, the results of the analysis will be displayed or the monitor operation will start depending on the setting in step. If "Stop" is selected in step, the following key operations are available.

[Stop] :Displays the auto-configuration screen.

[Run] :Renews the configuration.

<Conditions required for automatic determination of communication conditions>

- Various data must be sent through the communication channel.
- A bit pattern '101' or '010' must be on the data lines.
- In the case of SDLC/HDLC (NRZ/NRZI), many frames which include normal FCS must be present.

> Over 115.2Kbps transmission rate can not be analyzed.

6.5 Logging Function for a Long Time(Auto save)

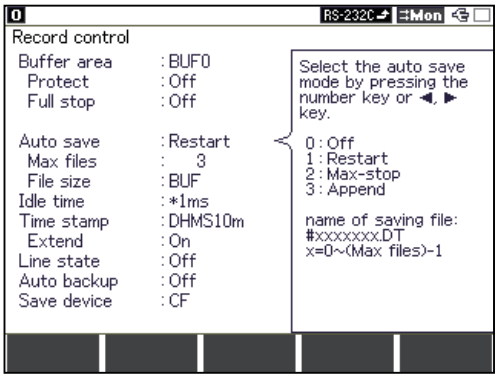
Data in capture memory while monitoring can be saved automatically to the optional CF card or USB flash drive as a logging file. The file automatically saved can be checked the data by file management function of this analyzer or optional accessories of PC link software. It is useful for rare network trouble of unknown cause as communication state for a long time can be stored.

Setting

Move "▶ ◀ " and find "3: Record control" in the setup window. Press[3]: "Record control".

Move the cursor to "Auto save". Select the device where you want to save the data by “Save device”.

Select [0]:Off, or [1]-[3]. (USB flash drive is supported only by LE-8200A.)

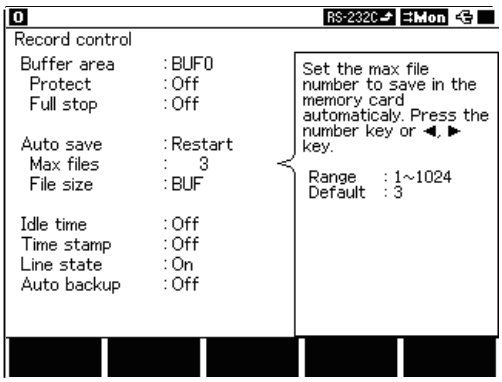


Move the cursor to "Auto save".

Select [0]:Off, or [1]-[3].

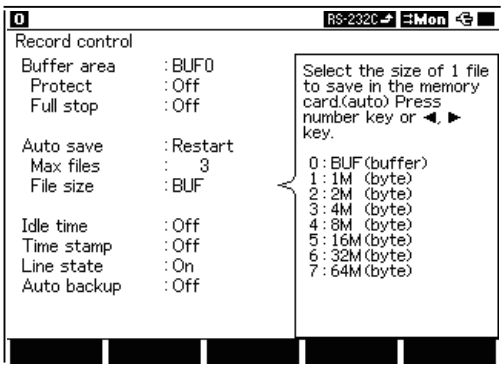
"1 : Restart"	When any auto-saved files exist in the "save device" (CF card or USB flash drive), the analyzer deletes all the files before start measuring. Then, it starts to save data until the number set in "Max files" or until the full capacity of the save device. After reaching the number or the capacity, it continues to save deleting the oldest files.
"2 : Max-stop"	When any auto-saved files exist in the "save device" (CF card or USB flash drive), the analyzer deletes all the files before start measuring. Then, it starts to save data until the number set in "Max files" or until the full capacity of the save device. After reaching the number or the capacity, it stops saving.
"3 : Append"	When re-executed, the existing auto save file is not deleted and a new auto save file is saved after that.

■When choosing "Restart"



"Max files" : set the max file to save (1-2048).

It may not be able to save data up to the maximum number of files because of the limitation of media even if the save device (CF card or USB flash drive) has remaining capacity.



"File size" : set the file size to be saved.

"BUF" Same capacity as the selected capture buffer.

A memory card of optional accessories is needed.

■ Preparation

Insert a CF card or a USB flash drive to LE-8200 / LE-8200A depending on the setting of “Save device”. <Continuous recording time reference>

Communication Speed(*)	CF card (2 GB)	CF card (8 GB)	CF card (16 GB)
9600bps	about 120 hours	about 480 hours	about 960 hours
1Mbps	about 76 minutes	about 5 hours	about 10 hours

*In the case that the communication on full duplex where data is being transmitted per 1ms.

- Only the CF card which LINEEYE guarantees for action.
- Make sure that you should let the battery fully charged and use AC adaptor before starting long time measurement.

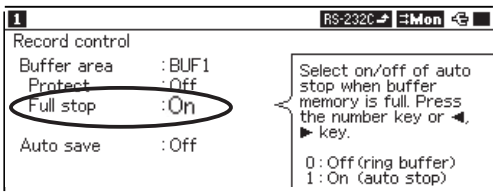
⚠ Attention	When the power of the analyzer is turned off during the long time measurement, not only auto-save files but also the save device (CF card or USB flash drive) may be unable to be accessed. So do not turn off the power during measurement.

■ Measurement

Press [Run] to start measuring on the action mode previously selected. The analyzer makes files every time when amount of "File size" in "Buffer select" is saved to the capture memory. The file named "#XXXXXXX.DT"(XXXXXXX is the number which starts from 0000000) is saved to the save device (CF card or USB flash drive). When the number of the auto-saved files is over the setting of "Max files" or the free space of the save device is not enough, the old ones for the those files are deleted from the oldest file(,the measurement stops without doing the deletion of the file, when "Max stop" has been chosen).

- When any auto-saved files exist in the save device (CF card or USB flash drive), the message box appears at the time of starting the new measurement. If you like to delete the old files, press again to start measurement. If you would like to keep them, press “Stop” and save them to your PC or use another save device.

  Note: This message will also appear when you chose “Append”. Because in some cases it deletes data in the save device (e.g. When the automatically-saved files exceed the maximum number, or when the save device has run out of its capacity).
- Up to about 1Mbps makes the Auto save function operate without lack of capturing data. During measurement if lack of data occurs, the lack number is displayed at the bottom line in the screen.
- After measurement, when you display the auto-saved data on the screen, the "Lost" shows the place of lacking data in the screen.



- When the "Full stop" of "Buffer area" is on, be sure the measurement stops when the capture buffer is full.

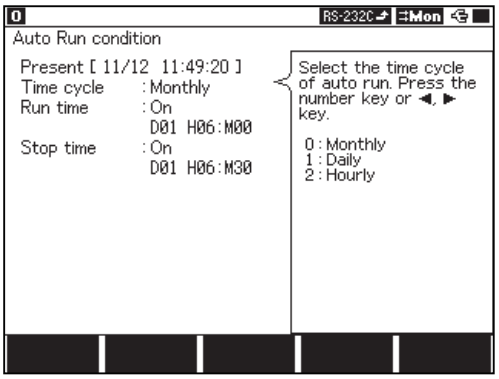
2.5 Environmental Setting

- When the measurement mode is "AI&DELAY", "TREND" or "BERT", the "Auto save" function is invalid regardless the setting of the "Auto save" item.

6.6 Automatic Start and Stop Function(Auto Run)

The AUTO RUN function enables you to start and stop a measurement at the specified time (per a month or a day or an hour).

- It is useful when you monitor at the specific time only.



From the top menu, press [F2] "System menu" and then press[4] "Auto run".

Time cycle :Selects Monthly, Daily and Hourly.

Items	Cycle
Monthly	The action in every month specific day (D), time (H), minute (M) (H is the 24 time unit)
Daily	The action in every day specific hour and minute
Hourly	The action in every hour specific minute

Run time :Selects date, minute, and hour to start measurement.

Stop time :Selects date, minute, and hour to stop measurement.

P-Off standby: Select On/Off of the function which automatically turns off the power while waiting the start of the measurement. When this function is On and there are more than 2 minutes between the moment auto-measurement wait state started and the moment next measurement starts, the power automatically turns off in 10 seconds. Then, 1 minute before the time the measurement starts, it automatically turns on the power and becomes auto-measurement wait state.

Power check: Select On/Off of the function by which it checks the existence of external power supply. If this function is On and there is no external power supply when automatic measuring starts, it keeps being wait state and does not start measuring. And when it is wait state by above situation and “P-off standby” is On, it turns off the power in ten minutes.

- If you want to use "Auto save" function, it is useful to set "Append".

2.5 Environmental Setting

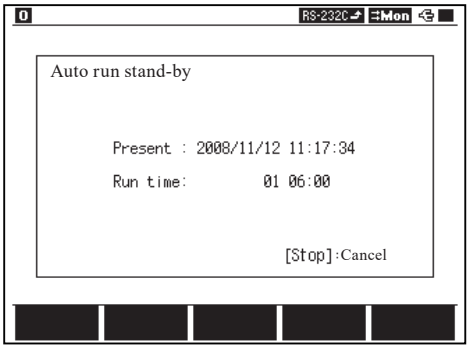
- You can set only "Run time" (Start) or "Stop time" (Stop) (Set off either of "Run time" or "Stop time")
- Once you press [Run], analyzer will remain standby until preset time.

Operation

1.After setting, when you press [Run] to display "Auto run stand-by," this analyzer starts receiving data.

2.If it comes to the time of setting, the measurement starts or stops according to the setting.

3.If you want to cancel the " Auto run" function, press [Stop].



6.7 Screen Switching Function

Screen Switching

You are able to change the Screen by pressing [Data] key while measuring or after the measurement. While measuring, the type of the display screen is different in while measuring and after the measurement.

In the measurement (after pressing [Run])

•ASYNC

Data display--> Display per one frame--> BSC translation display-->User definition translation-->Timer/Counter display-->Data display--> . . .

•SYNC/BSC

Data display-->BSC translation display-->User definition translation-->Timer/Counter display-->Data display--> . . .

•HDLC/SDLC

Data display-->BSC translation display-->Frame/Packet translation display-->User definition translation-->Timer/Counter display-->Data display--> . . .

•ASYNC-PPP

Data display-->BSC translation display-->PPP translation display-->User definition translation-->Data display--> . . .

After the measurement (after pressing [Stop])

•ASYNC

Data display--> Display per one frame--> BSC translation display-->User definition translation-->Timer/Counter display-->Wave monitor display-->Data display--> . . .

•SYNC/BSC

Data display-->BSC translation display-->User definition translation-->Timer/Counter display-->Wave monitor display-->Data display--> . . .

•HDLC/SDLC

Data display-->BSC translation display-->Frame/Packet translation display-->User definition translation-->Timer/Counter display-->Wave monitor display-->Data display--> . . .

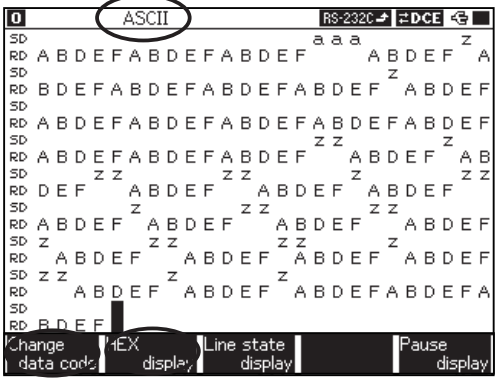
•ASYNC PPP

Data display-->BSC translation display-->PPP translation display-->User definition translation-->Timer/Counter display-->Wave monitor display-->Data display--> . . .

- "Display per one frame" of ASYNC is available only under the condition that "Time stamp" at "Record control" is set to anything but "Off", and "ASYNC frame NL" at "Display control" is set to "On". "Record control" is from the top menu, and "Display control" will be displayed by pressing [Shift] +[F5] on the data display screen.
- Wave monitor display is displayed only when setting "Sampling" to be "on" at "Wave monitor".
- Refer to "6.9 Translation Function" for translation display.

Change Data Code / Display in HEX

You are able to change the data code or display data in hex.



Change the data code by pressing [F1]"Change data code".

ASCII→EBCDIC→EBCDIK→JIS7→JIS8→HEX→EBCD→Transcode→IPARS→Baudot(→ASCII→)

- Block check codes and flags are displayed in special characters.

Change to the HEX display by pressing [F2]"HEX display".

- Changing data code is only for the temprary function. When starting the measurement, it displays data with the data code which you set at "Configuration".
- It displays data including special characters in HEX.

Display Two Separated Screen

Display the saved data in Buffer1 and Buffer2 at the same time. It is useful when comparing two data for finding a problem.

1) Save data in Buffer1 or Buffer2.

Select Buffer1 or Buffer2 from "Record control" to save data.

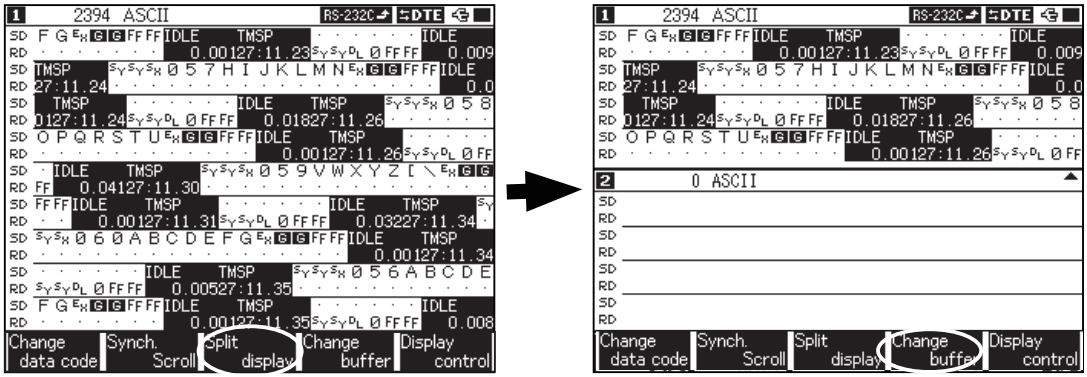
2.5 Environmental Settingl

Then start measuring[Run] or load the measured data from the CF card(press [File]).

2) Display two separated screen.

Press [Data](cannot work while measuring). Press [Shift]+[F3]"Split display" to display two separated screen.

(Left Picture: Normal Screen. → Right Picture: Two Separated Screen.)



3) Display data of another buffer.

Press [Shift]+[F4]"Change buffer" to change to another buffer.

Press [Run] to start measuring or press [File] to load the data in the CF card (option). (Data will be saved in this buffer memory.) (Press [Stop] while measuring and) Press [Data] and press [Shift]+[F3]"Split display" to display two separated screen.

You are able to use the function keys, such as "Change data code" to the selected the buffer memory.

This arrow tells you which buffer memory is used.

4) Scroll the two separated screen at the same time.

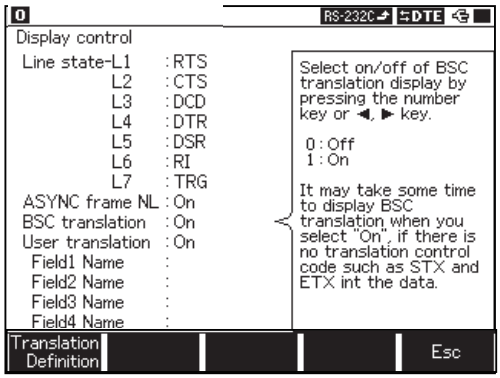
For the normal operation, it only displays data on one side which is selected by an arrow. However, there is a function to scroll both side displays at the same time. Press [Shift]+[F2] "Synch. scroll" to scroll the two separated screen at the same time. "Synch" will be appeared on the right middle of the screen.

6.9 Translation Function

Translation Display Screen

■ BSC Translation Display

Only the communication control characters of the BSC procedure are displayed while decoding the transmitted/received data.



After the measurement, press [Shift]+[F5] "Display control".
To have BSC translation, set "BSC translation" to be "On".
Press [Data] to display BSC translation.

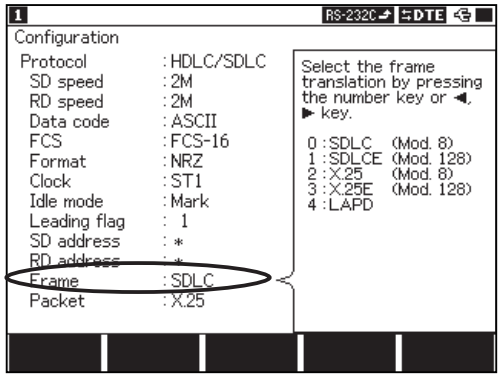
6.7 Screen Switching Function

Set "BSC translation" to be "Off" if BSC translation display is not necessary. BSC translation displays takes time to process.

■ Frame Translation Display

The address field, control field and other information of the frame are translated and displayed, while decoding the transmitted/received data, when the "Protocol" has been set to "HDLC / SDLC" in the "Configuration" menu.

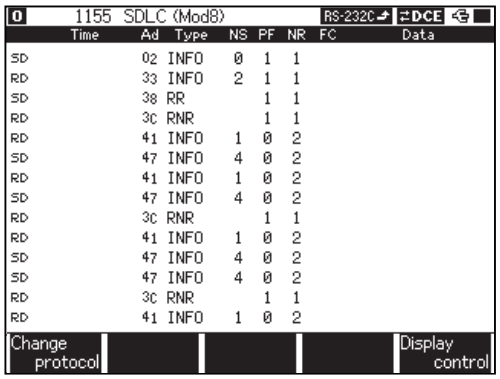
2.6 Communication Condition Setting



Select "0 : Configuration " from top menu.
Select "Protocol" to be "HDLC/SDLC". Select "Frame " to be the appropriate protocol.

1. SDLC Frame Translation

SDLC frame translation operates by modulo 8.



To switch the screen for translation display, press [Data].
Screen scrolling and jumping during the BSC translation is done by translating the data of one-screen after scroll-paging the normal data display. Therefore, if the one screen data in the screen after paging includes only text characters to be omitted, the translation display does not change by performing one paging operation.

Displaying words & phrases	Meaning
SD line	Indicates that the frame is on the SD side.
RD line	Indicates that the frame is on the RD side.
Time	Shows the time when the frame was received. *1
Ad	Displays the contents of the address field in HEX codes.
Type	Displays the frame type in the form of mnemonic.
NS	Displays the frame sequence number with the decimal notation.
PF	Displays the logical value of P/F bit.
NR	Displays the frame sequence number with the decimal notation.
FC	Displays the results of frame check.
Data	Displays the information field data.

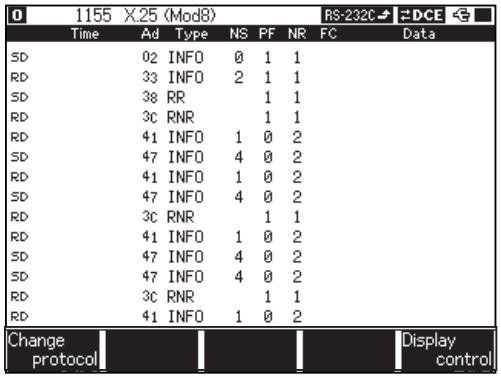
*1 It appears when “Time stamp”to be other than “Off”in the “Record control”.

2. SDLCE frame translation

SDLC frame translation operates by modulo 128.

3. X.25 frame translation

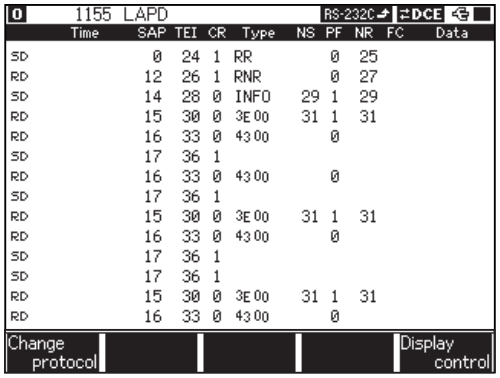
X. 25 frame translation operates by modulo 8.



4. X.25E frame translation

X. 25 frame translation operates by modulo 128.

5. LAPD frame translation



Displaying words & phrases	Meaning
SD line	Indicates that the frame is on the SD side.
RD line	Indicates that the frame is on the RD side.
Time	Shows the time when the frame was received. *1
SAP	Displays the value of service access point identifier with the decimal notation.
TEI	Displays the value of the termination point identifier of the terminal with the decimalnotation.
CR	Displays the value of COMMAND • RESPONSE display bit.
Type	Displays the frame type in the form of mnemonic.
NS	Displays the frame sequence number with the decimal notation.
PF	Displays the logical value of P/F bit.
NR	Displays the frame sequence number with the decimal notation.
FC	Displays the results of frame check.
Data	Displays the information field data.

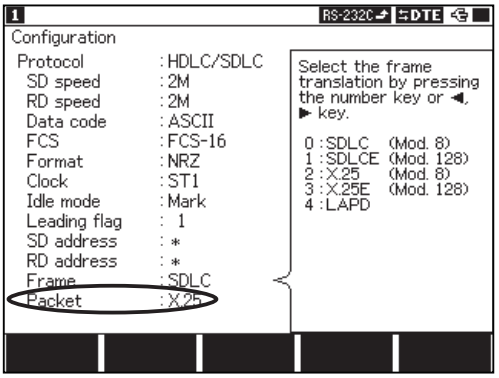
*1 It appears when “Time stamp”to be other than “Off”in the “Record control”.

9.5 Specifications of Translation Display

■ Packet Translation Display

If you select "Protocol" to be "HDLC/SDLC" in the "Configuration" menu, it will decode received/transmitted data. And it will translate contents of packet header in the text message.

2.6 Communication Condition Setting



Select "0: configulation" from top menu. Select "Protocol" to be "HDLC/SDLC". Select "Packet" to be the appropriate protocol.

1. X.25 Packet Translation Display

Displaying words & phrases	Meaning
SD line	Indicates that the frame is on the SD side.
RD line	Indicates that the frame is on the RD side.
Time	Shows when the packet was received. *1
GN	Indicates the logic channel group number with the decimal notation.
LCN	Indicates the logic channel number with the decimal notation.
P-Type	Indicates the packet type in mnemonic.
PS	Indicates the packet sequence number with the decimal notation.
PR	Indicates the packet sequence number with the decimal notation.
M	Indicates the logical values of more data bit.
Q	Indicates the logical values of qualifier bit.
D	Indicates the logical values of transmission verification bit.
FC	Displays the results of frame check.
Data	Displays the information field data.

*1 It appears when “Time stamp”to be other than “Off”in the “Record control”.

