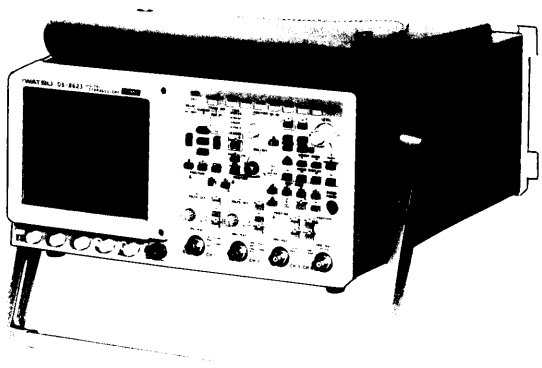


OPERATION MANUAL

DIGITAL STORAGESCOPE

DS – 8623

Version 2

Note:
The software used in the instruments was developed by using *1 Lattice-C compiler and includes its run-time routines.

*1 Lattice-C is a registered trademark of Lattice, Inc.

C81-722500(L)

KML009311

Introduction

◇ Thank you very much for your purhase of Iwatsu electronic measuring instruments. We appreciate your continued patronage of Iwatsu electronic measuring instruments.

◇ Please use your instrument after thoroughly reading this instruction manual and understanding its contents. After reading this manual, please keep it in a safe place for future reference.

Cautions for safe use

Matters that must be observed for sale operation of this instrument and for prevention of injury to humans and damage to property are described as "⚠ warnings" and "⚠ cautions" in this instruction manual.

Explanation of "⚠ warnings" and "⚠ cautions" columns in this instruction manual

⚠ **Warning**	Incorrect operation or failure to need warnings may result in death or serious injury.
⚠ **Caution**	Incorrect operation or failure to need cautions may result in injury or damage to equipment.

Cautions

◇ Parts of the contents of this instruction manual may be modified without notice to accommodate improvements in performance and function.

◇ It is prohibited to transfer or reproduce the information in this instruction manual.

◇ Reproduction of the contents of this instruction manual without previous consent is prohibited.

History

◇ Nov. 1995: Issue of the 2nd edition

⚠ Warnings

- **Do not use this instrument in a location where there is explosive gas in the vicinity.**

  The use of this instrument in a location where there is explosive gas could result in explosion.

- **If there is any smoke, abnormal odor, or abnormal sound coming from this instrument, immediately set the power switch to OFF and disconnect the power cord.**

  Use of this instrument under these conditions could result in electrical shock or fire. After setting the power switch to OFF and disconnecting the power cord, contact one of our service offices for repair. Repair by the user is dangerous and should be strictly avoided.

- **Take care to not allow water to get into this instrument or the wetting of this instrument.**

  The use of this instrument in a wet state could result in electrical shock or fire. If water or other foreign matter has gotten into this instrument, first set the power switch to OFF and remove the power cord and then contact one of our service offices for repair.

- **Do not touch the power cord with wet hands.**

  Touching the power cord with wet hands could result in electrical shock.

- **Do not place this instrument on an unstable place such as on a shaky stand or on a slant.**

  The dropping or turning over of this instrument could result in electrical shock, injury, or fire. If this instrument has dropped or its cover has been damaged, first set the power switch to OFF and remove the power cord and then contact one of our service offices for repair.

- **Do not allow any foreign matter such as metal or inflammable substance to get in from the air hole, etc.**

  The entrance of any foreign matter from the ventilation port, etc., could result in fire, electrical shock, or power failure. If any foreign matter has entered, first set the power switch to OFF and remove the power cord and then contact one of our service offices for repair.

⚠Warnings (cont'd)

● Be sure to use a 3-core power cord suitable for supply voltage.

Failure to use a 3-core power cord could result in electric shock or power failure. Also, failure to use a power cord which does not suit supply voltage could cause a fire.

When supplying power from a 2-wire receptacle using a 3-core/2-core convension adapter, be sure to connect the grounding terminal of the 3-core/2-core conversion adapter to ground. When supplying power from a 3-wire receptacle using the attached 3-core power cord, the grounding wire of the power cord is connected to ground.

● When handling the power cord, strictly observe the following:

Failure to heed this inspection could result in fire or electrical shock. If the power cord has been damaged, contact one of our service offices for repair.

- Do not modify the power cord.
- Do not bend the power cord forcibly.
- Do not twist the power cord.
- Do not bundle the power cord.
- Do not pull the power cord.
- Do not heat the power cord.
- Do not moisten the power cord.
- Do not place a heavy object on the power cord.

● Use this instrument with the rated AC power supply.

Use of this instrument with a voltage other than specified could result in electrical shock, fire, or power failure. The usable power voltage range (90 to 250 VAC) is marked on the rear panel.

● Do not remove either the cover or panel.

There are high-voltage parts inside the cover and panel and touching any of them could result in electrical shock. Please contact one of our service offices for any inspection, calibration, or repair.

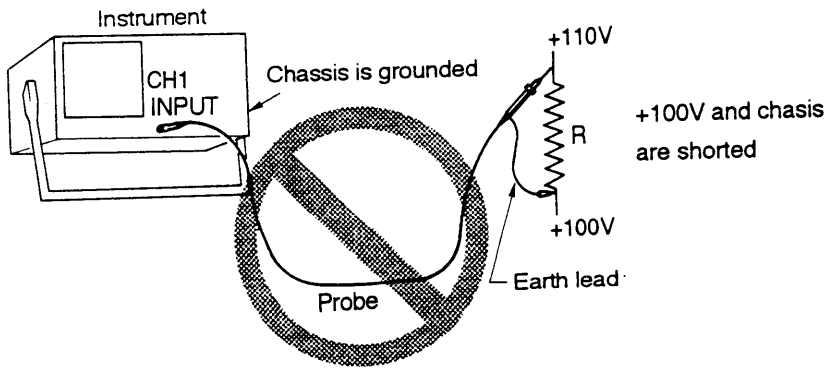
● Take sufficient care when measuring high voltages.

Touching a high-voltage part during measurement could result in electrical shock.

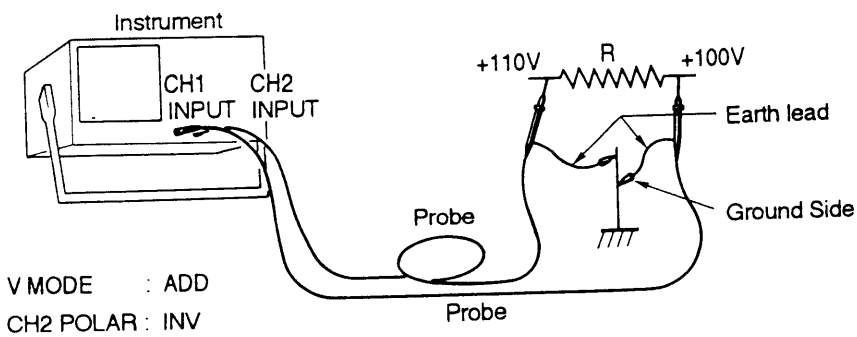
⚠ Warnings (cont'd)

● Be sure to connect the ground side of probes and input connectors to the grounding potential of the object being measured.

If the grounding lead is connected to potential other than the ground, electrical shock or other accidents (damages to the object being measured, the instrument itself or other units conbnected to the instrument) may occur (refer to the "Example of improper configuration" shown below).
[Example of improper configuration]



When measuring the floating potential, measurement by the differential method (CH1 and CH2 input) is recommended (refer to the example shown below).
[Example of recommended measurement method]



● Do not modify this instrument.

Modification of this instrument could result in electrical shock, fire, or power failure. Repair of a modified instrument may be refused.

Be sure to read this page to assure safety. Read the next page also.

⚠ Cautions

- **Do not apply voltage to an input terminal exceeding the posted rating.**
  Applying a voltage exceeding the posted rating could result in power failure. The maximum voltage than can be applied is as follows:
  - At 50 Ω input (CH1, CH2): 5 V RMS, or one-second average power of ±50 V peak pulse is 0.5 W or less.
  - At 1M Ω input (CH1, CH2, CH3, CH4):
    Direct: ±400 V at maximum
    When SS-082R probe (10:1) is used: ±600 V at maximum
  - External brightness modulation (Z-axis): ±50 V at maximum
- **Be sure to use a specified fuse when replacing the fuse.**
  The use of a fuse other than a specified one could result in fire or power failure. Disconnect the power cord when replacing the fuse.
  - The specified fuse is as follows: 6.3 A, 250 V, Slow
  - When replacing the fuse, disconnect the power cord from a plug socket.
- **Be sure to connect and disconnect the power cord after setting the power switch to OFF.**
  Connection and disconnection of the power cord with power supplied could result in electrical shock or power failure.
- **When disconnecting the power cord from the receptacle, pull it by holding the plug.**
  Pulling by the cord may damage the cord and could result in fire or electrical shock.
- **Avoid use of any damaged cable or adapter.**
  The use of any damaged cable or adapter could result in fire or electrical shock.
- **When using this instrument in an upright position, take care not to allow it fall over.**
  The falling over of this instrument could result in injury, fire, or electrical shock.
- **When probes or measuring cables, etc. are connected to this instrument, take care not to cause this instrument to fall over by pulling them.**
  The falling over of this instrument could result in injury, fire, or electrical shock.
- **Do not handle violently or vibrate this instrument.**
  Violent handling or vibrations may damage the CRT and injure the operator.
- **Do not use this instrument if it has failed.**
  The use of this instrument in a state of failure could result in fire or electrical shock. In the case of failure, contact one of our service offices for repair.

⚠ Cautions (cont'd)

- **Be sure to use the handle locked.**
  Using it without locking could result in injury or power failure. For details concerning use of the handle, please refer to page XIV.
- **Avoid placing any object on this instrument.**
  If any object is placed on this instrument, the cover may contact the internal circuity and could result in electrical shock, fire, or power failure.
- **Do not place any object in the vicinity of the air hole or fan of this instrument.**
  Placing any object in the vicinity of the air hole or fan may generate internal heat and could result in fire or electrical shock.
- **Do not place this instrument in a location with a high degree of moisture or dust.**
  Placing this instrument in a location with a high degree of moisture or dust could result in fire or electrical shock.
- **Always use this instrument only within the rated operating range.**
  The use of this instruction out of the rated operating range could result in power failure. The temperature and humidity ranges that allow the use of this instrument are as follows:
  Temperature : 0°C to +50°C
  Relative humidity : 90% or less (40°C)
- **Do not raise trace or character intensity beyond what is necessary.**
  The use of an intensity beyond what is necessary could result in eye fatigure or burn in of the CRT.
- **To assure safety, be sure to disconnect the power cord if the instrument is not to be used for a long period.**
- **When transporting this instrument, be sure to use the original packing material that came with the instrument or other packing material that is equal or superior.**
  Large vibrations and/or shocks applied to the instrument during transportation could result in power failure and fire. If there is no appropriate packing material and/or cushion material, consult one of our service offices.
  When using a carrior, label "precision machine" on each face of the packing box.

Table of Contents

Background of the Oscilloscope

Old days:

- There may be some engineers who would be surprised to hear the oscilloscope, which is normally used today, was a teaching tool developed by Dr. Braun to show students the electric current waveform. Before that, he had invented the cathode - ray tube in 1897 as well.

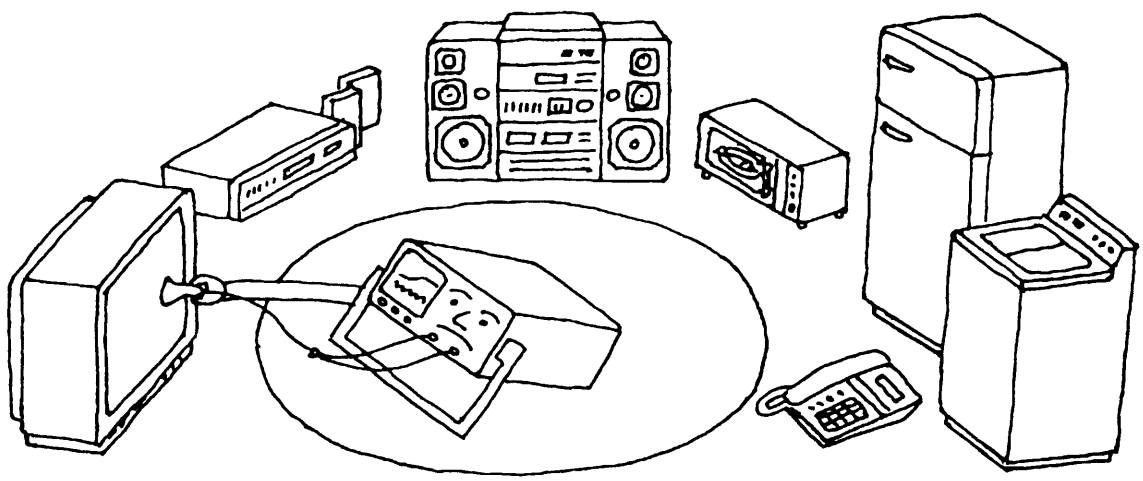
- The first commercial CRT oscilloscope was introduced to the world by a U.S.A manufacturer in 1946.

- In Japan, it was the then - president of Iwatsu who found the triggering oscilloscope of today's de facto standard in his trip to the U.S.A. in early fifties, and recognized quickly its capability, and started developing the oscilloscope as soon as he returned to Japan. From Iwatsu, the first Japanese oscilloscope was delivered in 1954.

- The oscilloscope has been improved its performance and functions towards higher - speed, more sophistication and digitization. The oscilloscope has been widened its product line including storage oscilloscope, sampling oscilloscope, and digitl storage oscilloscope. These improvements have contributed greatly to the world's electronic technology development, and have been due to the large scale integration of the components as well as the circuit technology evelopment.

Now today:
The oscilloscope is an important mother tool in many industries including the electronic industry firstly.

- As familiar examples of its applications, the oscilloscope is often used as the development and repair tools for TV set, VCR, stereo, microwave oven, communication equipment, electric wasing machine, and the like. Further more, measurements for the material and chemical analysis, biological research, and the structural analysis of the building depend on the oscilloscope performance, too.



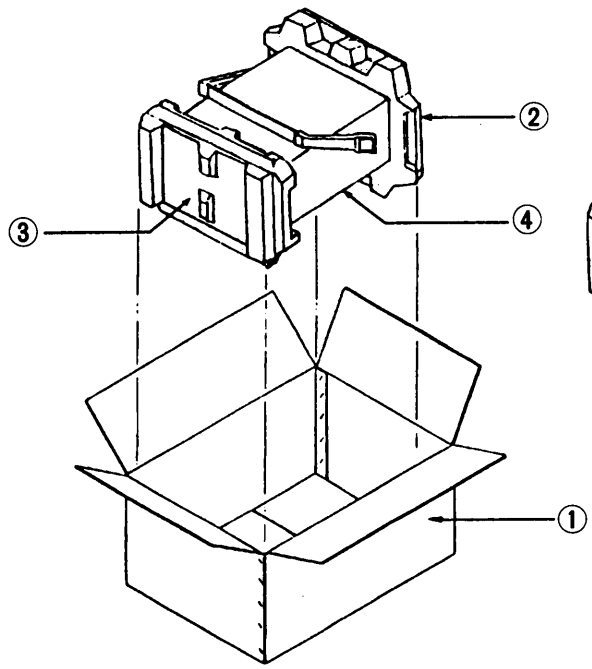
- Not only the electric signal but sound, light, chemical change and mechanical movement are measured by the oscilloscope by using the transducer, which converts energy from one form to the electric energy.

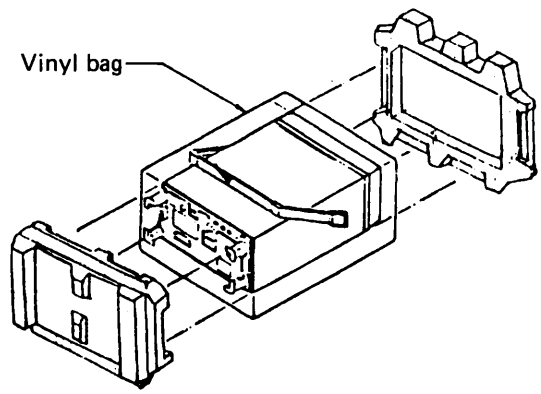
Accessories and Packing

♦ Packing List

Open the carton and carefully unpack the digital storage scope and accessories.

- Packing





① Carton
② Front cushion
③ Rear cushion
④ Digital storage scope (DS-8623)

♦ Accessories

Make sure you have all items.

Accessory bag	1	Probe	2
Accessory list	1	Operation manual DS-8623	1
Power cord	1	Introduction manual DS-8623	1
Fuse	1		
Panel cover	1		

1 2 3 4 5 6 7 8 9

Getting to Know This Manual

1 MEMO

Getting to Know This Manual
(Introduction and Operation)

The introduction and operation manuals cover the follwoings. If you are a first-time user, start from the beginning in the following list.

Before use

"Precautions in Handling"	describes what to do and what not to do.
"Accessories and Packing"	describes all your items for your initial inspection.

For a first-time user

"DS-8623 Introduction Manual"	describes how to use the digital storage scope. Anyone can perform accurate measurement using the digital storage scope.

Basic Operation

"Basic Operation"	describes the primary information for the operations.

Learning operation

"Functions and Operations" (Section 3)	describes how to use the digital storage scope from the beginning step by step.
"Advanced Operation" (Sections 4 and 5)	describes how to control the digital storage scope remotely.
"Applications" (Section 6)	describes the important measurement methods of the digital storage scope.

Maintenance

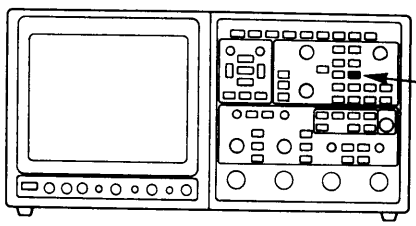
"Daily check"	describes how to keep the digital storage scope in good conditions over the long period.

1 General Rules

♦ **Each function and operation are described in the following order:**

- Purpose : is the outlines what you obtain from the operation.
- Waming! : describes what may cause some hazard, accordingly prevents any accident.
- Caution : describes what you must or must not do, accordingly prevents any instrument damage.
- Preliminary setup : describes necessary signal connections and the likes.
- Key opration : describes key operation sequence.
- Operating procedure: describes the details of the key operation and its result.
- One-point advice : describes some useful tips to know.

♦ **Notations and Conventions**



♦ **Panel illustration**

The panel illustration at the top and right of the each page shows the locations of the keys used for operations as painted keys.

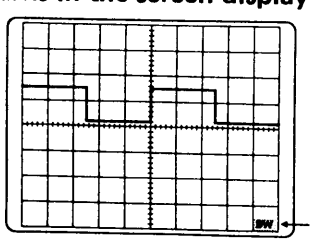
♦ **Key notations**

- ALT AUTO LVL — is used to indicate the actual key or switch. dotted line surrounding the key is a tentative line used to clarify the key.
- POSITION — is used to indicate the actual control.
- DC AC / DC AC — is used to indicate a toggle key. Pressing the key toggles between states.
- CH1 , CH2 — is used to indicate all the necessary keys for the operation. You can push the keys in any order, and you may need to push one key several times.
- B → CH2 — is used to indicate the key operation sequence.
- ID + ENT — is use to indicate that you should press the second key while pressing the first.

♦ **Notations in the operation procedure**

- ①,②,③ . . . is used to indicate the operation procedure.
- SWEEP is used to indicate the function to be selected.
- ← connects the description of operation procedure and the illustration.

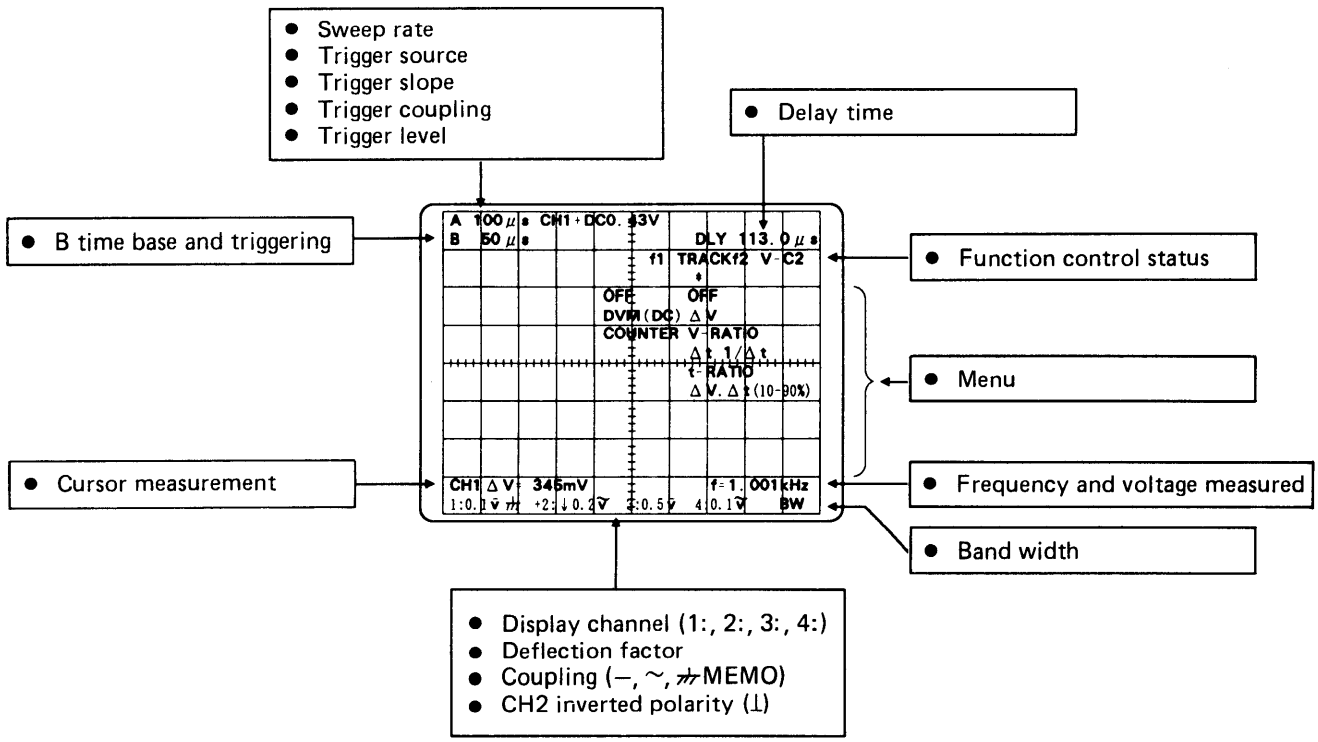
♦ **Marks in the screen display illustration.**



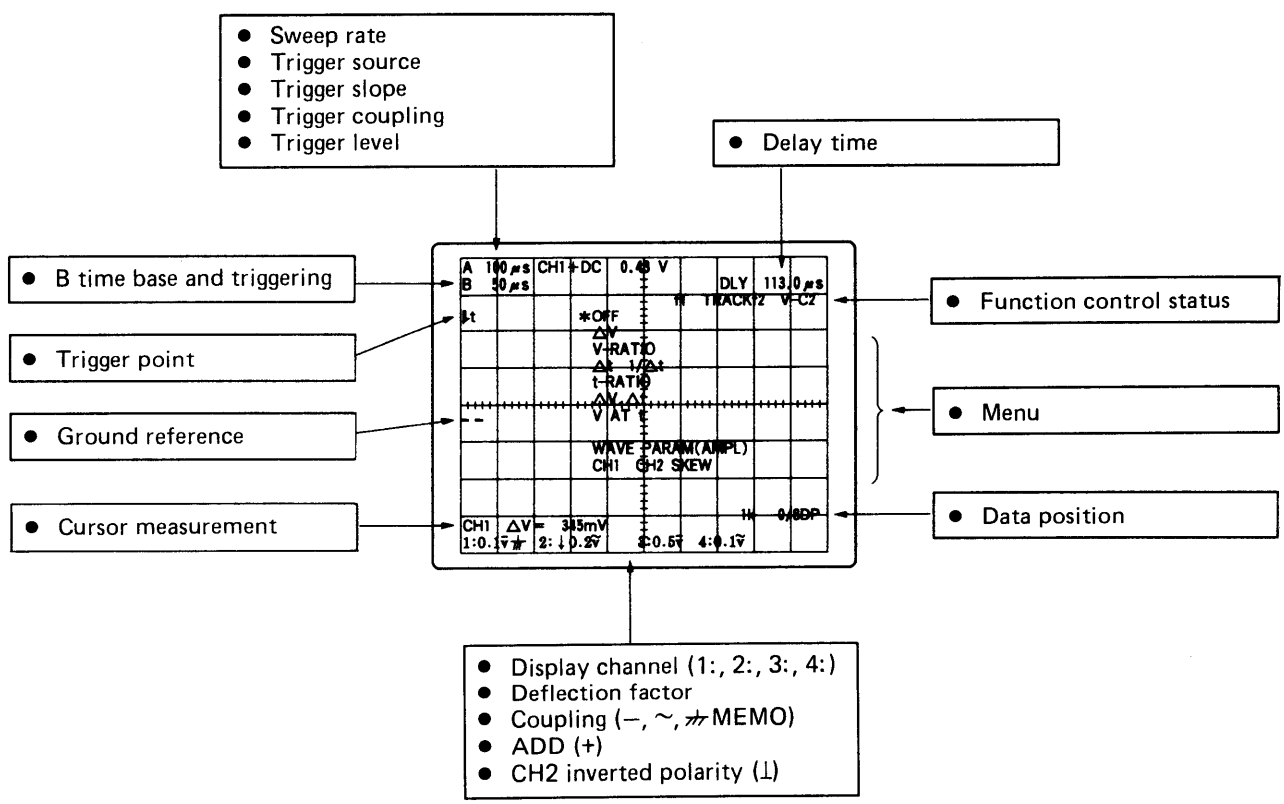
The ← and ▒ are used to indicate the functions or operations selected. Certainly these marks are not shown on the actual screen.

Viewing Area and On-Screen Message

Real Mode



Storage Mode



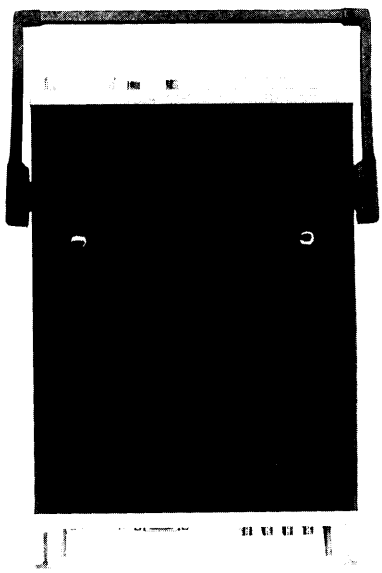
1 MEMO

1 2 3 4 5 6 7 8 9

Basic Operations

Using the Handle

◇ **Setting the handle position**

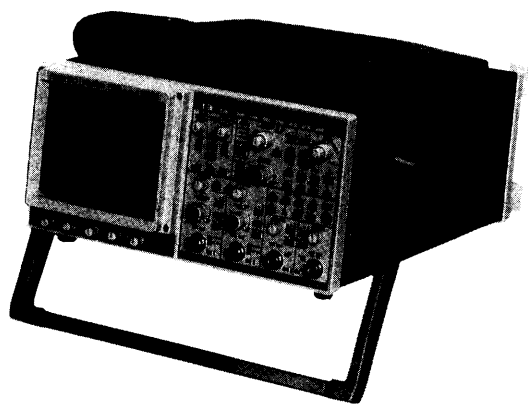


The handle is used as a carrying handle and as a stand. Pressing the both bases (rotating the joints) of the handle simultaneously inward will release the lock. Rotate the handle while pressing to obtain the desired position.

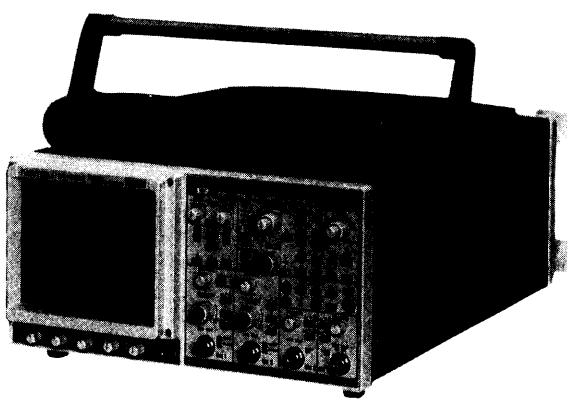
When you take your hands off the rotating joints, the handle is automatically locked.

Set the handle position to the right angle so that you can easily observe the signal on the screen.

Propped-up condition

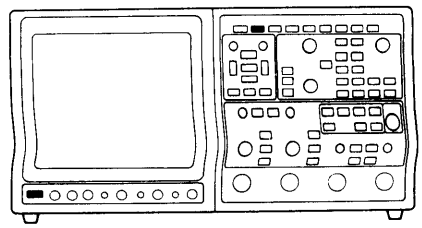


◇ **Leaving unused**



When you leave the digital storage scope unused, it is recommended that you set the handle to the upper deep position.

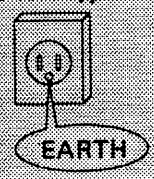
Turning Power On and Off and Selecting REAL/STORAGE



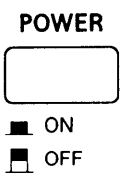
WARNING

◇ **Follow the next rules for the safety operation when connecting the power cord.** Three-core type source

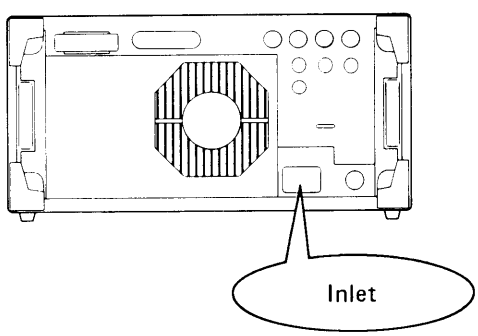
Check the line voltage and use the proper power cord suiting to the line voltage.
Never use the wrong power cord.



♦ **Turning the power on.**



(Rear panel drawing)



① Push out the power switch and turn the power off position ▀.

② Insert the power cord plug into the inlet located on the rear panel of the digital storage scope.

③ Insert the power cord plug into the outlet in the wall.

④ Push the power switch and turn the power on position ▀.

- In a short time, the trace and/or character READ-OUT are displayed. If not, turn the INTEN A knob or the INTEN B knob clockwise. (This INTEN knob is set fully counterclockwise at the factory prior to sphipment.

⑤ Start the measurement at the following pages.

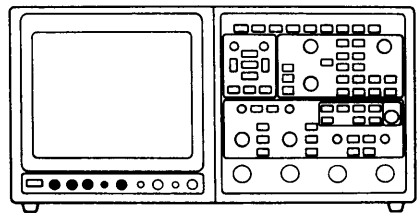
♦ **Selecting REAL (operation by a oscilloscope) or STORAGE (operation by a digital storage scope)**

REAL or STORAGE can be selected by pressing the REAL STORAGE key. Note that some functions are characteristic of REAL or STORAGE.

One-point advice

- The last setup before power-off is backed up by the internal fixed lithium battery. When the digital storage scope is turned on, the setup before power-off is recalled.
- The RUNNING SELF TEST is performed briefly immediately after turning on the power.

A INTEN
B INTEN
ENHANCE
READOUT
ASTIG



To obtain the best measurement circumstances, adjust the brightness of WAVE, READOUT, and SCALE on the display before starting measurement.

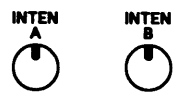
CAUTION

Do not increase the CRT intensity too highly. High intensity may result in eye irritation. When the instrument is left on under high intensity for a long time, this may burn the phosphor on the CRT face plate or shorten the life.

♦ **Intensity of the trace**

- A INTEN and B INTEN

Rotating the A or B INTEN control clockwise increases the trace intensity.
In STORAGE, the B INTEN control does not work.
By turning the A INTEN control, the intensity of traces on both of the A and B time bases.



- ENHANCE (only for REAL)

Pusing the FOCUS control increases the intensity further. The ENHANCE mode is available at the sweep rate between 10ns/div and 500ns/div on the both of the A and B time base. A word of ENHANCE appears on the screen.

♦ **Intensity of Character**

- READOUT

READOUT adjustment controls the intensity of character. Rotating the INTEN knob clockwise increases the character intensity. On the other hand, fully rotating it counterclockwise stops displaying characters.

♦ **Astigmation control of the trace and character.**

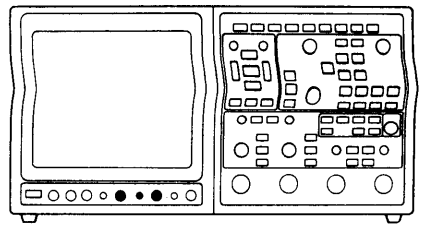
- ASTIG

Adjust the ASTIG in conjunction with the FOCUS control to obtain the well-aligned display by using the small screw driver.
The ASTIG is adjusted at the factory shipment and in most cases it is not necessary to readjust the ASTIG frequently.

One-point advice • By selecting AUTO SET, the intensity of A INTEN and READOUT can be automatically adjusted for the best viewing. But, if the intensity is high or low before setting AUTO SET, a certain range may not be adjusted even if you turn the READOUT knob or the INTEN A knob. In this case, turn the knob until the intensity vaires before starting the adjustment.

• If you select SINGLE for SWEEP MODE, the ENHANCE control can be automatically set to ON by fixing the sweep rate of A or B time base at 10ns/div to 500ns/div. Then, the ENHANCE control cannot be set to OFF even if you select those modes other than SINGLE for SWEEP MODE.

FOCUS
TRACE ROTATION
SCALE
BEAM



♦ **Focus of the trace and character.**

• FOCUS

Adjust the FOCUS control to optimize the trace and character and cursor.

♦ **Display alignment**

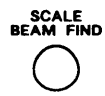
• TRACE ROTATION

The earth magnetism may cause the display to become tilted. Using a small screw driver, adjust the TRACE ROTATION control to align the tilted display.

♦ **SCALE illumination**

• SCALE

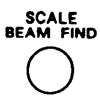
In the case such as taking a picture, adjust the SCALE illumination to optimize the contrast between the dsiplay and scale.



♦ **Locating the trace positiion**

• BEAM FIND

Pushing the SCALE control locates the trace position.

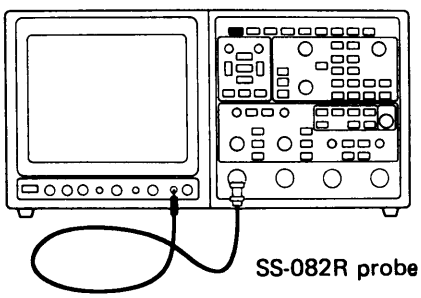


Displaying the CAL Waveform

2

(CAL signal is used for the probe phase compensation.)
Displaying the signal on the screen is the first step for the digital storage scope users. For a first-time user of DS-8623, the following steps describe how to display a signal on the screen allowing the provided CAL signal to be fed to the CH1 for display.

♦ **Preliminary setup**



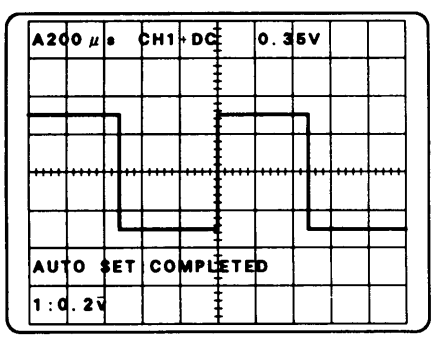
Using the accessory probe (SS-082R), apply the CAL signal (calibration signal) to the CH1 input.

♦ **Key operation**

AUTO SET

Setting
AUTO SET

♦ **Operation procedure**



① Press the AUTO SET key.

- "AUTO SET COMPLETED" appears on the screen and the CAL waveform is displayed after completion of AUTO SET.

One-point advice · When the AUTO SET function is selected, the digital storage scope is automatically set to an appropriate setup after the input signal amplitude and frequency are checked.

1 2 3 4 5 6 7 8 9

Functions and Operations

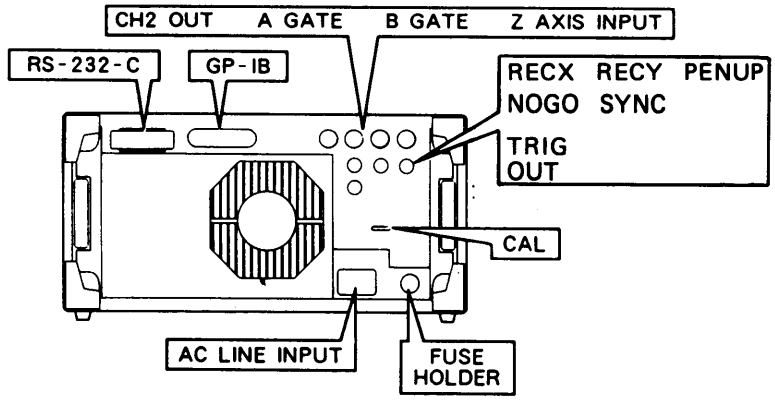
- Summary

  The functions and operations are described in detail in this section.

- Test signal used in this section

  Unless described, CAL (calibration) signals or sine waves are used for the test signal. To apply the CAL signal, see the "Displaying the CAL waveform" in the "2. BASIC OPERATIONS" section.

INPUT and OUTPUT (on the rear panel)



♦ CH2 OUT

An output connector for the signal applied into CH2 INPUT connector on the front panel.

Output voltage (at 50Ω load)	: 20 mV/div ±30%
Bandwidth (–3dB)	: 100 MHz
Output resistance	: 50Ω ±20%

♦ A GATE OUT (only for REAL)

An output connector for the pulse signal that provides high level while the A sweep is running.

Output voltage	: Approx. 5 Vp-p
Output R	: Approx. 2.7 kΩ

♦ B GATE OUT (only for REAL)

An output connector for the pulse signal that provides high level while the B sweep is running.

Output voltage	: Approx. 5Vp-p
Output R	: Approx. 2.7 kΩ

♦ Z AXIS INPUT (only for REAL)

A connector for the external intensity modulation. Positive going signal decreases the intensity and the negative goint signal increases the intensity.

Maximum input voltage	: ±50 V (MAX)
Minimum modulation voltage	: 0.5 Vp-p
Frequency range	: DC to 5 MHz
Input impedance	: Approx. 5 kΩ

♦ RECX, NOGO (only for STORAGE)

- REC X

An output connector for the analog signal applied into X axis of pen recorder.

Output voltage	: 0 ~ 1.6 V ±20%
Output resistance	: 50 Ω ±20%
Output current	: 2 mA or less (load resistance: 1 kΩ or more)

- NOGO

The judged result is output on GO/NOGO operation.

GO/NOGO	Output voltage	Output resistance
GO	0 ± 0.5V	50Ω ± 20%
NOGO	5 ± 1V	50Ω ± 20%

Output current : 2mA or less (load resistance : 3kΩ or more)

◆ **REC Y, SYNC (only for STORAGE)**

• REC Y

An output connector for the analog signal applied into Y axis of pen recorder.

Output voltage	: 0 ~ 2 V ±20%
Output resistance	: 50 Ω ±20%
Output current	: 2 mA or less (load resistance: 1.2 kΩ or more)

• SYNC

An output connector for the sync signal on GO/NOGO operation.

SYNC/NO	Output voltage	Output resistance
SYNC	5 ± 1V	50Ω ± 20%
NO	0 ± 0.5V	50Ω ± 20%

Output current : 2mA or less (load resistance : 3kΩ or more)

◆ **PEN UP (only for STORAGE)**

Outputs pen-up signal of pen recorder.

Output voltage	: 4.5 ±1 V, 0 ±0.5 V
Output resistance	: 2.5 kΩ or less at 4.5 V
Output current	: 2 mA or less (load resistance: 20 kΩ or more)

◆ **TRIG OUT (only for STORAGE)**

Outputs trigger signal.

Output voltage	: 0 ±0.5 V on TRIG'D ON, 4.0 to 5.5 V on OFF
Output resistance	: Approximately 2.7 kΩ

◆ **CAL (current calibration signal)**

Provides the current loop of the 10 mA and 1 kHz square-wave signal. The current flows according to the arrow alongside of the current loop. The current loop is used for the current probe calibration.

◆ **AC LINE INPUT**

Inlet for connecting power cord.

◆ **FUSE HOLDER**

Sets a fuse for instrument safety.

Use the 6.3 A/250 V slow-blow fuse only as specified.

◆ **RS-232C**

A DIN25-pin connector for the RS-232-C interface developed by the Electronic Industries Association to govern the interface between the data terminal equipment (DTE) and data communications equipment (DCE).

◆ **GP-IB**

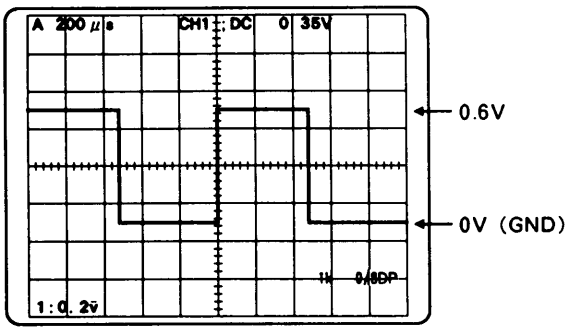
Provides the GP-IB interface, or the IEEE 488 Standard, to build the test and measurement system.

3.2 Simple Accuracy Checking

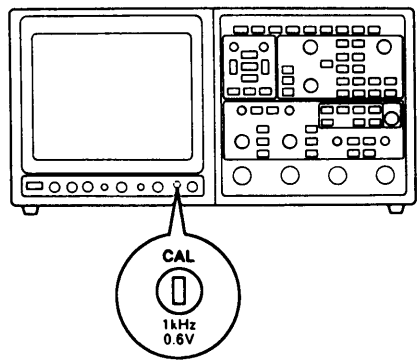
CAL 1kHz 0.6V
CAL 1kHz 10mA

The CAL signal output is used for probe phase compensation as well.

- **CAL (Voltage calibration signal)**

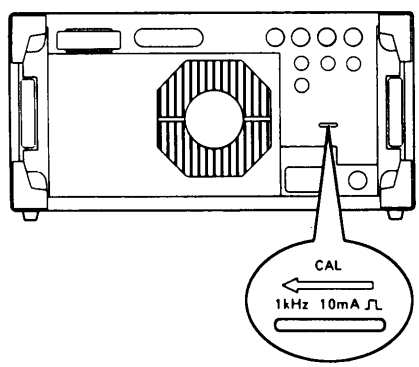


The left figure shows the waveform observed by the DS-8623.



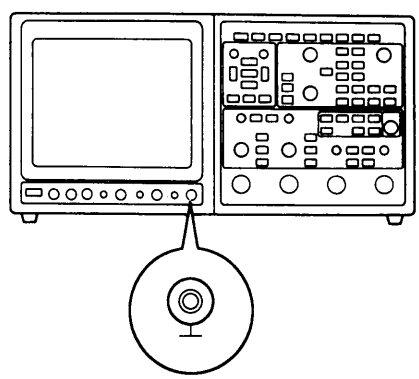
- **CAL (Current calibration signal)**

The current is the 1 kHz square-wave signal which flows in the direction of the arrow alongside of the current loop. The current loop is used for the current probe calibration.

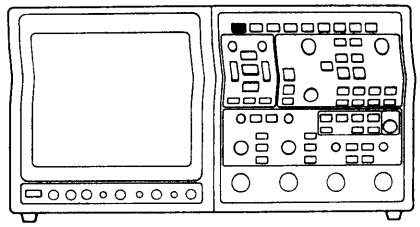


3.3 Grounding

The measuring ground terminal connects the ground between the digital storage scope and signal source under test.



AUTO SET

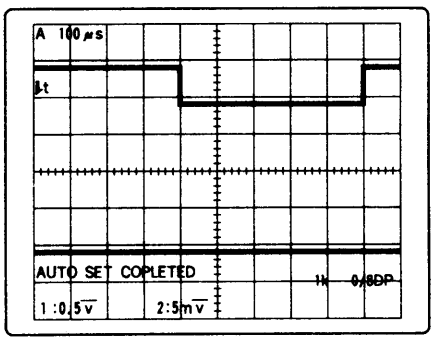


Allows you to display the waveform on the screen automatically in the appropriate conditions.

♦ Key operation

AUTO SET
Setting
AUTO SET

♦ Operating procedure



① Press the AUTO SET key and activate the AUTO SET function.

◇ Triggering

Function	Selection made
A TRIG SOURCE	Last setup before AUTO SET, if not triggered, the lowest numbered channel which is triggered.
A TRIG COUPLING	DC
A TRIG SLOPE	Last setup before AUTO SET
A TRIG LEVEL	AUTO LEVEL

◇ Storage, etc.

Function	Selection made
LENGH	Last setup before AUTO SET
AVERAGE	OFF
ENVELOPE	OFF
ROLL	OFF
Measurement	OFF
EVENT/TV LINE	OFF

◇ Vertical system

Function	Selection made
VERT MODE	Last setup before AUTO SET
CH2 INV	Last setup before AUTO SET
BW(20MHz) (only for REAL)	OFF
VOLTS/DIV	About one to seven divisions SCREEN amplitude (about 1kHz~100MHz)
VARIABLE	CALIB
COUPL	Last setup before AUTO SET
GND	OFF

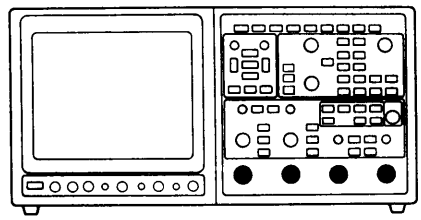
◇ Horizontal system

Function	Selection made
HORIZ DISPLAY	A
A SEC/DIV	2.5 to 5 cycles of the signal between 2ms/div and 10ns/div sweep rates
VARIABLE (only for REAL)	NORM
x10 MAG	OFF

One-point advice

- For positioning waveform after AUTO SET, see page 23 positioning signal.
- When you activate the AUTO SETUP function by pressing the AUTO SETUP key, you may not adjust the A INTEN and READOUT of the control. But, if the intensity is high or low before setting AUTO SET, a certain range may not be adjusted even if you turn the INTEN knob or the READ OUT knob. In this case, turn the knob until the intensity varies before starting the adjustment.
- No measurement conditions may be found depending on the type of signal. The AUTO SET ERROR character may appear in this case.
- The "AUTO SET COMPLETED:: message will be displayed after the AUTO SET function completed.

INPUT



Receive signal. Use the standard probe or coaxial cable for applying signal.

CH4 can also be used as EXT CLK.

CAUTION

Never apply an excessive voltage to inputs.

Input	Maximum Input voltage
CH1, CH2, CH3, CH4 at 1MΩ position	±400V MAX without probe ±600V MAX with SS-082R probe
CH1, CH2 at 50Ω position	5Vrms, or 0.5W-second during any one second within ±50V peak voltage

- **Connecting probe**
  - The attenuation factors for each channel are automatically corrected by using the standard probe SS-082R.

One-point advice ◇ Grounding

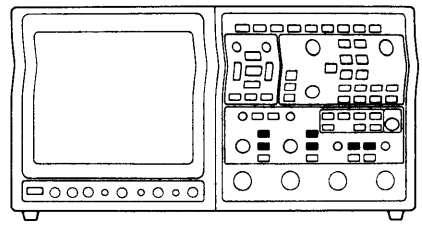
- Connect the digital storage scope ground ( ) and the device ground under test.
- Connection of signal ground is especially important for observing high-frequency signal waveform.
  Connect the signal ground as near as possible to the probe ground.

◇ How to operate EXT CLK
See the SEC/DIV at page 61.

◇ Loading effect
For accurate measurement, it is important to minimize the loading effect. Using the standard probe SS-082R is generally the best solution for this.
Input RC of DS-8623 without probee: 1 MΩ, 16 ± 1 pF
Input RC of DS-8623 with probe: 10 MΩ, 13 pF

DC · AC · GND

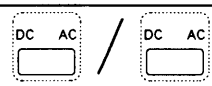
GND



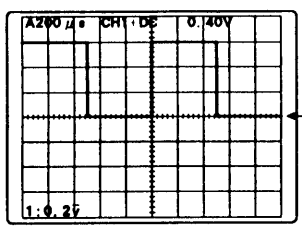
Couples input signal. In many cases, DC coupling is the best choice since the DC coupling eliminates no signal component. When you measure a small signal amplitude having a large DC offset, use the AC coupling to eliminate the DC level. You will obtain the ground reference level using the GND coupling.

DC coupling CH1, CH2, CH3, CH4

♦ **Key operation**



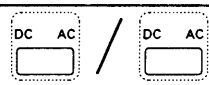
♦ **Operating procedure**



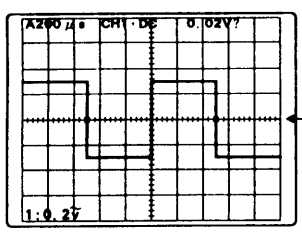
① Press the DC AC key and select the DC coupling.
- The CAL signal on the screen is displayed above the ground level.

AC coupling CH1, CH2, CH3, CH4

♦ **Key operation**



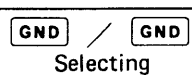
♦ **Operating procedure**



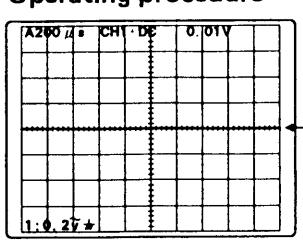
① Press the DC AC key and select the AC coupling.
- The CAL signal on the screen is displayed symmetrically over the ground level.

GND coupling CH1, CH2

♦ **Key operation**



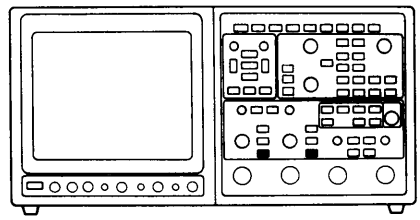
♦ **Operating procedure**



① Press the GND key and select GND coupling.
- The GND coupling shows the ground reference level on the screen. Knowing the ground level, you can measure the DC offset level of the signal.

3.6 Selecting Input Impedance

1MΩ
50Ω



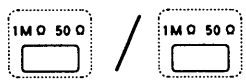
Selects the input impedance.

CAUTION

- **Do not apply the overload into the inputs.**

3

♦ **Key operation**



Selecting 1MΩ/50Ω (LED indicator lights for 50Ω)

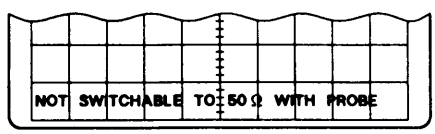
♦ **Operating procedure**

① Press the 

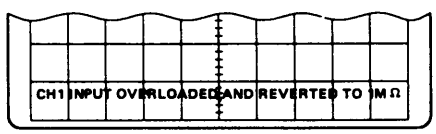
key and select 1 MΩ or 50 Ω.

One-point advice

- Input coupling is automatically set to DC if input impedance is set to 50Ω.
- Input resistor was not selected to 50Ω when the SS-082R probe was connected to the INPUT. An error message appears on the screen if an input impedance of 50Ω is selected.



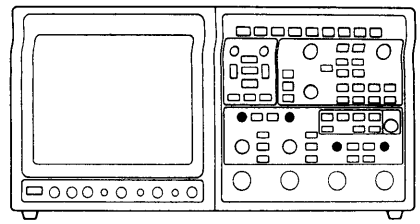
- Connecting the SS-082R probe to the INPUT when selecting an input impedance of 50Ω automatically switches to 1MΩ.
- When the power is turned on, the input impedance becomes the setting immediately before turning off the power switch.
- When you apply the excessive voltage into the input channel in the 50Ω impedance position, the input impedance will be automatically set to the 1MΩ impedance position and the error message will be displayed on the screen such as;



- If you set input impedance to 50Ω, the input impedance at the INPUT can be turned to "∞" by selecting GND for COUPL.

POSITION

POSITION



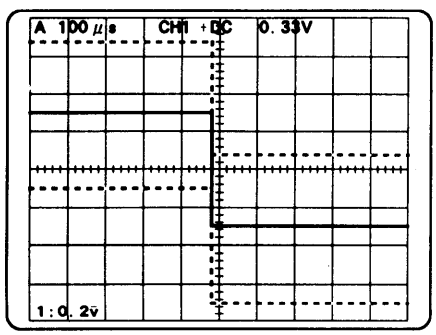
Allows to move signal up and down on the screen to obtain a desired waveform position.

♦ **Key operation**

POSITION

Positioning Signal

♦ **Operating procedure**

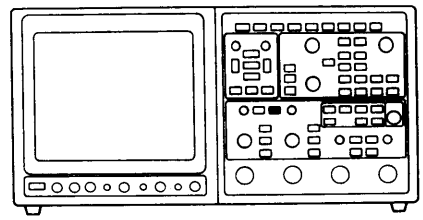


① Using the POSITION knob, position the signal.

One-point advice · When you activate the AUTO SETUP function by pressing the AUTO SETUP key, you may not move the signal in some range of the POSITION control knob. In this case, rotate the POSITION control knob further until it will be in action again.

3.9 Inverting Signal

CH2 INV



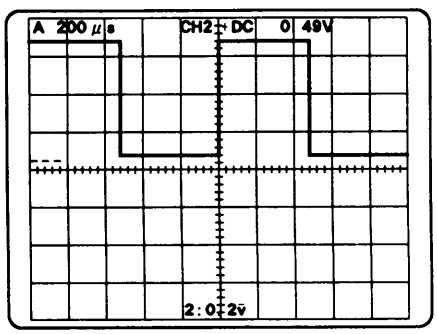
Inverts the polarity of CH2 signal to the negative.

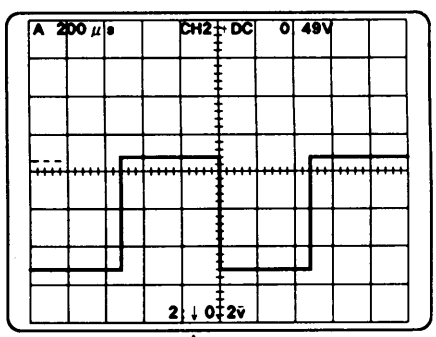
♦ **Key operation**

CH2 INV / CH2 INV

Selecting Polarity (LED indicator lights at INV mode)

♦ **Operating procedure**





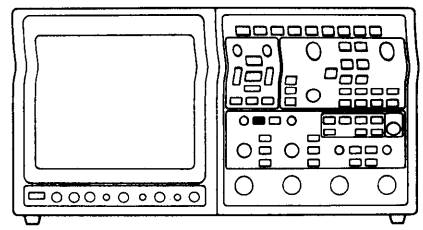
① Press the CH2 INV key and the polarity of the signal being displayed is inverted in reference to the center of ground.
The LED indicator lights when the CH2 signal is inverted.

- No trigger polarity changes by setting the CH2 INV polarity.
- The "↓" mark beside the CH2 sensitivity shows that the CH2 signal is inverted.

One-point advice · When you stop updating a screen in STORAGE mode, the indicator goes on by pressing the CH2 INV key. But, the polarity of the signal displayed would not be inverted.

3.10 Limiting Bandwidth
(only for REAL)

20MHz BW

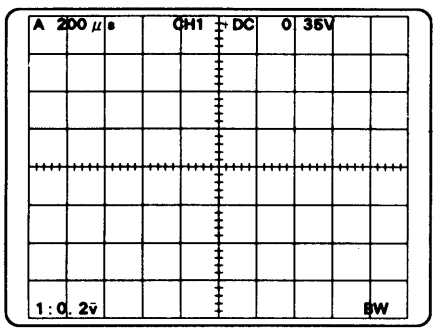


Limits the bandwidth to the 20 MHz and reduces the noise accordingly.