9.5 Specifications of Translation Display

2. LAPD Packet Translation Display

Displaying words & phrases	Meaning
SD line	Indicates that the frame is on the SD side.
RD line	Indicates that the frame is on the RD side.
Time	Shows the time when the packet was received. *1
PID	Displays the protocol identifier with the hexadecimal notation.
Message	Displays the contents separately for message type in the form of mnemonic.
CRF	Displays the value of nominal number flag.
CR	Displays the value of nominal number with HEX.(Maximum 2 octet)
FC	Displays the results of frame check.
Data	Displays the first five bytes of the information field data in HEX codes.

*1 It appears when “Time stamp” to be other than “Off”in the “Record control”.

9.5 Specifications of Translation Display

■ Frame / Packet Translation Screen

While measuring or after pressing [Stop] key, press [Data] key for some times to display the measured data.
Press [F2] "Frame translate" or [F3] "Packet translate" to display data.

- "Packet" will be displayed on top of the screen while choosing "Packet translate".

Press [F1] "Protocol Change" to change the protocol type.

- At first, it will display data in the protocol type which you set in the "Configuration".
- Your selected protocol type will be displayed in the top of the screen.

■ PPP Translation

The protocol value, code in LCP packet, identifier and other information of the frame are translated and displayed.

The screen is displayed only when "Protocol" has been set to "ASYNC-PPP".

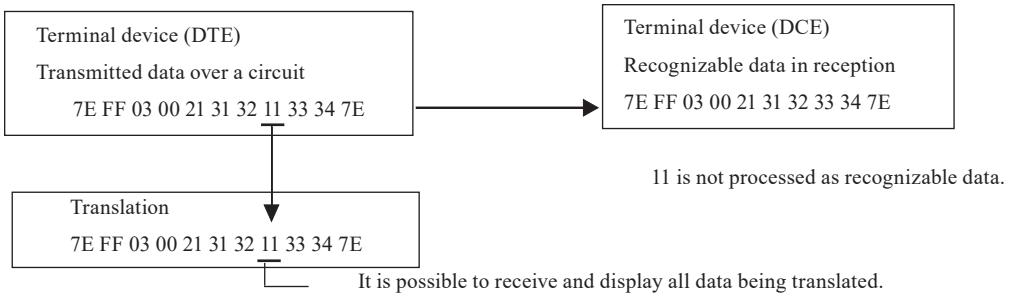
Displaying words & phrases	Meaning
SD line	Indicates that the frame is on the SD side.
RD line	Indicates that the frame is on the RD side.
Time	Shows the time when the frame was received. *1
Protocol	Translates and displays the protocol value.
Code	Translates and displays the code field value.
ID	Displays the value of identifier field as decimal figure.
FC	Displays the results of frame check.
Data	Displays the data.

*1 It appears when “Time stamp” to be other than “Off”in the “Record control”.

9.5 Specifications of Translation Display

◆ This analyzer translates all bits of ACCM as 0.

(e.g.) All bits of ACCM are ON (1) between communications equipment.



When data (7E FF 03 00 21 31 32 11 33 34 7E) is sent on the circuit as shown above, only 11 from received data is not processed as recognizable data; However, this analyzer translates 11 as data.

■ PPP Frame Display

The time stamp on reception of the frame and the contents of the data are displayed. PPP frame display makes it to check overall data exchange and communication.

The screen is displayed only when "Protocol" has been set to "ASYNC-PPP".

Displaying words & phrases	Meaning
SD line	Indicates that the frame is on the SD side.
RD line	Indicates that the frame is on the RD side.
Time	Shows the time when the frame was received. *1
Data	Displays the data.

*1 It appears when “Time stamp” to be other than “Off”in the “Record control”.

9.5 Specifications of Translation Display

■ MODBUS, PROFIBUS display

You can switch from normal data display to translation display or dump display by pressing [Data].

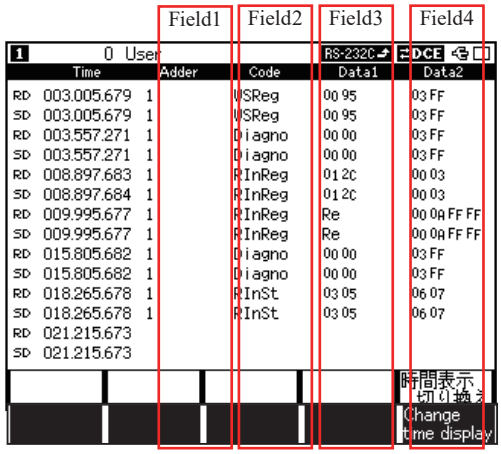
9.5 Specifications of Translation Display

User Translation Definition Function

■ The outline of User Translation Definition Function

User Translation Definition Function is the function that translates the frame data of communication into the character strings or numbers according to the rule defined by user.

This function is in the standard sub board, OP-SB85, OP-SB85C and OP-SB85IR. But not in the other expand sets.



User's defined translation display screen

The translated contents are displayed at field1 to 4.Furthermore, you can print out the data by pressing [Print], when "User translation" is on in setting and the data is now on the screen.

The translated contents are displayed at field1 to 4. Furthermore, you can display this screen by pressing [Data] several times ,and print out the data by pressing [Print], when "User translation" is on in setting and the data is now on the screen.

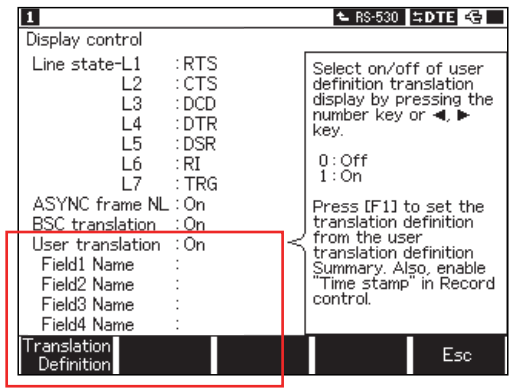
In the protocol of ASYNC, SYNC/BSC, BURST, the data must be with the time stamps for User Translation Definition Function. So the time stamps should be set to be valid in advance.

Flag in SDLC/HDLC, Block check code(BCC) and Frame check sequence(FCS)set in the "Configuration" , Break[B] and Abort[A] are not included to the frame data. In the protocol of I2C, Re-start sequence is not included. In the protocol of PPP or IrDA, Escape sequence is decoded.

Items	Meaning
SD line	Indicates that the frame is on the SD side.
RD line	Indicates that the frame is on the RD side.
Time	Shows the time when the frame was received.
Field 1 to 4	Indicates the content defined by user (1 to 4)

■ Procedure of setting User's defined translation

1. Press [Shift]+[F5](Display control) on the data display screen and set the "User translation" in "Display control".



The screen of setting User's translation

• User translation

Set the display of "User translation" on/off.

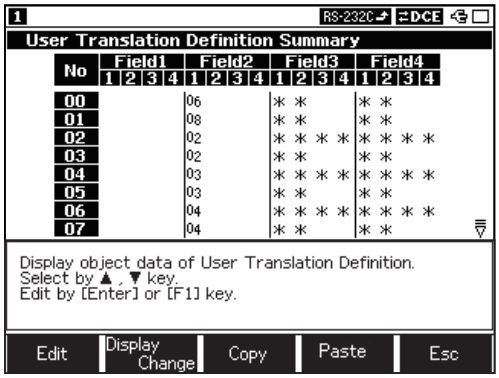
On User's translation is on. Then when you press [Data], you can change the screen to that of User's translation.

Off User's translation is off.

• Field1 name to Field4 name

Set the name of Field1 to Field4 within six characters.

2. Press [F1] "Translation Definition" to go to "User Translation Definition Summary " screen.



The screen of "User Translation Definition Summary"

The settings of User's defined translation are listed in this area, so you can select the No. which you want to edit from this list.

"User Translation Definition" can be made up to 16 sets (No. 00 to 15).

On the data display screen, the frames are checked along with the condition from No. 00 to 15.

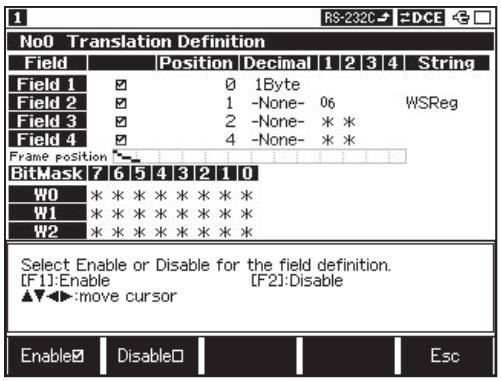
If the frames are corresponding to more two definitions, the definition of low number is displayed.

All fields(Field1 to Field4) of the frame not corresponding to any translating definitions are empty.

[F1]	:"Edit"	Press [F1] to edit the translating definition that you've selected by the cursor.
[F2]	:"Display Change"	Press [F2] to change the area of "Field" whether "1,2,3,4"(for the object of translation) or "String"(for translated characters)
[F3]	:"Copy"	Press [F3] to copy the translating definition.
[F4]	:"Paste"	Press [F4] to paste the data that was copied.
[F5]	:"Esc"	Press [F5] to go back to "Display control" screen.
[Shift]+[F2]	:"All filed Enable"	Press [Shift]+[F2] to make Field1 to Field4 of translating definition enable.
[Shift]+[F3]	:"All filed Disable"	Press [Shift]+[F3] to make Field1 to Field4 of translating definition disable.(In spite of this setting, the content is not deleted) (Color of gray means invalid settings. The character of number displayed in decimal is blue and boldfaced type.)
[Shift]+[F4]	:"Delete"	The contents of Field1 to Field4 are all deleted.

When [Print] is pressed, the definition are all printed.

3.Select the No. by moving the cursor with [▲] and [▼] , and press [Enter] or [F1] to enter the editing screen of User's translating definition.



"Translation Definition" screen

Set the condition on which the measured frame is translated and displayed in the raw of Field1 to Field4.

In the data display screen, the frame is translated only when it meets Field1 to Field4 all.

When the definition is changed, the display will be changed according to it.

If pressing [F5] "Esc", you can go back to the screen of "User Translation Definition Summary".

●Check box ☑

Set each field valid or invalid.

Only the fields which are checked(valid) are used for translation. Although some contents(including "Position", "Decimal", "1" to "4" and "String") of the "Field" are set, the "Field" which is invalid is not used for translation.

[F1]:"Enable"	Each field's definition is valid.
[F2]:"Disable"	Each field's definition is invalid.

While the definition is invalid, Position, Decimal, 1 to 4 and String are displayed in gray and cannot be edited.

●Position

Set position(byte) of data from top of the frame to translate.(from 0 to 60)

[F1]:"Decrement"	Reduces the value by 1.
[F2]:"Increment"	Adds the value by 1.

If more two "Field"s start positions are the same, the "Field" must be set to the same value or "*"(Don't care.) or Bit mask(W0 to W2). If you enter a different value, the condition will not be met and the translation will not be displayed. The flag of SDLC/HDLC is not the object to be translated.

• Decimal

Select how to display the translated data in decimal in "Field".

[F1]:"None"	The frame data is displayed in characters or HEX (not in decimal).
[F2]:"1Byte"	1 byte data from the "Position" is displayed in decimal.
[F3]:"Little"	2 bytes data from the "Position" are displayed in decimal from lowest bit(Little endian).
[F4]:"Big"	2 bytes data from the "Position" are displayed in decimal from highest bit(Little endian).

When something except for "None" is selected, 1 to 4 and String are invalid and it is not translated to characters.

Furthermore 1 to 4 and String are in grey and cannot be edited.

• 1 to 4

Set target data to be translated into characters. The data of the size set in this term from the point of "Position" will be translated and the MAX size is 4 bytes in HEX. The setting starts from "1. Then " * "(Don't care) and "W0" to "W2" can be set.

If nothing is set in this term, the "Field" is invalid.

[F2]:"W0"	Press [F2] to input the bitmask "W0".
[F3]:"W1"	Press [F3] to input the bitmask "W1".
[F4]:"W1"	Press [F4] to input the bitmask "W2".
[End/X]:	Press [End/X] to input " * "(Don't care).

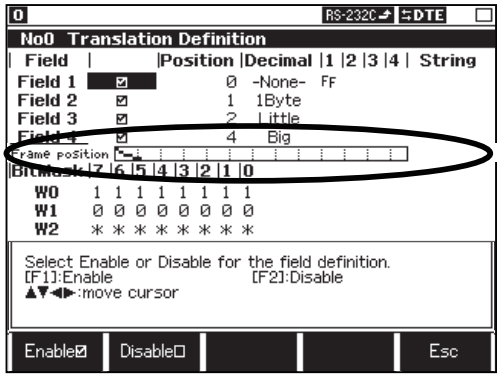
• String

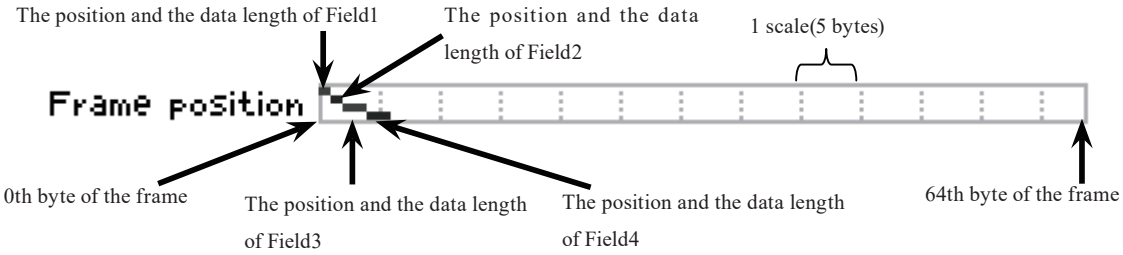
Set how to translate data "1" to "4" into characters.

you can set up to 6 characters. When nothing is set, the data is displayed in HEX.

• Frame position

"Frame position" means the position to be defined in the frame. The line in the frame presents the position to be set and the length of the object data.





●BitMask

Set bit mask(Bit7 to 0) of Data1 to 4 to specify in bit unit.

You can set "Bitmask" per "No". And There are 3 kinds of "BitMask"("W0","W1","W2") in one "No".

"BitMask" changes in order to Bit7 to Bit0 from the left.

[0]: Press [0] to input "0".

[1]: Press [1] to input "1".

[End/X]: Press [End/X] to input "*"(the mask).

<Example>

When the analyzer measures the frame [01h,02h,03h,04h,05h,06h,07h,08h,09h,10h],

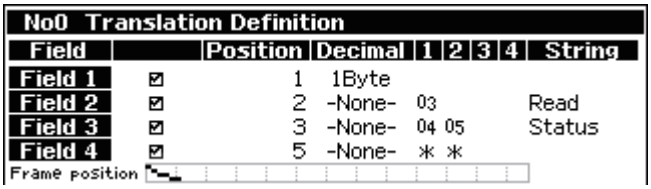
in Field1 it displays 1 byte in decimal from 1st byte from the top of the frame,

in Field2 it displays 1 byte(03h) as "Read" from 2nd byte from the top of the frame,

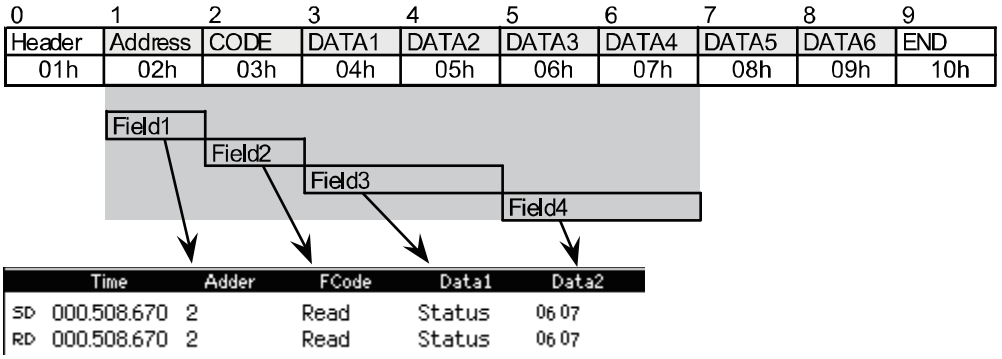
in Field3 it displays 2 byte2(04h, 05h) as "Status" from 3rd byte from the top of the frame,

in Field4 it displays 2 byte(if there is some of 2 bytes data) in HEX from 5th byte from the top of the frame.

Translating definition



Frame



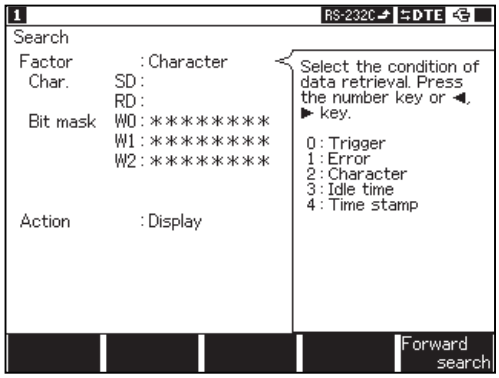
Display screen

6.10 Retrieval Function

The retrieval function enables you to find specific data among the vast amount of data recorded in the capture memory during monitoring. It also enables you to count the number which satisfies a particular condition.

<Displaying the retrieval condition setting screen>

Display the measured data and press [F5] "Find setup".



Retrieval Settig Screen

Setting

■ Factor

Select a retrieval condition item showing in the sub-window by a numerical key. Under some designate retrieval condition, more setting items are displayed under "Factor".

Item	Name for retrieval	Setting range	Note
Trigger	Data which satisfies the trigger condition		1
Error	Erroneous data	Error / Description / Setting Parity/MP / Parity error / MP bit=1 / On/Off Framing / Framing error / On/Off BCC/FCS / Block check error / On/Off Break/Abort / Break/Abort / On/Off Shortframe / Short frame / On/Off	2
Character	Specific character string	Char. : Sets character string to be retrieved separately for each of SD and RD sides up to 8 characters. Bit mask : Sets "0" on bits to be masked (up to 3 kinds(W0,W1,W2)).	3
Idle time	Idle time longer than the designated value	The designated value of idle time(0~9999).	4
Time stamp	The time stamp of the designated time	Min time: Set the min of time stamp where you want to start the retrieval. Max time: Set the max of time stamp where you want to finish retrieval	5

1. Data which satisfies the trigger condition (Factor) is retrieved. Trigger is not retrieved in the case the trigger condition is "Timer/Count".

6.1 Trigger Function(Trigger)

2".Parity/MP" and "BCC" are enabled only when items except "None" have been set in "Configuration".

2.6 Communication Condition Setting

3.Don't care (X) and flag (Press [F1]"Flag") of HDLC/SDLC can be set.

When there are some characters in both RS and SD, only the characters in SD side can be retrieved.

4.The setting unit of idle time for retrieval is needed to be the same as the unit of idle time for measurement.

To be the retrieval condition, idle time has to be displayed when measuring.

2.5 Environmental Setting

5.The setting unit of time stamp for retrieval is needed to be the same as the unit of time stamp for measurement.

To be the retrieval condition, time stamp has to be displayed when measuring.

2.5 Environmental Setting

6.12 Recording Function to Measure Additional Information

(e.g.)

Example o f entry	Time to search
15:48:20(HMS format)	15hours 48min. 20sec.
07:16:52(DHM format)	7th 16hours 52min.

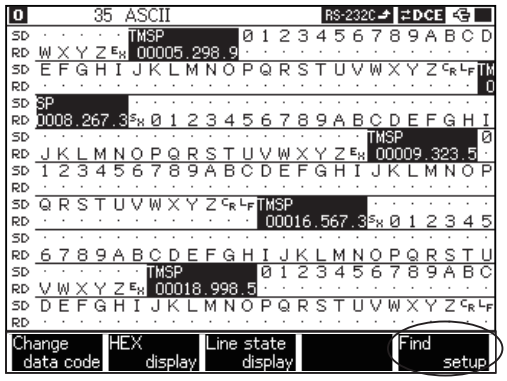
■ Action

"0:Display" Select "Action" to be taken upon a complete retrieval. Data which satisfies the retrieval condition is displayed at the top line of the screen.

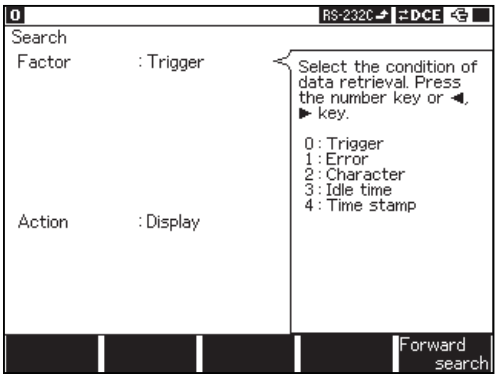
"1:Count" The count, which is the number of times the retrieval condition was satisfied, is displayed in the function display section.

Retrieval

After the measurement, press [Data] to display measured data.



Data display



Retrieval Condition Setting

Press [F] (forward search) or [E] (backward search).

- [F]"Forward search": The retrieval is executed from the display data of the head in the screen to the forward direction(the direction forward newer data captured).
- [E]"Backward search": The retrieval is executed from the display data of the head in the screen to the backward direction(the direction forward older data captured).
- To change the retrieval conditions, press [F5]"Find setup".

You can start retrieving from the Retrieval Condition Setting screen. Press [F5]"Forward search" or [Shift]+[F5]"Backward search".

Motion

■When the operation is "Display".

•"Finding" is displayed on the screen.

•Upon a complete retrieval, data which satisfies the condition is displayed at the top of the data display. Then, the retrieval mode will stop.

- If data which satisfies the retrieval condition is not found, the message "Not Found" is displayed. (Press [Menu], [Enter], or [Stop] key to go back to the screen.)
- The retrieval operation for the same condition can be repeated by pressing [F] or [E].(Press [F5]"Forward search" or [Shift]+[F5]"Backward search" from the Retrieval condition setting screen.)Data which subsequently satisfy the condition are displayed at the head on the data display. (The retrieval operation starts with the data piece next to that at the head of the page currently on screen.)

■When the operation is "Count".

•"Finding" is displayed on the screen.

•The number of data piece which satisfy the retrieval condition are counted. When all the data have been scanned, the results ("count : nn") of the retrieval are displayed. Then, the retrieval mode will stop. Press [Menu], [Enter], or [Stop] key to go back to the screen.

- If data which satisfies the retrieval condition is not found, the message "Not Found" is displayed. (Press [Menu], [Enter], or [Stop] key to go back to the screen.)

6.11 Bit Shift Function

This function shifts the separation of characters of received data bit by bit, to find errors such as deviations from the character synchronization of the serial data.

When the characters are displayed on the data display, press [Shift] + [◄]. Then, the character separation is shifted one bit from the lower bit to the upper bit. A mark bit (‘1’) is added to the lowest bit position where continuity of the data is broken, such as the head character of a frame.