♦ Key operation

Setting (LED indicator lights)
20MHz BW

♦ Operating procedure



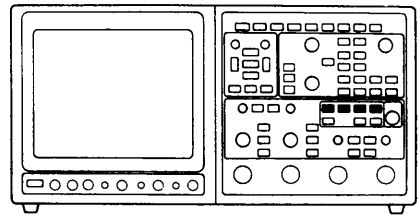
① Press the 

key and set the 20 MHz BW mode.

- The bandwidth is limited to the 20 MHz.
- The "BW" message is displayed at the right bottom screen in the 20 MHz bandwidth mode.

CH1 · CH2
CH3 · CH4

REF1 CH1 | REF2 CH2 | REF3 CH3 | REF4 CH4



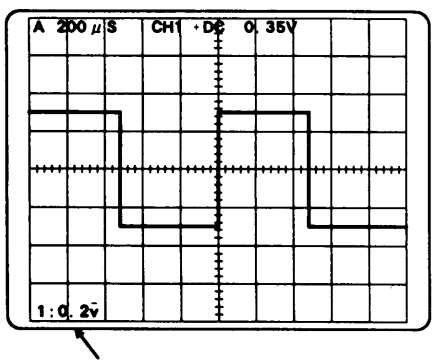
Select signal channel to be displayed.

♦ **Key operation**

REF1 CH1 , REF2 CH2 , REF3 CH3 , REF4 CH4

Selecting Display channel — (LED indicator lights)

♦ **Operating procedure**



① Press the appropriate key to display the desired channel.

- Pressing each key again turns off the specified channel.

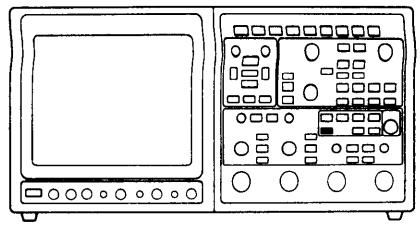
One-point advice ◇ When you select STORAGE, channel(s) is(are) recorded in the following order.

- Single display
  One channel out of CH1, CH2, CH3, and CH4 is recorded.
- Dual display, namely CH1/CH2 or CH3/CH4, are displayed.
  Either CH1/CH2 or CH3/CH4 are simultaneously recorded.
- Multiple display (2~4 channels) display other than the above CH1/CH2 and CH3/CH4 are recorded alternately.
  Thus, if you select a channel covering the CH1/CH2 and CH3/CH4, the indication LED ALT ACQ lights.
- When you select ALT for the HORIZ DISPLAY mode, the indication LED ALT ACQ goes on.
- Press the REF key to cancel REF if REF has been specified when specifying a channel to be displayed.

3.11 Selecting Signal VERT MODE *(only for REAL)*

ADD

ADD / CALC

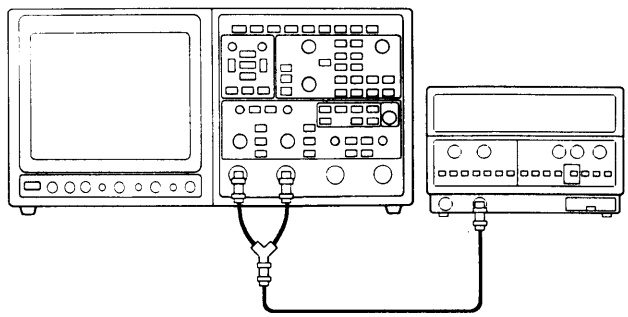


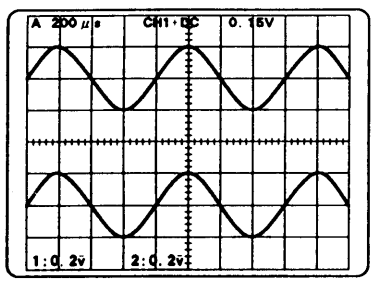
Displays the algebraic added signal between the CH1 and CH2 signals.

♦ Preliminary setup

Apply the signal from the generator (e.g. Iwatsu SG-4111) to the CH1 and CH2 inputs.

- Signal frequency : 1 kHz sine waveform
- amplitude : 0.4 Vp-p





♦ Key operation

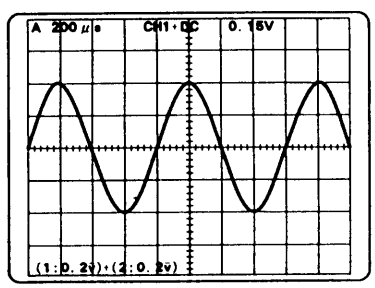
VERT MODE

ADD / CALC

Selecting ADD (LED indicator lights)

♦ Operating procedure

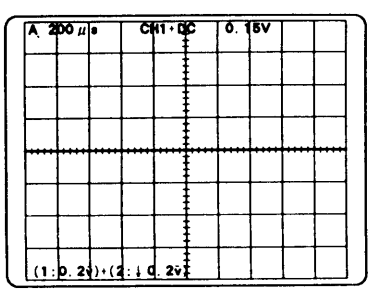
ADD / CALC : Added display with the CH2 INV off



① Press the ADD / CALC key and select the ADD mode.

- The CH1 and CH2 signals are added on the screen.
- When you press the CH2 INV key in the ADD mode, you can make the differential measurement.

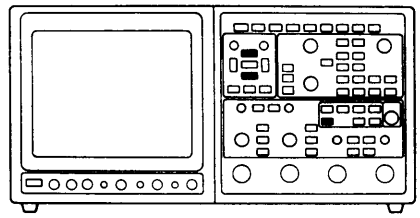
ADD / CALC and CH2 / INV : Differential display with the CH2 INV on



3.11 Selecting Signal VERT MODE (only for STORAGE)

CH1 + CH2

ADD CALC

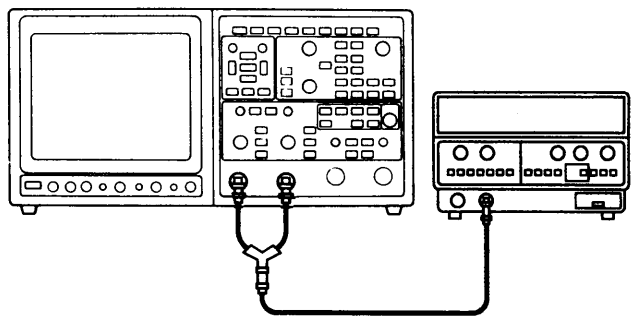


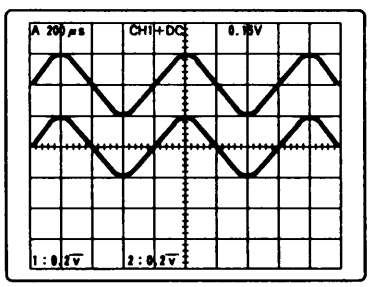
Displays the algebraic sum (CH1 + CH2)of CH1 and CH2 signals.
It is convenient to observe signals at two points being floated from the ground in differential system to readily judge the difference between two signals.

♦ **Preliminary setup**

Apply the signal from a signal generator (e.g., Iwatsu SG-4111) to CH1 and CH2.

- Signal frequency : Sine waveform 1 kHz
- Amplitude : 0.4 Vp-p





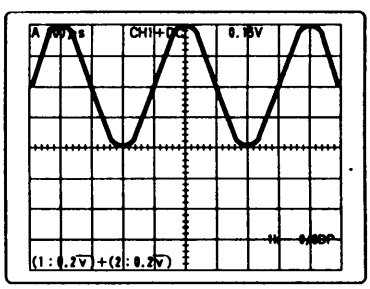
♦ **Key operation**

ADD CALC / ADD CALC → ADD CALC

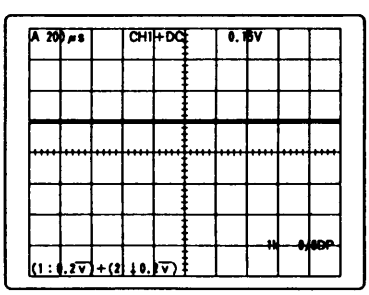
Setting CALC — Selecting CH1 + CH2

♦ **Operating procedure**

ADD CALC : Added display with the CH2 INV off



ADD CALC and CH2 INV : Differential display with the CH2 INV on



① Press the ADD CALC key and set CALC.

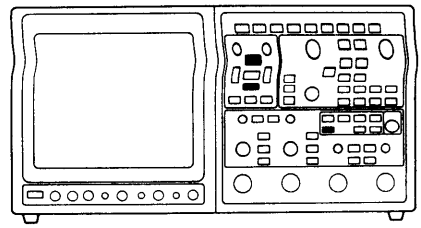
② Press the ADD CALC , ▲ or ▼ key and select CH1 + CH2.

- Displays the sum of signals of CH1 and CH2.
- If you specify INV by pressing the CH2 INV key, the polarity of CH2 signal is inverted. The difference in the signal between CH1 and CH2 is displayed on the screen.

3.11 Selecting Signal VERT MODE *(only for STORAGE)*

CH1 x CH2

ADD CALC



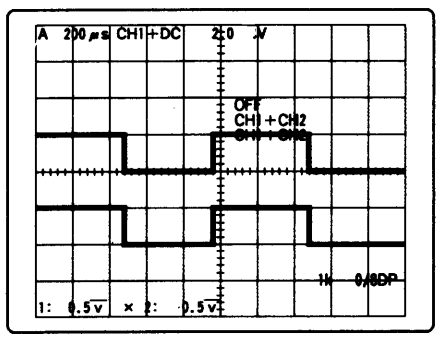
Multiplies CH1 signal by CH2 signal.
It is convenient to measure power after multiplying current waveform by voltage waveform.

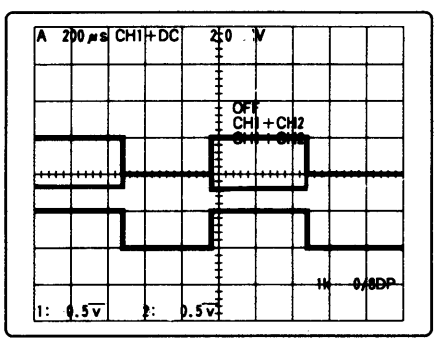
♦ **Key operation**

ADD CALC / ADD CALC → ADD CALC

Setting CALC — Setting CH1 x CH2

♦ **Operating procedure**





① Press the ADD CALC key and set CALC.

② Press the ADD CALC, ▲ or ▼ key and set CH1 x CH2.

◇ **To suspend measurement of CH1 x CH2:**

③ Press the ADD CALC, ▲ or ▼ key and select OFF.

One-point advice

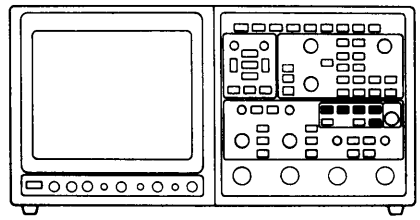
- The selection menu of CALC will be turned off after the certain time which is set in the SYSTEM configuration menu. See SYSTEM MENU ON PERIOD for setting display time.
- Perform multiplication by setting the upper 4 div to +1 and lower 4 div to −1 from the center of the screen.

3.11 Selecting Signal VERT MODE (only for STORAGE)

REF

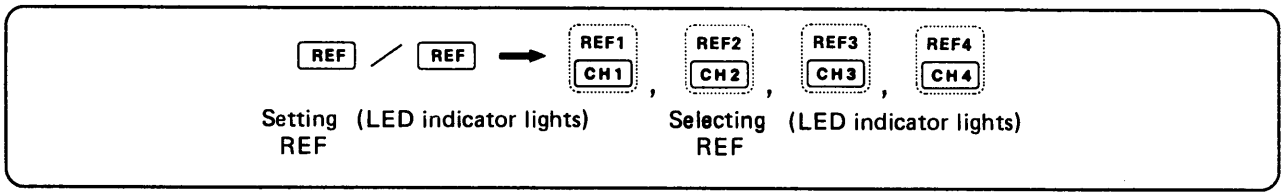
REF

REF1 CH1 | REF2 CH2 | REF3 CH3 | REF4 CH4



Specifies and channel out of REF1, REF2, REF3 and REF4 as a REF memory channel. The REF memory is used for saving a reference waveform by GO/NOGO judgement.

♦ **Key operation**



♦ **Operating procedure**

① Press the REF key and set the REF.

② Press the REF1 CH1 , REF2 CH2 , REF3 CH3 ,or REF4 CH4 key and select the channel of REF memory to be displayed.

◇ **To erase unneeded channel:**

③ Press the REF key and set the REF.

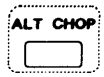
④ Press the REF1 CH1 , REF2 CH2 , REF3 CH3 , or REF4 CH4 key.

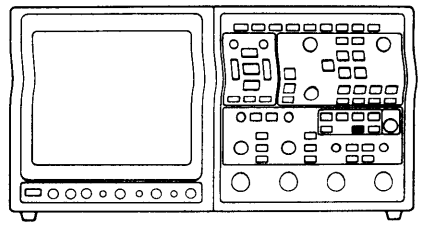
One-point advice · See SAVE REF of SAVE RECALL menu at page 126 for saving of the reference waveform.

· You can turn on or off CH1 ~ CH4, REF1 ~ REF4, and CALC independently. However, a maximum of 8 traces can be displayed. The order of priority is as shown below:
CH1, CH2, CH3, CH4, CALC, REF1, REF2, REF3, REF4

3.11 Selecting Signal VERT MODE (only for REAL)

ALT





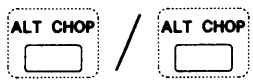
Selects display method of the multi-channel signals on the screen and is recommended at the higher sweep rate, since the ALT mode provides nonflickering display at higher sweep rate.

♦ **Preliminary setup**

Set the oscilloscope to the multi-channel display mode by pressing the VERT MODE keys whose channels will be displayed.

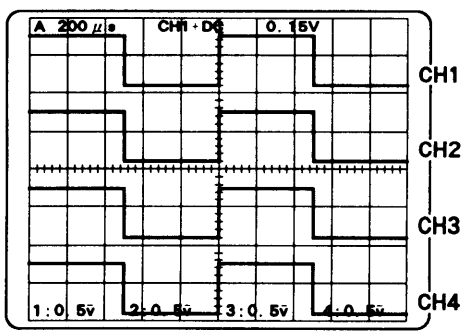
♦ **Key operation**

VERT MODE



Selecting ALT (LED indicator lights)

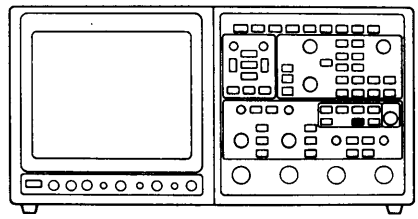
♦ **Operating procedure**



① Press the ALT CHOP key and select the ALT display mode, in which the signals are displayed alternatively each time the sweep runs.

3.11 Selecting Signal VERT MODE (only for REAL)

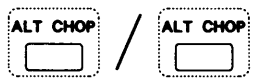
CHOP



Selects display method of the multi-channel signals on the screen and is advantageous for displaying the slow speed signal.

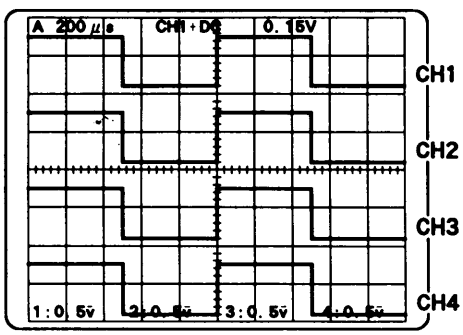
♦ **Key operation**

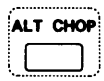
VERT MODE



Selecting CHOP (LED indicator lights)

♦ **Operating procedure**

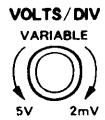


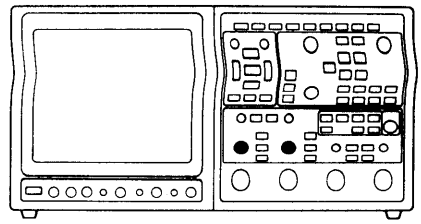
① Press the 

key and select the CHOP display mode, in which the signals are displayed sequentially at the chop switching rate of about 500kHz.

- The LED indicator lights when the CHOP mode is selected.

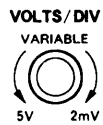
VOLTS/DIV VARIABLE





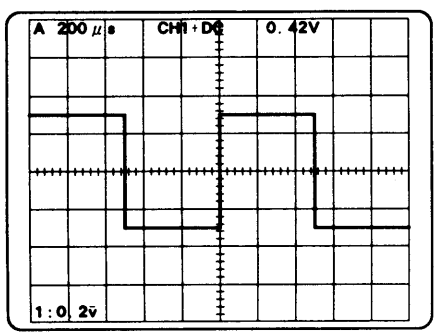
Changes the signal amplitude to obtain the appropriate size. The deflection factor is displayed on the screen. You can change the amplitude continuously by using the VARIABLE function.
(VOLTS/DIV: voltage sensitivity) The recorded waveform can be enlarged (X10) or reduced (X1/2, 1/2.5) when you select STORAGE.

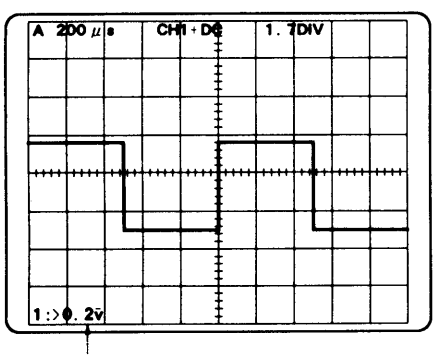
♦ Key operation



Selecting CH1 or CH2
Deflection factor

♦ Operating procedure



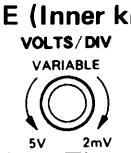


◇ VOLTS/DIV (Outer-knob)

① Turn the 

knob, select deflection factor.

◇ VARIABLE (Inner knob)

① Turn the 

knob, changes amplitude continuously. The minimum variable range is 1/2.5 times or less of the deflection factor at the CALIB position, or fully clockwise position.

◇ Enlargement or reduction (for STORAGE)

① Press the STOP SGL key and stop updating data.

② Turn the 

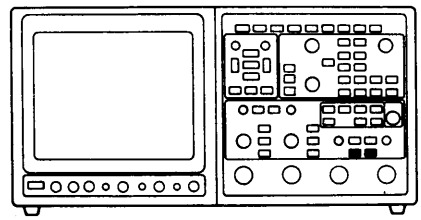
knob for enlargement (up to X10) or reduction (up to X1/2, 1/2.5).

One-point advice · Turn the VARIABLE control counterclockwise until the ">" mark appears on the screen.

· If you use the accessory SS-082R probe, the sensitivity display of CH1, CH2, CH3, and CH4 is equal to the value compensated by reduction ratio (10:1) of the probe.

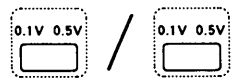
3.12 Changing Signal Amplitude
CH3 CH4

0.1V 0.5V



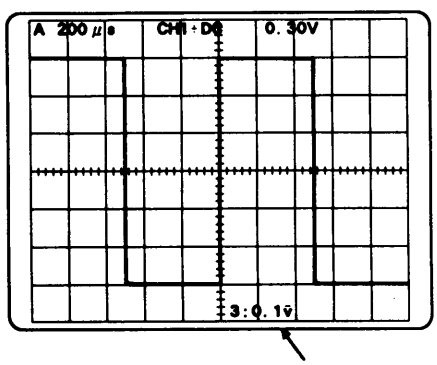
Allows you to display the signal in an appropriate amplitude. It is also possible to enlarge or reduce the recorded waveform when you select STORAGE.

♦ **Key operation**



Selecting
0.1V or 0.5V/div.

♦ **Operating procedure**



◊ **VOLTS/DIV**

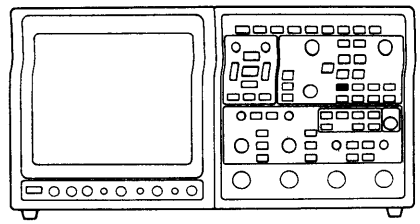
① Press the 

key and select the 0.1V/div or 0.5V/div deflection factor.

- The LED indicator lights at the 0.5V/div position.

One-point advice · No continuous variable function is available.

AUTO LEVEL

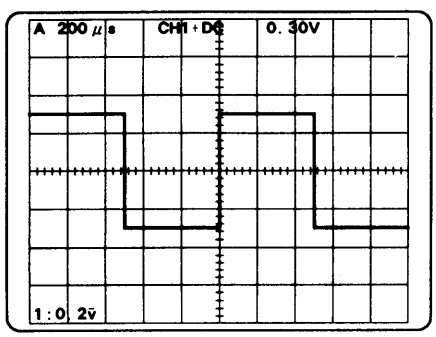


Automatically sets the trigger level and displays the signal on the screen. The trigger LEVEL range varies with the amplitude change of the trigger signal. The AUTO LEVEL mode is the easy way to obtain the triggering in most cases.

♦ Key operation

AUTO LVL — Selecting AUTO LEVEL (LED indicator lights)

♦ Operating procedure



① Press the AUTO LVL key and set the AUTO LEVEL.

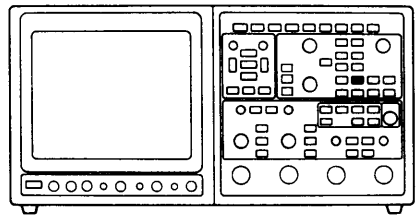
One-point advice

- The AUTO LEVEL mode is selected after the AUTO SET function.
- The AUTO LEVEL ERROR message will be displayed when the triggering is improper.

3.13 Selecting Sweep Mode
SWEEP MODE

AUTO

AUTO



Generates the sawtooth signal in either case the oscilloscope is triggered or not. Triggering the oscilloscope provides the stable display, and not triggering the oscilloscope may provide the erroneous display. Use the NORM sweep mode, when your signal frequency is below 50Hz or you do not want to display the trace at the lack of triggering.

3

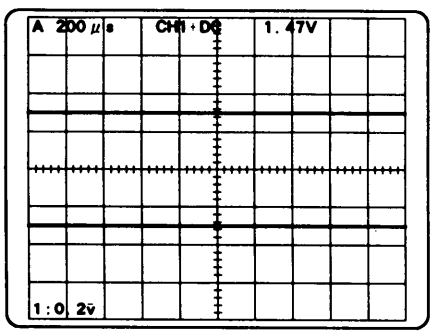
♦ **Key operation**

SWEEP MODE

AUTO (LED indicator lights)

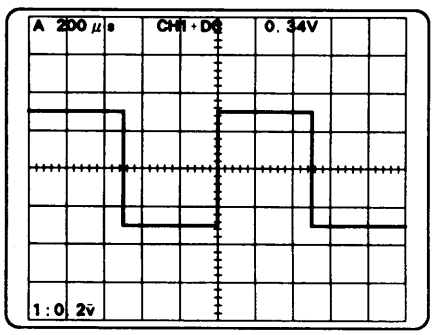
Selecting AUTO

♦ **Operating procedure**



① Press the AUTO key and set AUTO mode.

- CAL display without triggering.
- CAL display with triggering.

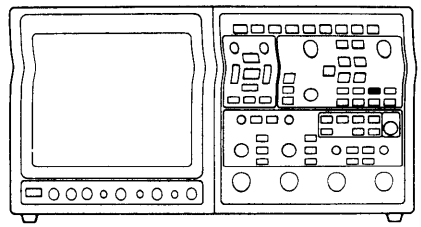


One-point advice · If the repeating frequency of an input signal is 10ns/div to 5ms/div of sweep frequency and if it is 10ms/div to 0.5s/div, signals are automatically swept at less than 50Hz and at less than 10Hz respectively.

3.13 Selecting Sweep Mode
SWEEP MODE

NORM

NORM



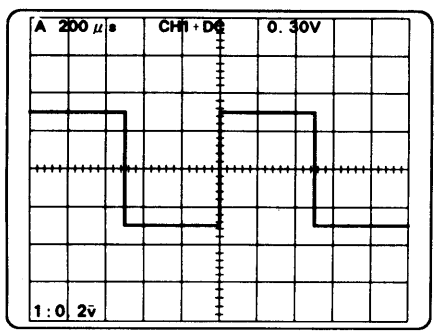
Allows to display the signal only when the digital storage scope is triggered. The AUTO LEVEL or AUTO mode is easier way to obtain the triggering. Use the NORM sweep mode, when your signal frequency is below 50Hz or you do not want to display the trace at the lack of triggering.

♦ Key operation

SWEEP MODE	
NORM	(LED indicator lights)
Setting	
NORM	

3

♦ Operating procedure



① Press the NORM key and set the NORM mode.

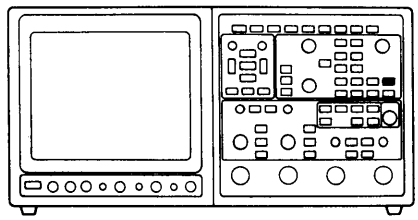
- No trace is available on the screen at the lack of triggering.
  (When you select STORAGE, the waveform, recorded before stopping displaying trace, is shown.)

One-point advice · Select the NORM sweep mode to observe a signal at the frequency of less than 50Hz and of less than 10Hz, if the repeating frequency of a signal is 10ns/div to 5ms/div of sweep frequency and it is 10ms/div to 0.5s/div respectively.

3.13 Selecting Sweep Mode
SWEEP MODE

SINGLE

RESET/STOP
SGL



When you select SINGLE, trace is displayed only once with a triggering signal entered.

♦ **Preliminary setup**

Let's suppose the CAL signal as the single shot event. Do not apply the CAL signal until the instruction says so.

3

For REAL

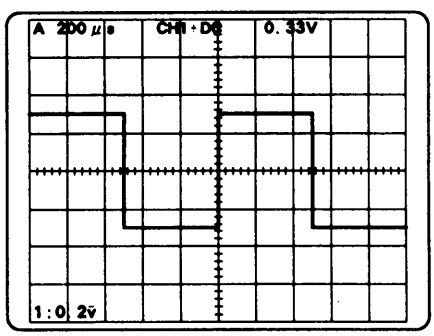
♦ **Key operation**

SWEEP MODE

RESET/STOP
SGL

Selecting SINGLE (LED indicator lights)

♦ **Operating procedure**



① Press the RESET/STOP SGL key and select SINGLE.

- The indication LED lights when ready for signal input, and READOUT and SCALE ILLUMI go off.

② Apply CAL signal.

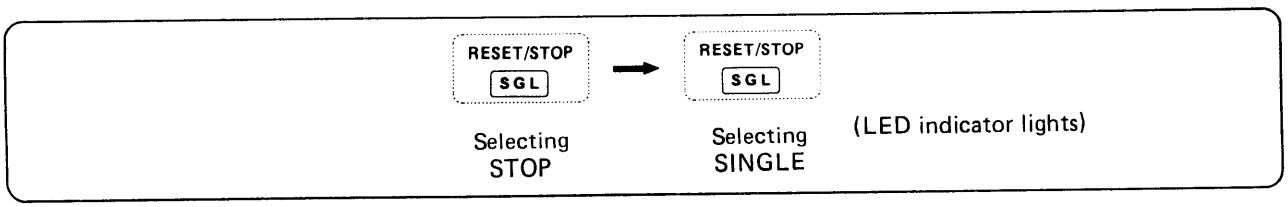
The sweep runs once with the TRIG'D indicator on, then the READY indicator goes off after the sweep ends.

One-point advice · Press the RESET/STOP SGL key to set the oscilloscope ready again.

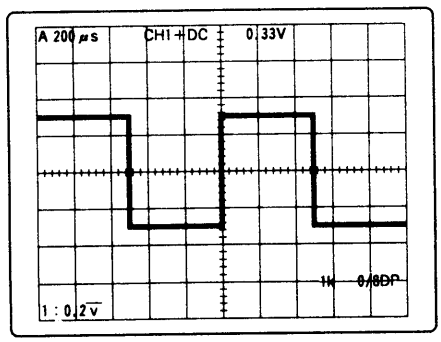
- In the SINGLE mode, the scale illumination and the character readout are not available, and those flicker once for certain time for photographing after the sweep ends when the oscilloscope is triggered.
- When you change the VERT MODE or HORIZ DISPLAY during the ready condition at SINGLE mode, only the indicators will be changed. The changed setup will be only active after the oscilloscope is triggered.

For STORAGE

♦ Key operation



♦ Operating procedure



① Press the RESET/STOP SGL key and select STOP.

② Press the RESET/STOP SGL key and select SINGLE.

- The TRIG STATUS indication LED lights when ready for signal input.

③ Apply CAL signal.

The sweep runs once with the TRIG'D indicator on, then the TRIG STATUS READY indicator goes off after the sweep ends.

- Single sequence data is stored. The succeeding data is not stored.

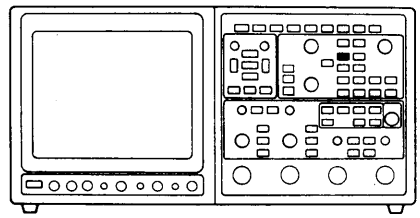
- Press the RESET/STOP SGL key and select SGL again.

One-point advice ◇ Define one sequence as follows:

1. Dual display mode (CH1, CH2)
   It stops after storing one-time data.
2. Dual display mode (CH3, CH4)
   It stops after storing one-time data.
3. ALT. ACQ
   A sweep : It stops after CH1, CH2 → CH3, CH4.
   ALT sweep : It stops after A sweep of CH1, CH2 → B sweep of CH1, CH2 → A sweep of CH3, CH4 → B sweep of CH3, CH4.
4. Average mode
   It stops after storing for the number of times set for averaging.
5. Roll mode
   It stops at a set data position if triggering conditions are established after starting with roll.
6. MAX-HOLD
   It stops after storing data for the number of times set.
7. Equivalent sampling
   Sweeping is made for the number of times until 50% of all memories (1kW/ch) is filled with data.
   With averaging on equivalent sampling, sweeping is made for the number of times obtained by multiplying the above number of sweeping times by the number of averaging times.
   Averaging is based on the EXP averaging.
8. CH1 ADVANCE
   It stops after storing the first recorded data into the CH1 memory and the second recorded data into the CH2 memory.
9. MEMORY ADV
   Data is recorded for the set recording length. It stops after the total length reaches 16kW.

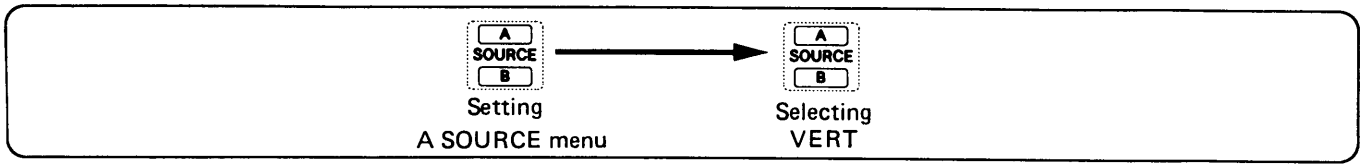
3.14 Selecting Trigger Source A (only for REAL)

VERT

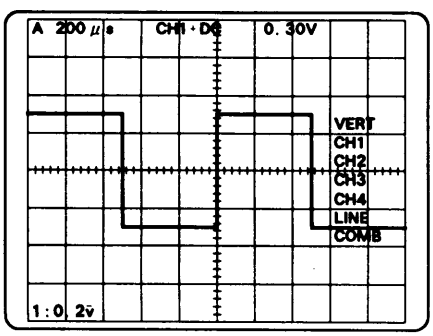


Assigns the display channels, which is set by the VERT MODE, as the trigger source. When you set the single channel display at the VERT trigger source, the trigger source is automatically set to the display channel. When you set the ALT multi - display mode at the VERT trigger source, the trigger source is alternatively set to the current display channel. When you set the CHOP multi - display mode at the VERT trigger source, the trigger source is set to the lowest numbered display channel.

♦ Key operation



♦ Operating procedure



① Press the A SOURCE key and set the A SOURCE menu.

- The menu will not appear on the screen when you set the menu off in the SYSTEM configuration menu.

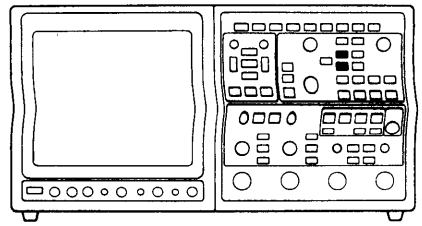
② Press the A SOURCE , ▲ or ▼ key and select the VERT trigger source.

- The selected item in the menu is highlighted.

One-point advice

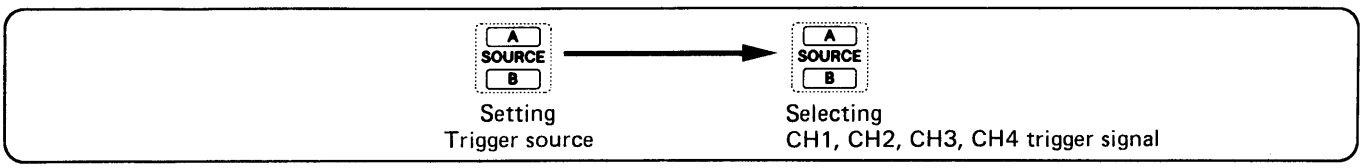
- If you select a multi-display mode CHOP in VERT MODE, the channel where the smallest number is assigned serves as a trigger source.
- Avoid to use the VERT trigger source in conjunction with the AUTO LEVEL sweep mode.
- The trigger menu will be turned off after the certain time which is set in the SYSTEM configuration menu. For the detail, see SYSTEM MENU ON PERIOD on page 153.

CH1, CH2 CH3, CH4

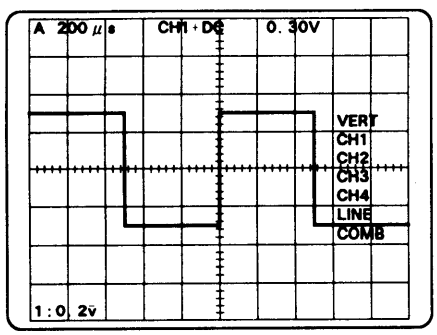


The trigger source can be selected from four signals of CH1, CH2, CH3, and CH4.

♦ **Key operation**



♦ **Operating procedure**



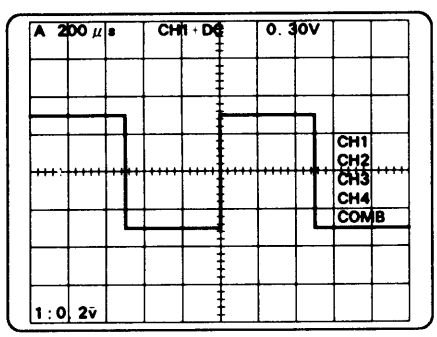
◊ **Trigger signal source of A trigger source**

① Press the [A SOURCE] key and set the trigger source of A trigger.

- The left screen appears when you select REAL.

② Press the [A SOURCE], [▲] or [▼] key and select A trigger source.

- The selected item in the menu is highlighted.



◊ **Trigger signal source of B trigger source**

① Press the [SOURCE B] key and set the trigger source of B trigger.

② Press the [SOURCE B], [▲] or [▼] key and select CH1, CH2, CH3 or CH4.

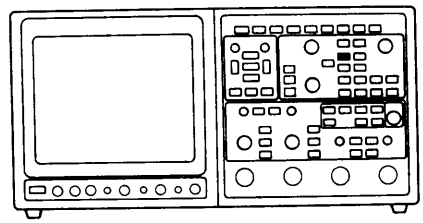
- The selected item in the menu is highlighted.

One-point advice

- Any vertical input channel can be assigned for the trigger source regardless of the display channel.
- The trigger menu will be turned off after the certain time which is set in the SYSTEM configuration menu. For the detail, see SYSTEM MENU ON PERIOD on page 153.

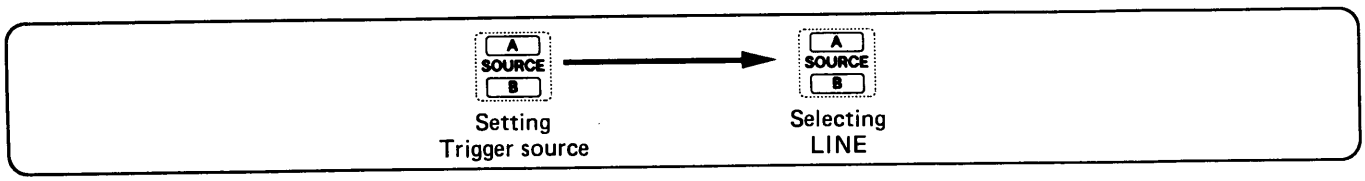
3.14 Selecting Trigger Source A

LINE



Triggers the digital storage scope with line frequency. The LINE trigger source is advantageous for checking line voltage, ripple voltage, and other voltages relating to the line frequency.

♦ **Key operation**



♦ **Operating procedure**

① Press the A SOURCE B key and set trigger source of A trigger.

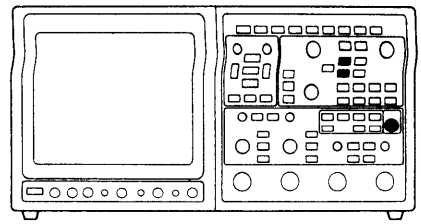
② Press the A SOURCE B , ▲ or ▼ key and select the LINE.

- The selected item in the menu is highlighted.

One-point advice

- The trigger menu will be turned off after the certain time which is set in the SYSTEM configuration menu. For the detail, see SYSTEM MENU ON PERIOD on page 153.

COMB

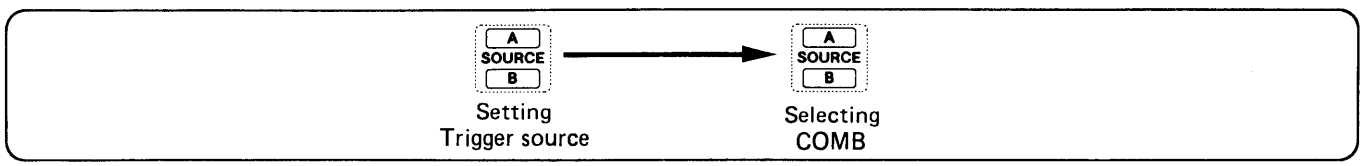


Allows you to trigger the digital storage scope with the complex logical signals by using the optional Combination Trigger Probe SS-0071.

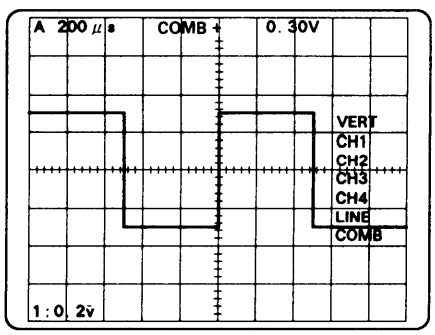
♦ **Preliminary setup**

Connect the optional Combination Trigger Probe SS-0071 to the COMB PROBE terminal at the front panel.

♦ **Key operation**



♦ **Operating procedure**

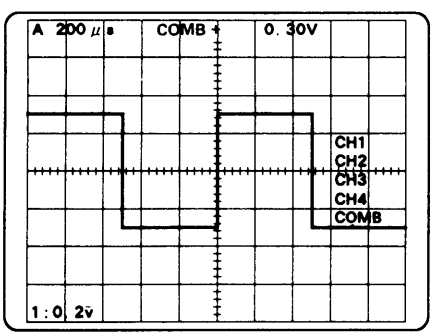


◇ **Trigger source of A trigger**

① Press the [A SOURCE] key and set the trigger source of A trigger.

② Press the [A SOURCE], [▲] or [▼] key and select COMB.

- The selected item in the menu is highlighted.



◇ **Trigger source of B trigger**

① Press the [SOURCE B] key and set the trigger source of B trigger.

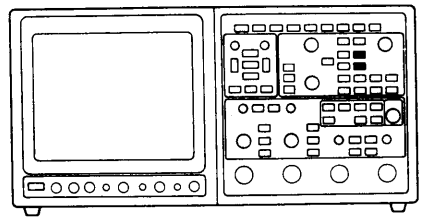
② Press the [SOURCE B], [▲] or [▼] key and select COMB.

- The selected item in the menu is highlighted.

One-point advice

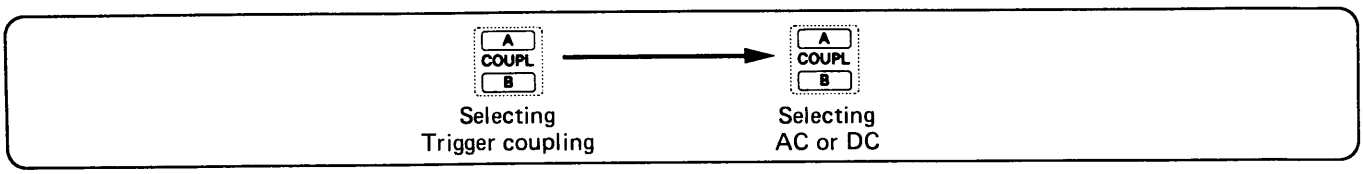
- For the detail, see the SS-0071 combination trigger probe instruction manual.
- The trigger menu will be turned off after the certain time which is set in the SYSTEM configuration menu. For the detail, see SYSTEM MENU ON PERIOD on page 153.

AC, DC

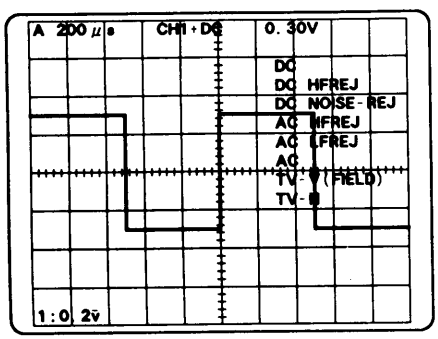


Allows you to select the suitable trigger coupling for the measurement.

♦ Key operation



♦ Operating procedure

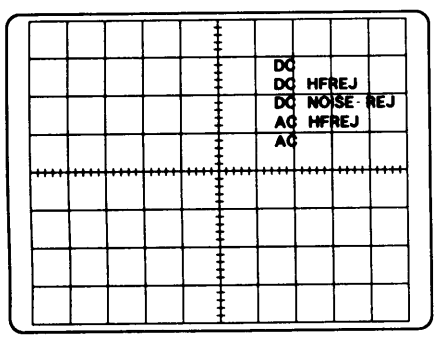


◇ **Trigger source of A trigger**

① Press the A COUPL key and set the trigger source of A trigger.

② Press the A COUPL , ▲ or ▲ key and select the AC or DC.

- The selected item in the menu is highlighted.



◇ **Trigger source of B trigger**

① Press the COUPL B key and set the trigger source of B trigger.

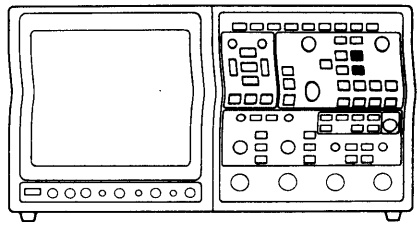
② Press the COUPL B , ▲ or ▼ key and select the AC or DC.

- The selected item in the menu is highlighted.

One-point advice

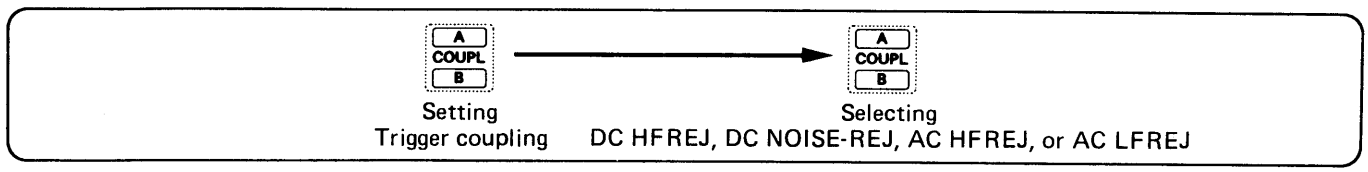
- AC: rejects the dc offset level from the trigger signal. Below the 100Hz frequency the triggering may be difficult because of the trigger signal amplitude attenuation.
- DC: passes all the signal components.
- When the AC coupling is selected, the "?" mark is displayed alongside the trigger level value to show that the trigger level value does not represent the trigger point directly because of the AC coupling.

DC HFREJ, DC NOISE-REJ AC HFREJ, AC LFREJ

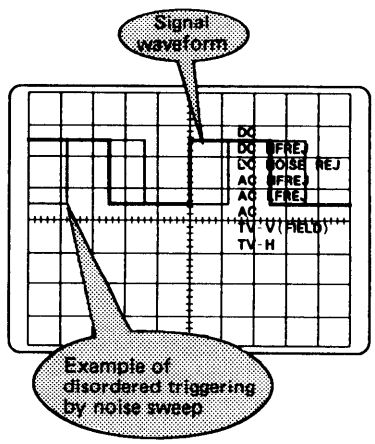


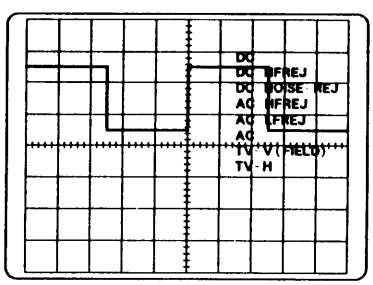
Occasionally trigger signal noise may cause triggering difficult to obtain the stable display. Use the frequency rejection coupling to reject noise.

♦ Key operation



♦ Operating procedure





◇ Triggering source of A trigger

① Press the A COUPL key and set the trigger source of A trigger.

② Press the A COUPL , ▲ or ▼ key and select the DC HFREJ, DC NOISE-REJ, AC HFREJ, or AC LFREJ.

- The selected item in the menu is highlighted.

◇ Trigger source of B trigger

① Press the COUPL B trigger and set the trigger source of B trigger.

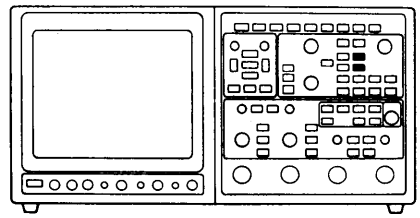
② Press the COUPL B , ▲ or ▼ key and select the DC HFREJ, DC NOISE-REJ, or AC HFREJ.

- The selected item in the menu is highlighted.

One-point advice

- DC HF REJ:
  attenuates the signal components above the 500kHz frequency and retains the DC coupling.
- DC NOISE-REJ:
  degrades the trigger sensitivity about three times.
- AC HF REJ:
  attenuates the signal components above the 500kHz frequency and retains the AC coupling.
- AC LF REJ:
  attenuates the signal components below the 1kHz frequency and retains the AC coupling.
- When the AC coupling is selected, the "?" mark is displayed alongside the trigger level value to show that the trigger level value does not represent the trigger point directly because of the AC coupling.
- The trigger menu will be turned off after the certain time which is set in the SYSTEM configuration menu. For the detail, see SYSTEM MENU ON PERIOD on page 153.

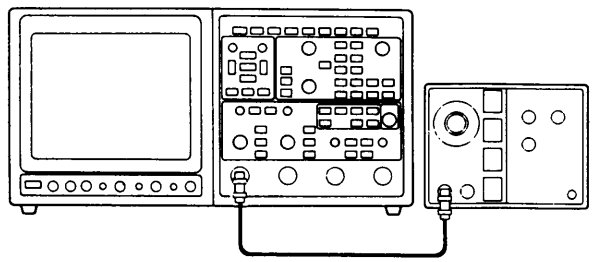
TV-V, TV-H



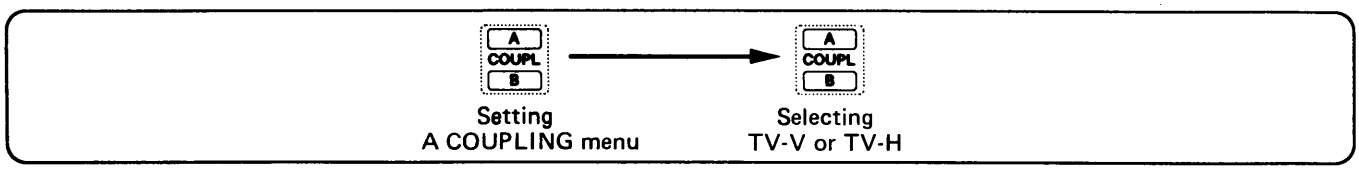
Allows to trigger the composite video signal easily.

♦ **Preliminary setup**

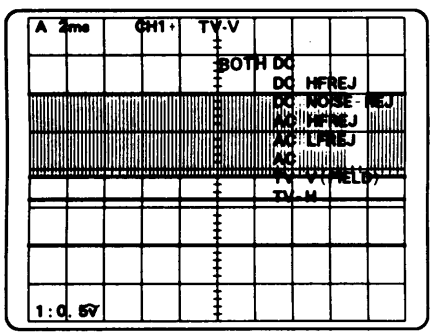
Apply the signal from the video signal generator into the CH1 input.

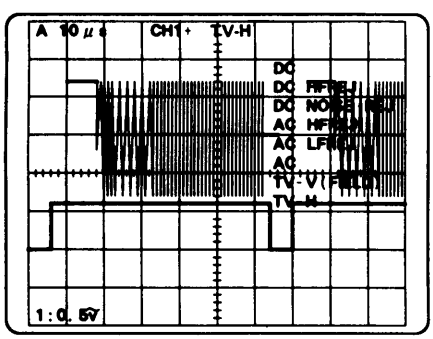


♦ **Key operation**



♦ **Operating procedure**





① Press the A COUPL key and set the A COUPLING menu.

- The menu will not appear on the screen when you set the menu off in the SYSTEM configuration menu.

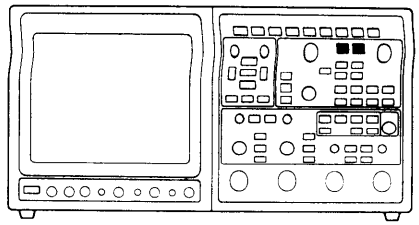
② Press the A COUPL , ▲ or ▼ key and select the TV - V or TV - H trigger coupling in the A COUPLING menu.

- The selected item in the menu is highlighted.

One-point advice

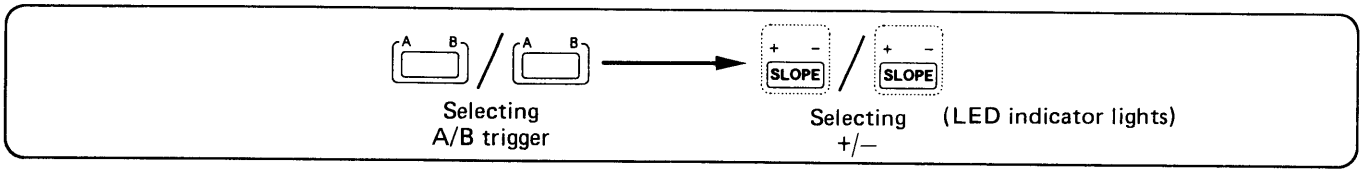
- TV - V:
  allows to trigger with the vertical sync pulse of the video signal.
- TV - H:
  allows to trigger with the horizontal sync pulse of the video signal.
- At the TV - V mode, the TV field is selected by pressing the COUPL B key to display odd or even field or both fields.
- When you set the A trigger coupling to the TV - V, the B trigger coupling is automatically set to the TV - H coupling.
- The trigger menu will be turned off after the certain time which is set in the SYSTEM configuration menu. For the detail, see page 87.

SLOPE

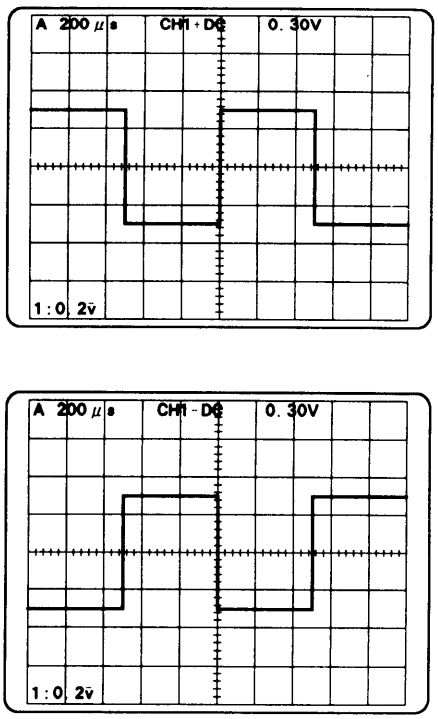


Allows you to trigger at the positive or negative slope.

♦ Key operation



♦ Operating procedure



◇ A trigger slope

① Press the SLOPE key and select either + or −.

- Signal is triggered at the positive slope if the slope is +.
- Signal is triggered at the negative slope if the slope is −.
- The LED indicator lights when the − (negative) slope is selected.

◇ B trigger slope (for REAL)

① Press the B key or the ALT key and set HORIZ DISPLAY to B or ALT.

② Press the B MODE RUNS TRIG AFT DLY key to select TRIG AFT DLY.

③ Press the A B key and select the B trigger signal slope.

④ Press the SLOPE key and select either + or −.

◇ B trigger slope (for STORAGE)

① Press the EVENT/TV LINE key and select EVENT.

② Press the EVENT/TV LINE key, ▲ or ▼ key and select the COUNT.

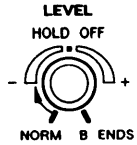
③ Press the A B key and select the B trigger.

④ Press the SLOPE key and select either + or −.

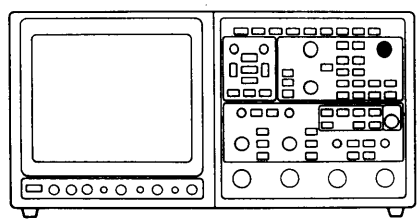
One-point advice

- The A/B selection will not work when the B MODE is set to the RUNS AFT DLY or the EVENT trigger function is off.
- The B trigger function including the B trigger slope will work when the EVENT trigger function is on.

TRIG LEVEL

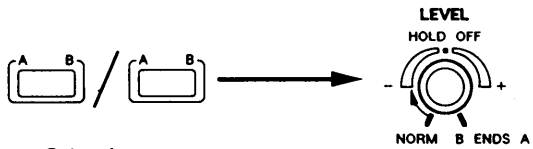


(Outer control)



Allows you to trigger at a desired signal level. It is necessary to trigger the digital storage scope.

♦ Key operation

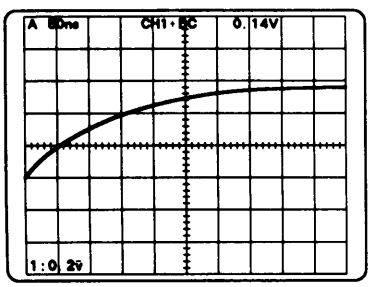


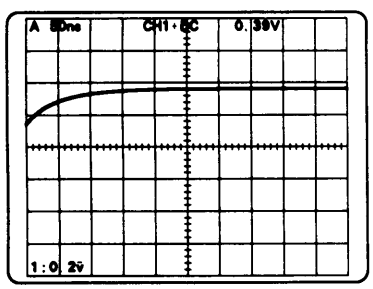
(Outer control)

Selecting
A/B trigger coupling

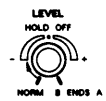
Adjusting
TRIG LEVEL

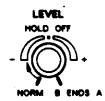
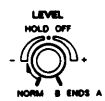
♦ Operating procedure





◇ A trigger level

① Turn the  (outer) control to adjust the A trigger level.

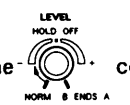
- The trigger level appears at the upper right corner of screen.
- An example where the  (outer) control is set to the center.
- An example where the  (outer) control is set to the right side from the center

◇ B trigger level (for REAL)

① Press the [B] key or the [ALT] key to set HORIZ DISPLAY to B or ALT.