- The bit shift is applied only to the screen on which data is presently displayed.
- Successive bit shifts can be made up to the number of bits constituting a character.
- Press [Shift]+ [►]. And the character separation is shifted one bit from the lower bit to the upper bit.
- The scroll paging operation turns the screen to the normal display without a bit shift.

e.g.) CODE: EBCDIC, bit length 8

LSB side (Bit first arrived) ◄— Order of bits arrival —► (Bit last arrived) MSB side

■ Before shift

received data	10011000	10011001	00000110	10000111	10000110
	‘EM’19H	‘r’ 99H	‘-’ 60H	‘△’E1H	‘/’ 61H

■ After 1 bit shift

received data	11001100	01001100	10000011	01000011	11000011
	IR’33 H	‘Sy’32H	‘A’ C1H	‘B’ C2H	‘C’ C3H

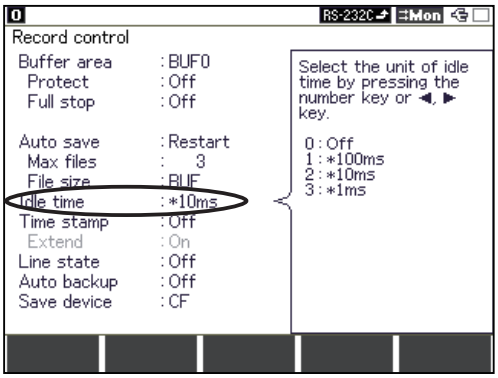
Mark bit added

6.12 Recording Function to Measure Additional Information (Idle Time Time Stamp etc.)

This section explains the setting of the additional information along with the data transmitted and received during measuring. Measuring and recording are carried out according to the conditions being set before the measurement. After the end of the measurement, the data is also displayed according to the initial setting, regardless of the conditions being set afterwards.

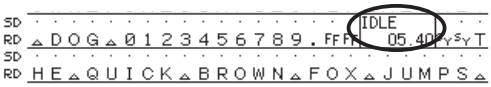
Idle Time Display Function

Idle time which is in mark state (not sending data) is measured. From top menu, press [3] "Record control", and then find "Idle time".



Item	Description	Range
OFF	The idle time is inactive.	
100ms	The idle time will be recorded in 100msec.	0~999.9sec
10ms	The idle time will be recorded in 10msec.	0~99.99sec
1ms	The idle time will be recorded in 1msec.	0~9.999sec

e.g.) The following data screen shows that there is an idle time of 5.400-5.409sec. (If setting in 10ms)



- The time until reaching to be ASNC, and the time until receiving an specific address at HDLC are considered to be an idle state.
- It will be some differences between real idle time and displayed idle time when low speed(less than 9600bps).
- It will display "OVER" when it passes the range of setting.

Time Stamp Function

This function can record the time, when the top character of each frame transmitted through on the communication channel is received, into the buffer memory, and can display it.

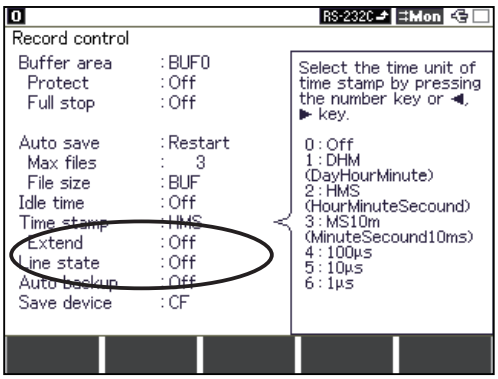
From top menu, press [3] "Record control", and then find "Time stamp".

■ Selection of Time Stamp

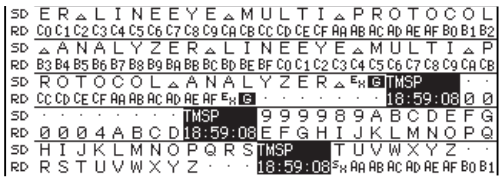
If "Extend" is off (No extended function of Time Stamp).

Item	Description
Off	The time stamp is inactive.
DHM	The time when a frame was received is set in "day, hour, minute".
HMS	The time when a frame was received is set in "hour, minute, second".
MS10m	The time when a frame was received is set in "minute, second, 10ms".
100µs	Elapsed time from the start of measurement is set in 100µs unit . (0 to 13421.7727 sec)
10µs	Elapsed time from the start of measurement is set in 10µs unit . (0 to 1342.17727 sec)
1µs	Elapsed time from the start of measurement is set in 1µs unit . (0 to 134.217727 sec)

Configuration



Measurement Data



It indicates that the last data was arrived at 18:59 and 08seconds.(Time stamp is set as "HMS")

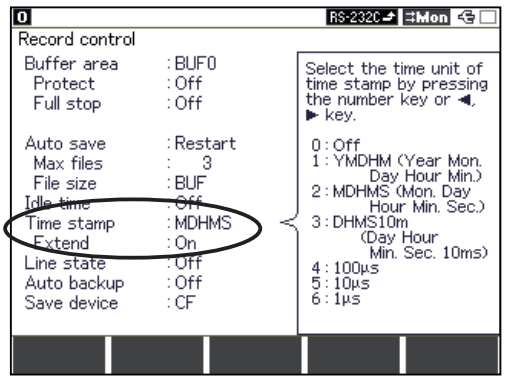
It indicates that the last data was arrived at 1.4006 seconds. (Time stamp is set as "100us")

■ Selection of Extended Time Stamp

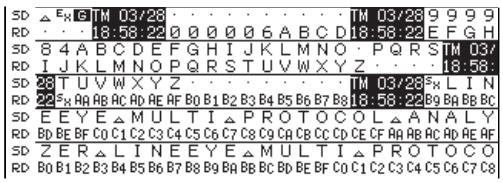
Select "DHM", "HMS" or "MS10m" and then select "Extend: On" in the "Record Control" to have the extended time stamp.

Item	Description
YMDHM	The time when a frame was received is set in "year, month, day, hour, minute". (extended "DHM" time stamp)
MDHMS	The time when a frame was received is set in "month, day, hour, minute, second". (extended "HMS" time stamp)
DHMS10m	The time when a frame was received is set in "day, hour, minute, second, 10ms". (extended "MS10m" time stamp)

Configuration



Measurement Data

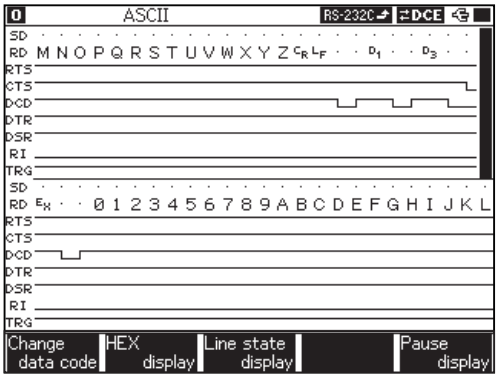


It indicates that the last data was arrived at 18: 58 and 22 seconds on Mar 28. (Time stamp is set as "MDHMS")

The logical states (timing form) of control lines and the data of SD/RD (one line for each) are displayed simultaneously.

Set the "Line state " to be "On" in the "Record control" before starting the measurement.

■ Display line state



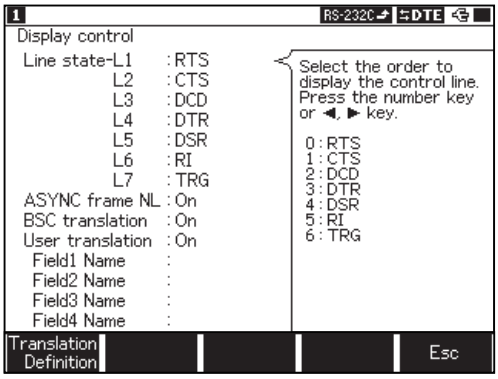
Line Control Screen

It will display only data code while measuring or after the measurement.
Press [F3] "Line state display" to display line states.

When logical state of control line is active, it is displayed as "H", and when non-active, it is displayed as "L".

"TRG" means "TRG.IN" signal of external input terminal. It displays "H" when high level at TTL level and "L" when low level at TTL level. You can control it at the same time controlling the control lines.

■ Change the order of control lines



Control line setting screen

Press [Shift]+[F5]"Display control" after stopping the measurement to change the order of control lines.
Press [Menu] to go back to the line control screen.

"Display per one frame" of ASYNC

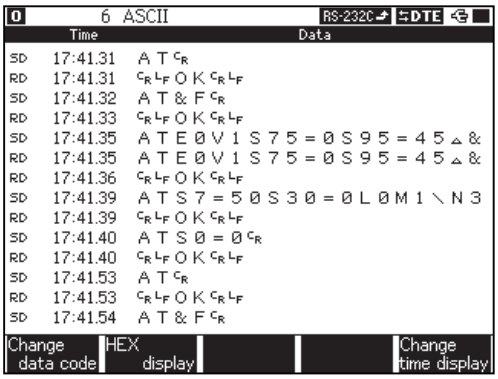
"Display per one frame" is the function that displays the frames for each time stamp in the new line in ASYNC protocol . Two items need to be set.

1. Time stamp : "Time stamp" at "Record control" which is from the top menu is set to anything but "Off".
2. ASYNC frame NL : Press [Data] to go to the data display screen. Then press [Shift]+[F5] to go to "Display control" screen. Set "ASYNC frame NL" to "On".

After measuring the data, by pressing [Data] some times, "Display per one frame" screen will be displayed.

- Each frame will be displayed in the range of the screen width.
- "Display per one frame" is available only in ASYNC protocol.

Nornmal data display screen

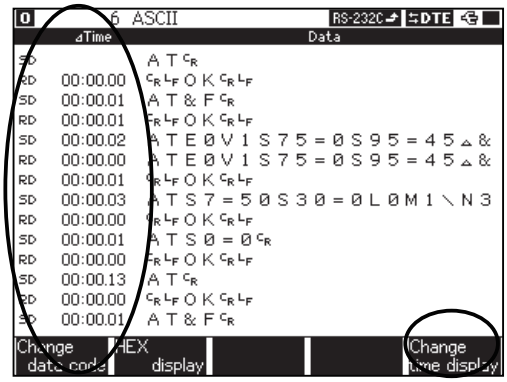


Display per one frame of ASYNC

Change Time Display Function

In the translation display screen or "Display per one frame" screen, the timestamp display style can be changed.(The time from starting measurement ("Time") or of the time from the previous frame ("⊿Time")).
Press [Data] some times to go to the screen where each frame is displayed per one line. Then press [F5]"Change time display" to change the time stamp style.

- To use this function, the setting of "Time stamp" is set to anything but "DHM".



Example of the time from the previous frame ("⊿Time")

6.13 Use of Data on your PC

The PC link software (LE-PC800G light version) stored in the attached CD can measure/display data at real time in the PC and convert measured data into text files.

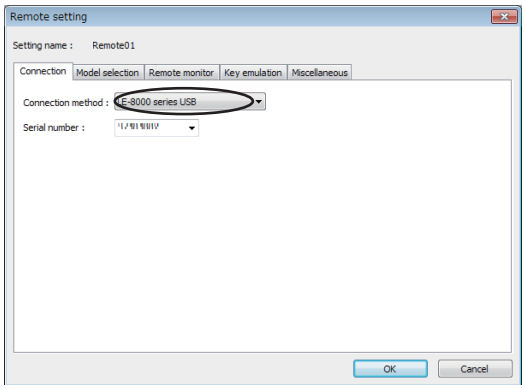
The Captured data is in unique data form thus you need to convert it to use it on PC.

PC link software “LE-PC800G (Light Edition)”

With this software you can take the monitor data into PC through USB port, AUX port(serial), or storage device.

■ Install of PC link software

The Utility folder of attached CD-ROM includes the light edition of the PC link software “LE-PC800G”.Double-click setup.exe in the folder and install it following the install wizard.



■ PC Connection

The Utility folder of attached CD-ROM includes the light edition of LE-PC800G.

Double-click setup.exe in the folder and install it following the install wizard.

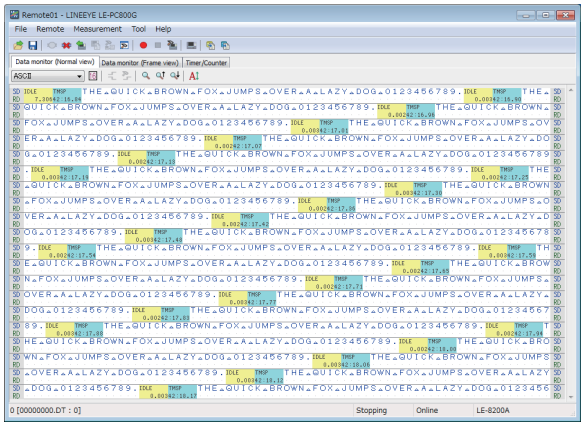
When you use USB connection, you need to install the USB driver before the use. The driver is in the Driver folder of attached CD-ROM.

■ Start/Stop measurement

After finishing configuration of communication condition, click ● to display and record the measured data. Click ■ to stop measurement.

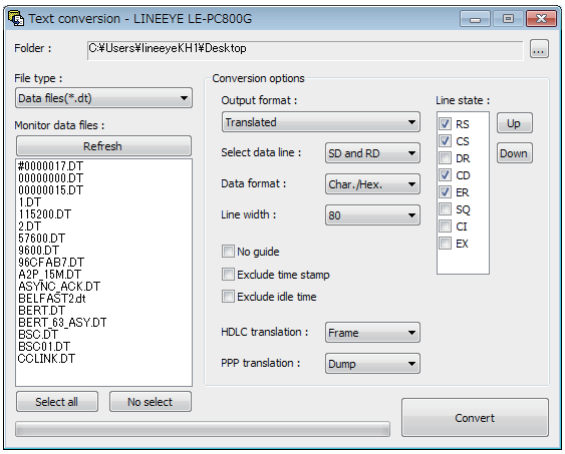
LE-PC800G (Light Edition) has 10 minutes limitation for measurement time. When you need to measure for more long time please purchase the full edition of LE-PC800G.

For “how to use” of LE-PC800G (Light Edition), refer to the online help of LE-PC800G.



■ Text conversion

You can convert the data file which is measured by the analyzer into text file. By clicking of LE-PC800G, the text conversion window opens. Then select the folder which has the data to be converted and select the data. You can select normal format or translation format for the text conversion. You can also convert it to csv format.



LE-PC800G (Light Edition) has 3 files limitation (at one time) for the file conversion. When you need to convert many files at one time, please purchase the full edition of LE-PC800G.

■ Save

Click to save the data which was measured by LE-PC800G.

Chapter 7 Printing Function

The printing function enables it to continuously printout data in various formats. The hard copy printing of the screen image can also be obtained.

Connection to a Printer

- When using a printer with a RS-232C serial interface.

  Connect AUX (RS-232C) port of analyzer and printer using the proper RS-232C cable.

  Please use "LE2-8P" (optional cable) if you use DPU-414 (optional printer).

- When capturing the print data to your PC

  Connect AUX (RS-232C) port of your analyzer and your PC by AUX cable.

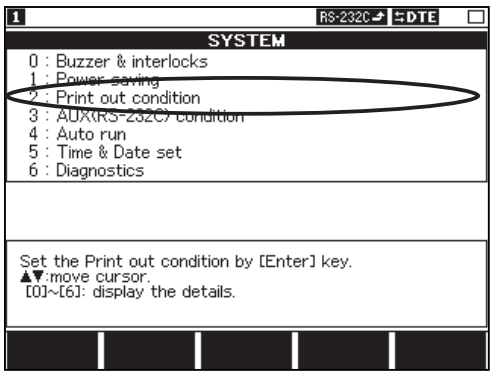
6.13 Use of Data on your PC

Setting for Print out

"Print out condition" and "AUX(RS-232C) condition" in the "SYSTEM menu" are needed to be set.

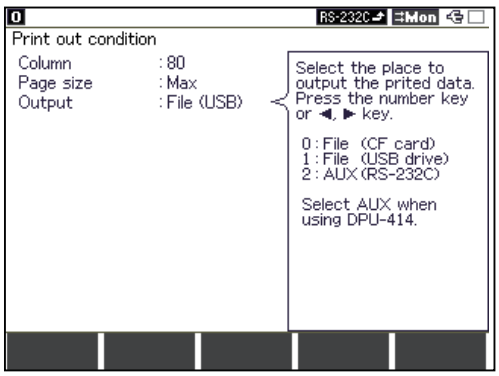
Set above conditions to be same as the conditions of the printer. Please read the instruction manual of DPU-414 (optional printer).

■ Print out condition



From top menu, press [F2] "System menu".

Press [2] "Print out condition" (or move "▶" to "2" and press [Enter])



If you select "AUX" at "Output" term, the data is output as serial data from AUX port , according to the setting of "AUX condition". This function is used for the option printer and the attached software "LEPRTIN_WIN".

If you select "File (CF)" at "Output" term, the data is saved as a text file to the CF card.

If you select "File (USB)" at "Output" term, the data is saved as a text file to the USB flash drive. (This feature is only by LE-8200A.)

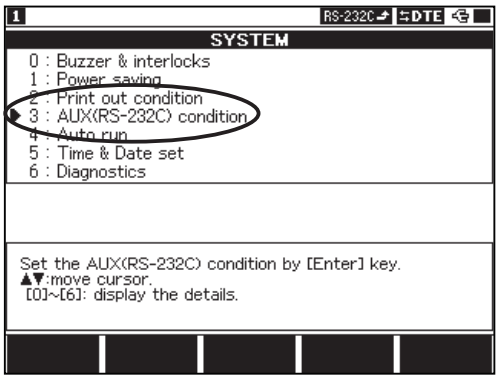
Three items are needed to be set in "Print out condition".

Select "Output" to be "AUX"(RS-232C).

Item	Description	Setting range
Column	Number of digits per line	40,80,136
Pagesize	Mode of printing page	Max(Continuous),66
Output	Place to output data	File (USB)* AUX(RS-232C)

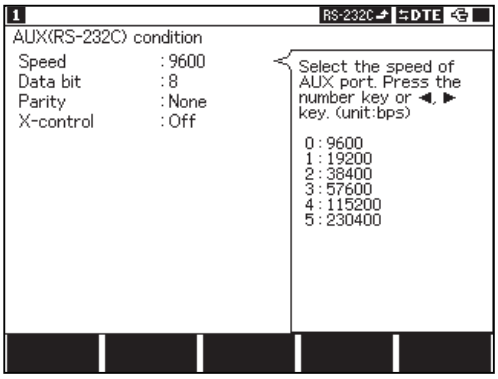
*If you print out the data without making the especial filename, the data is made to the textfile named "DDHHMMSS. TXT"(DDHHMMSS is the day and the time when it was made).

■ AUX(RS-232C) condition



From top menu, press [F2] "System menu".

Press [3] "AUX(RS-232C) condition" (or move "▶" to "3" and press [Enter]).



Four items are needed to be set in "AUX(RS-232C) condition"

Item	Description	Setting range
Speed	Data transmit speed	9600, 19200, 38400, 57600, 115200, 230400bps
Char bit	Data bit length	7 bits, 8 bits
Parity	Parity bit of AUX	None(none), Odd, Even
X-control	Xon/Xoff Flow Control	Off(no flow control), On(Xon/Xoff and RTS-CTS with flow control)

■ Example of how to connect analyzer and DPU-414 (optional printer).

<Analyzer(LE-8200)>

Print out condition

Item	Setting
Column	80
Pagesize	Max (continuous)
Output	AUX(RS-232C)

AUX(RS-232C) condition

Item	Setting
Speed	9600bps
Char bit	8 bit
Parity	None
X-control	Off (no flow control)

<DPU-414> (setting which is different from the factory setting):

"Soft DIP SW1" NO.1 OFF serial
"Soft DIP SW2" NO.1 OFF 80 column
"Soft DIP SW3" NO.5-8 [OFF ON ON ON] 9600bps

For more details, read the instruction manual of DPU-414 (optional printer).

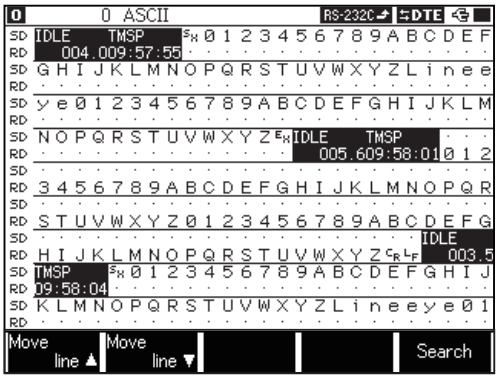
Set "Busy Control" to be "H/W Busy"(X-control can be either "On" or "Off".) If you select XON/XOFF, set "X-control" of this analyzer to be "On".

7.1 Hard Copy Printing (Screen copy)

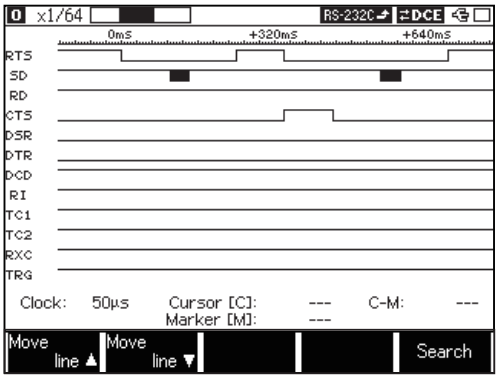
If you have a CF card or a printer (option), you can copy the screen of analyzer in bit map file. Press [Shift] + [Print] to save it to the CF card (option) or USB flash drive (only by LE-8200A), or to send it to the printer via AUX port.

- Output data will be sent to the CF card or USB flash drive or AUX port depending on the setting by "Print out condition". Insert the CF card to the analyzer before saving data to the CF card.
- If you want to save the data to a CF card, insert it to the analyzer before saving.
- The output file will be saved in the "SCRNSHOT" folder in the CF card or the USB flash drive.

To print measured data stored in the capture buffer



Data display



Wave Monitor Screen

1. Press [Data] and use function keys to change data code etc. Display the data to the format in which you wish to print the data.

2. Display the measured data which you wish to start printing on the screen by using the page/scroll operation or the search function.

3. Press [Print] to display "Page: 1" on the screen, and enter the range of data to be printed in 5-digit-decimal figure.
   - Enter "99999" in the range of printing if you want to print till the last data.
   - If you want cancel the printing operation, press [Stop]

4. Press [Enter]. The measured data of the specified number of pages, satarting with data currently on the screen, will be printed. If you want to abort the printing operation, press [Stop].
   - If the range of printing is set greater than the measured data size, the operation will stop after printing the last data.
   - Data already entered into the printer buffer will be printed out, even after the key [Stop] is pressed..
   - The measured data stored in the capture buffer will be printed in the format, which corresponds to the screen display mode.
   - During RUN, printing cannot be obtained.

Printing Format For The Measured Data

The measured data stored in the buffer memory is printed out in the format, which corresponds to the screen display mode.

■ Data Display Mode
Information of one character of the measured data is printed in two lines in both hexadecimal code form and characters using 4-character space.

<Display>

SX	A	B	EX

→

<Printout>

02	41	42	43	HEX (hexadecimal)
SX	A	B	EX	Character

◆ In case the character code is not defined or " △" (space code), nothing is printed in the character code printout line.
◆ If there is no data, "-" is printed in the HEX printout line.
◆ Information about time and the line state of control line displayed on the screen as shown below:

Idle time	[IDLE]	Time stamp	[TMSP]	Line state	H	"11"
	[0020]		[051735]		L	"00"
					H to L	"10"
					L to H	"01"

◆ If characters of the measured data have special attribute, symbols as shown below will be printed in the character code printout line.

Printing.	Meaning
?1	Parity error
?2	Framing error
?3	Parity & framing error
?4	Over run error
?5	Short frame
??	BCC (error)
{}	BCC (normal)
^^	Flag
BB	Break
AA	Abort
##	MP bit

Printing Example of Data

◇ Normal printing

```
*=[LE-8200]=====[2012-10-17 14:29:02]=*
* Model     : LE-8200                *
* Version   : 1.11                   *
* Extension : Standard               *
* Serial No.: 38807015               *
* Start time: 2011-11-16 20:46:12    *
* Stop time : 2011-11-16 20:53:11    *
*------------------------------------*
* MONITOR DATA                       *
*  PROTOCOL: ASYNC                   *
*  S-SPEED : 19200   R-SPEED : 19200 *
*  CODE    : ASCII   CHAR BIT: 8     *
*  PARITY  : ODD     STOP BIT: 1     *
*  BCC     : NONE                    *
*                 PRINT CODE : ASCII *
*====================================*

SD:[ IDLE ][ TMSP ]253033234D4446464646464630430D[ IDLE ]25
   [ 2307 ][461434] % 0 3 # M D F F F F F F 0 CCR[ 0001 ] %
RD:                - - - - - - - - - - - - - - -       -


SD:3033244D4430420D[ IDLE ][ TMSP ]253033234D444430303130300
   0 3 $ M D 0 BCR[ 0047 ][461440] % 0 3 # M D D 0 0 1 0 0
RD: - - - - - - - -                - - - - - - - - - - - -


SD:443030313031443030313037443030313039443030313530443030313
   D 0 0 1 0 1 D 0 0 1 0 7 D 0 0 1 0 9 D 0 0 1 5 0 D 0 0 1
RD: - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


SD:353144303030313532443030313533443030313730443030313731443
   5 1 D 0 0 1 5 2 D 0 0 1 5 3 D 0 0 1 7 0 D 0 0 1 7 1 D 0
RD: - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


SD:303137324430303137334430303137364430303137374430303137344
   0 1 7 2 D 0 0 1 7 3 D 0 0 1 7 6 D 0 0 1 7 7 D 0 0 1 7 4
RD: - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

◇ Printing Example of Line state

```
*=[LE-8200]======[2012-10-18 9:26:04]=*
* Model     : LE-8200                *
* Version   : 1.11                   *
* Extension : Standard               *
* Serial No.: 38807015               *
* Start time: 2012-10-18 09:23:54    *
* Stop time : 2012-10-18 09:24:00    *
*------------------------------------*
* MONITOR DATA (WITH LINE STATE)     *
*  PROTOCOL: ASYNC                   *
*  S-SPEED : 115.2k  R-SPEED : 115.2k*
*  CODE    : ASCII   CHAR BIT: 8     *
*  PARITY  : ODD     STOP BIT: 1     *
*  BCC     : LRC E                   *
*                 PRINT CODE : ASCII *
*====================================*

SD:  [ IDLE ][T 1809]5448452051554943 4B2042524F574E20464F58
     [ 0956 ][235514] T H E   Q U I C K   B R O W N   F O X
RD:                - - - - - - - - - - - - - - - - - - -


RS:11111111111111111111111111111111111111111111111111111111111111111
CS:00000000000000000000000000000000000000000000000000000000000000000
CD:00000000000000000000000000000000000000000000000000000000000000000
ER:11111111111111111111111111111111111111111111111111111111111111111
DR:00000000000000000000000000000000000000000000000000000000000000000
CI:00000000000000000000000000000000000000000000000000000000000000000
EX:11111111111111111111111111111111111111111111111111111111111111111
SQ:11111111111111111111111111111111111111111111111111111111111111111

SD:204A554D5053204F564552204120 4C415A5920444F472030313233334
     J U M P S   O V E R   A   L A Z Y   D O G   0 1 2 3 4
RD: - - - - - - - - - - - - - - - - - - - - - - - - - - - -


RS:11111111111111111111111111111111111111111111111111111111111111111
CS:00000000000000000000000000000000000000000000000000000000000000000
CD:00000000000000000000000000000000000000000000000000000000000000000
ER:11111111111111111111111111111111111111111111111111111111111111111
DR:00000000000000000000000000000000000000000000000000000000000000000
CI:00000000000000000000000000000000000000000000000000000000000000000
```

■ Translation Printing

◇ [SDLC] [X.25 (LAPB)] frame translation

Item	Meaning
SD	The frame on the SD side.
RD	The frame on the RD side.
Time	The time when the frame was received.
Ad	The contents of the address field in HEX code.
Type	The frame type in the form of mnemonic.
NS	The frame sequence number in decimal figure.
PF	The value of P/F bit.
NR	The frame sequence number in decimal figure.
FC	The results of frame check.
Data	The data in the information field in HEX code.

◇ LAPD frame translation

Item	Meaning
SD	That the frame on the SD side.
RD	The frame on the RD side.
Time	The time when the frame was received.
SAP	The value of the service access point identifier in decimal figure.
TEI	The value of the terminal endpoint identifier in decimal figure.
CR	The figure of the command response display bit.
Type	The frame type in mnemonic.
NS	The frame sequence number in decimal figure.
PF	The value of P/F bit.
NR	The frame sequence number in decimal figure.
FC	The results of frame check.
Data	Displays the information field data.

◇ X.25 packet translation

Item	Meaning
SD	The frame on the SD side.
RD	The frame on the RD side.
Time	The time when the packet was received.
GN	The logical channel group number in decimal figure.
LCN	The logical channel number in decimal figure.
P-Type	The packet type in mnemonic.
PS	The packet sequence number in decimal figure
PR	The packet sequence number in decimal figure
M	The value of more data bit.
Q	The value of quality bit.
D	The value of transmission confirmation bit.
FC	The results of frame check.
Data	Displays the information field data.

◇ Printing Example of Frame

```
*=[LE-8200]=====[2012-10-18 13:32:01]=*
* Model    : LE-8200                  *
* Version  : Unrecorded               *
* Extension : Standard                *
* Serial No.: 38303001                *
* Start time: 2012-04-25 19:24:01     *
* Stop time : 2012-04-25 19:25:10     *
*-------------------------------------*
* MONITOR DATA (X.25 FRAME)           *
*  PROTOCOL: HDLC                     *
*  S-SPEED : 9600    R-SPEED : 9600   *
*  CODE    : ASCII   FCS     : FCS16  *
*  FORMAT  : NRZ     CLOCK   : RT     *
*  S-ADDR  : 0B      R-ADDR  : 0B     *
*=====================================*

------TM-----AD-TYPE---NS-PF-NR-FC---------------------DATA----------------------
SD: 19 24 05 0B SARM       1      G
RD: 19 24 06 0B UA         1      G
SD: 19 24 07 0B INFO   0   0   0    G 5448452051554943 4B2042524F574E20464F58204A55
SD: 19 24 08 0B INFO   1   0   0    G 4C494E4545594520 4C452D5043333030472043686563
SD: 19 24 08 0B INFO   2   0   0    G 2122232425262728292A2B2C2D2E2F303132333435 36
SD: 19 24 09 0B INFO   3   0   0    G 4C494E4545594520 434F4D4D414E44203031
SD: 19 24 09 0B INFO   4   0   0    G 4C494E4545594520 434F4D4D414E44203032
SD: 19 24 09 0B INFO   6   0   0    G 4C494E4545594520 434F4D4D414E44203033
SD: 19 24 10 0B INFO   7   1   0    G 4C494E4545594520 434F4D4D414E4420454E44
RD: 19 24 11 0B INFO   0   0   1    G 4C494E4545594520 52455350524553504F5345203031
RD: 19 24 12 0B INFO   1   0   2    G 4C494E4545594520 52455350524553504F5345203032
RD: 19 24 13 0B INFO   2   0   3    G 4C494E4545594520 52455350524553504F5345203033
RD: 19 24 13 0B INFO   3   0   4    G 4C494E4545594520 52455350524553504F5345203034
RD: 19 24 14 0B INFO   4   0   5    G 4C494E4545594520 52455350524553504F5345203035
RD: 19 24 14 0B INFO   5   0   6    G 4C494E4545594520 52455350524553504F5345203036
RD: 19 24 14 0B INFO   6   0   7    G 4C494E4545594520 52455350524553504F5345203037
RD: 19 24 16 0B INFO   7   1   0    G 4C494E4545594520 52455350524553504F534520454E44
SD: 19 24 17 0B INFO   0   0   0    G 4C494E4545594520 434F4D4D414E44204E4558542030
SD: 19 24 17 0B INFO   1   0   0    G 4C494E4545594520 434F4D4D414E44204E4558542030
SD: 19 24 18 0B INFO   2   0   0    G 4C494E4545594520 434F4D4D414E44204E4558542030
SD: 19 24 18 0B INFO   3   0   0    G 4C494E4545594520 434F4D4D414E44204E4558542030
SD: 19 24 19 0B INFO   4   0   0    G 4C494E4545594520 434F4D4D414E44204E4558542030
SD: 19 24 19 0B INFO   5   0   0    G 4C494E4545594520 434F4D4D414E44204E4558542030
SD: 19 24 19 0B INFO   7   1   0    G 4C494E4545594520 434F4D4D414E44204E4558542030
```

◇ Printing Example of Packet

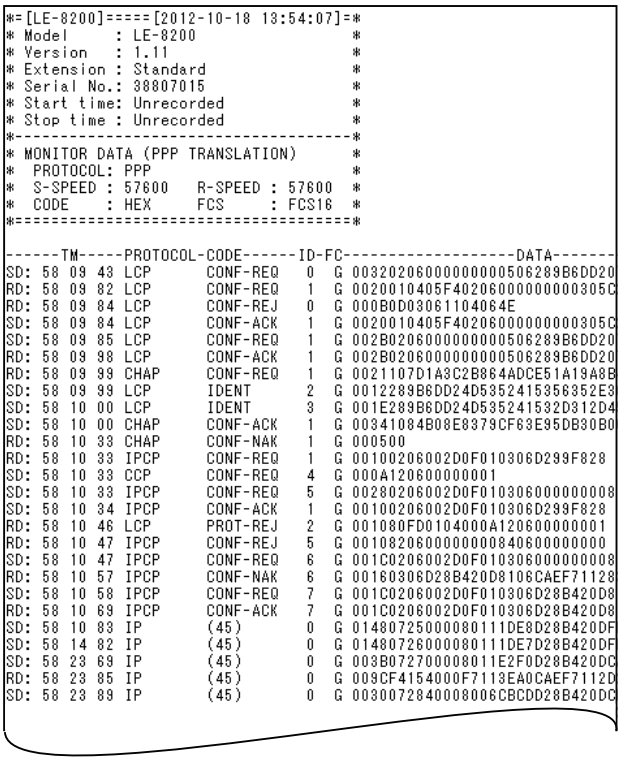
```
*=[LE-8200]=====[2012-10-18 13:32:08]=*
* Model    : LE-8200                  *
* Version  : Unrecorded               *
* Extension : Standard                *
* Serial No.: 38303001                *
* Start time: 2012-04-25 19:24:01     *
* Stop time : 2012-04-25 19:25:10     *
*-------------------------------------*
* MONITOR DATA (X.25 PACKET)          *
*  PROTOCOL: HDLC                     *
*  S-SPEED : 9600    R-SPEED : 9600   *
*  CODE    : ASCII   FCS     : FCS16  *
*  FORMAT  : NRZ     CLOCK   : RT     *
*  S-ADDR  : 0B      R-ADDR  : 0B     *
*=====================================*

------TM-----GN--CN-PTYPE--PS--PR-MOD-FC-----------------DATA----------------
SD: 19 24 05  [SARM  ]                 G
RD: 19 24 06  [UA    ]                 G
SD: 19 24 07   4  72 RNR         2     G 20515549434B2042524F574E20464F58204A55
SD: 19 24 08 12  73 DT      7    2 001 G 4545594520 4C452D5043333030472043686563
SD: 19 24 08   1  34 IT                G 2425262728292A2B2C2D2E2F303132333435 36
SD: 19 24 09 12  73 DT      7    2 001 G 4545594520 434F4D4D414E44203031
SD: 19 24 09 12  73 DT      7    2 001 G 4545594520 434F4D4D414E44203032
SD: 19 24 09 12  73 DT      7    2 001 G 4545594520 434F4D4D414E44203033
SD: 19 24 10 12  73 DT      7    2 001 G 4545594520 434F4D4D414E4420454E44
RD: 19 24 11 12  73 DT      7    2 001 G 4545594520 52455350524553504F5345203031
RD: 19 24 12 12  73 DT      7    2 001 G 4545594520 52455350524553504F5345203032
RD: 19 24 13 12  73 DT      7    2 001 G 4545594520 52455350524553504F5345203033
RD: 19 24 13 12  73 DT      7    2 001 G 4545594520 52455350524553504F5345203034
RD: 19 24 14 12  73 DT      7    2 001 G 4545594520 52455350524553504F5345203035
RD: 19 24 14 12  73 DT      7    2 001 G 4545594520 52455350524553504F5345203036
RD: 19 24 14 12  73 DT      7    2 001 G 4545594520 52455350524553504F5345203037
RD: 19 24 16 12  73 DT      7    2 001 G 4545594520 52455350524553504F534520454E44
SD: 19 24 17 12  73 DT      7    2 001 G 4545594520 434F4D4D414E44204E4558542030
```

◇ LAPD packet translation

item	Meaning
SD	The packet on the SD side.
RD	The packet on the RD side.
Time	The time when the packet was received.
PID	The protocol identifier in HEX code.
Message	The contents of each message type in mnemonic.
CRF	The value of the call reference flag.
CR	The call reference value in HEX code. (Maximum 2 octet)
FC	The results of frame check.
Data	The first 5 bytes of data in the information field in HEX code.

◇ PPP Translation

item	Meaning
SD	Indicates that the frame is on the SD side.
RD	Indicates that the frame is on the RD side.
Time	Shows the time when the frame was received.
Protocol	Translates and displays the protocol value.
Code	Translates and displays the code field value.
ID	Displays the value of identifier field as decimal figure.
FC	Displays the results of frame check.
Data	Information field data (hexadecimal)



```
*=[LE-8200]=====[2012-10-18 13:54:07]=*
* Model     : LE-8200                 *
* Version   : 1.11                    *
* Extension : Standard                *
* Serial No.: 38807015                *
* Start time: Unrecorded              *
* Stop time : Unrecorded              *
*-------------------------------------*
* MONITOR DATA (PPP TRANSLATION)      *
*  PROTOCOL: PPP                      *
*  S-SPEED : 57600   R-SPEED : 57600  *
*  CODE    : HEX     FCS     : FCS16  *
*=====================================*

------TM-----PROTOCOL-CODE------ID-FC-------------------DATA-------
SD: 58 09 43 LCP       CONF-REQ   0  G 00320206000000000506289B6DD20
RD: 58 09 82 LCP       CONF-REQ   1  G 0020010405F402060000000000305C
RD: 58 09 84 LCP       CONF-REJ   0  G 000B0D03061104064E
SD: 58 09 84 LCP       CONF-ACK   1  G 0020010405F402060000000000305C
SD: 58 09 85 LCP       CONF-REQ   1  G 002B020600000000506289B6DD20
RD: 58 09 98 LCP       CONF-ACK   1  G 002B020600000000506289B6DD20
RD: 58 09 99 CHAP      CONF-REQ   1  G 0021107D1A3C2B864ADCE51A19A8B
SD: 58 09 99 LCP       IDENT      2  G 0012289B6DD24D5352415356352E3
SD: 58 10 00 LCP       IDENT      3  G 001E289B6DD24D535241532D312D4
SD: 58 10 00 CHAP      CONF-ACK   1  G 00341084B08E8379CF83E95DB30B0
RD: 58 10 33 CHAP      CONF-NAK   1  G 000500
RD: 58 10 33 IPCP      CONF-REQ   1  G 00100206002D0F010306D299F828
SD: 58 10 33 CCP       CONF-REQ   4  G 000A120600000001
SD: 58 10 33 IPCP      CONF-REQ   5  G 00280206002D0F010306000000008
SD: 58 10 34 IPCP      CONF-ACK   1  G 00100206002D0F010306D299F828
RD: 58 10 46 LCP       PROT-REJ   2  G 001080FD0104000A120600000001
RD: 58 10 47 IPCP      CONF-REJ   5  G 00108206000000008406000000000
SD: 58 10 47 IPCP      CONF-REQ   6  G 001C0206002D0F010306000000008
RD: 58 10 57 IPCP      CONF-NAK   6  G 00160306D28B420D8106CAEF71128
SD: 58 10 58 IPCP      CONF-REQ   7  G 001C0206002D0F010306D28B420D8
RD: 58 10 69 IPCP      CONF-ACK   7  G 001C0206002D0F010306D28B420D8
SD: 58 10 83 IP        (45)       0  G 0148072500008011 1DE8D28B420DF
SD: 58 14 82 IP        (45)       0  G 0148072600008011 1DE7D28B420DF
SD: 58 23 69 IP        (45)       0  G 003B072700008011E2F0D28B420DC
RD: 58 23 85 IP        (45)       0  G 009CF4154000F7113EA0CAEF7112D
SD: 58 23 89 IP        (45)       0  G 00300728400080 06CBCDD28B420DC
```

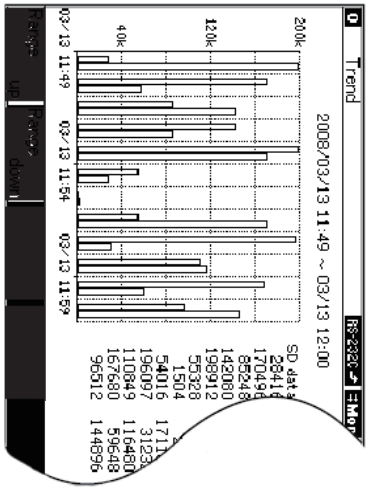
◇ Printing Example of BERT

```
*=[LE-8200]=====[2012-10-18 14:58:12]=*
* Model      : LE-8200                 *
* Version    : 1.11                    *
* Extension : Standard                 *
* Serial No.: 38807015                 *
* Start time: 2012-10-18 16:34:26      *
* Stop time : 2012-10-18 16:34:27      *
*--------------------------------------*
* BERT RESULTS                         *
*  PROTOCOL: ASYNC                     *
*  S-SPEED : 921.6k  R-SPEED : 921.6k *
*  CHAR BIT: 8       STOP BIT: 1       *
*======================================*

 DATE-TIME     LOSS    R-BIT    E-BIT  BIT-ER   E-BLK  BLK-ER   E-SEC  %E.F.S
10/12 21:55       0        0        0 0.00E+0       0 0.00E+0       0 100.000
10/12 21:58       0        0        0 0.00E+0       0 0.00E+0       0 100.000
10/12 22:01       0        0        0 0.00E+0       0 0.00E+0       0 100.000
10/12 22:04       0 1570888        0 0.00E+0       0 0.00E+0       0 100.000
10/12 22:07       1 5.25E+7      200 3.81E-6       1 3.90E-5       1  99.329
10/12 22:10       2 6.37E+7      400 6.28E-6       2 6.43E-5       2  98.883
10/12 22:13       5 6.21E+7     1000 1.61E-5       5 1.65E-4       5  97.207
10/12 22:16       1 6.20E+7      200 3.23E-6       2 6.61E-5       1  99.444
10/12 22:19       1 6.19E+7      200 3.23E-6       1 3.31E-5       1  99.441
10/12 22:22       2 6.20E+7      400 6.45E-6       2 6.61E-5       2  98.883
10/12 22:25       0 6.17E+7        0 0.00E+0       0 0.00E+0       0 100.000
10/12 22:28       4 6.16E+7      800 1.30E-5       5 1.66E-4       4  97.765
10/12 22:31       0 6.17E+7        0 0.00E+0       0 0.00E+0       0 100.000
10/12 22:34       1 6.15E+7      200 3.25E-6       1 3.33E-5       1  99.441
10/12 22:37       2 6.15E+7      400 6.50E-6       3 9.99E-5       2  98.889
10/12 22:40       1 6.16E+7      200 3.25E-6       2 6.65E-5       1  99.441
10/12 22:43       2 6.15E+7      400 6.50E-6       3 9.98E-5       2  98.883
10/12 22:46       2 6.15E+7      400 6.50E-6       3 9.98E-5       2  98.883
10/12 22:49       2 6.16E+7      400 6.49E-6       3 9.97E-5       2  98.889
10/12 22:52       0 6.15E+7        0 0.00E+0       0 0.00E+0       0 100.000
10/12 22:55       2 6.18E+7      400 6.47E-6       2 6.62E-5       2  98.889
10/12 22:58       3 6.18E+7      600 9.71E-6       3 9.95E-5       3  98.324
10/12 23:01       0 6.15E+7        0 0.00E+0       0 0.00E+0       0 100.000
10/12 23:04       2 6.18E+7      400 6.50E-6       2 6.65E-5       2  98.883
10/12 23:07       1 6.15E+7      200 3.25E-6       1 3.33E-5       1  99.441
```

◇ Printing Example of Trend Data in text

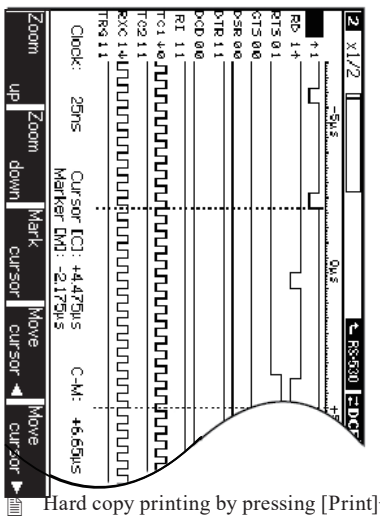
```
<< Trend List >>   2012/10/18 15:23:22