② Press the [B MODE RUNS TRIG / AFT DLY] key to select TRIG AFT DLY.

③ Press the [A B] key and select the B trigger level.

④ Turn the  control to adjust the B trigger level.

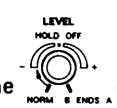
◇ B trigger level (for STORAGE)

① Press the [EVENT/TV LINE] key to select EVENT.

② Press the [EVENT/TV LINE] key, [▲] or [▼] key to select COUNT.

③ Press the [A B] key to select the B trigger.

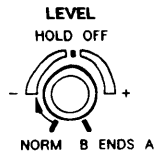
- The indication LED lights.

④ Turn the  control to adjust the B trigger level.

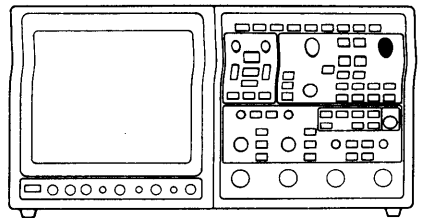
One-point advice

- The B trigger level does not function if B MODE and EVENT trigger are specified to RUNS AFT DLY and OFF, respectively.
- if the EVENT trigger is set to ON when you select STORAGE, the B trigger level does not function.

HOLD OFF



(Inner control)

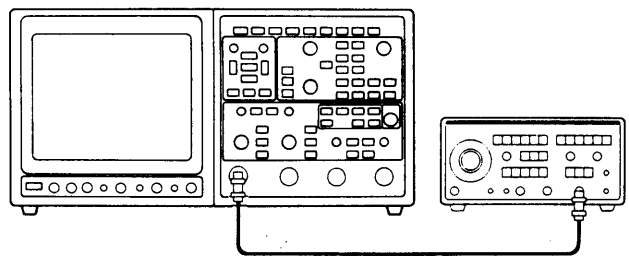


It may be difficult to trigger stably to observe a complex combination of pulse train. In this case, varying the hold off time allows you to trigger a complex signal.
In STORAGE, the distance at which signals are taken can be varied.

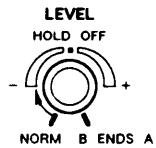
♦ **Preliminary setup**

Apply a signal to CH1 from a signal generator (e.g., FG-350).

Amplitude	: 0.6 V
SWEEP MODE	: CONT SWEEP
SWEEP	: 1 ms
START	: 1 kHz
STOP	: 2.4 kHz

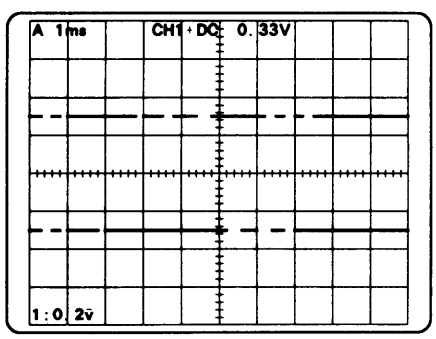


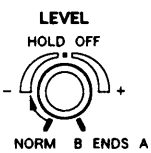
♦ **Key operation**



(Inner control)
Adjusting
Hold Off time

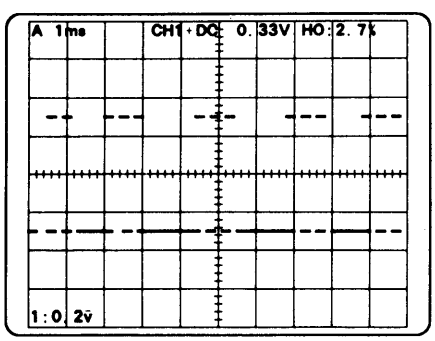
♦ **Operating procedure**



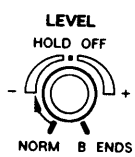
① Turn the 

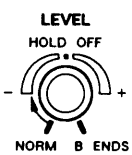
(inner) control to adjust hold off time.

- Double display
- Display pulse train stably.



One-point advice

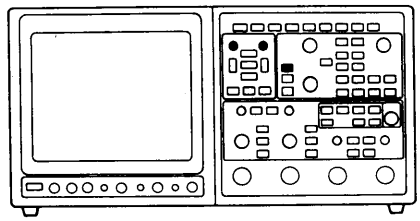
- Turning the 

control fully counterclockwise allows the HOLD OFF display to go off and the HOLD OFF time to be minimized.
- Turning the 

control fully clockwise allows the HOLD OFF display to go off and the B ENDS A mode to start (only for REAL).

3.19 Selecting Continuous Delay

RUNS AFT DLY TRACE SEP

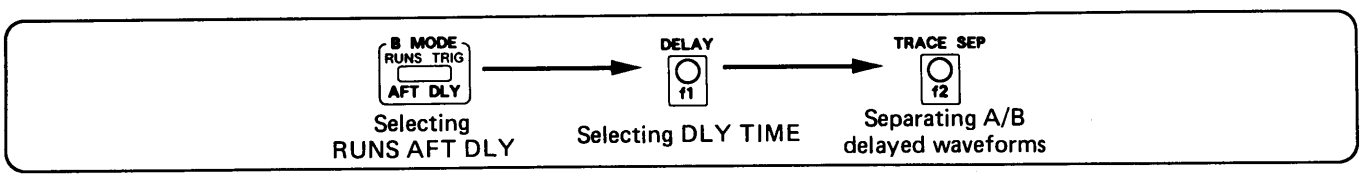


Allows you to expand any part of waveform on the screen. The continuous delay sweep mode starts displaying B waveforms after the period of the delay time set in the DELAY mode. It is valid for ALT or B of HORIZ DISPLAY.

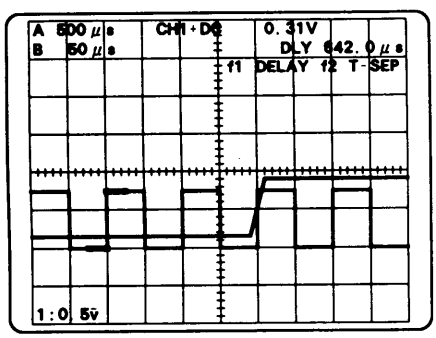
♦ **Preliminary setup**

- As an example, press the [ALT] key of HORIZ DISPLAY to select ALT.

♦ **Key operation**



♦ **Operating procedure**

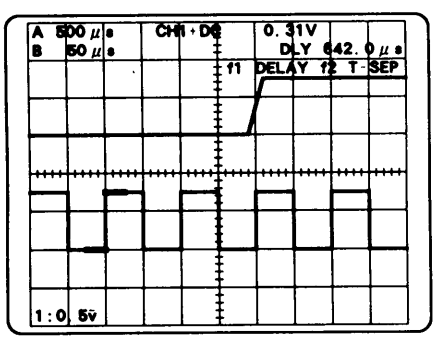


① Press the [B MODE RUNS TRIG / AFT DLY] key and set the RUNS AFT DLY.

- In STORAGE, the RUNS AFT DLY mode is automatically selected.
- The delayed sweep portion is intensified at the A sweep display.

② Turn the DELAY f1 control to select delay time.

- Separate the A and B sweep display in the following manner if they are overlapped.



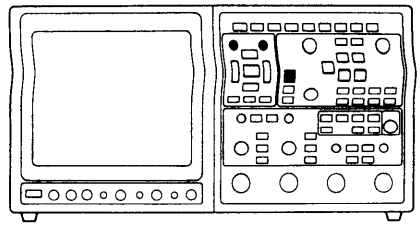
③ Turn the TRACE SEP f2 control to shift the B sweep display.

One-point advice

- The position of B waveform is retained until it is shifted by specifying TRACE SEP again.
- To select STORAGE, select one of those values other than 16k for LENGTH.
- Press the HORIZ DISPLAY [B] key to display the B waveform only.
- See "SEC/DIV" at page 61 for selecting B SEC/DIV.

3.20 Selecting Triggered Delay (only for REAL)

TRIG AFT DLY TRACE SEP

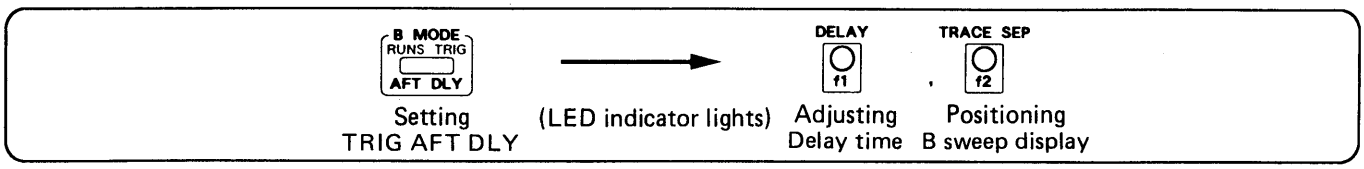


The triggered delay called TRIG AFT DLY allows to run the B sweep when the B sweep is triggered after the certain delay time. In the ALT display mode, the A and B sweep displays will be separated.

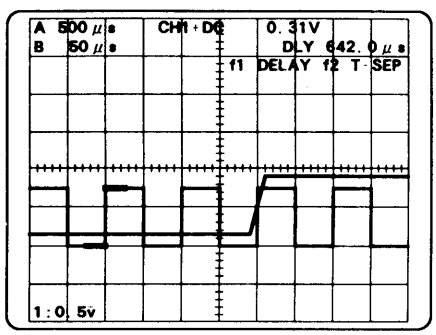
♦ **Preliminary setup**

- Press the [ALT] key and set the ALT display mode.

♦ **Key operation**



♦ **Operating procedure**

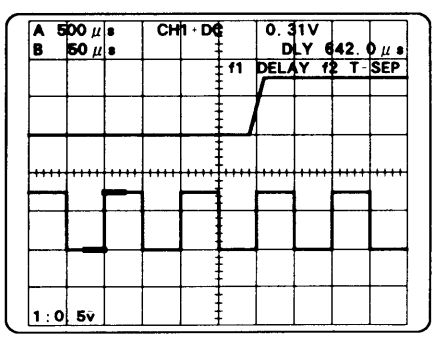


① Press the B MODE RUNS TRIG / AFT DLY key and set the TRIG AFT DLY.

- The delayed sweep portion is intensified at the A sweep display.

② Using the DELAY f1 knob, adjust the delay time.

- The delayed portion jumps to each trigger point.
- The following procedure describes how to separate the B sweep display from the A sweep display.

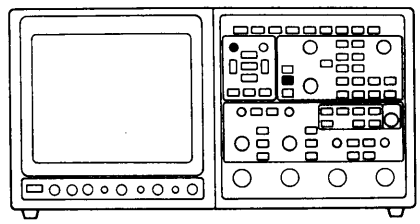


③ Using the TRACE SEP f2 key, position the B sweep display.

One-point advice · The B sweep position separated by using the TRACE SEP knob is always valid until next position setting.

EVENT COUNT

EVENT/TV LINE DELAY



It is convenient to confirm operation of the counter circuit.

♦ **Preliminary setup**

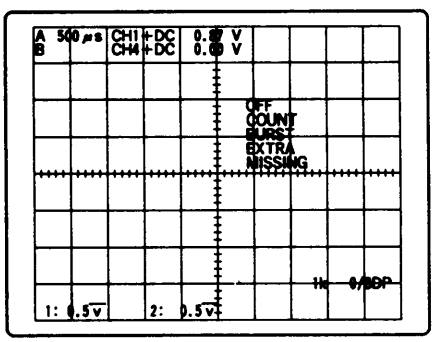
- Press the A COUPL key to select trigger coupling other than TV-V and TV-H.

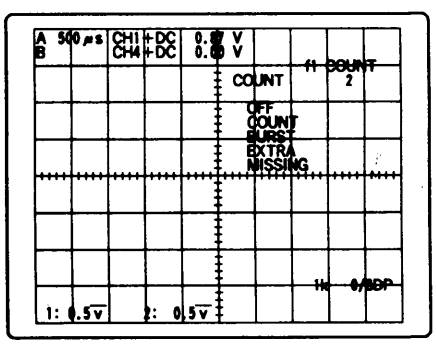
♦ **Key operation**

EVENT/TV LINE / EVENT/TV LINE → ▲, ▼ → DELAY

Setting EVENT — Selecting COUNT — Selecting COUNT

♦ **Operating procedure**





① Press the EVENT/TV LINE key and set EVENT.

② Press the EVENT/TV LINE key, ▲ or ▼ key and select COUNT.

③ Turn the DELAY control and select time.

◇ **To end COUNT:**

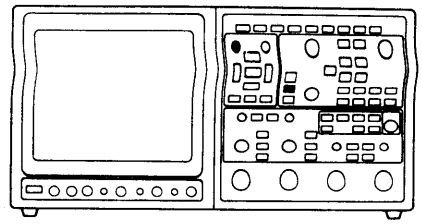
①Press the EVENT/TV LINE key and select OFF.

One-point advice

- The EVENT COUNT starts A sweep after the B trigger counts signals by the number of times set by the event counter starting from the trigger start point of A trigger.
- To select REAL, only for COUNT.
- The selection menu of EVENT displayed at the right side of the screen disappears automatically after the setting time passes.
  See SYSTEM MENU ON PERIOD on page 153 for setting display time.

3.21 EVENT/TV LINE
(only for STORAGE)

EVENT BURST

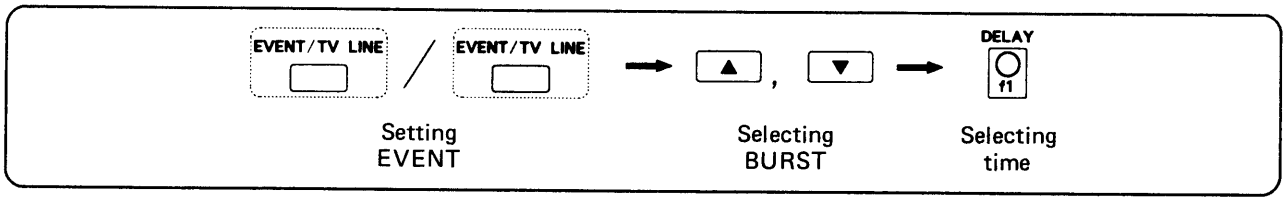


Used to observe BURST waveform.

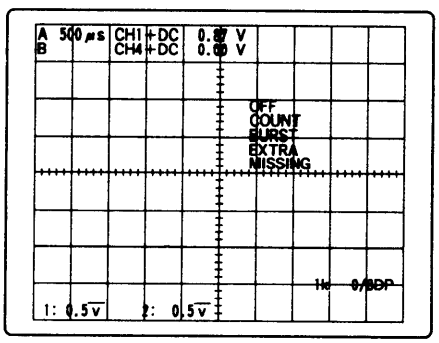
♦ **Preliminary setup**

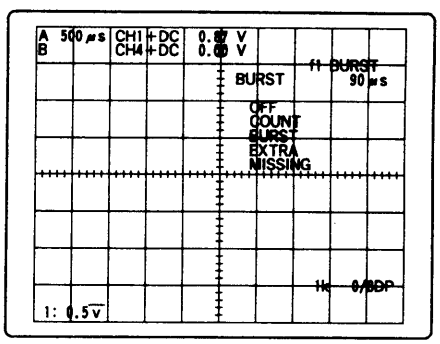
· Press the A COUPL key to select trigger coupling other than TV-V and TV-H.

♦ **Key operation**



♦ **Operating procedure**





① Press the EVENT/TV LINE key and set EVENT.

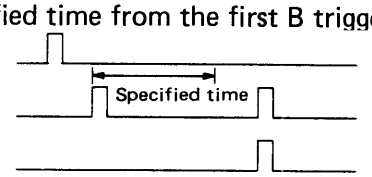
② Press the EVENT/TV LINE key, ▲ or ▼ key and select BURST.

③ Turn the DELAY f1 control and select time.

◇ **To end BURST:**

① Press the EVENT/TV LINE key and select OFF.

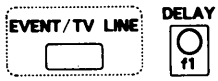
One-point advice · The EVENT BURST starts receiving signal by the A trigger.
A sweep is initiated by the next B trigger if the next B trigger does not occur within the specified time from the first B trigger.

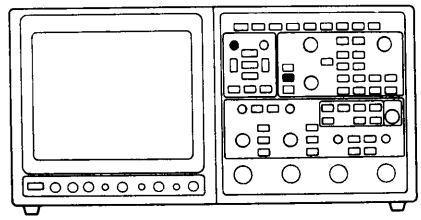


· The selection menu of EVENT displayed at the right side of the screen disappears automatically after the setting time passes.
See SYSTEM MENU ON PERIOD on page 153 for setting display time.
· If you set EVENT BURST, SWEEP MODE is automatically turned to NORM.

3.21 EVENT/TV LINE (only for STORAGE)

EVENT EXTRA



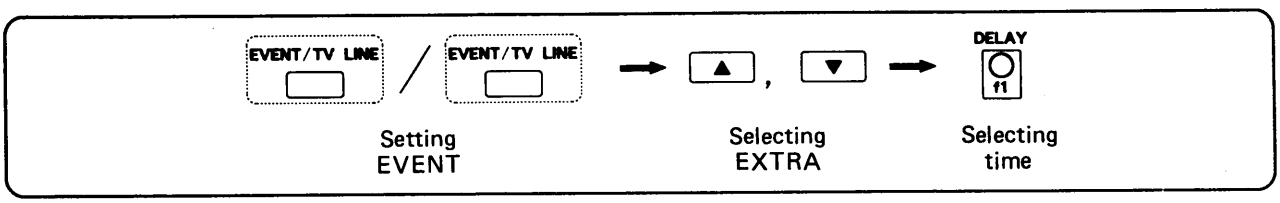


Allows you to trigger by spike noise on power line and glitch within clock signal.

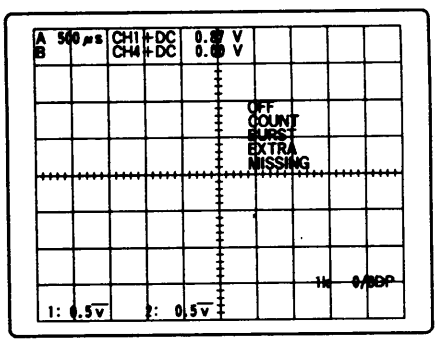
♦ **Preliminary setup**

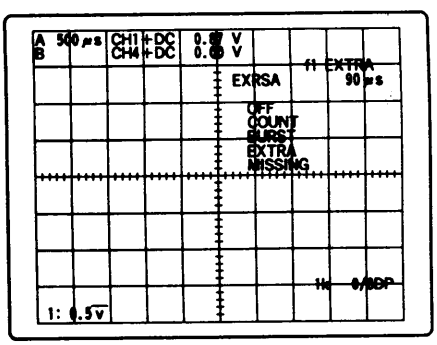
- Press the [A COUPL] key to select trigger other than TV-V and TV-H.

♦ **Key operation**



♦ **Operating procedure**





① Press the [EVENT/TV LINE] key and set EVENT.

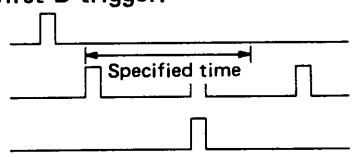
② Press the [EVENT/TV LINE] key, [▲] or [▼] key key and select EXTRA.

③ Turn the [DELAY f1] control and select time.

◇ **To end EXTRA:**

① Press the [EVENT/TV LINE] key and select OFF.

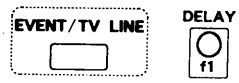
One-point advice · The EVENT EXTRA starts receiving signal by the A trigger.
A sweep is initiated if the next B trigger occurs within the specified time from the from the first B trigger.

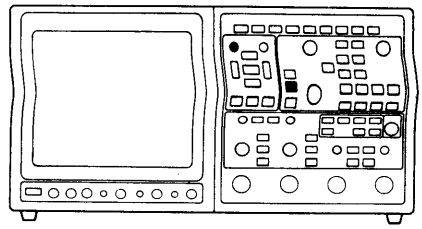


- The selection menu of EVENT displayed at the right side of the screen disappears automatically after a setting time passes.
See SYSTEM MENU ON PERIOD on page 153 for setting display time.
- If you set EVENT MISSING, SWEEP MODE is automatically turned to NORM.

3.21 EVENT/TV LINE
(only for STORAGE)

EVENT MISSING



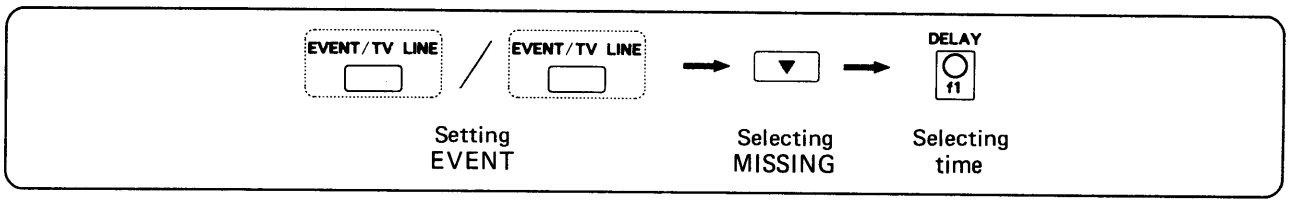


Allows you to trigger when one part of a signal is missing due to instantaneous power failure and data dropout.

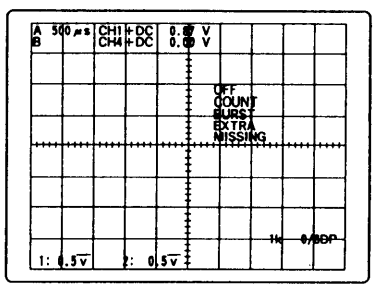
♦ **Preliminary setup**

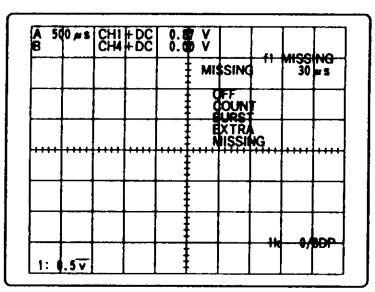
- Press the A COUPL key and select trigger other than TV-V and TV-H.

♦ **Key operation**



♦ **Operating procedure**





① Press the EVENT/TV LINE key and set EVENT.

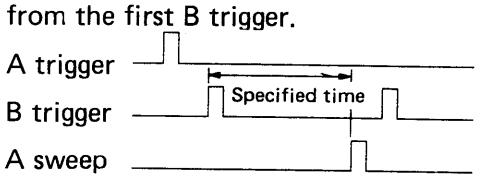
② Press the EVENT/TV LINE key or ▼ key, and select MISSING.

③ Turn the DELAY f1 control and select time.

◇ **To end MISSING:**

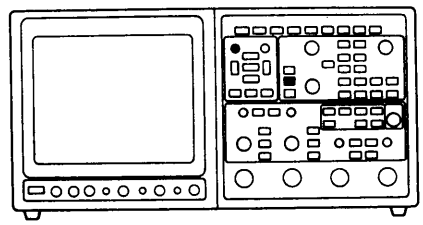
① Press the EVENT/TV LINE key and select OFF.

One-point advice · The EVENT MISSING starts receiving signal by the A trigger.
A sweep is initiated if the next B trigger does not occurs within the specified time from the first B trigger.



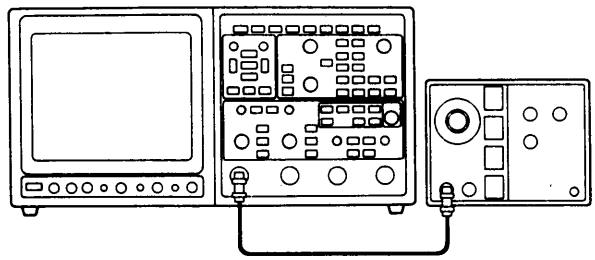
- The observed waveform is not related to the input signal in terms of triggering.
- The selection menu of EVENT displayed at the right side of the screen disappears automatically after a setting time passes.
  See SYSTEM MENU ON PERIOD on page 153 for setting display time.
- If you set EVENT MISSING, SWEEP MODE is automatically turned to NORM.

TV LINE



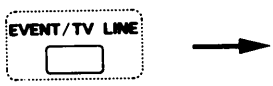
Allows you to trigger with any scanning line of TV.

♦ **Preliminary setup**



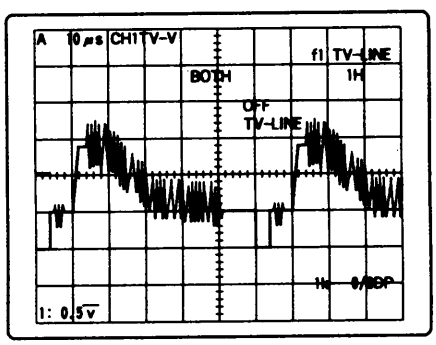
- Apply signal to CH1 from a TV test signal generator.
- Press the A COUPL B key to select the TV-V.
- Press the + − SLOPE key to select −.

♦ **Key operation**



Selecting TV LINE → Adjusting horizontal scanning line number

♦ **Operating procedure**



① Press the EVENT/TV LINE to select TV LINE.

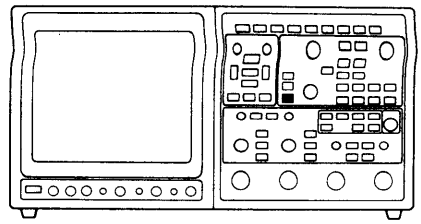
② Turn the DELAY f1 control to select horizontal scanning line number.

One-point advice · The selection menu of OFF/TV LINE displayed at the right side of the screen disappears automatically after the setting time passes.
See SYSTEM MENU ON PERIOD on page 153 for setting disaply time.
· If you set TV LINE, SWEEP MODE is automatically turned to NORM.

3.22 DATA POSITION
(only for STORAGE)

DATA POSITION (PRETRIGGER)

DATA POSITION



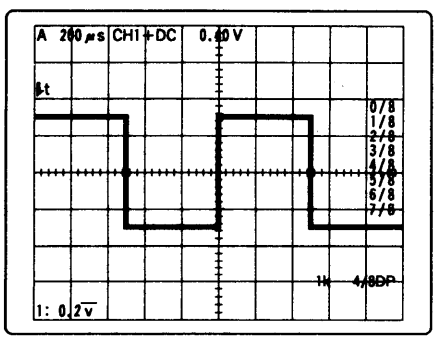
Allows you to select trigger-point position. It is used to observe phenomena before the trigger point.

♦ **Key operation**

DATA POSITION / DATA POSITION → DATA POSITION

Setting DATA POSITION — Selecting trigger point

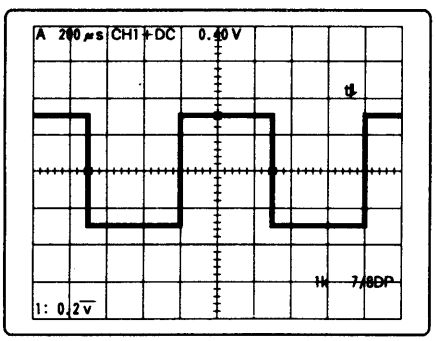
♦ **Operating procedure**



① Press the DATA POSITION key and set DATA POSITION.

② Press the DATA POSITION key or ▲, ▼ key to select triggering point.

- Select triggering point from 0/8 to 7/8 in steps of 1/8 of memory size.
- Triggering point is displayed by ↓t.
- Example where DATA POSITION was set to 7/8.

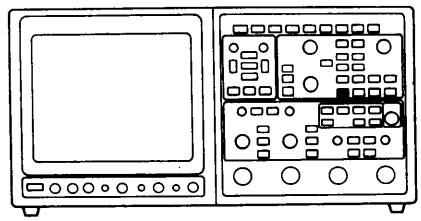


One-point advice · The selection menu of DATA POSITION displayed at the right side of the screen disappears automatically after the setting time passes.
See SYSTEM MENU ON PERIOD on page 153 for setting display time.

3.23 Selecting Horizontal Mode
HORIZ DISPLAY

A

[A]



Provides the primary time base.