EVENT  :DATA
RESOLUT:10min
MONIROT:2003/04/10 10:52 - 04/10 12:58


          Time       S  D         R  D
 ----------  ----------  ----------
 04/10 10:52      1073604      898449
       11:02       499912      499912
       11:12      6309240           0
       11:22      6445132     4762810
       11:32      6911840     6573087
       11:42      2107860     2072849
       11:52      1152631           0
       12:02      6911840     3875381
       12:12      6911840     6911840
       12:22      6911840     6911840
       12:32      6911840      378233
       12:42      6911842       81815
       12:52      3940508     3662903
```

◇ Printing Example of Trend Data in GRAPH



Hard copy printing by pressing [Print]+ [Shift]

◇ Printing Example of Wave monitor



Hard copy printing by pressing [Print]+ [Shift]

Chapter 8 Saving and Loading Data

This analyzer is equipped with a memory card interface for saving the measurement data and setting condition.

1.4 Panel Information

8.1 Storage device

You can use a CF card or a USB flash drive (flash drive is supported only by LE-8200A). By selecting “File (CF)” or “File (USB)” for output destination when you printout the data, you can save it as text data.

- To save the measured data as text file in a CF card or in a USB flash drive, select “File (CF card)” or “File (USB)” at "Output" section of "Print out condition" menu and print it out.

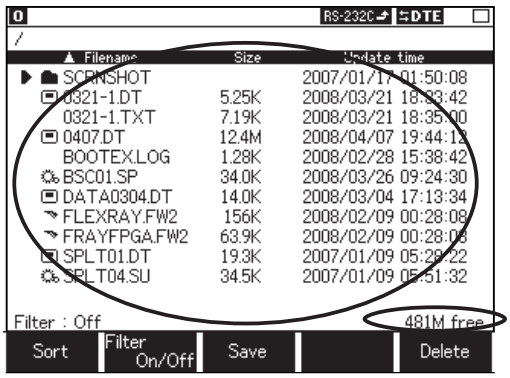
Chapter 7 Printing Function

- The CF card or the USB flash drive can be removed anytime unless a loading message is shown in the screen.

8.2 File Management Function

You can format (initializing) a storage device. You also can load (readout), save (storing), and delete (erase) data in it.

Directory screen



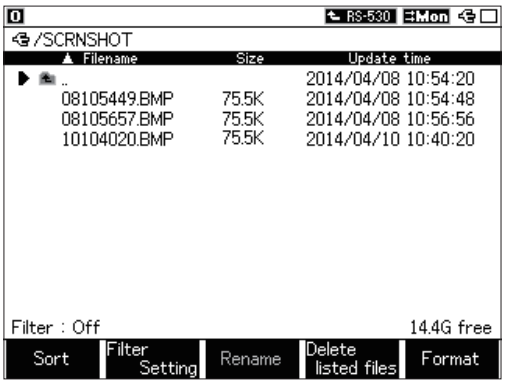
Directory Screen

Insert a CF card or a USB flash drive to the analyzer. Then press [File] to display the directory screen. (It does not work while measuring.)

By pushing [File] key, you can switch the device displayed on the screen when both a CF card and a USB flash device are inserted. The target device is displayed by symbol like ■ (CF card) or (USB flash drive) on the left side.

☜ Data files and folders in the storage device.

☜ Memory left



A memory card is not detected. Please insert a memory card.
A USB drive is not detected. Please attach a USB drive.

☜ If a storage device is not inserted, a message that tells it will be displayed. Insert a storage device.

- When the memory card is not formatted, the confirmation screen for execution of format will be displayed.
- Press [Enter], if the memory card need to be formatted. Press [Stop], if the memory card does not need to be formatted.
- Press [Shift] + [F5] for formatting again.
- The files are as follows.

DT/SU	Name	Contents
DT	Measurement data	Measured data
SU	Condition data	Condition for communication measurement

- A file saved by the auto back up function is automatically named. AUTOBU0(1,2).DT(0, 1 or 2 is the buffer number you selected for back-up.)
- A file saved by the auto save function is automatically named. #nnnnnnn.DT ("n" means sequence number from 0.)

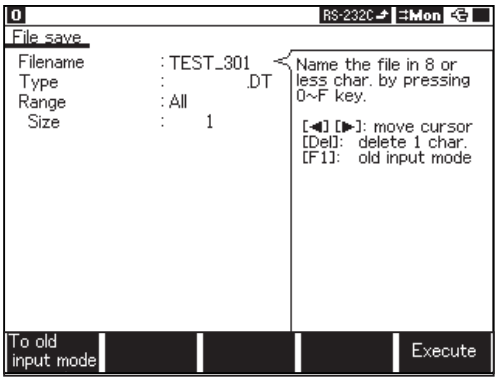
6.5 Logging Function for a Long Time

- A file saved by the trigger save is automatically named. TGSAVEnn.DT ("n" means sequence number from 0.)

6.1 Trigger Function

- Scroll by [▲] , [▼]
- To find the files in a folder, move "▶" to the file and press [Enter].

Save



To display the file save screen, press [F3] in the directory screen.

2.4 Character Input

1. Enter the file name.

   Input a file name in "Filename".

   Input a file name using [0]-[F] keys. Press [F1]"To old input mode" for the one who is used to use previous protocol analyzer. Press [F2] to input 0-9 and [F3] to input A-Z.

2.4 Character Input

2. Select a file type.

   Select a file type in "Type".

   Specify the range for saving when the TYPE of file is measured data(.DT).

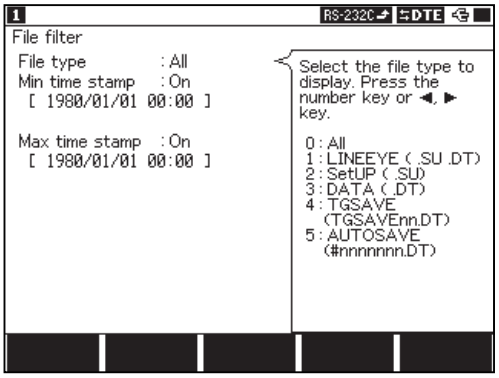
   All :All monitor data in the buffer memory.

   Current -- :The specified number of data starting with the page currently on display(1K each : 1-99999)

3. Start saving. (press [F5])

   Press [F5]"Execute" to start saving, after completion of the saving operation, the screen returns to the directory display. If the amount of data to be saved exceed the remaining capacity of the memory card, the error message is displayed in the last line and the saving operation is interrupted.

   - When this happens, try again reducing the range of data to be saved or deleting unnecessary files.



Filter Setting Screen

Press [F2] to use the filter function.

You can find the files in the CF card which match the data type or date of saving etc.

◆Press[Shift]+[F2] to go to filter setting screen.

File type	0 : ALL	All the files
	1 : LINEEYE(.SU .DT)	All the files saved on analyzers
	2 : SETUP(.SU)	Setup files
	3 : DATA(.DT)	Data files
	4 : TGSAVE(TRGnn.DT)	Trigger save files
	5 : AUTOSAVE(#nnnnnnn.DT)	Autosave files
Min time stamp	0 : Off	All the files
	1 : On	Files with the updated date of after the specified date
Max time stamp	0 : Off	All the files
	1 : On	Files with the updated date of before the specified date

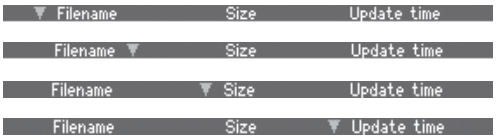
◆Press[Menu] to go back to the directory screen. Press [F2]"Filter On/Off" to switch the filter function to valid or invalid.

When the file filter is valid, [Filter : On] appears on the right bottom of the screen.

Sort

Press [F1] to chage the order of files.

Change the order of files by filename etc. Select an item by "▲" or "▼".



☜ Change according to the file name

☜ Change according to the file type.

☜ Change according to the file saze

☜ Change according to the data.

Load

To change the file name, set the cursor "▶" on a file which you want to rename, and push [Shift] + [F3].

Press [F4] or [Enter] to start loading.

Once loading is executed, communication conditions(.SU) or data(.DT) in capture memory are overwritten.

Delete

■ Specified file deletion

Move "▶" to the file to be deleted in the directory screen. Press [F5] or [Enter] to start deleting.

☜ Press [Stop] to cancel.

■ All files deletion

Press [Shift]+[F4] "Delete listed files" in the directory screen.

To cancel the deletion, press [Stop].

Rename

To change the file name, load the file and save it with the different name.

Format Storage Device

Press [Shift]+[F5] to format files in the storage device.

1. Press [Shift]+[F5]
2. A warning message appears on the screen.
3. Press [Enter] to execute and [Stop] to stop formatting the CF card.

9.1 Calculation of Block Check

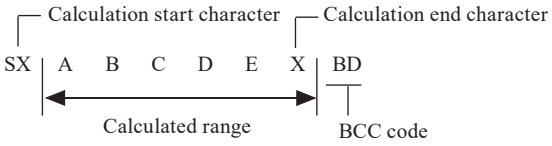
Block check is calculated as follows:

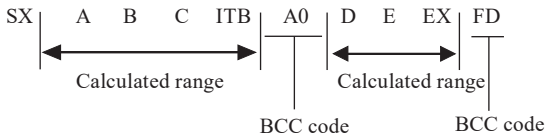
ASYNC, SYNC/BSC Transmission

Start of calculation :When any one of the characters set to "Begin code" is received, calculation will start with the next character.

End of calculation :When any one of the characters set to "End code" is received, calculation will finish just after the character.

BCC check :When the calculation end character is received after the calculation start character has been received, data next to the calculation end character will be checked as the BCC. The ITB code is applied equally to the calculation end character.





HDLC / SDLC Transmission

■ Start of calculation : After flag-synchronization has been established, calculation starts with the first data received.

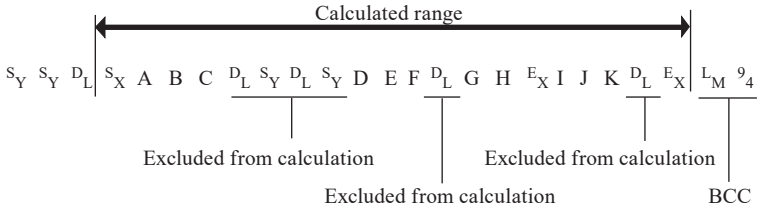
■End of calculation : The characters before the synchronization reset flag are calculated.

■FCS check : The character just before the synchronization reset flag is checked as FCS.

Transparent mode(Only ASYNC, SYNC/BSC)

- If you select "ON" for the "Transparent" setting, the Analyzer will enter the transparent mode and calculate BCC as follows.
- The character set in the "DLE code" setting is handled as the Data Link Escape code.
- The calculation starts and ends block upon <DLE + calculation start code> and <DLE + calculation end code>, respectively. The calculation end code without DLE is treated as normal character.
- The DLE code is excluded from the calculation of BCC.

  If two DLE codes appear successively, only the first DLE code will be excluded. The second DLE code will be treated as a normal character and therefore be included in the calculation of BCC.
- If the synchronization character precede by the DLE code is received, the synchronization character will also be excluded.



The block of the calculation starting with the calculation start code without DLE is the same as that when "TRANSPRT" is set to "OFF".

📖 Reference

LRC code

LRCO : Longitudinal parity odd

LRCE : Longitudinal parity even

('LRC E' is normally used.)

CRC code generating polynomial

CRC-6 : X^6+X^5+1

CRC-12 : $X^{12}+X^{11}+X^3+X^2+X+1$

CRC-16 : $X^{16}+X^{15}+X^2+1$

CRC-ITU-T: $X^{16}+X^{12}+X^5+1$

FCS code generating polynomial

FCS-16 : $X^{16}+X^{12}+X^5+1$

FCS-32 : $X^{32}+X^{26}+X^{23}+X^{16}+X^{12}+X^{11}+X^{10}+X^8+X^7+X^5+X^4+X^2+X+1$

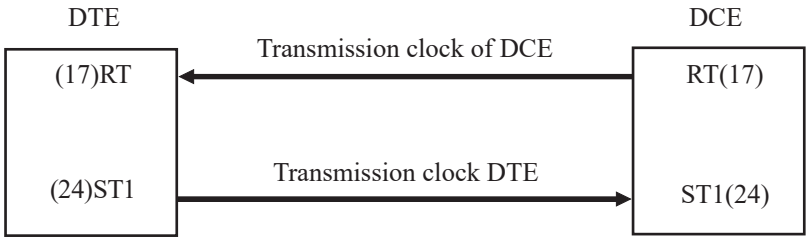
(All 1 initial)

9.2 Communication Clock

When transmitting/receiving data in synchronization with an external clock, setting of the transmission clock and the receiving clock varies according to the setting of DTE, DCE as shown below. Therefore, except for asynchronous communication (ASYNC mode), the synchronous clock for the specifications of the communicating device must be selected with "Clock" settings, to execute monitor, simulation, or bit error test functions of the analyzer.

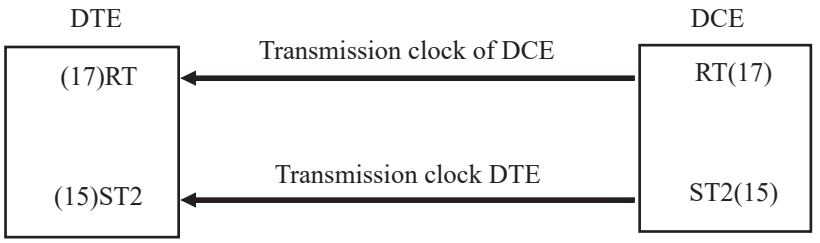
Generally, it becomes the follows with the transmission clock of DTE.

◆ In the case of "ST1"



• transmission with an internal clock • receiving with an external clock

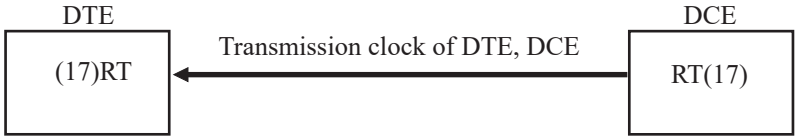
◆ In the case of "ST2"



signal name
RT =RXC
ST1 =TXC1
ST2 =TXC2

• transmission with an internal clock • receiving with an external clock

◆ In the case of "RT"



• transmission with an external clock • receiving with an internal clock

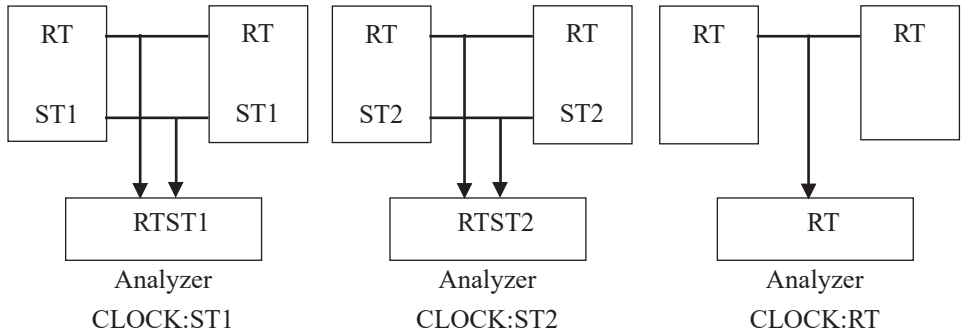
◆ "AR"(Auto Regulation)

AR refers to a data receiving process using the internal clock by detecting a change in the received data and implementing topology synchronization in accordance to the change. This process requires the channel speed to be the same as that of the transmitting/receiving equipment.

■ Change the specification of clock selection and port.

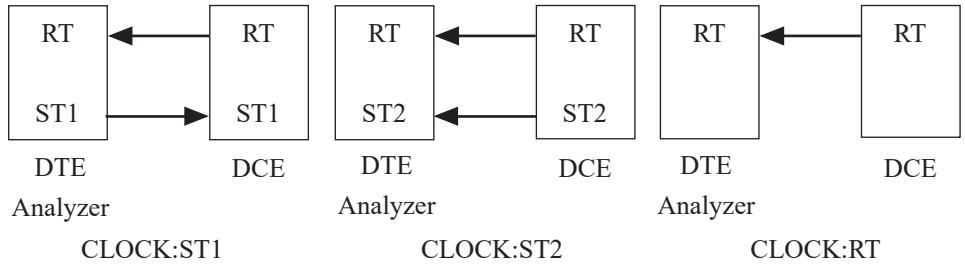
This analyzer allows selection of the synchronous clock with "Clock" to enable monitoring and simulating with any clock setting. This analyzer also allows to change specifications of the port with "DTE/DCE mode" in order to simulate the device whichever of DTE and DCE by an attached cable.

1 . When monitoring

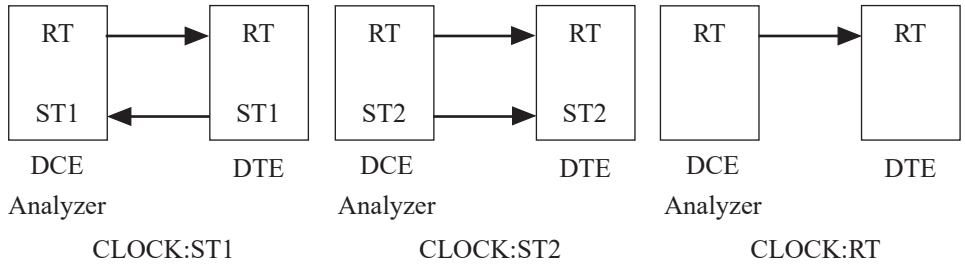


signal name
RT =RXC
ST1 =TXC1
ST2 =TXC2

2. When simulating with DCE (Analyzer: DTE mode)



3 . When simulating with DTE (Analyzer: DCE mode)



9.3 Frame

Definition of 1 frame for each protocol is as follows :

Protocol	Definition of 1 frame
ASYNC	A data string of either idle time (between 1 and 100ms) which is set at "Frame end time" or character which is set at "Frame end code".
SYNC/BSC	A data string from a synchronized character (Sync code) until a synchronization release character (Reset code).
HDLC/SDLC	A data string from a flag to a flag.
ASYNC-PPP	A data string from a flag character to a flag character. Escape code is not decoded.

9.4 Data code table

- Blank boxes (non defined code) appeared in the code tables are displayed in hexadecimal code.
- JIS7,EBCD and Baudot codes, SHIFT IN display, and SHIFT OUT display are alternated in accordance to SI SO data.
- Display is started with the SHIFT IN display, immediately after operating RUN.
- When SI is received first, the SHIFT IN is displayed until the next SO is received.
- When SO is received first, the SHIFT OUT is displayed until the next SI is received.

■ ASCII

	0	1	2	3	4	5	6	7
0	NU	DL	r	0	@	P	`	p
1	SH	D1	!	1	A	Q	a	q
2	SX	D2	"	2	B	R	b	r
3	EX	D3	#	3	C	S	c	s
4	ET	D4	$	4	D	T	d	t
5	EQ	NK	%	5	E	U	e	u
6	AK	SY	&	6	F	V	f	v
7	BL	EB	’	7	G	W	g	w
8	BS	CN	(	8	H	X	h	x
9	HT	EM	)	9	I	Y	i	y
A	LF	SB	*	:	J	Z	j	z
B	VT	EC	+	;	K	[	k	{
C	FF	FS	,	<	L	\	l	|
D	CR	GS	-	=	M	]	m	}
E	SO	RS	.	>	N	^	n	~
F	SI	US	/	?	O	_	o	DT

■ EBCDIC

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NU	DL	DS		r	&	-						{	}	\	0
1	SH	D1	SS				/		a	j	~		A	J		1
2	SX	D2	FS	SY					b	k	s		B	K	S	2
3	EX	D3	WS	IR					c	l	t		C	L	T	3
4	PF	RE	BP	PN					d	m	u		D	M	U	4
5	HT	NL	LF	TN					e	n	v		E	N	V	5
6	LC	BS	EB	NS					f	o	w		F	O	W	6
7	DT	PC	EC	ET					g	p	x		G	P	X	7
8	GE	CN	SA	S2					h	q	y		H	Q	Y	8
9	S1	EM	SE	IT					i	r	z		I	R	Z	9
A	RT	US	SM	RF	¢	!		:								
B	VT	C1	CP	C3	.	$	,	#								
C	FF	IF	MA	D4	<	*	%	@								
D	CR	IG	EQ	NK	(	)	_	’								
E	SO	RS	AK		+	;	>	=								
F	SI	IB	BL	SB	|	¬	?	‘								

■ JIS7(7)

Roman

SHIFTIN

	0	1	2	3	4	5	6	7
0	NU	DL	△	0	@	P	`	p
1	SH	D1	!	1	A	Q	a	q
2	SX	D2	”	2	B	R	b	r
3	EX	D3	#	3	C	S	c	s
4	ET	D4	$	4	D	T	d	t
5	EQ	NK	%	5	E	U	e	u
6	AK	SY	&	6	F	V	f	v
7	BL	EB	’	7	G	W	g	w
8	BS	CN	(	8	H	X	h	x
9	HT	EM	)	9	I	Y	i	y
A	LF	SB	*	:	J	Z	j	z
B	VT	EC	+	;	K	[	k	{
C	FF	FS	,	<	L	¥	l	|
D	CR	GS	-	=	M	]	m	}
E	SO	RS	.	>	N	^	n	¯
F	SI	US	/	?	O	_	o	DT

• When SI is received first, Roman chracter are displayed until the next SO is received

Kana

SHIFTOUT

	0	1	2	3	4	5
0	NU	DL	△	−	タ	ミ
1	SH	D1	。	ア	チ	ム
2	SX	D2	「	イ	ツ	メ
3	EX	D3	」	ウ	テ	モ
4	ET	D4	、	エ	ト	ヤ
5	EQ	NK	・	オ	ナ	ユ
6	AK	SY	ヲ	カ	ニ	ヨ
7	BL	EB	ァ	キ	ヌ	ラ
8	BS	CN	ィ	ク	ネ	リ
9	HT	EM	ゥ	ケ	ノ	ル
A	LF	SB	ェ	コ	ハ	レ
B	VT	EC	ォ	サ	ヒ	ロ
C	FF	FS	ャ	シ	フ	ワ
D	CR	GS	ュ	ス	ヘ	ン
E	SO	RS	ョ	セ	ホ	゛
F	SI	US	ッ	ソ	マ	゜

• When SO is received first, Kana (Japanese characters) are displayed until the next SI is received.

■ JIS(8)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NU	DL	△	0	@	P	`	p				−	タ	ミ		
1	SH	D1	!	1	A	Q	a	q			。	ア	チ	ム		
2	SX	D2	”	2	B	R	b	r			「	イ	ツ	メ		
3	EX	D3	#	3	C	S	c	s			」	ウ	テ	モ		
4	ET	D4	$	4	D	T	d	t			、	エ	ト	ヤ		
5	EQ	NK	%	5	E	U	e	u			・	オ	ナ	ユ		
6	AK	SY	&	6	F	V	f	v			ヲ	カ	ニ	ヨ		
7	BL	EB	’	7	G	W	g	w			ァ	キ	ヌ	ラ		
8	BS	CN	(	8	H	X	h	x			ィ	ク	ネ	リ		
9	HT	EM	)	9	I	Y	i	y			ゥ	ケ	ノ	ル		
A	LF	SB	*	:	J	Z	j	z			ェ	コ	ハ	レ		
B	VT	EC	+	;	K	[	k	{			ォ	サ	ヒ	ロ		
C	FF	FS	,	<	L	¥	l	|			ャ	シ	フ	ワ		
D	CR	GS	-	=	M	]	m	}			ュ	ス	ヘ	ン		
E	SO	RS	.	>	N	^	n	¯			ョ	セ	ホ	゛		
F	SI	US	/	?	O	_	o	DT			ッ	ソ	マ	゜		

■ EBCDIK

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NU	DL	DS		△	&	-			ソ			{	}	\	0
1	SH	D1	SS				/		ア	タ	～		A	J		1
2	SX	D2	FS	SY					イ	チ	ヘ		B	K	S	2
3	EX	D3	WS	IR					ウ	ツ	ホ		C	L	T	3
4	PF	RE	BP	PN					エ	テ	マ		D	M	U	4
5	HT	NL	LF	TN					オ	ト	ミ		E	N	V	5
6	LC	BS	EB	NS					カ	ナ	ム		F	O	W	6
7	DT	PC	EC	ET					キ	ニ	メ		G	P	X	7
8	GE	CN	SA	S2					ク	ヌ	モ		H	Q	Y	8
9	S1	EM	SE	IT					ケ	ネ	ヤ		I	R	Z	9
A	RT	US	SM	RF	¢	!		:	コ	ノ	ユ	レ				
B	VT	C1	CP	C3	.	¥	,	#				ロ				
C	FF	IF	MA	D4	<	*	%	@	サ		ヨ	ワ				
D	CR	IG	EQ	NK	(	)	_	’	シ	ハ	ラ	ン				
E	SO	RS	AK		+	;	>	=	ス	ヒ	リ	゛				
F	SI	IB	BL	SB	|	¬	?	”	セ	フ	ル	°				

■ Baudot

SHIFTIN

	0	1
0	NU	T
1	E	Z
2	LF	L
3	A	W
4	△	H
5	S	Y
6	I	P
7	U	Q
8	CR	O
9	D	B
A	R	G
B	J	SO
C	N	M
D	F	X
E	C	V
F	K	SI

SHIFTOUT

	0	1
0	NU	5
1	3	”
2	LF	)
3	-	2
4	△	#
5	’	6
6	8	0
7	7	1
8	CR	9
9	$	?
A	4	&
B	BL	SO
C	,	.
D	!	/
E	:	;
F	(	SI

■ EBCD

SHIFTIN

	0	1	2	3
0	r	2	1	3
1	-	k	j	l
2	@	s	/	t
3	&	b	a	c
4	8	0	9	#
5	q	VT	r	$
6	y	FF	z	,
7	h		i	.
8	4	6	5	7
9	m	o	n	p
A	u	w	v	x
B	d	f	e	g
C		SO	RS	ET
D		BS	CR	SY
E		EB	LF	EC
F		SI	HT	DT

SHIFTOUT

	0	1	2	3
0	r	<	=	;
1	-	K	J	L
2		S	?	T
3	+	B	A	C
4	*	)	(	"
5	Q	VT	R	!
6	Y	FF	Z	,
7	H		I	.
8	:	,	%	>
9	M	O	N	P
A	U	W	V	X
B	D	F	E	G
C		SO	RS	ET
D		BS	CR	SY
E		EB	LF	EC
F		SI	HT	DT

■ Transcode

	0	1	2	3
0	SH	&	-	0
1	A	J	/	1
2	B	K	S	2
3	C	L	T	3
4	D	M	U	4
5	E	N	V	5
6	F	O	W	6
7	G	P	X	7
8	H	Q	Y	8
9	I	R	Z	9
A	SX	r	EC	SY
B	.	$	,	#
C	<	*	%	@
D	BL	US	EQ	NK
E	SB	ET	EX	EM
F	EB	DL	HT	DT

■ IPARS

	0	1	2	3
0			@	$
1	1	/	J	A
2	2	S	K	B
3	3	T	L	C
4	4	U	M	D
5	5	V	N	E
6	6	W	O	F
7	7	X	P	G
8	8	Y	Q	H
9	9	Z	R	I
A	0	-	:	?
B	*	#	<	.
C	CR	r	+	%
D	EI	EC	EU	EP
E	=	[	)	S2
F		,	(	S1

9.5 Specifications of Translation Display

BSC Translation Display

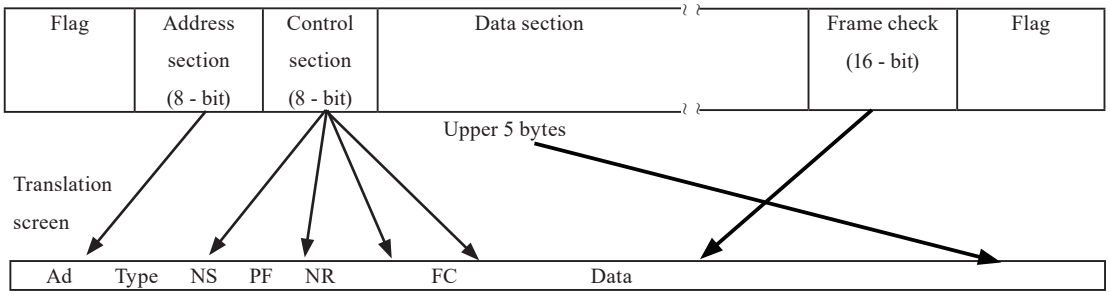
Only the control characters used in the BSC communication are displayed.

Transmission control character	Display	EBCDIC (EBCDIK)	ASCII (JIS)	Transcode
SOH	SH	01	01	00
STX	SX	02	02	0A
ETB	EB	26	17	0F
ETX	EX	03	03	2E
EOT	ET	37	04	1E
ENQ	EQ	2D	05	2D
ACK0	$^{A}{}_{K}0$	10 70	10 30	1F 20
ACK1	$^{A}{}_{K}1$	10 61	10 31	1F 23
NAK	$^{N}{}_{K}$	3D	15	3D
DLE	$^{D}{}_{L}$	10	10	1F
ITB	$^{I}{}_{B}$(Us)	1F	1F	1D
WACK	WAK	10 6B	10 3B	1F 26
RVI	RV	10 7C	10 3C	1F 32
TTD	TD	02 2D	02 05	0A 2D
ACK	$^{A}{}_{K}$	2E	06	-

- A character next to DLE is always displayed unconditionally.
- The character string between STX and ETB or ETX is omitted and displayed as "-". While the control codes between them are also not displayed, only ITB is displayed together with the result of the BCC calculation.
- The results of the BCC calculation are displayed when the text is completed.

Frame Level Translation Display

SDLC, HDLC frame constitution



List of SDLC mnemonics (Modulo 8)

Mnemonic		Name		Bit configuration of control							
SD	RD	SD	RD	b8 b7b6 b5 b4 b3 b2b1							
INFO	INFO	INFOmation		N(R)			P/F	N(S)			0
RR	RR	Receive Ready		N(R)			P/F	0	0	0	1
RNR	RNR	Recieve Not Ready		N(R)			P/F	0	1	0	1
REJ	REJ	REJect		N(R)			P/F	1	0	0	1
SNRM		Set NormalResponse Mode		1	0	0	P	0	0	1	1
SNRME		Set Normal Response ModeExtended		1	1	0	P	1	1	1	1
DISC	RD	DISConnect	Request Disconnect	0	1	0	P/F	0	0	1	1
SIM	RIM	Set Initialization Mode	Request InitializationMode	0	0	0	P/F	0	1	1	1
	DM	DisconnectMode		0	0	0	F	1	1	1	1
UP		Unnumbered Poll		0	0	1	P	0	0	1	1
	UA	Unnumbered Acknowledgement		0	1	1	F	0	0	1	1
UI	UI	Unnumbered IDentification		0	0	0	P/F	0	0	1	1
XID	XID	eXchange IDentification		1	0	1	P/F	1	1	1	1
	FRMR	FReMe Reject		1	0	0	F	0	1	1	1
TEST	TEST	TEST		1	1	1	P/F	0	0	1	1
	BCN	BeaCoN		1	1	1	F	1	1	1	1
CFGR	CFGR	ConFiguRe		1	1	0	P/F	0	1	1	1

When a control section of a bit-configuration without the above is received, it is displayed in hexadecimal code.

List of SDLCE mnemonics (Modulo 128)

Mnemonic	Name	Bit configuration of control									
		b16~10b9b8 b7 b6 b5 b4 b3 b2 b1									
INFO	INFOmation	N(R)	P/F	N(S)							0
RR	Receive Ready	N(R)	P/F	0	0	0	0	0	0	0	1
RNR	Recieve Not Ready	N(R)	P/F	0	0	0	0	0	1	0	1
REJ	REJect	N(R)	P/F	0	0	0	0	1	0	0	1

When a control section of a bit-configuration without the above is received, it is displayed in the same code to Modulo 8.

List of X.25 mnemonics (Modulo 8)

Mnemonic		Name		Bit configuration of control							
SD	RD	SD	RD	b8 b7 b6 b5b4b3 b2 b1							
INFO	INFO	INFOmation		N(R)			P/F	N(S)			0
RR	RR	Receive Ready		N(R)			P/F	0	0	0	1
RNR	RNR	Receive Not Ready		N(R)			P/F	0	1	0	1
REJ	REJ	REJect		N(R)			P/F	1	0	0	1
SARM	DM	Set Asynchronous Response Mode	DisconnectMode	0	0	0	P/F	1	1	1	1
SABM		Set Asynchronous Balanced Mode		0	0	1	P	1	1	1	1
SABME		Set Asynchronous Balanced ModeExtended		0	1	1	P	1	1	1	1
DISC		DISConnect		0	1	0	P	0	0	1	1
	UA	Unnumbered Acknowledgement		0	1	1	F	0	0	1	1
	FRMR	FRaMe Reject		1	0	0	F	0	1	1	1

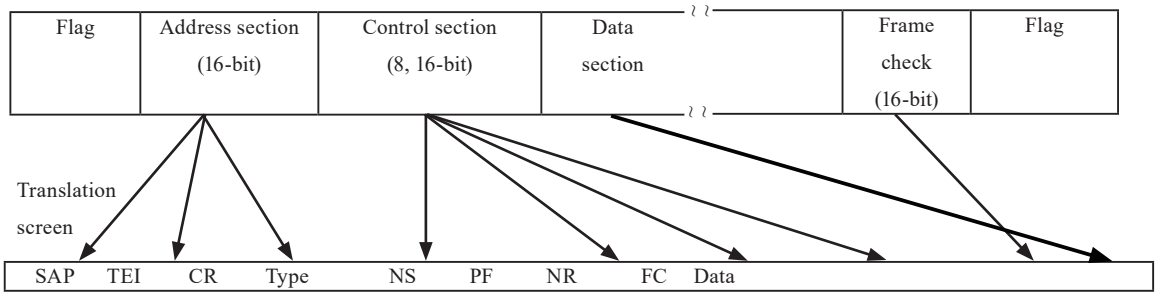
When a control section of a bit-configuration without the above is received, it is displayed in HEX code.

List of X.25 mnemonics (Modulo 128)

Mnemonic		Name		Bit configuration of control							
SD	RD	SD	RD	b8	b7	b6	b5	b4	b3	b2	b1
INFO	INFO	INFOmation		N(S)							0
				N(R)							PF
RR	RR	Receive Ready		0	0	0	0	0	0	0	1
				N(R)							P
RNR	RNR	Recieve Not Ready		0	0	0	0	0	1	0	1
				N(R)							PF
REJ	REJ	REJect		0	0	0	0	1	0	0	1
				N(R)							PF

When a control section of a bit-configuration without the above is received, it is displayed in the same code to Modulo 8.

LAPD frame configuration

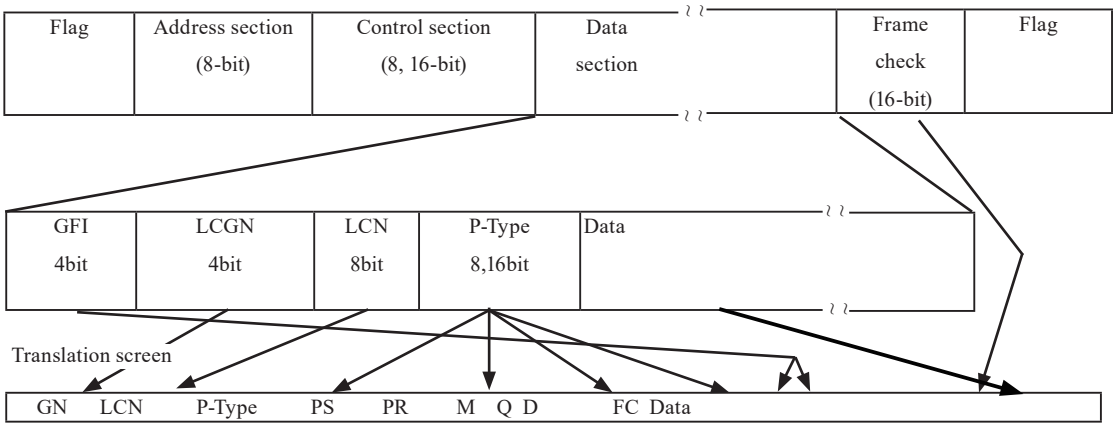


List of LAPD mnemonics

Mnemonic		Name		Bit configuration of control							
SD	RD	SD	RD	b8	b7	b6	b5	b4	b3	b2	b1
INFO		INFOmation		N(S)							0
				N(R)							P
RR	RR	Receive Ready		0	0	0	0	0	0	0	1
				N(R)							P/F
RNR	RNR	Receive Not Ready		0	0	0	0	0	1	0	1
				N(R)							P/F
REJ	REJ	REJect		0	0	0	0	1	0	0	1
				N(R)							P/F
SABME		Set Asynchronous BalancedMode Extended		0	1	1	P	1	1	1	1
	DM		Disconnected Mode	0	0	0	F	1	1	1	1
UI		Unnumbered Infomation		0	0	0	P	0	0	1	1
DISC		DISConnect		0	1	0	P	0	0	1	1
	UA		Unnumbered Acknowledgement	0	1	1	F	0	0	1	1
	FRMR		FRaMe Reject	1	0	0	F	0	1	1	1
XID	XID	eXchange IDentification		1	0	1	P/F	1	1	1	1

When a control section of a bit-configuration without the above is received, it is displayed in HEX code.

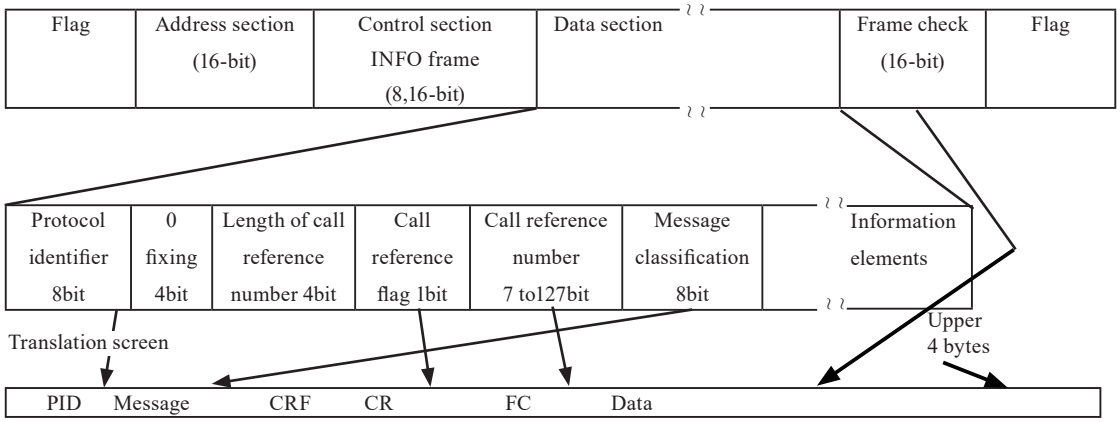
X. 25 packet configuration



List of X.25 mnemonics

Mnemonic		Name		Bit configuration of packet type							
SD	RD	SD	RD	b8 b7 b6 b5b4 b3b2 b1							
DT	DT	Data		P(R)			M	P(S)			0
RR	RR	Receiver Ready		P(R)			0	0	0	0	1
RNR	RNR	Recerve Not Ready		P(R)			0	0	1	0	1
REJ		REJect		P(R)			0	1	0	0	1
CR	IC	Call Request	Incoming Call	0	0	0	0	1	0	1	1
CA	CC	Call Accept	Call Connected	0	0	0	0	1	1	1	1
CQ	CI	Clear reQuest	Clear Indication	0	0	0	1	0	0	1	1
CF	CF	Clear conFirmation		0	0	0	1	0	1	1	1
SQ	SI	reStart reQuest	reStart Indication	1	1	1	1	1	0	1	1
SF	SF	reStart conFirmation		1	1	1	1	1	1	1	1
RQ	RI	Reset reQuest	Reset Indication	0	0	0	1	1	0	1	1
RF	RF	Reset conFirmation		0	0	0	1	1	1	1	1
REGQ		REGister(Facility)reQuest		1	1	1	1	0	0	1	1
	REGF	REGister(Facility) conFirmation		1	1	1	1	0	1	1	1
IT	IT	InTerrupt		0	0	1	0	0	0	1	1
IF	IF	Interrupt conFirmation		0	0	1	0	0	1	1	1
DIAG	DIAG	DIAGnostic		1	1	1	1	0	0	0	1

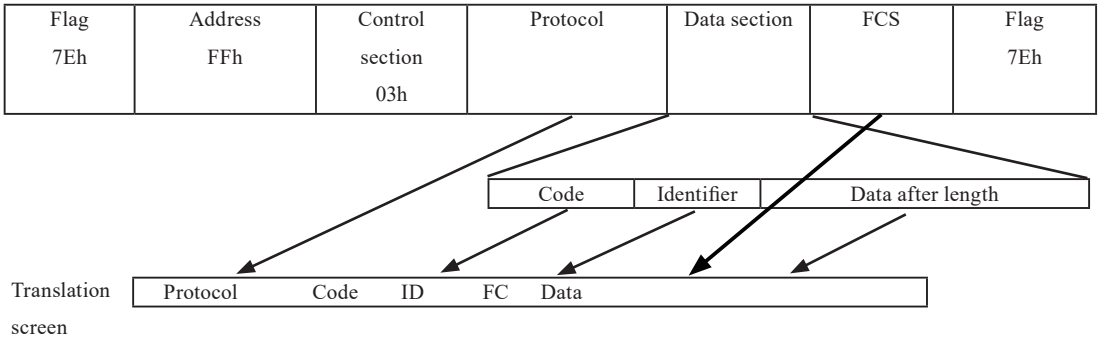
🕮 LAPD packet configuration



🕮 List of LAPD mnemonics

Mnemonic	Name	Bit configuration of message							
		b8	b7	b6	b5	b4	b3	b2	b1
ESCAPE	ESCAPE	0	0	0	0	0	0	0	0
ALERT	ALERTing	0	0	0	0	0	0	0	1
CALL PROC	CALL PROCeeding	0	0	0	0	0	0	1	0
CONN	CONNect	0	0	0	0	0	1	1	1
CON NACK	CONNect ACKnowledge	0	0	0	0	1	1	1	1
PROG	PROGress	0	0	0	0	0	0	1	1
SETUP	SETUP	0	0	0	0	0	1	0	1
SETUP ACK	SETUP ACKnowledge	0	0	0	0	1	1	0	1
RES	RESume	0	0	1	0	0	1	1	0
RES ACK	RESume ACKnowledge	0	0	1	0	1	1	1	0
RES REJ	RESume REJect	0	0	1	0	0	0	1	0
SUSP	SUSPend	0	0	1	0	0	1	0	1
SUSP ACK	SUSPend ACKnowledge	0	0	1	0	1	1	0	1
SUSP REJ	SUSPend REJect	0	0	1	0	0	0	0	1
USER INFO	USER INFOrmation	0	0	1	0	0	0	0	0
DISC	DISConnect	0	1	0	0	0	1	0	1
REL	RELease	0	1	0	0	1	1	0	1
REL COMP	RELease COMPlete	0	1	0	1	1	0	1	0
REST	RESTart	0	1	0	0	0	1	1	0
REST ACK	RESTart ACKnowledge	0	1	0	0	1	1	1	0
SEGMENT	SEGMENT	0	1	1	0	0	0	0	0
CON CON	CONgestion CONtrol	0	1	1	1	1	0	0	1
INFO	INFOrmation	0	1	1	1	1	0	1	1
FAC	FACility	0	1	1	0	0	0	1	0
NOTIFY	NOTIFY	0	1	1	0	1	1	1	0
STATUS	STATUS	0	1	1	1	1	1	0	1
STATUS EN	STATUS ENqiry	0	1	1	1	0	1	0	1

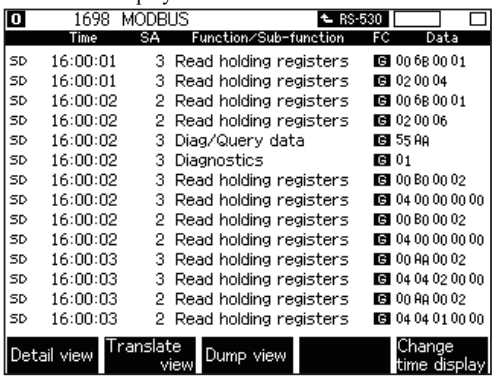
PPP frame constitution



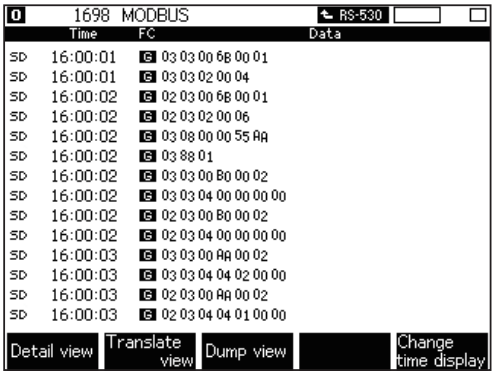
Protocol value (h)	Mnemonic	Name
0001	Padding	Padding Protocol
0021	IP	Internet Protocol
0023	OSI	OSI Network Layer
0025	XNS	Xerox NS IDP
0027	DECnet	DECnet Phase IV
0029	AT	AppleTalk
002b	IPX	Novell IPX
002d	VJCTCPIP	Van jacobson Compressed TCP/IP
002f	VJUTCPIP	Van jacobson Uncompressed TCP/IP
0031	BPDU	Bridging PDU
0033	ST	Stream Protocol (TS-II)
0035	VINES	Banyan Vines
0039	AT-EDDP	AppleTalk EDDP
003b	AT-SB	AppleTalk SmartBuffered
003d	MP	Multi-Link
003f	NETBIOS	NETBIOS Framing
0041	Cisco	Cisco Systems
0043	Ascom	Ascom Timeplex
0045	LBLB	Fujitsu Link Backup and Load Barancing
0047	DCA	DCA Remote Lan
0049	SDTP	Serial Data Transport Protocol (PPP-SDTP)
004b	SNA802.2	SNA over 802.2
004d	SNA	SNA
004f	IPv6	IPv6 Header Compression
006f	SB	Stampede Bridging
00fb	CSLMG	Compression on single link in multilink group
00fd	1stComp	1st choice compression
0201	802.1dHP	802.1d Hello Packet
0203	SR-BPDU	IBM Source Routing BPDU
0205	DECLBST	Dec LANBridge 100 Spanning Tree
0231	Luxcom	Luxcom

Protocol value (h)	Mnemonic	Name
233	SigmaNS	Sigma Network Systems
8021	IPCP	Internet Protocol Control Protocol
8023	OSINLCP	OSI Network Layer Control Protocol
8025	XNSCP	Xerox NS IDP Control Protocol
8027	DNCP	DECnet Phase IV Control Protocol
8029	ATCP	Apple Talk Control Protocol
802b	IPXCP	Novell IPX Control Protocol
8031	BCP	Bridging NCP
8035	BVCP	Banyan Vines Control Protocol
803d	MPCP	Multi-Link Control Protocol
803f	NETBIOSC	NETBIOS Framing Control Protocol
8041	CiscoCP	Cisco Systems Control Protocol
8043	AscomCP	Ascom Timeplex
8045	LBLBCP	Fujitsu LBLB Control Protocol
8047	DCA-CP	DCA Remote Lan Network Control Protocol
8049	SDCP	Serial Data Control Protocol (PPP-SDCP)
804b	SNA802CP	SNA over 802.2 Control Protocol
804d	SNACP	SNA Control Protocol
804f	IPv6CP	IPv6 Header Compression Protocol
806f	SBCP	Stampede Bridging Control Protocol
80fb	CSLMGCP	compression on single link in multilink group control
80fd	CCP	Compression Control Protocol
c021	LCP	Link Control Protocol
c023	PAP	Password Authentication Protocol
c025	LQR	Link Quality Report
c027	SPAP	Shiva Password Authentication Protocol
c029	CBCP	CallBack Control Protocol (CBCP)
c223	CHAP	Challenge Handshake Authentication Protocol
c26f	SBAP	Stampede Bridging Authorization Protocol
c281	PropAP	Proprietary Authentication Protocol
c481	PropNIDA	Proprietary Node ID Authentication Protocol

< Translated display >



< Dump display >



* You can change the damp display to translated data display by [F2].

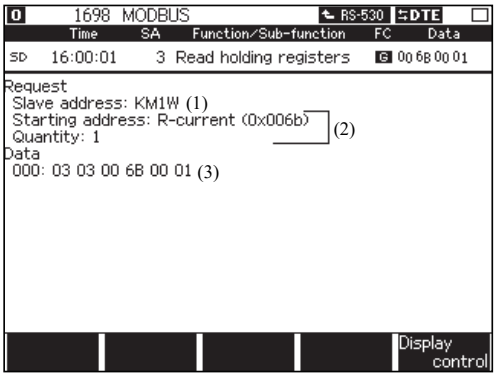
Item	Meaning
SD or RD	Show the position (SD or RD) of received frame.
Time	Show the time of receiving frame.
SA	Show the address in decimal.
Function/Sub-function	Show the detail of function/sub-function codes.
FC	Show the result of CRC (RTU)/LRC (ASCII) acceptance.
Data	Show the data field in HEX.

* It displays without distinguishing commands from responses

* Frames with " ∗ " mean error frames.

By LE-8200 with version V1.17 or above, you can display the detail of the data after measurement. At detail display, it displays the data in conformity to the power meter “KW1M (by Panasonic)”. Detail display translates data in the order of head frame, Request, and Response. You can change the translation of Request/Response by pushing [F1] key.

< Detail display >



1. Slave address display part

   Displays a slave address in decimal number. It can also display a character string defined by a user.

2. Translation part

   Displays the translated data in accordance with the function codes.

3. Data part

   Displays the data field (without CRC) from the slave address. Displays in ASCII by Modbus ASCII, and displays in hex number by Modbus RTU.

■ Function code

Code	Display	Description
0x01	Read coils	Read Coils
0x02	Read discrete inputs	Read Discrete inputs
0x03	Read holding registers	Read Holding Registers
0x04	Read input registers	Read Input Registers
0x05	Write single coil	Write Single Coil
0x06	Write single register	Write Single Register
0x07	Read exception status	Read Exception Status
0x08	Diagnostics	Diagnostics
0x0B	Get comm event counter	Get Comm Event Counter
0x0C	Get comm event log	Get Comm Event Log
0x0F	Write multiple coils	Write Multiple Coils
0x10	Write multiple registers	Write Multiple registers
0x11	Report slave ID	Report Slave ID
0x14	Read file record	Read File Record
0x15	Write file record	Write File Record
0x16	Mask write register	Mask Write Register
0x17	R-W multiple registers	Read/Write Multiple registers
0x18	Read FIFO queue	Read FIFO queue
0x2B	Encapsulated	Encapsulated Interface Transport

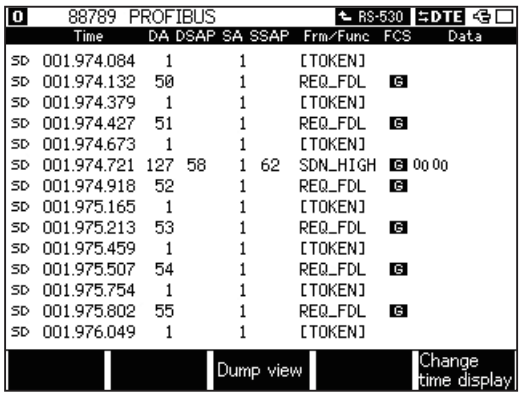
■ Sub-function code

Code	Sub-function (Diagnostics)	Description
0x00	Diag/Query data	Return Query Data
0x01	Diag/Restart comm	Restart Communications Option
0x02	Diag/Diagnostic register	Return Diagnostic Register
0x03	Diag/ ASCII delimiter	Change ASCII Input Delimiter
0x04	Fiag/Force listen only	Force Listen Only Mode
0x0A	Diag/Clear counters	Clear Counters and Diagnostic Register
0x0B	Diag/Bus msg count	Return Bus Message Count
0x0C	Diag/Bus comm err cnt	Return Bus Communication Error Count
0x0D	Diag/Bus except err cnt	Return Bus Exception Error Count
0x0E	Diag/Slave msg count	Return Slave Message Count
0x0F	Diag/Slave no res count	Return Slave No Response Count
0x10	Diag/Slave NAK count	Return Slave NAK Count
0x11	Diag/Slave busy count	Return Slave Busy Count
0x12	Diag/Bus overrun count	Return Bus Character Overrun Count
0x14	Diag/Clear overrun	Clear Overrun Counter and Flag

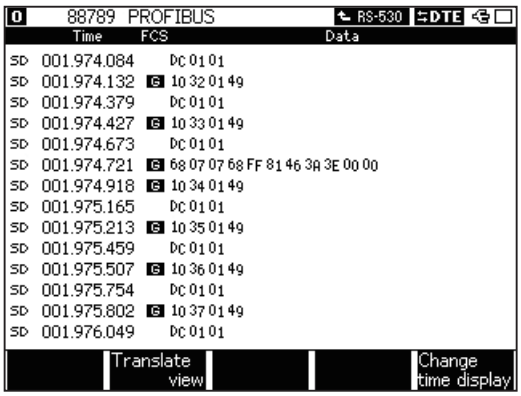
Code	Sub-function (Encapsulated)	Description
0x0D	Enca/CANopen general	CANopen General Reference Request and Response PDU
0x0E	Enca/Read device ident	Read Device Identification

You can select the normal data display or the translated data display by pushing the [Data] key. When the display is the translated data display, you can also change it to the dump display by the [F3] key.

< Translated data display >



< Dump display >



Note: You can move to the translated data display from the dump display by [F2] key.

■ Contents

Item	Meaning
(SD or RD)	Shows the position (SD or RD) of received frame.
Time	Shows the time of receiving frame.
DA	Shows the destination address in decimal.
DSAP	Shows the destination service access point in decimal.
SA	Shows the source address in decimal.
SSAP	Shows the source service access point address in decimal.