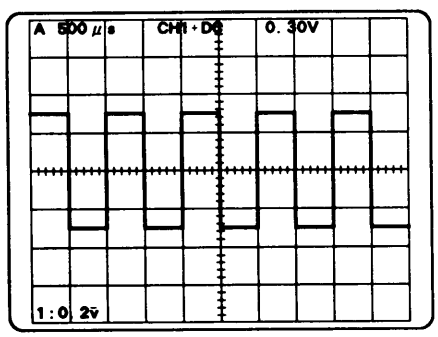
♦ Key operation

HORIZ DISPLAY

[A]

Setting (LED indicator lights)
A time base

♦ Operating procedure

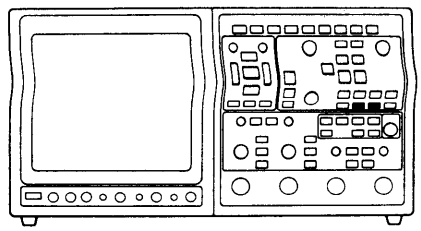


① Press the [A] key and set sweep mode.

- The selected LED indicator lights.

ALT, B

ALT B

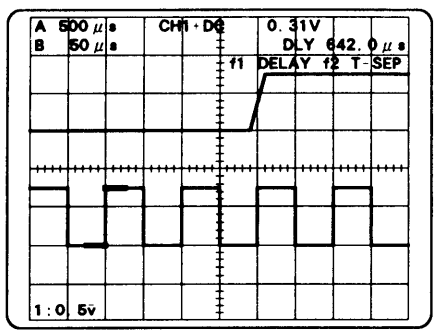


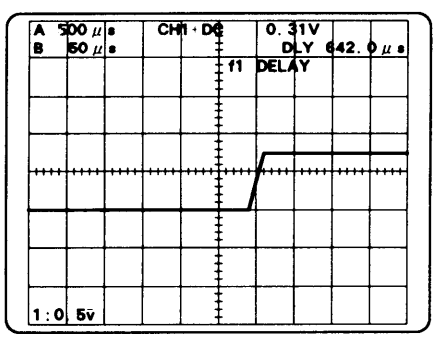
Provides the delayed time base. The B mode provides only the delayed sweep.
The ALT mode provides the A primary sweep intensified by the delayed sweep as well as the B delayed sweep alternately.

♦ **Key operation**

HORIZ DISPLAY
ALT , B
Setting ALT or B (LED indicator lights)

♦ **Operating procedure**





① Press the ALT or B key and set ALT or B horizontal mode.

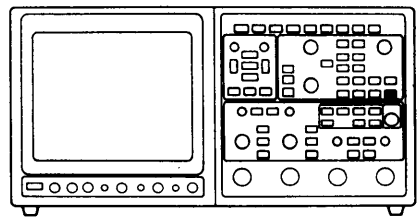
- The selected LED indicator lights.
- Top drawing : ALT sweep display
- Bottom drawing : B sweep display

One-point advice

- Even if the B sweep position is shifted by TRACE SEP in the ALT sweep, switching to the B sweep returns to the same position as the A sweep.
- For detailed delayed sweep operation, see page 50, 51.

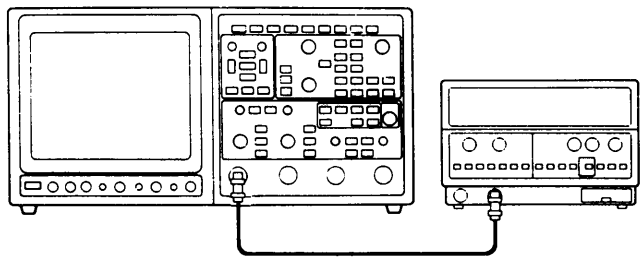
X-Y

[X-Y]



Allows you to display the signal in the X-Y format. The X-Y display mode is advantageous for displaying the Lissajous pattern or voltage-current curve of the semiconductor characteristic.

♦ **Preliminary setup**

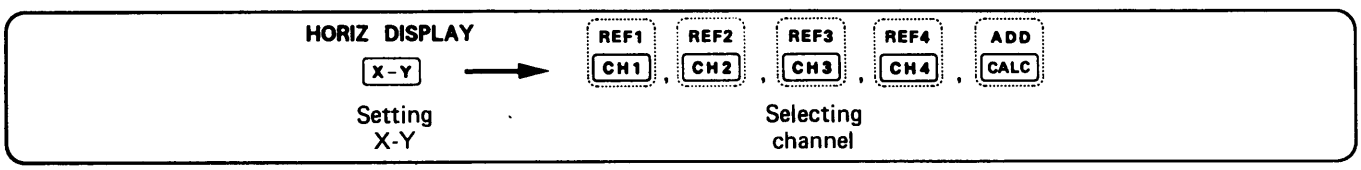


◇ Apply a sine waveform to channel 1 from a signal generator (for example, SG-4111) as a measurement signal.

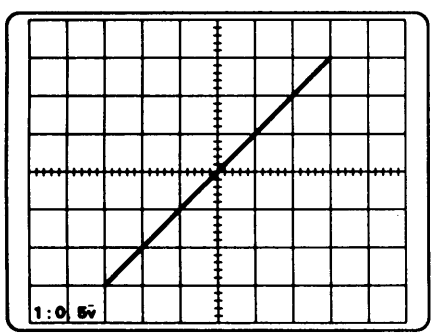
Out put frequency : 1 kHz
Output voltage : 3 Vp-p

◇ The following introduces an example of a litharge figure when selecting CH1 for X and Y.

♦ **Key operation**



♦ **Operating procedure**



Sensitivity (for both X and Y):
0.5V/div

① Press the [X-Y] key of HORIZ DISPLAY to select X-Y.

② Press the [CH1] key of VERT MODE.

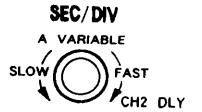
- The following table shows the voltage sensitivity switching and position adjustment.

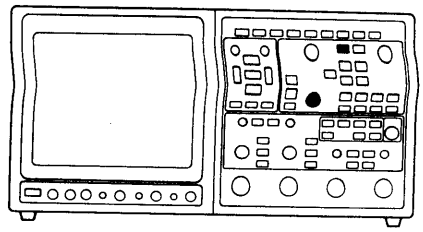
	X axis	Y axis	
Input	CH1	CH2, CH3, CH4	CH1
Voltage sensitivity switching	CH1 VOLTS/DIV VARIABLE 5V 2mV	CH2 VOLTS/DIV VARIABLE 5V 2mV; CH3 0.1V 0.5V; CH4 0.1V 0.5V	CH1 VOLTS/DIV VARIABLE 5V 2mV
Position adjustment	(REAL) (STORAGE)	CH2. CH3. CH4 POSITION	CH1 POSITION

One-point advice ◇ It is possible to display a maximum of 4 waveforms in combination with the following:

- X: CH1
  Y: CH1, CH2, CH3, CH4, ADD or CALC
- X: REF1 (for STORAGE)
  Y: REF1, REF2, REF3, or REF4

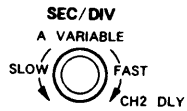
SEC/DIV A VARIABLE





Allows you to select sweep rate.

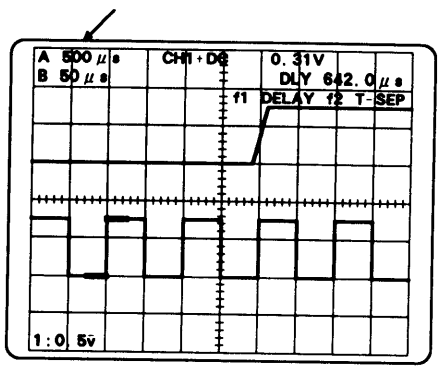
♦ Key operation

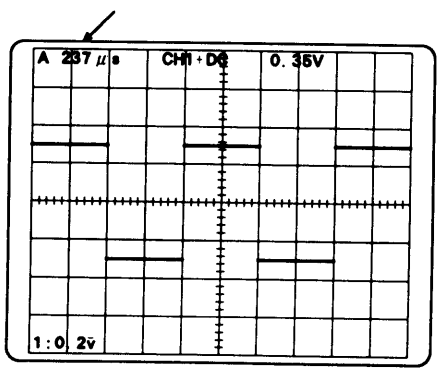


Selecting
Sweep rate

3

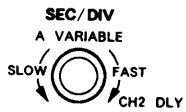
♦ Operating procedure





◇ SEC/DIV

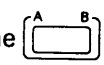
Selecting sweep rate of A sweep

① Turn the 

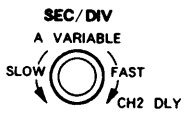
(outer) control and select sweep rate of A sweep.

Selecting sweep rate of B sweep

② Press the [ALT] key or [B] key and set ALT or B of HORIZ DISPLAY.

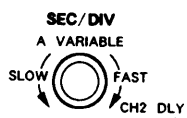
③ Press the 

key to select the B sweep rate.

④ Turn the 

(outer) control to select the sweep rate of B sweep.

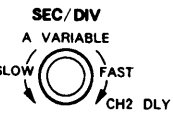
◇ A VARIABLE (only for REAL)

① Using the 

knob (inner knob), decrease the sweep rate continuously.

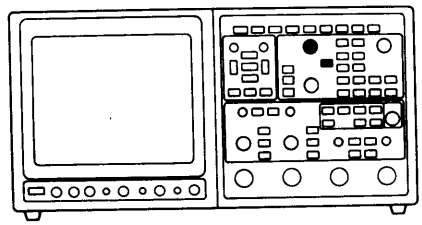
- The slowest sweep rate in variable is two and a half times slower than the fastest sweep rate, or the sweep rate at the VARIABLE OFF position.

One-point advice

- To stop varying the sweep rate continuously, turn the 

knob (inner) fully clockwise.
- For the X10 sweep magnification, see "Position" on the next page.

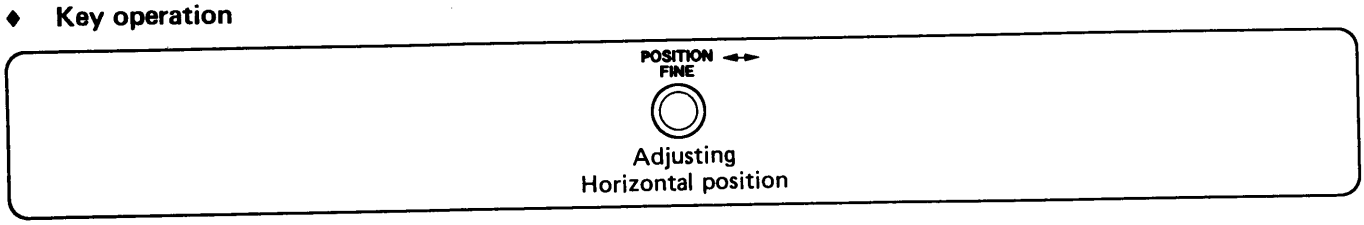
POSITION
x 10



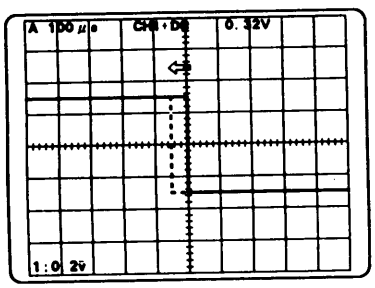
Display signal is positioned and magnified by ten times horizontally in reference to the center of the screen.

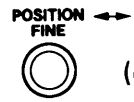
POSITION

♦ **Key operation**



♦ **Operation procedure**

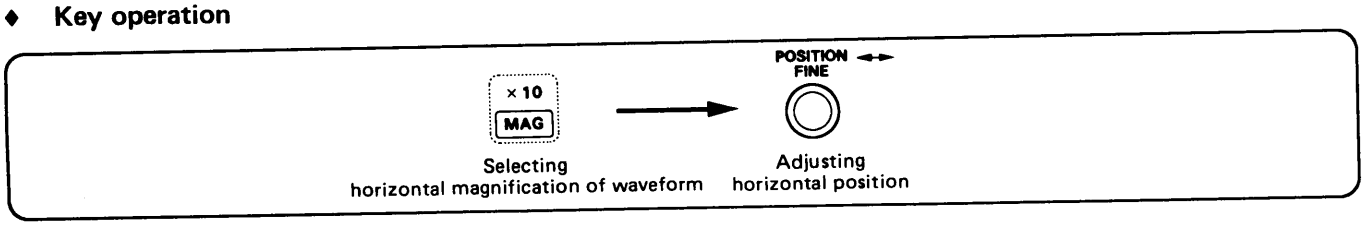




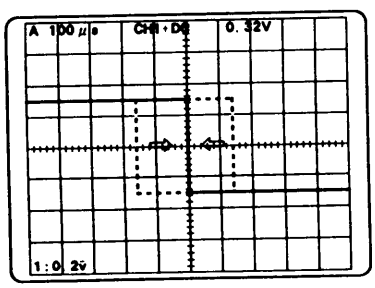
① Turn the (outer) control to shift waveform for the best viewing.

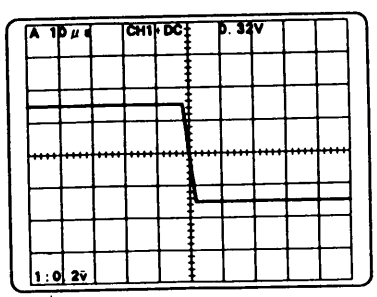
FINE, X 10

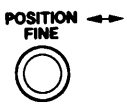
♦ **Key operation**



♦ **Operating procedure**

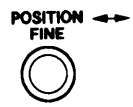






① Using the knob (outer knob), position the signal portion which is to be magnified to the horizontal center screen.

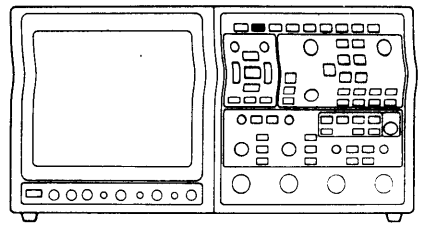
② Press the key to magnify waveform horizontally in reference to the center of the screen.



· Use the knob (inner knob) for the wide positioning , since the FINE position range is limited to about one division at the magnified sweep rate.

One-point advice · If you select STORAGE MODE ROLL, X10 mode does not work.

REAL STORAGE



Allows to select REAL (operation by an oscilloscope) or STORAGE (operation by a digital storage scope).

♦ **Key operation**

Selecting REAL/STORAGE (LED indicator lights)

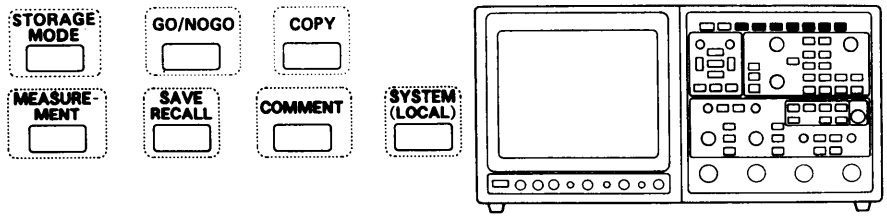
♦ **Operating procedure**

① Press the 

key to select REAL or STORAGE.

- If you select STORAGE, the indicator lights.

MENU TREE



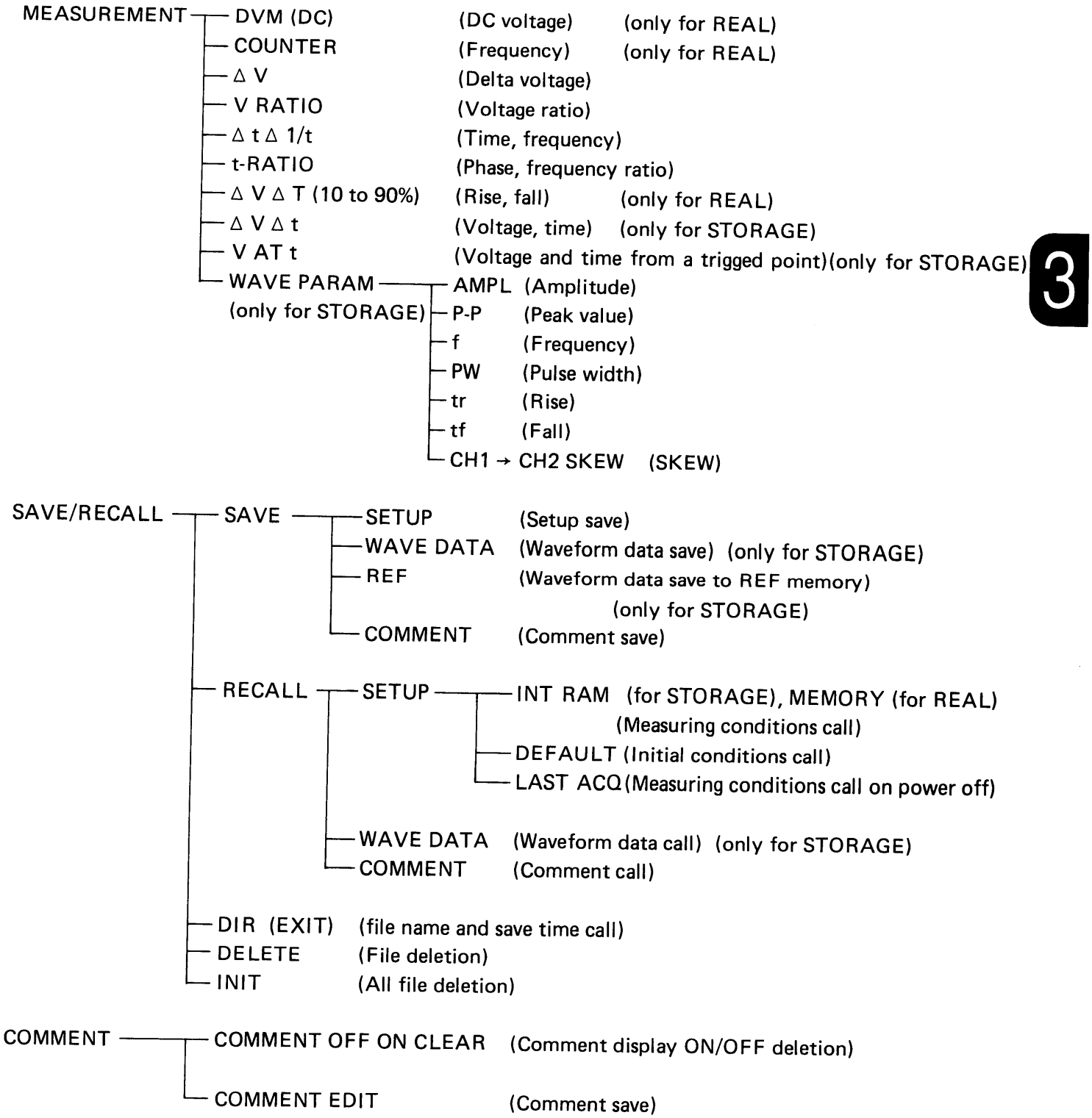
- Menu provides STORAGE MODE, GO/NOGO, COPY, MEASUREMENT, SAVE/RECALL, COMMENT, SYSTEM.
  The following introduces functions and operations.

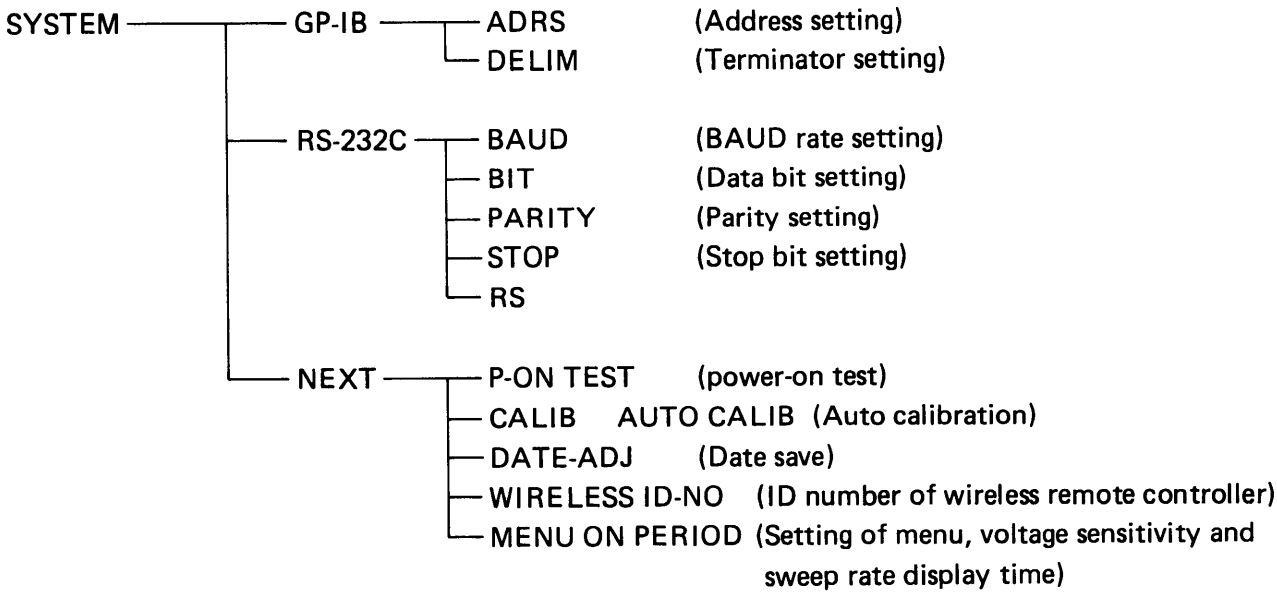
- **Menu Tree**

STORAGE MODE (only for STORAGE)
- AVG (Averaging)
- MAX - HOLD (Maximum holding)
- ENV (Envelope)
- EQ - SAMPL (Equivalent sample)
- ROLL (Roll)
- CH1 ADV (CH1 advance)
- MEM ADV (Memory advance)
- LENGTH (Recording length)
- VECTOR (Vector)
- INTPLT (Interpolate)
- SMOOTHING (Smoothing)

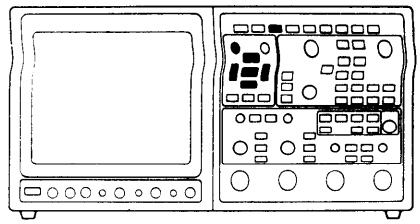
GO/NOGO (only for STORAGE)
- EXECUTE (Execution)
- EXIT (Cancel)
- GO/NOGO RANGE
  - Cursor - Cursor
  - Waveform - Cursor
  - Measured value
    - Time
    - Voltage
- STORAGE STOP (Storage stop)
- PLOT OUT (Plotter output)
- DATA SAVE (Data save)

COPY (only for STORAGE)
- DUMMY PLOT (Plotting position check)
- PLOTTER OUT EXECUTE (Plotting)
- XY - RECORDER (XY-recorder write)


MEASUREMENT
DVM (DC) (DC voltage) (only for REAL)
COUNTER (Frequency) (only for REAL)
Δ V (Delta voltage)
V RATIO (Voltage ratio)
Δ t Δ 1/t (Time, frequency)
t-RATIO (Phase, frequency ratio)
Δ V Δ T (10 to 90%) (Rise, fall) (only for REAL)
Δ V Δ t (Voltage, time) (only for STORAGE)
V AT t (Voltage and time from a trigged point)(only for STORAGE)
WAVE PARAM (only for STORAGE)
AMPL (Amplitude)
P-P (Peak value)
f (Frequency)
PW (Pulse width)
tr (Rise)
tf (Fall)
CH1 → CH2 SKEW (SKEW)
SAVE/RECALL
SAVE
SETUP (Setup save)
WAVE DATA (Waveform data save) (only for STORAGE)
REF (Waveform data save to REF memory) (only for STORAGE)
COMMENT (Comment save)
RECALL
SETUP
INT RAM (for STORAGE), MEMORY (for REAL) (Measuring conditions call)
DEFAULT (Initial conditions call)
LAST ACQ (Measuring conditions call on power off)
WAVE DATA (Waveform data call) (only for STORAGE)
COMMENT (Comment call)
DIR (EXIT) (file name and save time call)
DELETE (File deletion)
INIT (All file deletion)
COMMENT
COMMENT OFF ON CLEAR (Comment display ON/OFF deletion)
COMMENT EDIT (Comment save)

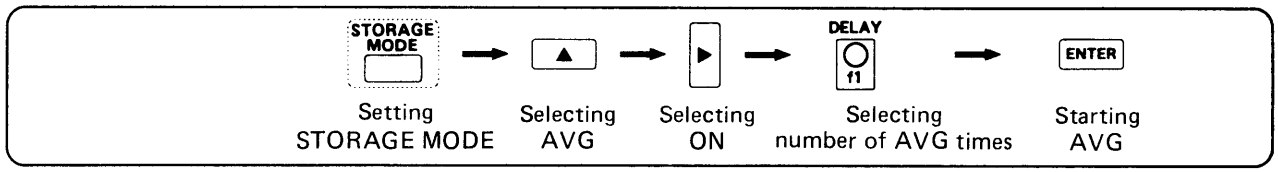

SYSTEM
GP-IB
ADRS (Address setting)
DELIM (Terminator setting)
RS-232C
BAUD (BAUD rate setting)
BIT (Data bit setting)
PARITY (Parity setting)
STOP (Stop bit setting)
RS
NEXT
P-ON TEST (power-on test)
CALIB AUTO CALIB (Auto calibration)
DATE-ADJ (Date save)
WIRELESS ID-NO (ID number of wireless remote controller)
MENU ON PERIOD (Setting of menu, voltage sensitivity and sweep rate display time)

AVG

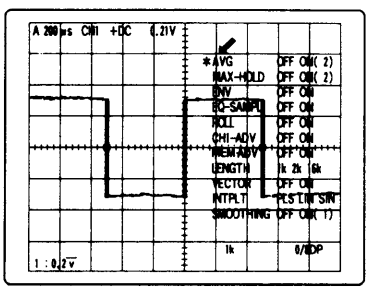


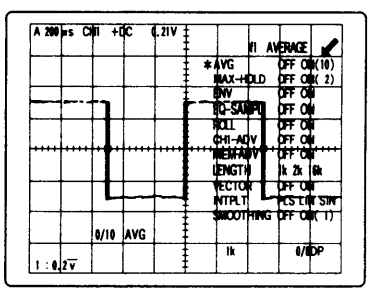
Allows you to reduce random noise superimposed on regular signal. The number of averaging times contributes to the amount of reduction in noise. If noise is large in comparison with signal, the number of averaging times should be increased for improved efficiency, requining much measuring time.

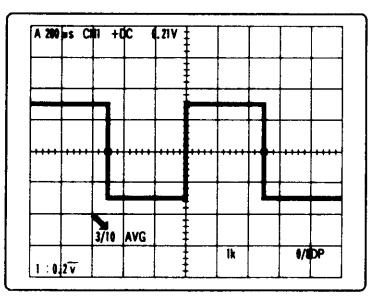
♦ Key operation



♦ Operating procedure







◇ **When wxecuting AVG:**

① Press the STORAGE MODE key and set STORAGE MODE.

② Press the ▲ key and select AVG.
- The "*" mark appears at the head of AVG.

③ Press the ▶ key and select ON.
- Brightness of "ON" character is intensified.

④ Turn the DELAY f1 control and select the number of AVG times.
- The left figure shows an example for selecting 10 as the number of AVG times.

⑤ Press the ENTER key to erase the menu screen and initiate AVG.
- The number of times specified and that being executed appear at the lower left corner of the screen along with the execution process of AVG.

◇ **When ending AVG:**

① Press the STORAGE MODE key and set STORAGE MODE.

② Press the ◀ key and select OFF.

◇ **When erasing the menu screen:**

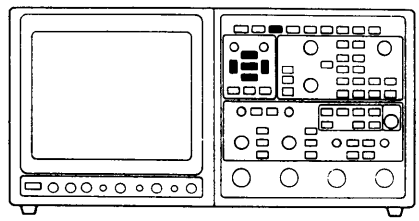
① Press the STORAGE MODE key.