Frm/Func	Displays the translation of frame type or function code. (*1) Meanings of the special displays. [TOKEN]: SD4(0xDC) frame [SC]: Single Character (0xE5) [(XX)]: A first byte of unknown data string (HEX) [ILL]: When the length of SD2 (LE,LEr) is invalid. (XX): Function code not to be translated (HEX).(FCB(b5), FCV(b4) will be displayed by masking) Note: XX is displayed by two HEX.
FCS	Displays the check result of FCS (Frame Check Sequence). G: Valid value E: Invalid value B: B Break detection (which is not a FCS result)
Data	Displays the field data of the protocol data unit (PDU) (which does not include the address expansion) in HEX (max. 5 byte). (*2)

*1: Refer to the next page for translation of function codes.

*2: It displays 2nd byte or later if continuous data are not recognized as PROFIBUD DP standard frame. For dump display, it displays maximum 18byte data from the top of frame in HEX.

■ Function codes

Function Code Request

Codes								Content	Display
b7	b6	b5	b4	b3	b2	b1	b0		
1	1	x	x	0	0	0	0	Clock Value	CV
0	1	x	x	0	0	0	0	Time Event	TE
0	1	x	x	0	0	1	1	Send Data Acknowledged - low priority	SDA_LOW
0	1	x	x	0	1	0	0	Send Data Not acknowledged - low priority	SDN_LOW
0	1	x	x	0	1	0	1	Send Data Acknowledged - high priority	SDA_HIGH
0	1	x	x	0	1	1	0	Send Data Not acknowledged	SDN_HIGH
0	1	x	x	0	1	1	1	Send Request Data with Multicast Reply	MSRD
0	1	x	x	1	0	0	1	Request FDL Status	REQ_FDL
0	1	x	x	1	1	0	0	Send and Request Data	SRD_LOW
0	1	x	x	1	1	0	1	Send and Request Data	SRD_HIGH
0	1	x	x	1	1	1	0	Request Ident with reply	REQ_ID
0	1	x	x	1	1	1	1	Request LSAP Status with reply	REQ_LSAP

Function Code Response

Codes								Content	Display
b7	b6	b5	b4	b3	b2	b1	b0		
0	0	x	x	0	0	0	0	OK	OK
0	0	x	x	0	0	0	1	User Error	UE
0	0	x	x	0	0	1	0	No resources	RR
0	0	x	x	0	0	1	1	SAP not enabled	RS
0	0	x	x	1	0	0	0	Data Low (normal case with DP)	DL
0	0	x	x	1	0	0	1	No response data ready	NR
0	0	x	x	1	0	1	0	Data High (DP diagnosis pending)	DH
0	0	x	x	1	1	0	0	Data not received and Data Low	RDL
0	0	x	x	1	1	0	1	Data not received and Data High	RDH

“x” is “don’t care” and will be masked.

10.1 Specifications of Function and Hardware

Item	Specifications
Interface	RS-232C (V. 24), RS-422/485 (RS-530)
Expansion measurement interface(*1)	RS-422/485 terminal block [LE-25TB], X. 20/21 [LE-25Y15], RS-449 [LE-25Y37], V. 35 [LE-25M34], 3V/5V TTL/I2C/SPI [OP-SB85L], Current loop [OP-SB85C], CAN/LIN [OP-SB87],CAN/CAN FD/CXPI [OP-SB87FD], FlexRay [OP-SB88], USB [OP-SB84] LAN (PoE) [OP-SB89], Gigabit Ethernet [OP-SB89G], LAN (EtherCAT) [OP-SB89E]
Standard Protocol	ASYNC (Asynchronous), ASYNC-PPP, Character synchronous SYNC/BSC, Bit synchronous HDLC/SDLC/X. 25, MODBUS, PROFIBUS-DP
Optional Protocol	I^2C, SPI, BURST(※ 2), IrDA(IrLAP), CC-LINK(※ 3), CAN, CAN FD, Devicenet,(※ 3), LIN, CXPI, FlexRay, LAN, EtherCAT, USB1.1/2.0
Synchronous clock	ST1 (DTE transmission clock), ST2 (DCE transmission clock), RT (DCE reception clock), AR (The synchronous clock extracted from the edge of the transmission and reception data)
Capture memory(*4)	Capacity : 100MB It is composed of DDR-SDRAM of which allows high-speed access. Two separated screens. Auto backup(*5). Error erasure prevention. Choose ring buffer or fixed size buffer.
Backup memory	Capacity:4MB It can be saved the measurement data and conditions by the built-in lithium battery for 10 years.
Max. speed	Full duplex: 2.150Mbps / Half duplex: 4.000Mbps
Speed setting range	50bps to 4.000Mbps Freely set to four effective digits, separately for transmission and reception. (Margin of error: ± 0. 01% or less)
Expansion speed(HDLC mode)	115.2Kbps to 12Mbps [OP-FW12G]
Data format	NRZ, NRZI, FM0, FM1, 4PPM, ASK, Manchester0, Manchester1
Data code	ASCII, EBCDIC, JIS7, JIS8, Baudot, Transcode, IPARS, EBCD, EBCDIK, HEX
Character Framing	ASYNC : data bit (5, 6, 7, 8) + parity bit (0, 1) + stop bit (1, 2) Character synchronous : data bit + parity bit (6 or 8bits in total) Bit synchronous : data bit (8bits)
Parity bit	NONE, ODD, EVEN, MARK, SPACE
Multiprocessor bit	MP (multiprocessor) bit is shown with a special mark.
Bit transmission order	LSB first or MSB first (switchable)
Polarity inversion	Normal, Invert (switchable)
Error check	Parity (ODD, EVEN, MARK, SPACE), Framing, Break, Abort, Short frame, BCC (LRC, CRC-6, CRC-12, CRC-16, CRC-ITU-T, FCS-16, FCS-32). BCC permeation mode.
Online monitor function	Communication log is recorded continuously and displayed in the LCD without affecting the communication lines.
Idle time display	OFF (no record); Resolution: 100ms, 10ms, 1ms; Max 999. 9 sec
Time stamp display	Standard; Date time stamp: unit selectable among "Day/Hr/Min", "Hr/Min/Sec" and "Min/Sec/10ms"; Elapsed time from the measurement start(9 digits. Max.134217727): 100μsec/10μsec/1μsec
Line status display	Records and displays the wave form of 7 signals (chosen from RS(RTS), CS(CTS), ER(DTR), DR(DSR), CD(DCD), CI(RI), TRGIN(external trigger input) along with the transmission/ reception data.
Address filter	Records only frames of the specified address. (only when HDLC/SDLC/X.25)
Data display and operations	Display pause during capture, 2-split comparison display, scroll and paging display, jump to specified display position
Bit shift display	Entire frame can be shifted to the right or left in 1 bit increments.
Protocol translation display	SDLC (modulo 8/128), ITU-T X.25 (modulo 8/128), LAPD, PPP, BSC, IrLAP, I^2C, MODBUS, PROFIBUS
Line status LED	Two color LEDs of SD, RD, RS(RTS), CS(CTS), ER(DTR), DR(DSR), CD(DCD), CI(RI), ST1(TXC1), ST2(TXC2), RT(RXC).
RS-232C	Logic ON (red) , logic OFF (green) , no connection NC (light off)
Other I/F	Logic ON (red) , logic OFF or no connection NC (light off)
Interval timer	4kinds; Max. count: 999999 (Resolution: 1ms ,10ms ,100ms)
General-purpose counter	4kinds; Max. count: 999999
Address filter	Can set each address of SD and RD frames in HEX on monitoring HDLC communication .

Item	Specifications
Data counter	For SD and RD (1 each): Max. count: 4294967295
Trigger function	Up to 8 pairs of trigger condition and action can be specified. (sequential action, which validates another condition after one condition satisfied, is also possible.)
Trigger condition	Communication error (Parity, MP, framing, BCC, break, abort, short frame can be specified individually.), communication data string up to 8 characters (don't care and bit mask available), idle time more than the specified duration, match time/counter value, logic status of interface signal line and external trigger input
Trigger action	Stops measurement/test (offset can be set), validates trigger condition: controls timer (start/stop/ restart), controls counter (count/clear), activates buzzer, saves monitor data on a memory card, sends the specified character string (during manual simulation), sends pulse to external signal
Data search function	Retrieves the data with specific condition from capture memory.
Search condition	Communication error (Parity, MP, framing, BCC, break, abort, short frame),communication data string up to 8 characters (don't care and bit mask available), idle time more than the specified duration, specified timestamp (don't care available), trigger matching data.
Search action	Shows the match data at the top or enumeration display (selectable)
Monitor conditions auto setting	Measurement conditions such as protocol, transmission speed, (max. 115.2Kbps), data code, synchronous character and BCC check can be set.
Auto run/stop function	Enables measurement to start and end at the specified time at the selected repeating cycle (monthly, daily, hourly).
Auto save function	Automatically saves the monitored data in the capture memory and saves as communications log file in the CF card.
File size	BUF (capture memory size) , 1MB , 2MB , 4MB , 8MB, 16MB , 32MB , 64MB
Max files	2048
Delay time function	Measures and displays the interval of change in the interface signal line. (current/min/max/average, resolution: 0. 1ms)
Signal voltage measuring function	Measures and displays the value of voltage amplitude: SD, RD, ER(DTR), external signal EXIN. (current/min/max, range ±15V resolution : 0.1V)
Statistical analysis function	Takes statistics at resolution of 1 to 240 (sec. or min.) and displays graphs of transmission/reception data count, number of frames, and satisfied trigger condition count.
Logic analyzer function	Measures the logical change of the interface signal in the sampling clock period, and displays its wave.
Sampling clock	1KHz to 40MHz (15 steps), 100MHz
Sampling memory	Min 4,000
Trigger condition	Trigger conditions in the ONLINE monitor functions match. Logical status match between interface signal line and external signal.
Trigger position	Before, center, after
Zoom in/out	×10 , ×5 , ×2 , ×1 , ×1/2 , ×1/4 , ×1/8 , ×1/16 , ×1/32 , ×1/64
Other functions	Time measurement by cursor, signal line exchange, signal status search
Bit error rate test	At DTE or DCE mode (It is possible to change of the pin arrangement), line quality measurement test such as error rates can be done by loop back test or interactive test. CTS/RTS Flow control is available.
Communication mode	Synchronous (SYNC), Asynchronous (ASYNC)
Measuring speed	50bps~4. 000Mbps, freely set to four effective digits
Measurement mode	Continuous measurement, specifies the number of receiving bit, specifies the time to measure, repeatedly measurement at the unit of 1 - 1440
Test pattern	2^6-1, 2^9-1, 2^{11}-1, 2^{15}-1, 2^{20}-1, 2^{23}-1, MARK, SPACE, ALT, DBL-ALT, 3in24, 1in16, 1in8, 1in4
Error bit insertion	Inserts 1-bit or 5-bit error in test pattern by key operation.
Measurement range	It is able to measure the parameter of the ITU-T advice G.821. Effective received bit (0 to 9999999 to 9. 99E9), bit errors (0 to 9999999 to 9. 99E9), bit error rate(0 to 9. 99E-9 to 1), block errors (0 to 9999999 to 9. 99E9), block error rate (0 to 9. 99E-9 to 1), Savail(available measurement time: 0 to 9999999sec), loss count (synch loss: 0 to 9999), error duration (0 to 9999999sec), %EFS (normal operation rate: 0. 000 to 100. 000%)
Simulation function	Enables transmission/reception test of any given data in DTE or DCE mode (selectable with pin assignment).
Transmit data entry	Can be registered in 160 types of transmission data tables (Total of 16 K data).
Error data entry	A part of transmission data can be registered as error data such as parity error.
Line control mode	Auto (Controls transmission timing with RS(RTS), CS(CTS), ER(DTR), CD(DCD) signal lines automatically in 1 ms increments) or manual (key operation) can be selected.

Item	Specifications
Transmit driver control	Auto control (Turns ON driver only before and after data transmission) or manual mode (link with ER(DTR), CD(DCD) key operation) can be selected during simulation of RS-485.
Simulation test mode	6 types of test mode are available.
MANUAL mode (Manual test)	Sends the data assigned to operation keys each time a key is pressed, while checking communications status on the display. Can be used together with the trigger function.
FLOW mode (Flow control test)	Simulates the X-on /X-off control data and flow control procedures of RTS/CTS control line. (Sender and receiver selectable).
ECHO mode (Echo test)	Sends the received data frame by frame (buffer echo), by data (character echo) or by loop back.
POLLING mode (Multi-polling test)	Simulates multi-polling communications procedures. (Sender and receiver selectable)
BUFFER mode (Buffer transmission test)	Reproduces transmission of selected data (SD or RD) captured in memory by monitor function.
PROGRAM mode (Program simulation)	Creates a simulation program (Max. type: 4, Max steps: 512) using the dedicated commands (47 types) to test the communication procedure.
PULSGEN mode(*6) (Pulse generation)	It regenerates the timing waveform on a communication line, which captured by the logic analyzer function.
File management function	Measurement data and condition can be saved in CF card or USB flash drive. And the format of the data/condition can be used in the PC.
File types	Measurement data (.DT), measurement condition (.SU), trigger save data (TGSAVEnn. DT), auto save data (#nnnnnnn.DT), auto back-up data(@AUTOBU0/1/2.DT)
File controls	Normal file display, sort display, file display by specified type, save, load, delete, delete all, format
Memory card	512M byte to 128G byte CF card (only the LINEEYE guarantees to use).
Printout function	Measurement data can be printed in various formats. Text files can be saved in the CF card. Screen image can be printed and saved in the CF card.
LCD	5.7 inch TFT color liquid crystal display. 320×240 dot. LED back light can be adjusted.
AUX(RS-232C) port	Mini DIN8 pin connector. Communication speed: 9600bps to 230.4Kbps (6 steps) Print out data, Can be used with PC [LE-PC800G], Can be used to upgrade the firmware.
USB2.0 device port	B-connector in device side. Transfer data in high-speed. Can be used with PC [LE-PC800G], Can be used to upgrade the firmware.
USB2.0 host port (*6)	Host side: Type A connector. It supports high-speed transfer. This is for the connection to a USB flash drive.
Power supply	Built-in nickel hydrogen battery or AC adapter DC9V, 2A(AC100 ~ 240V), 50/60Hz
Battery operating time (*7)	About 4 hours Power saving mode: Auto back light off, Auto power off (It will not work while measuring.)
Battery charging time	About 2.5 hours
Environment	Use under the following environment.
Ambient temperatures	0~40 degrees
Storage temperature	-10~50 degrees
Ambient humidity	20~80%RH (No condensation)
Storage humidity	10~85%RH (No condensation)
Standard	CE(class A), EMC(EN61326-1 : 2006)
Dimension (*8), mass	240 (W)×190 (D)×48 (H) mm , about 1.1Kg
Accessory	Monitor cable for the DSUB25 pin (LE-25M1), serial AUX cable for the DSUB9 pin (LE2-8V), external signal input/output cable (LE-4TG), AC adapter (6A-181WP09), carrying bag (LEB-01), hand strap, utility CD, line state sheet, instruction manual and warranty

*1 : To have the function, optional accessory described in "[ ]" is need.

*2 : Mode in which all data is imported in synch with clock edge.

*3 : Raw data display only.

*4 : The capture memory is not backed up by the battery. It consumes 4 bytes of memory each time the send/receive data, idle time, time stamp, and line status are captured.

*5 : This function automatically saves the measurement data in the CF card or back up memory, when the measurement end.

*6 : These features are supported only by LE-8200A

*7 : According to our measurement conditions assuming normal usage.

*8 : Hand strap is not contained.

RS-422/485 port