One-point advice

- AVG cannot be used along with MAX-HOLD, EVN, or ROLL.
- Select 2k or less for LENGTH (recording length) when AVG is selected.
- The AVG times range from 2 to 256.
- The AVG is moving average.
- Press the STOP SGL key to suspend AVG.
- Press the AUTO LVL, AUTO, or NORM key to restart AVG.

3.28 STORAGE MODE
(only for STORAGE)

MAX-HOLD

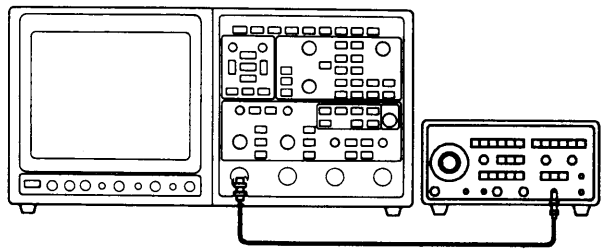


MAX-HOLD repeats sweeping by the number of times specified by the MAX-HOLD times and repeats and displays the maximum and minimum values at the same position of waveform generated up to the final specified times. It is optimal for observing noise generated abruptly within signal waveform.

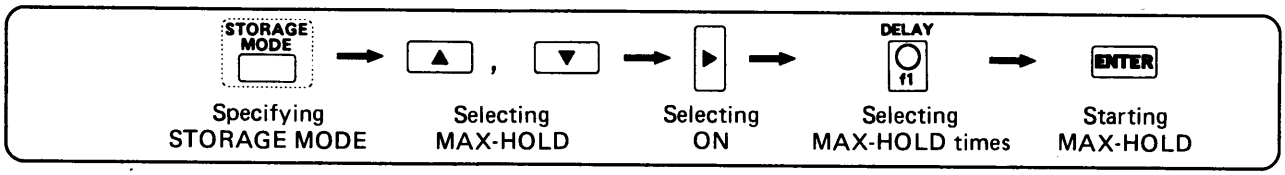
♦ **Preliminary setup**

Apply a triangular waveform to CH1 from a signal generator (for example, FG-350).

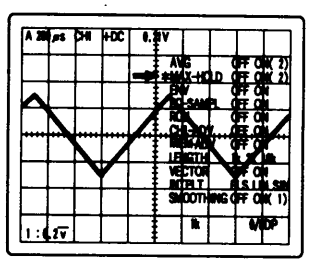
Frequency : 1 kHz
Output voltage : 0.6 Vp-p

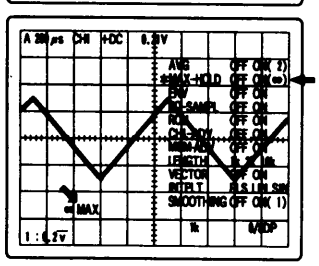


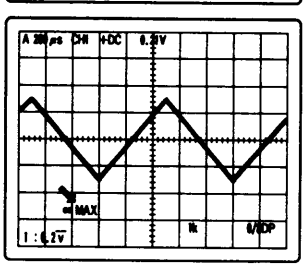
♦ **Key operation**



♦ **Operating procedure**







◇ **When executing MAX-HOLD:**

① Press the STORAGE MODE key and specify STORAGE MODE.

② Press the ▲ or ▼ key and select MAX-HOLD.
- The "*" mark appears at the head of MAX-HOLD.

③ Press the ▶ key and select ON.
- Brightness of "ON" character is intensified.

④ Turn the DELAY f1 control and select the number of MAX/HOLD times.
- The left figure shows an example for selecting infinity as the number of MAX-HOLD times.
- The number of times specified and that being executed appear at the lower left corner of the screen. The MAX-HOLD execution process also appears.

⑤ Press the ENTER key and erase the menu screen and initiate MAX-HOLD.
- When the ∞ is selected even if you press the GND key to shut off the input signal, you can confirm that the display waveform can be held.

◇ **When ending MAX-HOLD:**

① Press the STORAGE MODE key to specify the STORAGE MODE.

② Press the ◀ key to select OFF.

◇ **When erasing the menu screen:**

① Press the STORAGE MODE key.

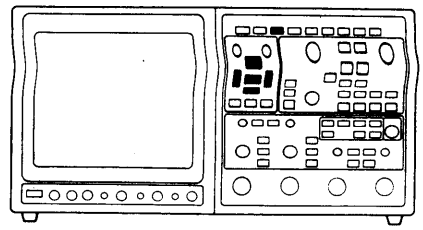
One-point advice

- MAX-HOLD cannot be used along with AVG or ROLL.
- The selectable MAX-HOLD times range from 2 to 255 and infinity.
- Press the STOP SGL key to suspend MAX-HOLD.
- Press the AUTO LVL , AUTO , or NORM key to restart MAX-HOLD.

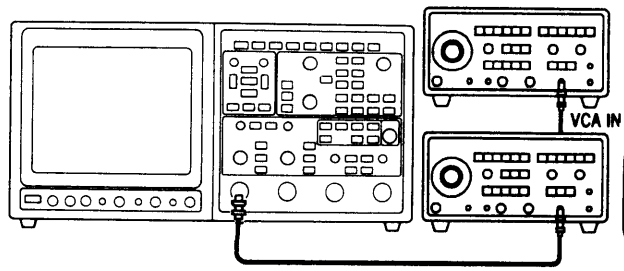
3.28 STORAGE MODE (only for STORAGE)

ENV

STORAGE MODE



Allows you to detect the glitch, to observe AM modulation waveform and to avoide aliasing. The maximum and minimum values of the observed signal are detected alternately, and both are displayed on the screen.

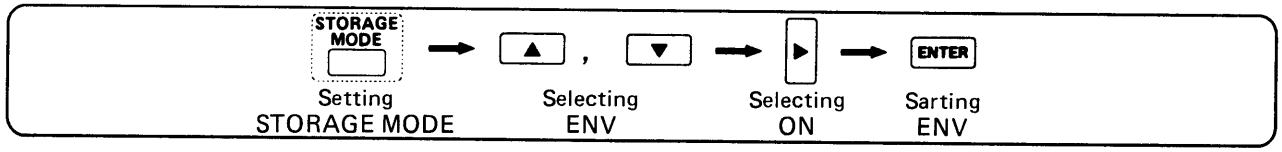


♦ **Preliminary setup**

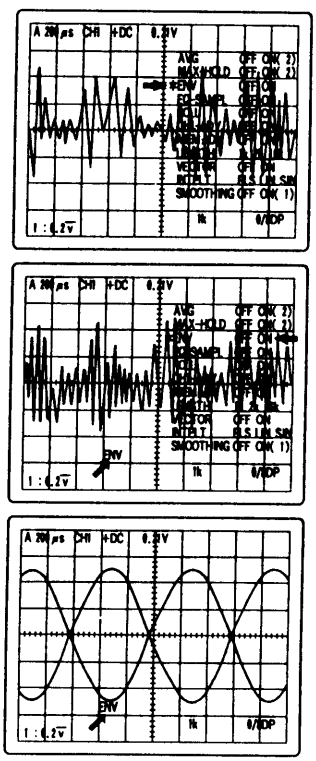
Apply AM modulation waveform to CH1 from a signal generator (for example, FG-350).

Carrier signal frequency : 20 kHz
Modulation signal frequency : 1 kHz

♦ **Key operation**



♦ **Operating procedure**



◇ **When executing ENV:**

① Press the STORAGE MODE key and set STORAGE MODE.

② Press the ▲ or ▼ key and select ENV.
- The "*" mark appears at the head of ENV.

③ Press the ▶ key and select ON.
- Brightness of "ON" character is intensified.

④ Press the ENTER key to erase the menu screen and start ENV.

◇ **When ending ENV:**

① Press the STORAGE MODE key and set STORAGE MODE.

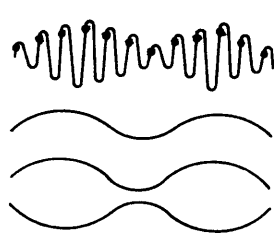
② Press the ◀ key and select OFF.

◇ **When erasing the menu screen:**

① Press the STORAGE MODE key.

One-point advice

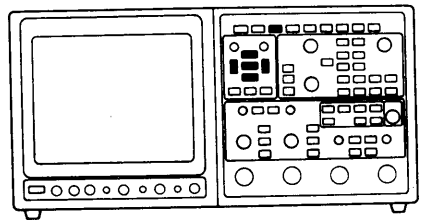
- If the aliasing signal frequency exceeds 1/2 of the sampling frequency, a seemingly genuine signal may occur (right figure).
- Its use along with VECTOR allows the portion between dots to be displayed in a straight line for better viewing.



3.28 STORAGE MODE
(only for STORAGE)

EQ-SAMPL

STORAGE MODE



EQ-SAMPL (equivalent sampling) is valid for observing a high-speed signal. The signal to be observed must be repetitive, and a seeming sampling rate can be increased (equivalent to 20 GSPS max.) as compared with the method for recording (sampling) a normal one-shot signal.

3

♦ **Preliminary setup**

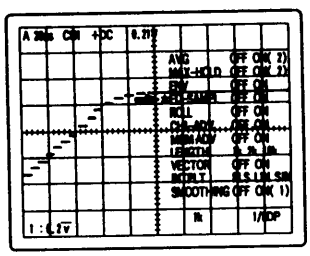
- Turn the SEC/DIV SLOW FAST control and select the sweep time within the range on the right. 10ns to 500ns/div.

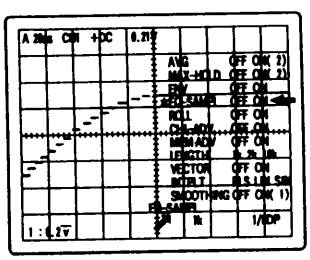
♦ **Key operation**

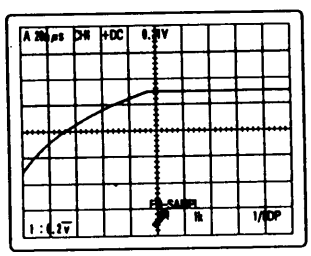
STORAGE MODE → ▲ , ▼ → ▶ → ENTER

Setting STORAGE MODE — Selecting EQ-SAMPLE — Selecting ON — Starting EQ-SAMPLE

♦ **Operating procedure**







◇ **When executing EQ-SAMPL:**

① Press the STORAGE MODE key and set STORAGE MODE.

② Press the ▲ or ▼ key and select EQ-SAMPLE.
- The "*" mark appears at the head of EQ-SAMPLE.

③ Press the ▶ key and select ON.
- Brightness of "ON" character is intensified, and EQ-SAMPLE appears at the bottom of the screen.

④ Press the ENTER key to erase the menu screen and initiate EQ-SAMPLE.

◇ **When ending EQ-SAMPLE:**

① Press the STORAGE MODE key and set STORAGE MODE.

② Press the ◀ key and select OFF.

◇ **When erasing the menu screen:**

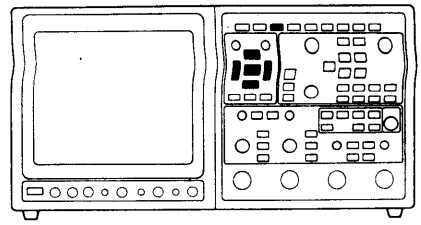
① Press the STORAGE MODE key.

One-point advice · You cannot use AVG along with ENV, CH1-ADV or MEM-ADV.
· Select the A sweep when select EQ-SAMPLE.

3.28 STORAGE MODE
(only for STORAGE)

ROLL

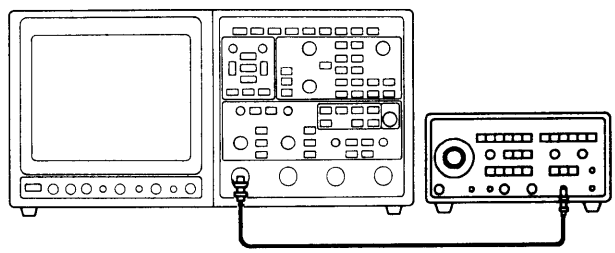
STORAGE MODE



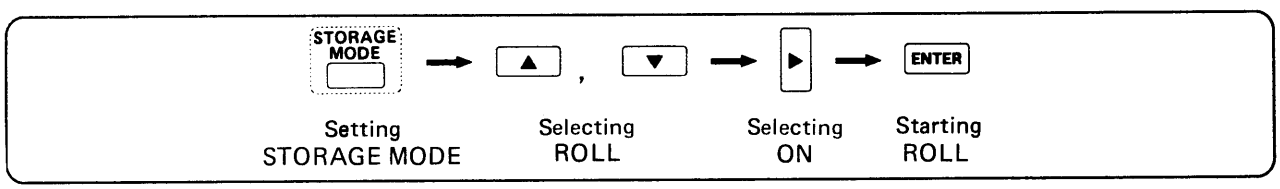
If the sweep rate becomes low, it takes long to record a new waveform and then display it. The ROLL allows a waveform to be displayed while rerecording it. You can confirm the change in waveform without waiting for time to rerecord it.

♦ **Preliminary setup**

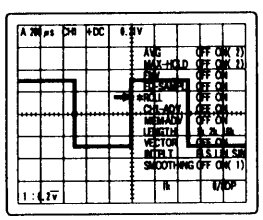
- Turn the SEC/DIV SLOW FAST control to select the sweep time within the range listed on the right: 100 ms to 500 ms/div
- Select 1 k for the LENGTH (recording length).
- Apply a rectangular waveform from a signal generator (for example, FG-350) to CH1.
  Frequency : 10 Hz
  Output voltage : 0.6 V

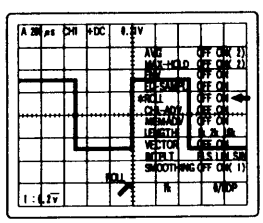


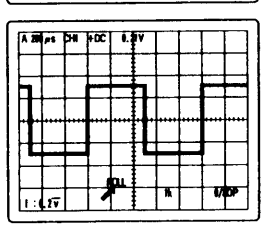
♦ **Key operation**



♦ **Operating procedure**







◇ **When executing ROLL:**

① Press the STORAGE MODE key and set STORAGE MODE.

② Press the ▲ or ▼ key and select ROLL.
- The "*" mark appears at the head of ROLL.

③ Press the ▶ key and select ON.
- Brightness of "ON" character is intensified.

④ Press the ENTER key and erase the menu screen and initiate ROLL.
- Waveform is written into a new one, being shifted to the left.

♦ **When ending ROLL:**

① Press the STORAGE MODE key and set STORAGE MODE.

② Press the ◀ key and select OFF.

♦ **When erasing the menu screen:**

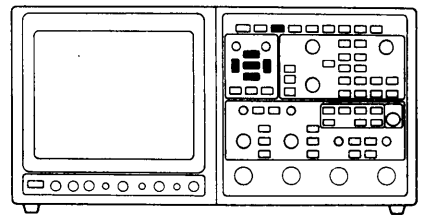
① Press the STORAGE MODE key.

One-point advice

- You cannot use ROLL along with AVG, MAX-HOLD, ENV, CH1-ADV, MEM-ADJ and EVENT.

3.28 STORAGE MODE
(only for STORAGE)

CH1-ADV



CH1-ADV divides signal input to the CH1 into the CH1 and CH2 memories and then records it. Arming is activated by signal of A trigger and recording to the CH1 memory starts by the first signal of B trigger and that to the CH2 memory starts by the next signal. If the recording is not made ready yet to the CH2 memory until the second B trigger is generated, arming is activated again by the signal of A trigger, and signals are recorded onto the CH1 memory with the second B trigger generated after that. It is convenient for comparing the cause and result of phenomena which occurred in the same signal line.

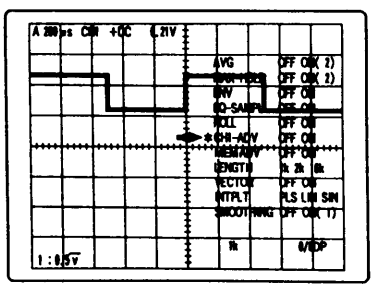
3

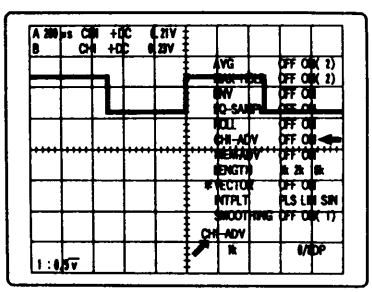
♦ Key operation

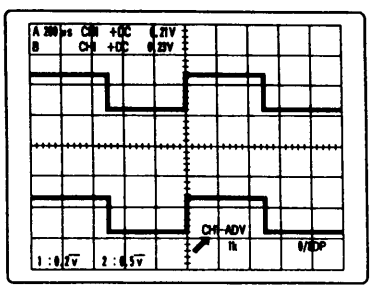
STORAGE MODE → ▲, ▼ → ▶ → ENTER

Setting STORAGE MODE	Selecting CH1-ADV	Selecting ON	Starting ROLL

♦ Operating procedure







◇ **When executing CH1-ADV:**

① Press the STORAGE MODE key and set STORAGE MODE.

② Press the ▲ or ▼ key and select CH1-ADV.
- The "*" mark appears at the head of CH1-ADV.

③ Press the ▶ key and select ON.
- Brightness of "ON" character is intensified.

④ Press the ENTER key and erase the menu screen and initiate CH1-ADV.

◇ **When displaying CH1 and CH2 data:**

① Press the REF1 CH1 key and REF2 CH2 key to set CH1 and CH2.

② Press the STOP SGL key and set STOP.

◇ **When ending CH1-ADV:**

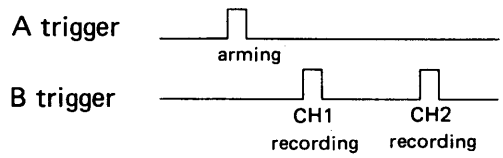
① Press the STORAGE MODE key and set STORAGE MODE.

② Press the ◀ key and select OFF.
- No CH1-ADV is recorded during display.

◇ **When erasing the menu screen:**

① Press the STORAGE MODE key.

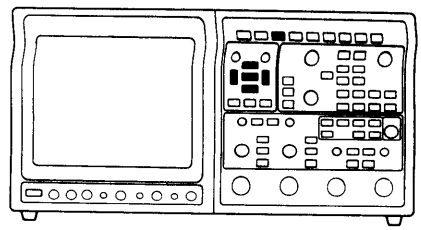
One-point advice · Recording waveform and timing of A and B triggers (right figure).
· If you set CH1-ADV, SWEEP MODE is automatically turned to NORM.



3.28 STORAGE MODE
(only for STORAGE)

MEM-ADV

STORAGE MODE



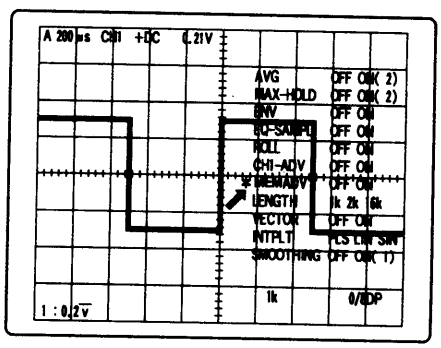
Records data successively into the divided memory block every time the digital storage scope is triggered. When the 1k LENGTH (record length) is selected, 16 waveforms can be recorded per channel, while 8 waveforms at 2k LENGTH.

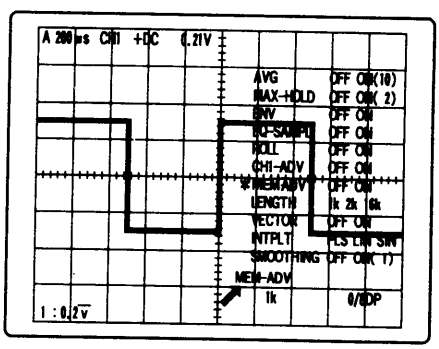
♦ **Key operation**

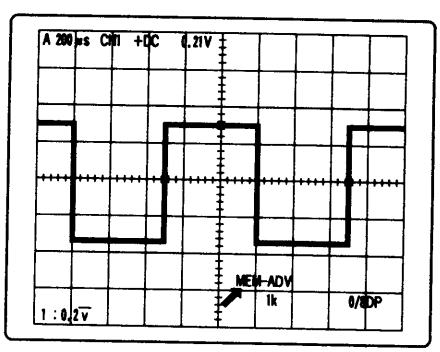
STORAGE MODE → ▲, ▼ → ▶ → ENTER

Setting STORAGE MODE — Selecting MEM-ADV — Selecting ON — Starting MEM-ADV

♦ **Operating procedure**







◇ **When executing MEM-ADV:**

① Press the STORAGE MODE key and set STORAGE MODE.

② Press either ▲ or ▼ key and select the MEM-ADV.

- The "*" mark appears at the top of the MEM-ADV.

③ Press the ▶ key and select ON.

- The brightness of "ON" characters is intensified.

④ Press the ENTER key and turn off the menu screen and start the MEM-ADV.

◇ **Screen display of recorded waveform**

⑤ Press the STOP SGL key and set the STOP.

⑥ Press the POSITION control and scroll waveform to bring up the measurement portion on the screen.

◇ **When ending MEM-ADV:**

① Press the STORAGE MODE key and set the STORAGE MODE.

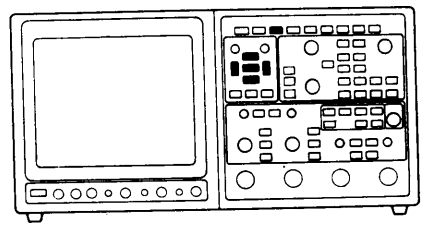
② Press the ◀ key and select OFF.

◇ **Turning off the menu screen:**

① Press the STORAGE MODE key.

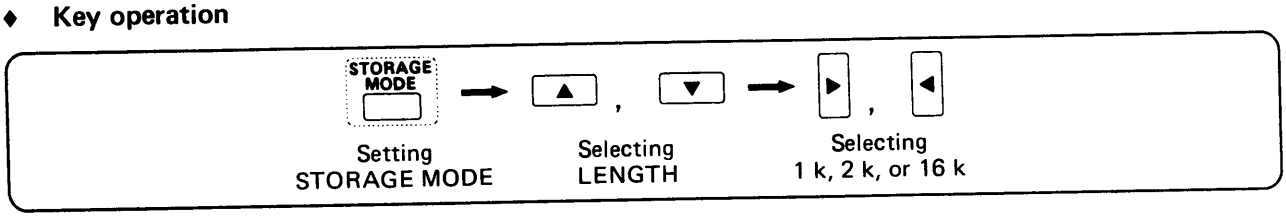
3.28 STORAGE MODE
(only for STORAGE)

LENGTH

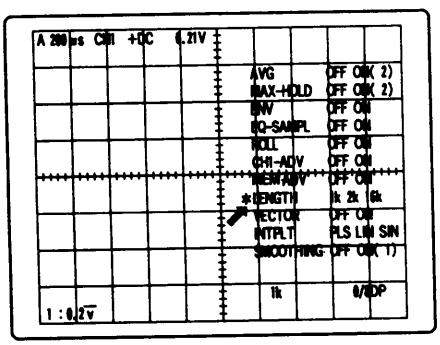


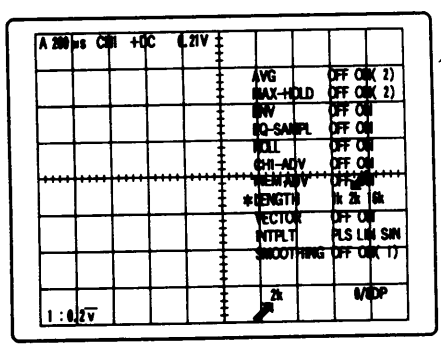
Allows to define the record length.
When the LENGTH is set longer, it takes longer to finish capturing signal, but this provides longer duration of the signal than in the shorter record length.

♦ **Key operation**



♦ **Operating procedure**





◇ **When executing LENGTH:**

① Press the STORAGE MODE key and set STORAGE MODE.

② Press either ▲ or ▼ key and select the LENGTH.
- The "*" mark appears at the top of the LENGTH.

③ Press other ◀ or ▶ key and select 1 k, 2 k, or 16 k.
- The brightness of "1 k", "2 k", or "16 k" characters is intensified.
- The left figure shows an example of "2 k".

④ Press the ENTER key and turn off the screen menu.

◇ **Screen when LENGTH is 2 k or 16 k:**

① Press the STOP SGL key and set the STOP.

② Press the POSITION control and scroll waveform to bring up the measurement portion on the screen.

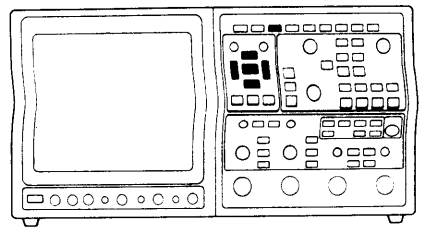
◇ **Turning off the menu screen:**

① Press the STORAGE MODE key.

One-point advice
- If you set ROLL, you cannot select 2k for LENGTH.
- If you set CH3, CH4 in AVG, ROLL, CH1-ADV, V MODE and ALT in HORIZ DISPLAY, you cannot select 16k for LENGTH.

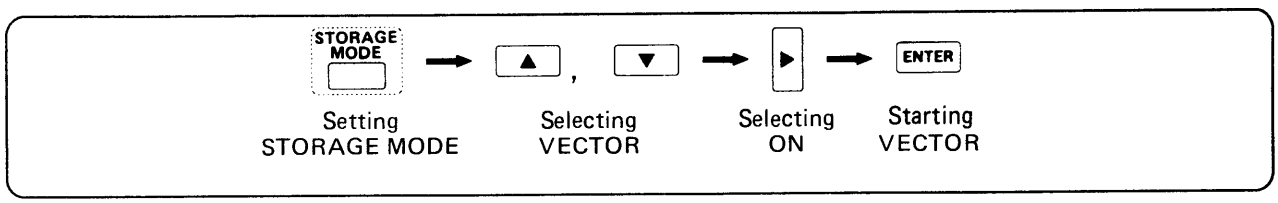
3.28 STORAGE MODE
(only for STORAGE)

VECTOR

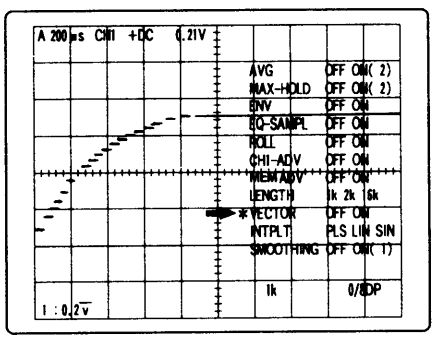


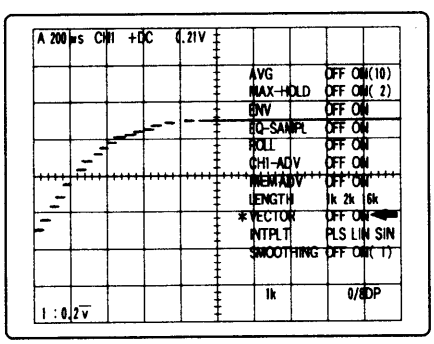
Allows to display the waveform with connecting lines between display data. This is especially useful when using MAX HOLD or ENV function, since the VECTOR shows more realistic waveform.

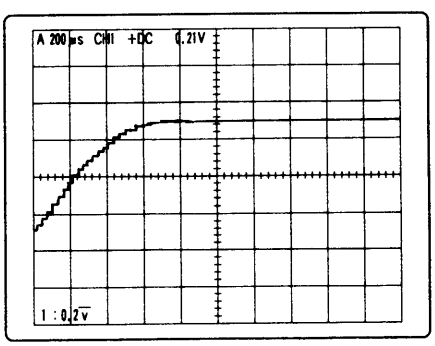
♦ **Key operation**



♦ **Operating procedure**







◇ **Executing VECTOR:**

① Press the STORAGE MODE key and set STORAGE MODE.

② Press either ▲ or ▼ key and select the VECTOR.

- The "*" mark appears at the top of the VECTOR.