This port is used for measuring and testing RS-422/485. The standard pin arrangement is the specification of RS-530, and can be used as ports of X.20/21 and RS-449 by the dedicated cables. Input/output specifications of each signal can be changed by setting monitor, simulation DTE (SIM-DTE),and simulation DCE (SIM-DCE).

2.2Interface Setup

■ Signal definition of RS-422/485(V35 Mode=OFF)

Signal name	RS-530(standard)		X.20/21(*1)		RS-449(*2)		Signal Input / Output(*3)			LineState	LineState
	DSUB25	Pin	DSUB15	Pin	DSUB37	Pin	MONITOR	SIM-DTE	SIM-DCE	LED	LED (JIS standard)
Shield ground	FG	1	FG	1	FG	1	-	-	-		
Transmission data	TXD[A]:-	2	T [A]:-	2	SD[A]:-	4	I	O	I	SD	SD
	TXD[B]:+	14	T [B]:+	9	SD[B]:+	22	I	O	I		
Receiving data	RXD[A]:-	3	R [A]:-	4	RD[A]:-	6	I	I	O	RD	RD
	RXD[B]:+	16	R [B]:+	11	RD[B]:+	24	I	I	O		
Request of transmission	RTS[A]:-	4	C [A]:-	3	RS[A]:-	7	I	O	I	RTS	RS
	RTS[B]:+	19	C [B]:+	10	RS[B]:+	25	I	O	I		
Capable of transmission	CTS[A]:-	5	I [A]:-	5	CS[A]:-	9	I	I	O	CTS	CS
	CTS[B]:+	13	I [B]:+	12	CS[B]:+	27	I	I	O		
Data set ready	DSR[A]:-	6			DM[A]:-	11	I	I	O	DSR	DR
	DSR[B]:+	22			DM[B]:+	29	I	I	O		
Terminal ready	DTR[A]:-	20			TR[A]:-	12	I	O	I	DTR	ER
	DTR[B]:+	23			TR[B]:+	30	I	O	I		
Signal ground	SG	7	SG	8	SG	19	-	-	-		
Data carrier detect	DCD[A]:-	8			RR[A]:-	13	I	I	O	DCD	CD
	DCD[B]:+	10			RR[B]:+	31	I	I	O		
Transmission timing of DTE	TXC1[A]:-	24			TT[A]:-	17	I	O	I	TXC1	ST1
	TXC1[B]:+	11			TT[B]:+	35	I	O	I		
Transmission timing of DCE	TXC2[A]:-	15			ST[A]:-	5	I	I	O	TXC2	ST2
	TXC2[B]:+	12			ST[B]:+	23	I	I	O		
Receiving timing of DCE	RXC[A]:-	17	S [A]:-	6	RT[A]:-	8	I	I	O	RXC	RT
	RXC[B]:+	9	S [B]:+	13	RT[B]:+	26	I	I	O		
	Not connected	18									
	Not connected	21									
	Not connected	25									

*1: Defines DSUB type 15pin connector signal when the dedicated cable LE-25Y15 (optional) is used.

When measuring X.21 interface by using exclusive cable LE-25Y15, set the item "Clock" of the communication clock at the communication condition setting to "RT" or "AR".

*2: Defines DSUB type 37pin connector signal when the dedicated cable LE-25Y37 (optional) is used.

*3: "I" is an input to the analyzer. "O" is an output from the analyzer.

■ Signal definition of RS422/485 port (V.35 Mode: ON)

Signal name	Port status		V.35 (*1)		Signal Input/Output (*2)			LineState LED	LineState LED (JIS standard)
	DSUB25	Pin	M type 34	Pin	MONITOR	SIM-DTE	SIM-DCE		
Shield ground	FG	1	FG	A	-	-	-		
Transmission data	TXD[A]:-	2	TXD[A]:-	P	I	O	I	SD	SD
	TXD[B]:+	14	TXD[B]:+	S	I	O	I		
Receiving data	RXD[A]:-	3	RXD[A]:-	R	I	I	O	RD	RD
	RXD[B]:+	16	RXD[B]:+	T	I	I	O		
Data set ready	V24_DSR	6	V24_DSR	E	I	I	O	DSR	DR
Terminal ready	V24_DTR	20	V24_DTR	H	I	O	I	DTR	ER
Signal ground	SG	7	SG	B	-	-	-		
Data carrier detect	V24_DCD	8	DCD	F	I	I	O	DCD	CD
Ring indicator	V24_CI	10	CI	J	I	I	O	RI	CI
Transmission timing DTE	TXC1[A]:-	24	TXC1[A]:-	U	I	O	I	TXC1	ST1
	TXC1[B]:+	11	TXC1[B]:+	W	I	O	I		
Transmission timing DCE	TXC2[A]:-	15	TXC2[A]:-	Y	I	I	O	TXC2	ST2
	TXC2[B]:+	12	TXC2[B]:+	AA	I	I	O		
Receiving timing DCE	RXC[A]:-	17	RXC[A]:-	V	I	I	O	RXC	RT
	RXC[B]:+	9	RXC[B]:+	X	I	I	O		
Request of transmission	V24_RTS	18	RTS	C	I	O	I	RTS	RS
Capable of transmission	V24_CTS	21	CTS	D	I	I	O	CTS	CS

*1 : Defines M type 34pin signal when the dedicated cable LE-25M34(optional) is connected.

*2 : "I" is an input to the analyzer. "O" is an output from the analyzer.

Terminal Control of RS-422/485 Port

When having a simulation test for RS-422/485(RS-530) port and this analyzer becomes a terminal , you need to set a terminal control. Connect a terminal control for input signal when using RS-422. Connect terminal controls for all signals when using RS-485.

2.3Connection Method

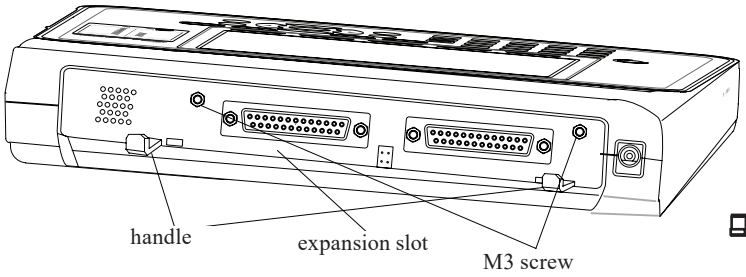
■ Terminal control connection.

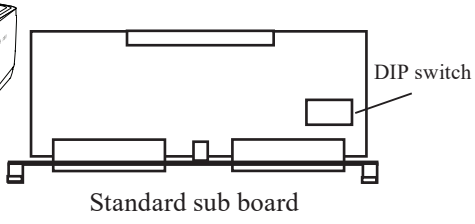
Remove the interface sub-board and change the dip switch to be On.

Switch No.	Signal	Switch No.	Signal
1	TXD	6	RTS
2	TXC1	7	DTR
3	RXD	8	CTS
4	RXC	9	DSR
5	TXC2	0	DCD

[Remove the interface sub-board]

1. Remove the screws for the sub-board.
2. Change the dip switch.
3. Insert the sub-board and drive the screws.





RS-232C(V.24) port

This port is used for measuring and testing RS-232C. The standard pin arrangement is used on the specification of V.24.
Input/Output specifications of each signal can be changed by setting monitor, simulation (DTE) ,and simulation (DCE).

2.2Interface Setup

■ Signal definition of RS-232C

Signal name	RS-232C(V.24)		Signal Input / Output (*3)			LineState LED	LineState LED (JIS standard)
	DSUB25	Pin(*2)	MONITOR	DTE	DCE		
Shield ground	FG	1	-	-	-		
Signal ground	SG	7	-	-	-		
Transmission data	SD	2	I	O	I	SD	SD
Receiving data	RD	3	I	I	O	RD	RD
Request of transmission	RTS	4	I	O	I	RTS	RS
Capable of transmission	CTS	5	I	I	O	CTS	CS
Terminal ready	DTR	20	I	O	I	DTR	ER
Data set ready	DSR	6	I	I	O	DSR	DR
Data carrier detect	DCD	8	I	I	O	DCD	CD
Call indicator	CI (*1)	22	I	-	-	RI	CI
Transmission timing DTE	ST1	24	I	O	I	TXC1	ST1
Transmission timing DCE	ST2	15	I	I	O	TXC2	ST2
Receive timing DCE	RT	17	I	I	O	RXC	RT

*1:CI signal cannot be outputted from this analyzer.

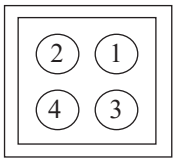
*2:The pins not mentioned are for non-connection.

*3:"I" is an input to the analyzer. "O" is an output from the analyzer.

External Input/Output Terminal

There are trigger connectors in the sub-board. Use a trigger cable which comes with the product.

■ Signal Table



Pin number	Signal name	Input/ Output	Function
1	TRG.OUT	O	When trigger factor is satisfied, output "LOW level (open drain output, +5V, 12K ohm pull up)
2	TRG.IN	I	External trigger input (TTL level input)*1
3	EXT.IN	I	External signal input (TTL level input) *1 Analog input*2
4	GND	Common	Signal ground

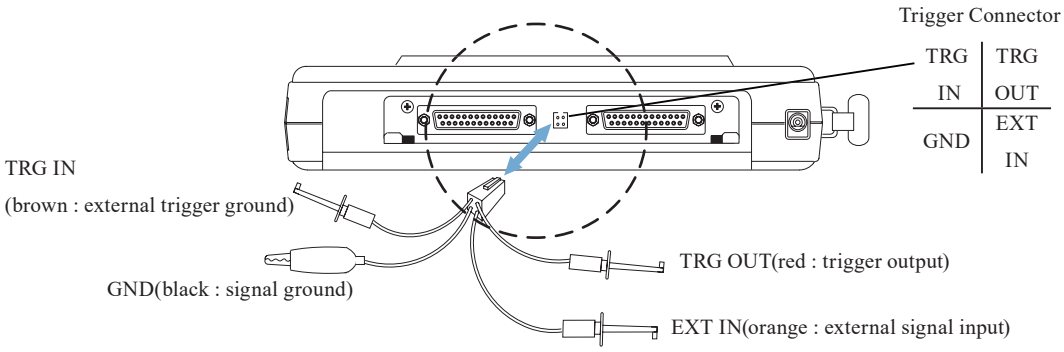
*1The voltage input range is from -0.5V to 6.0V.

*2Input a signal to measure voltage at "AI & DELAY"(Range±15V)

■ Trigger cable and connector(external input/ output terminal)

Connect the trigger cable as following

2.5 Environmental Setting
6.1 Trigger Function(Trigger)
10.2 Ports



Trigger cable

AUX Port

AUX port is the dedicated port to communicate with external devices equipped with RS-232C interface.

Signals are all RS-232C level.

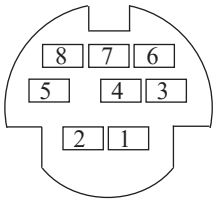
■ Signal table

Pin number	Signal name	I/O	Description
1	Empty terminal		
2	SG	-	Signal ground
3	AUXCS	I	Set to "Low" level to inhibit data output from the analyzer.
4	AUXRD	I	Receives data from an external device.
5	AUXRS	O	Remains on ‘High’ level when the analyzer is ready for data input.
6	AUXER1	O	Remains on ‘High’ level while the power of the analyzer is ON.
7	AUXSD	O	Outputs data to external device.
8	AUXER2	O	Remains on ‘High’ level while the power of the analyzer is ON.

■ Connector specification

Mini DIN8 pin connector (Female)

TCS7588-01-201 (the maker: Hosiden Corporation)



The analyzer (AUX port) Mini DIN connector Pin number		External device (RS-232C) DSUB connector Pin number	Name
1	———	4	DTR
2	———	5	GND
3	———	7	RTS
4	———	3	SD
5	———	8	CTS
6	———	1	DCD
7	———	2	RD
8	———	6	DSR
Metal shell	———	Metal shell	

The figure below shows the connection to connect with devices of DTE specifications by using the included AUX cable.

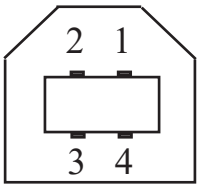
USB device port

USB port is used to communicate a PC via USB2.0 port.

USB port type is B(female). Signal is all TTL level.

Pin No.	Signal	Description
1	VCC	+5 VDC
2	D-	data -
3	D+	data +
4	GND	signal ground

Connector specification:Type B(Female)



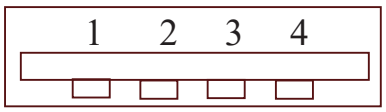
USB host port (This feature is only by LE-8200A)

Dedicated port for USB flash drive connection

Type A, Female. All the signaling is TTL level.

Pin No.	Signal	Description
1	VCC	+5 VDC
2	D-	data -
3	D+	data +
4	GND	signal ground

Connector specification:Type A(Female)



USB Drive Installation

There is an USB port in the right side of the analyzer.

USB port is used to update the latest firmware via PC or use an optional PC software.

You need to install a driver in the PC.

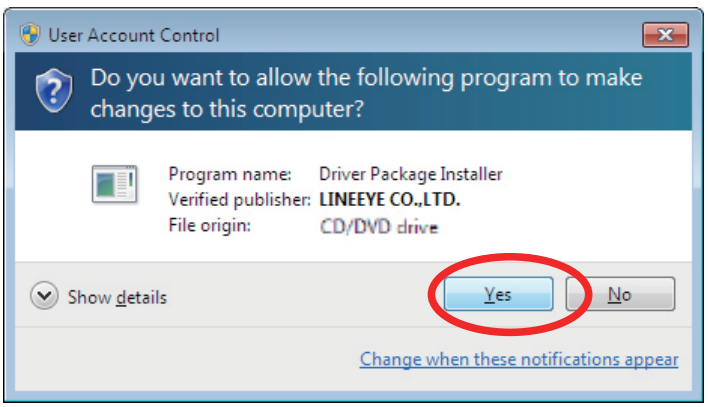
- Supported OS are Windows Vista/7/8/8.1/10

<Installation>

1.Set the attached CD-ROM into the CD-ROM driver of the PC that will be connected to LE-8200./LE-8200A

2.Execute "setup.exe" file in "Driver" folder of the attached CD-ROM.

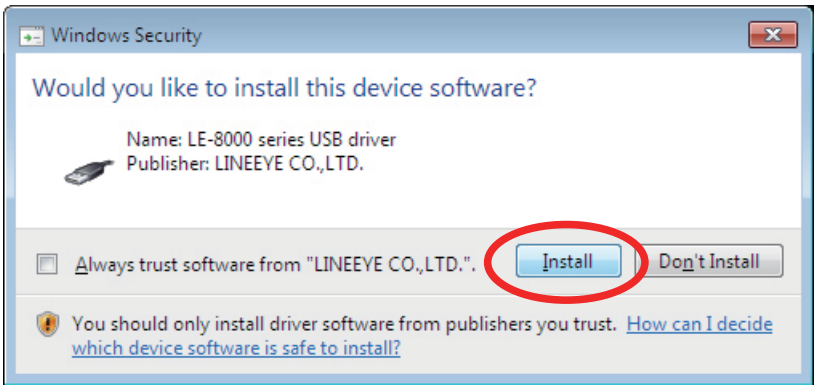
3."User Account Control" appears in the display of the PC. Then click "Yes".



4."LINEEYE driver package installer" appears. Then click "Yes".

5."Device Driver Installation Wizard" appears. Then click "Next".

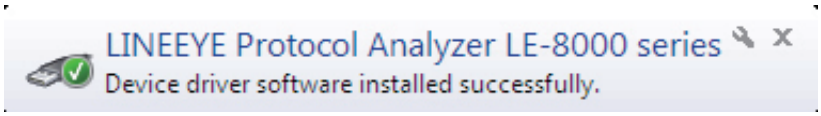
6.Windows security window appears. Then click "Install".



7.If the window says "Completing the Device Driver Installation Wizard", click "Finish".

8.Connect the LE-8200 device to the PC. The installation is completed if the message like below is appears on the task tray.

Above is the installation for Windows 7. It will be almost same for Windows Vista and 8 .



10.3 Soft Reset

Soft reset means restoring the analyzer to the initial condition at the time of delivery,

Turn on the power switch, while pressing [Enter]+[Top/Del] keys.

"Setting initialized !!" will be appeared.

10.4 Using the Latest Function

The new function addition and the improved latest firmware will be published on our web page. After you download to your PC, it is easy to rewrite up to date via USB or attached AUX cable.

For more details, refer to the explanation file of le8firm recorded in the Utility folder of the attached CD.

10.5 Troubleshooting

This section describes how to solve problems when the analyzer does not operate normally.

Problem	Cause / Remedy
Cannot turn on the power The power becomes off quickly.	• Charge the battery. • The battery reached its life span. • The product is breakdown if BT LED is not blinking green while connecting the AC adaptor.
Battery cannot be recharged	• If BT LED is not lighting, supply the power (AC adaptor). • If BT LED is blinking fast, the product is breakdown or disconnection. • Recharge under the temperature of 5-40℃. • The battery reached its life span.
Cannot display any	• Adjust the contrast. • Use the product under the temperature of 0-40℃.
Display <Firmware loader>	• Insert the sub-board. • Load the necessary firmware in the analyzer.
Disappear measured data	• If you press [Run], previous measured data will be erased. • Built-in battery reached its life span. Please ask LINEEYE to replace it.
Date or time is not displayed correctly.	• Display DATE/TIME on the condition menu and set the correct date and time. • Built-in battery reached its life span if date becomes incorrect often.
Cannot operate any keys	• Cannot operate any keys while accessing to the CF card. • Cannot operate any keys while using the PC link software (LE-PC800G). • Remove all cables. Key operation become extremely slow when high speed data is measured.
Cannot work well A part of display is not correct	• Turn off the power and then turn on the power again. • Reset the software (turn on the power while pressing [Enter]+[Top/Del]). It will go back to the factory setting and erase all data.
Line state LED does not light	• Connect the cable properly • Make sure a port you connect cable is same in the setting ([Menu]->[1]->[Port]). • Check the cable snapping or disconnection.
Line State LED lights but cannot monitor or display anything	• Select “On Line”monitor function. • Press [Menu]->[0] and set appropriate conditions. Check speed, SYNC clock and SYNC characters etc.
Line State LED lights but cannot monitor and display errors	• Select “On Line”monitor function. • Press [Menu]->[0] and set appropriate conditions. Check speed, data length, parity bit, FCS and BCC etc.
Errors occur in the target device when pressing [RUN]	• Select “On Line”monitor function. Output signals collide if selecting Simulation.
Cannot output data in Simulation or BERT	• Select “Simulation”or “BERT”function. • Press [Menu]->[1] and select appropriate interface. • Press [Menu]->[0] and set appropriate conditions. Check SYNC clock when measuring SYNC or HDLC.
Cannot set appropriate conditions by Auto Configuration	• Cannot use if the speed of target device is over 115.2Kbps. • Auto Configuration many not be correct because the communication condition of target device varies.
Cannot use the CF card	• Use the CF cards which LINEEYE guarantees to use. • Each model of analyzer has max capacity of using the CF card. • Insert the CF card before turning on the power. • Format the CF card by the analyzer.
Cannot load the file in the CF card or the USB flash drive.	• Cannot load the file which is not supported. • File may be affected by turning off the power while accessing to the CF card. • Cannot read the file of our previous models (LE-7000 etc.)
Unable to printout	• Select “OutputT”to “AUX”from [Menu]->[3]->[2]. • Select the serial port for DPU-414 printer.
Cannot connect to a PC via USB device port	• Install the USB driver in the PC. • Remove the device (USB flash drive) which is connected to USB host.
Cannot use USB flash drive	• Disconnect the connection of the USB device port. • Try another USB flash drive

10.6 Warranty and After service

Warranty

- When you face any problems,
  Please contact LINEEYE distributors or LINEEYE.
- The warranty
  The warranty card has been attached to this product. Please confirm its description and keep it in the safe place.

User Registration

For after service and other information, please register your product in our Website. (http://www.lineeye.com)

Repair

For malfunction, please contact LINEEYE distirutors or LINEEYE and tell us following details.

Model	LE-8200
Serial Number	8 digit numbers
Purchase Date	Year, Month, Day
Other	Details of malfunction

10.5 Troubleshooting

- Repair within the warranty
  LINEEYE repairs, following the repair regulations.
  Please provide the details of malfunction.
- Repair after the warranty
  LINEEYE will repair the products at your own expense.
- Calibration
  Enable to have a diagnostics by the analyzer
  1. Remove all cables from the analyzer and save the important data.
  2. Press [Menu] to go to the top menu. Press [F2] "System menu" and press [6] to go to Diagnostics. Press [F1] "Execute" to start diagnostics.
  3. Follow the instruction in the screen.
  4. If the diagnostics complete testing without any problems, "======OK======" will be displayed on the bottom line of screen.

After Support

Read "FAQ" in our Website or email us.

Website: https://www.lineeye.com

Email: info@lineeye.co.jp
TEL: 81-75-693-0161

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