③ Press the ▶ key and select ON.

- The brightness of "ON" characters is intensified.

④ Press the ENTER key and turn off the menu screen to initiate the VECTOR.

◇ **When ending VECTOR:**

① Press the STORAGE MODE key and set the STORAGE MODE.

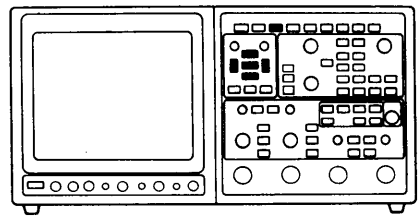
② Press the ◀ key and select OFF.

◇ **Turning off the menu screen:**

① Press the STORAGE MODE key.

3.28 STORAGE MODE (only for STORAGE)

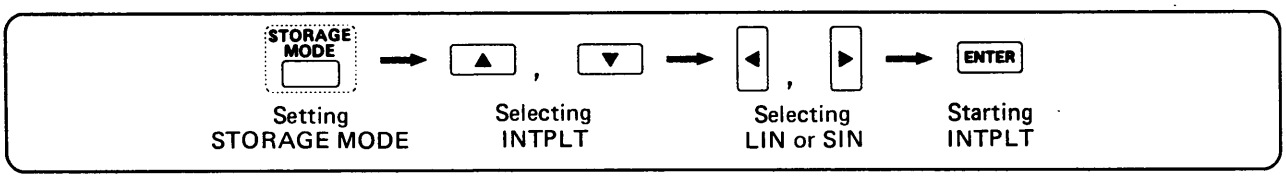
INTPLT



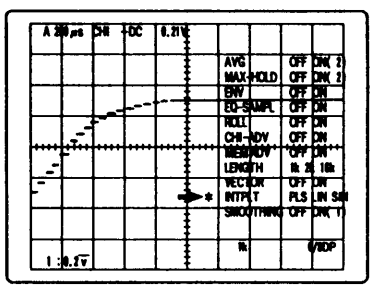
Adds computational data to the display waveform data when the display data are short to fulfill the screen area. The display data will be short when the waveform is magnified after capturing the signal or the signal is captured at the faster sweep rate. By using the LIN interpolation, the discrete data sampled are connected by the straight line. By using the SIN interpolation, the data are connected by the curved line. By using the PLS interpolation, the data are connected by the staircase line.

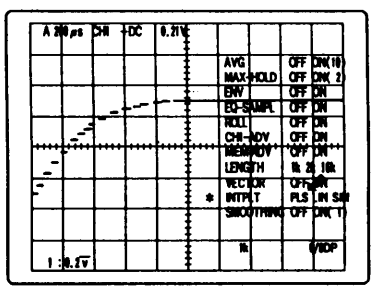
3

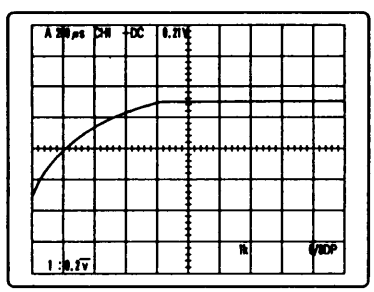
♦ Key operation



♦ Operating procedure







◇ **Executing INTPLT:**

① Press the STORAGE MODE key and set STORAGE MODE.

② Press either ▲ or ▼ key and select the INTPLT.

- The "*" mark appears at the top of the INTPLT.

③ Press the ▶ key and select either LIN or SIN.

- The brightness of "LIN" or "SIN" characters is intensified.
- The left figure shows that the LIN has been selected for INTPLT.

④ Press the ENTER key and turn off the menu screen to initiate the INTPLT.

◇ **When ending INTPLT:**

① Press the STORAGE MODE key and set the STORAGE MODE.

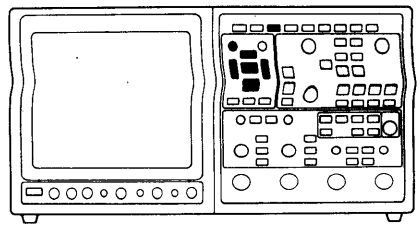
② Press the ◀ key and select PLS.

◇ **Turning off the menu screen:**

① Press the STORAGE MODE key.

One-point advice · The LIN may provide the optimum display in most cases. Select the SIN if your signal is sine wave. Select the PLS when the waveform with raw sampled data is required.

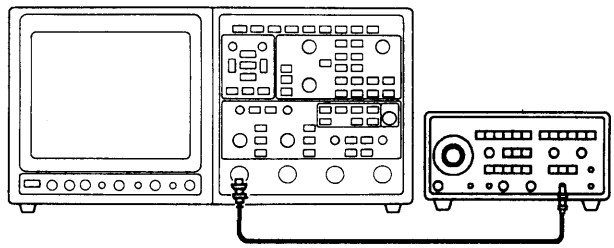
SMOOTHING



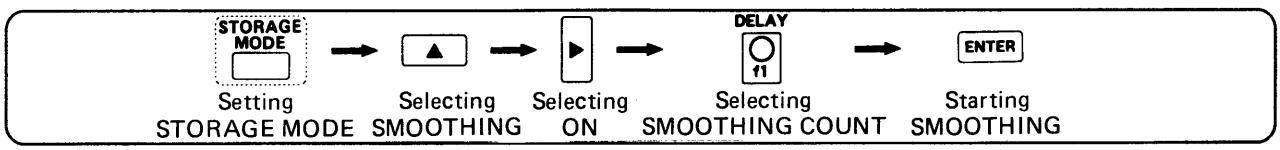
Reduces noise at capturing one-shot signal by using running average, which provides the average of the specified number of adjacent sample data in successive time at each horizontal address.

♦ **Preliminary operation**

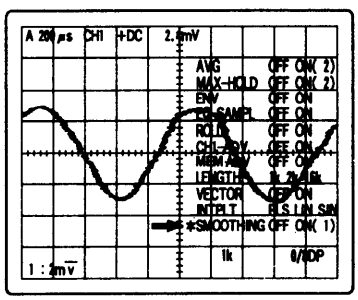
Input sinusoidal waveform of a signal generator (e.g., Iwatsu FG-350) to CH1.
Frequency : 1 kHz
Output voltage : 6 mVp-p

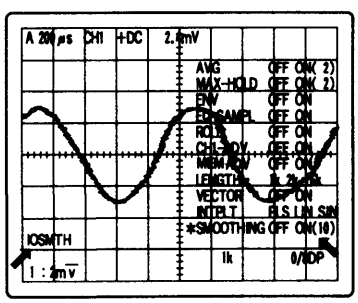


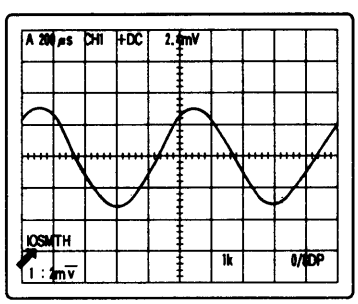
♦ **Key operation**



♦ **Operating procedure**







◇ **Executing SMOOTHING:**

① Press the STORAGE MODE key and set STORAGE MODE.

② Press either ▲ or ▼ key and select the SMOOTHING.
- The "*" mark appears at the top of the SMOOTHING.

③ Press the ▶ key and select ON.
- The brightness of "ON" characters is intensified.

④ Turn the DELAY f1 control and select the number of SMOOTHING.
- The specified number and the process of SMOOTHING being executed appear at the lower left corner of screen.
- The left figure shows an example of count 10.

⑤ Press the ENTER key and turn off the menu screen to initiate the SMOOTHING.

◇ **When ending SMOOTHING:**

① Press the STORAGE MODE key and set the STORAGE MODE.

② Press the ◀ key and select OFF.

◇ **Turning off the menu screen:**

① Press the STORAGE MODE key.

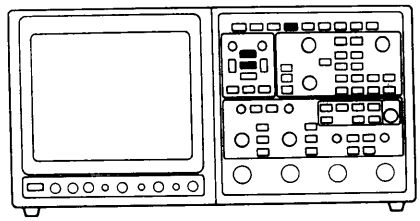
One-point advice

- The valid number for the smoothing is from 1 to 20.

3.29 GO/NOGO (only for STORAGE)

EXECUTE

GO/NOGO ENTER



Activates the GO/NOGO measurement. The NOGO output, which is activated when the signal enters into the NOGO limit area, is provided on the rear panel for the external instrument. The optional STRGSTP, PLOTOUT and DATASAVE functions will be executed when they are on.

♦ **Preliminary operation**

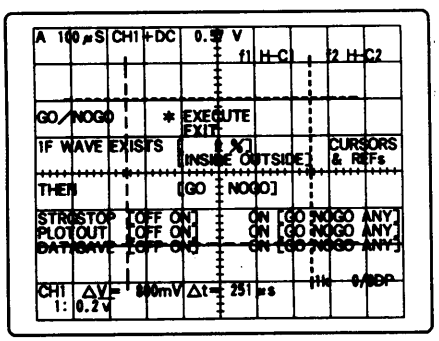
Set the range of GO/NOGO (Δv. Δt).

♦ **Key operation**

GO/NOGO → ▲ → ENTER

Setting GO/NOGO — Selecting GO/NOGO EXECUTE — Starting GO/NOGO

♦ **Operating procedure**



① Press the GO/NOGO key and set GO/NOGO.

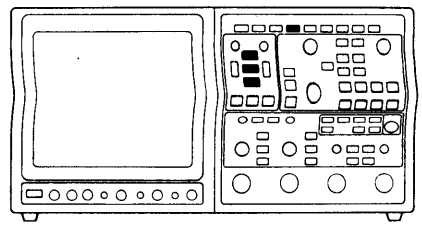
② Press the ▲ key and select the GO/NOGO EXECUTE.

- The "*" mark appears at the head of EXECUTE.

③ Press the ENTER key and turn off the menu screen to initiate GO/NOGO.

EXIT

GO/NOGO ENTER



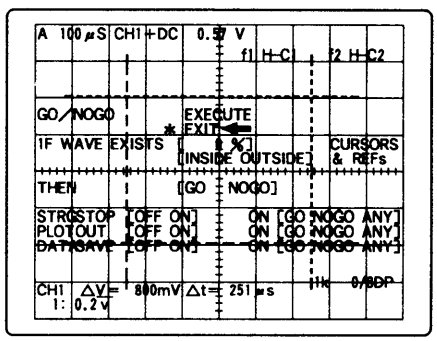
Quits the GO/NOGO measurement.

♦ **Key operation**

GO/NOGO → ▲, ▼ → ENTER

Setting	Selecting	Starting
GO/NOGO	GO/NOGO EXIT	GO/NOGO

♦ **Operating procedure**



① Press the GO/NOGO key and set GO/NOGO.

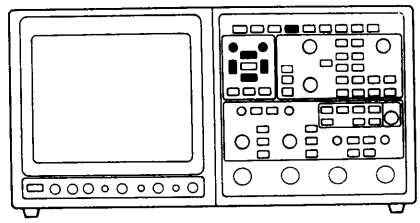
② Press the ▲ or ▼ key and select the GO /NOGO EXIT.

- The "*" mark appears at the top of EXIT.

③ Press the ENTER key and turn off the menu screen to quit GO/NOGO measurement.

3.29 GO/NOGO (only for STORAGE)

GO/NOGO RANGE CURSOR-CURSOR

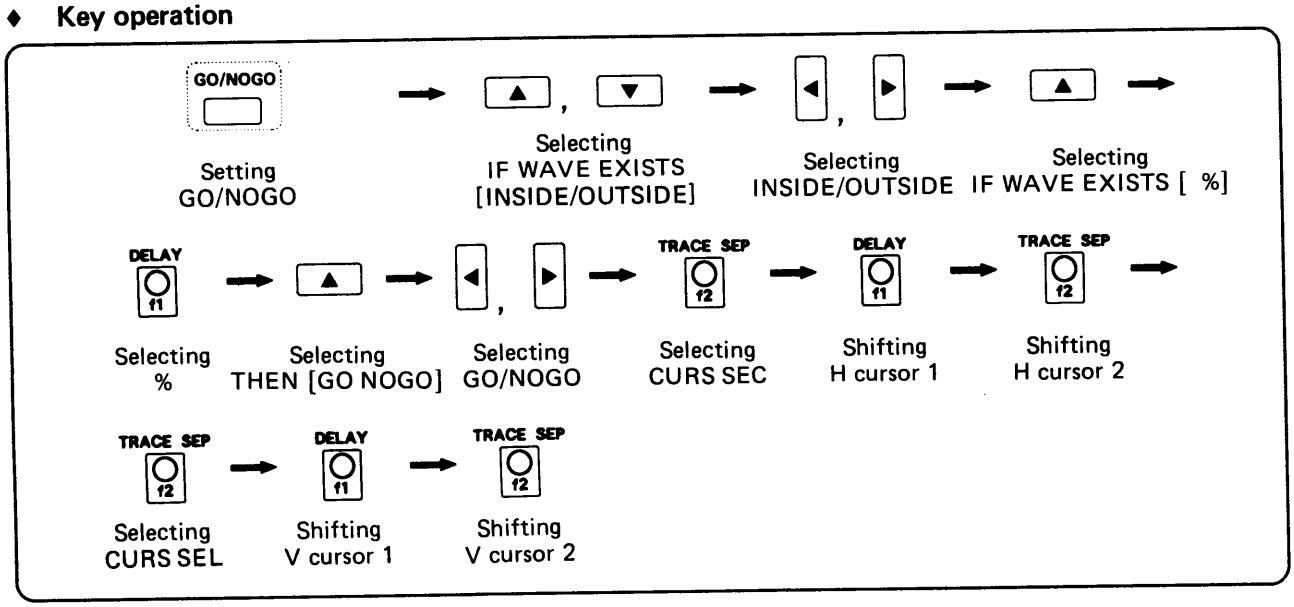


Allows to specify the limit area with cursors for the GO or NOGO decision of the input signal. The time cursors set the time window for the decision area, which is inside or outside the time cursor. The volt cursors set the vertical limit lines for the decision.

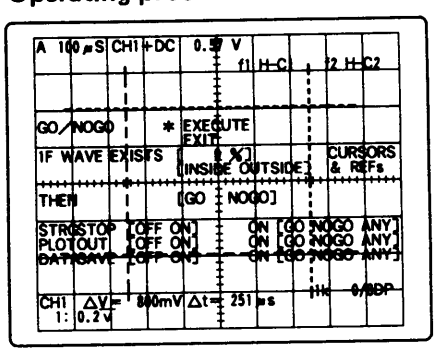
♦ **Preliminary operation**

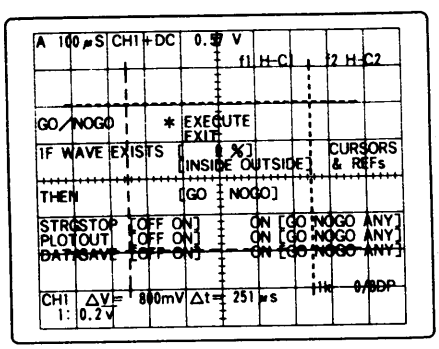
It is used to select ΔVΔ t of MEASUREMENT menu.

♦ **Key operation**



♦ **Operating procedure**





① Press the GO/NOGO key and set GO/NOGO.

② Press the ▲ or ▼ key and select the IF WAVE EXISTS [INSIDE/OUTSIDE].

- The "*" mark appears at the top of [INSIDE/OUTSIDE].

③ Press the ◀ or ▶ key and select INSIDE or OUTSIDE.

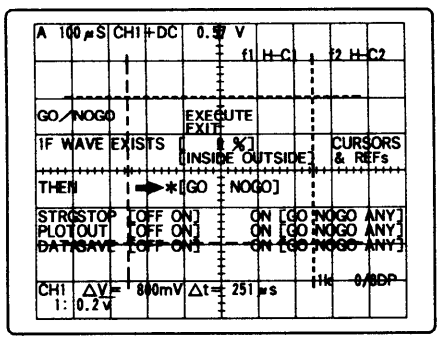
- The brightness of selected characters is intensified.

  INSIDE : sets the inside area enclosed by cursors to the decision area.

  OUTSIDE: sets the outside area of curors to the decision area.

④ Press the ▲ key and select the IF WAVE EXISTS [%].

- The "*"mark appears at the top of the [%].



⑤ Turn the DELAY f1 control and adjust percentage.

⑥ Press the ▼ and select the THEN [GO NOGO].

- The "*"appears at the top of the [GO NOGO].

⑦ Press the ◀ or ▶ key and select the GO or NOGO.

- The brightness of selected characters is intensified.

⑧ Press the TRACE SEP f2 control and select the H (Horizontal) cursor.

⑨ Turn the DELAY f1 control and shift the cursor 1 (¦) to the reference point.

⑩ Turn the TRACE SEP f2 control and shift the cursor 2 (¦) to the measuring point.

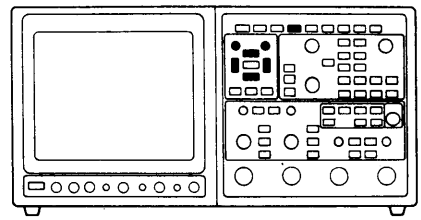
⑪ Press the TRACE SEP f2 control and select the V (Vertical) cursor.

⑫ Turn the DELAY f1 control and shift the cursor 1 (¦) to the reference point.

⑬ Turn the TRACE SEP f2 control and shift the cursor 2 (¦) to the measuring point.

One-point advice · The value of IF WAVE EXISTS [%] is the ratio between total data within the horizontal cursor at the decision area and tatal data within the vertical cursor at the decision area.

GO/NOGO RANGE CURSOR WAVEFORM

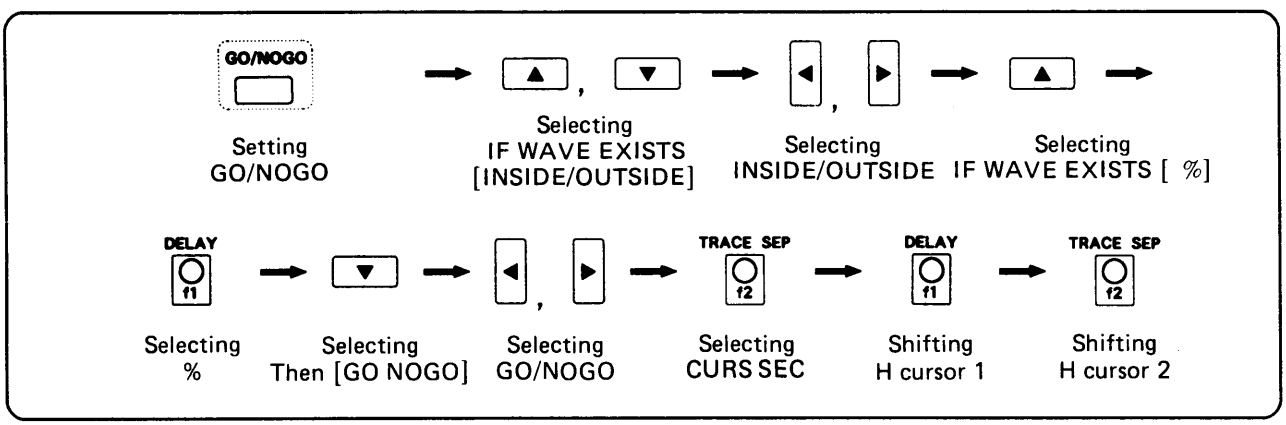


Allows to specify the limit area with cursors and waveforms from the REF memory for the GO or NOGO decision of the input signal. The time cursors set the time window for the decision area, which is inside or outside of the time cursor. The waceforms from the REF memory set the vertical limit lines for the decision.

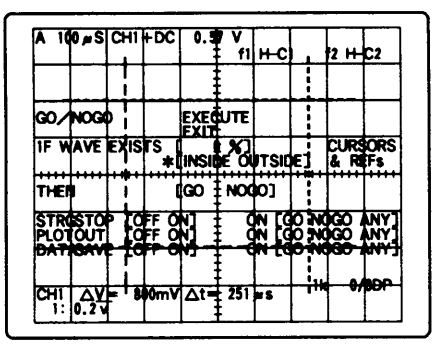
♦ **Preliminary operation**

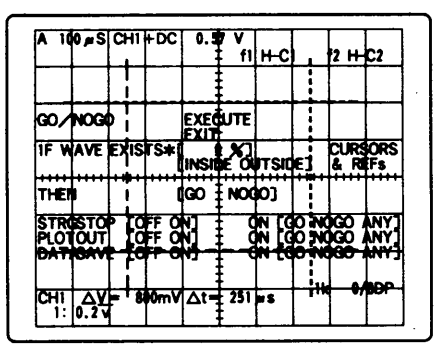
- Selects the Δt 1/Δt or t-RATIO of MEASUREMENT menu.
- Recalls the waveform saved in the REF memory.

♦ **Key operation**



♦ **Operating procedure**





① Press the GO/NOGO key and set the GO/NOGO.

② Press the ▲ or ▼ key and select the IF WAVE EXISTS [INSIDE OUTSIDE].

- The "*" mark appears at the top of [INSIDE /OUTSIDE].

③ Press the ◀ or ▶ key and select the INSIDE or OUTSIDE.

- The brightness of selected characters is intensified.

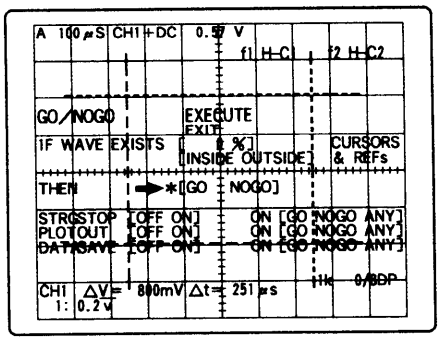
INSIDE : sets the inside area enclosed by cursors to the decision area.

OUTSIDE : sets the outside area of cursors to the decision area.

④ Press the ▲ key and select the IF WAVE EXISTS [%].

- The "*" mark appears at the top of the [%].

⑤ Turn the DELAY f1 control and adjust percentage.



⑥ Press the [▼] key and select the THEN [GO NOGO].

- The "*" appears at the top of the [GO NOGO].

⑦ Press the [◀] or [▶] key and select the GO or NOGO.

- The brightness of selected characters is intensified.

⑧ Press the TRACE SEP [f2] control and select the H (Horizontal) cursor.

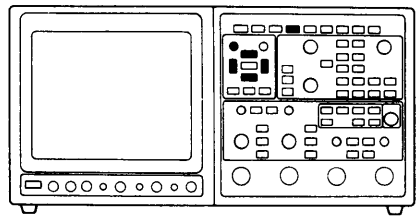
⑨ Turn the DELAY [f1] control and shift the cursor 1 (¦) to the reference point.

⑩ Turn the TRACE SEP [f2] control and shift the cursor 2 (¦) to the measuring point.

3

One-point advice · The value of IF WAVE EXISTS [%] is the ratio between total data within the horizontal cursor at the decision area and total data within the vertical cursor at the decision area.

GO/NOGO RANGE MEASUREMENT VALUE (TIME)

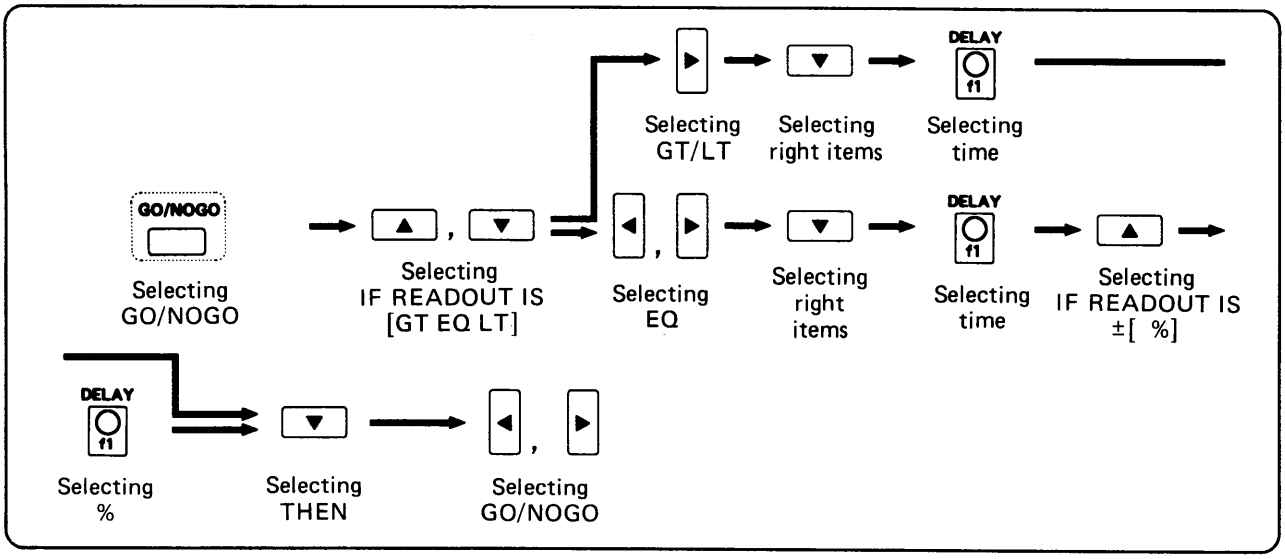


Allows to specify the limit measurement value for the GO or NOGO decision of the input signal. The limit measurement value is set on f(frequency), PW(pulse width), tr(rise time), tf(falling time), or CH1 → CH2 skew (time skew between CH1 and CH2).

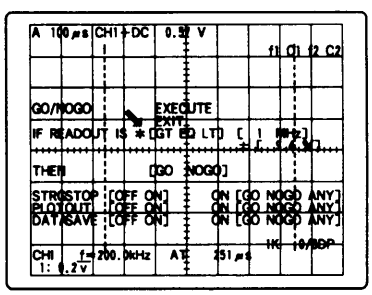
♦ **Preliminary operation**

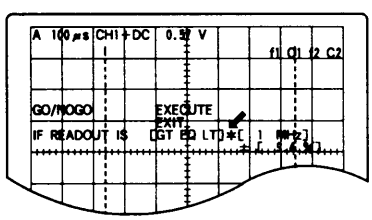
- Specifies the f, PW, tr, tf, or CH1 → CH2 SKEW of WAVE PARM of MEASUREMENT MENU.

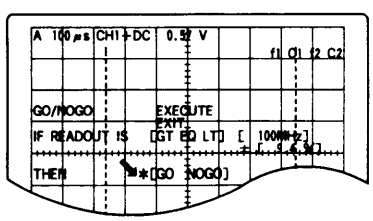
♦ **Key operation**



♦ **Operating procedure**







① Press the GO/NOGO key and specify the GO/NOGO.

② Press the ▲ or ▼ key and select the IF READOUT IS [GT EQ LT].

- The "*" mark appears at the head If [GT EQ LT].

③ Press the ◀ or ▶ key to select the GT (greater than), EQ (equal), or LT (less than).

- The brightness of selected characters is intensified.

④ Press the ▼ to shift the "*" mark to the row of right items.

⑤ Turn the DELAY f1 control to select time.

- Go to ⑧ when you select GO or EQ.
- The left figure shows an example where −3.15V is selected for voltage.

⑥ Press the ▼ key to select the IF READOUT IS ± [%].

- The "*" mark appears at the head of ± [ ].

⑦ Turn the DELAY f1 control to select %.

- The left figure shows an example where 9.4 is selected for %.

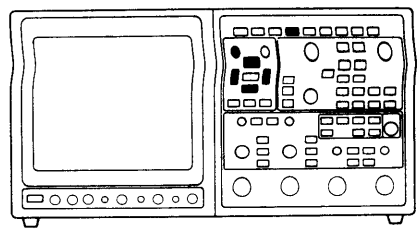
⑧ Press the ▼ key to select the THEN [GO NOGO].

- The "*" mark appears at the head of [GO NOGO].

⑨ Press the ◀ or ▶ key to select the GO or NOGO.

- The brightness of selected characters is intensified.

GO/NOGO RANGE MEASUREMENT VALUE (VOLTAGE)

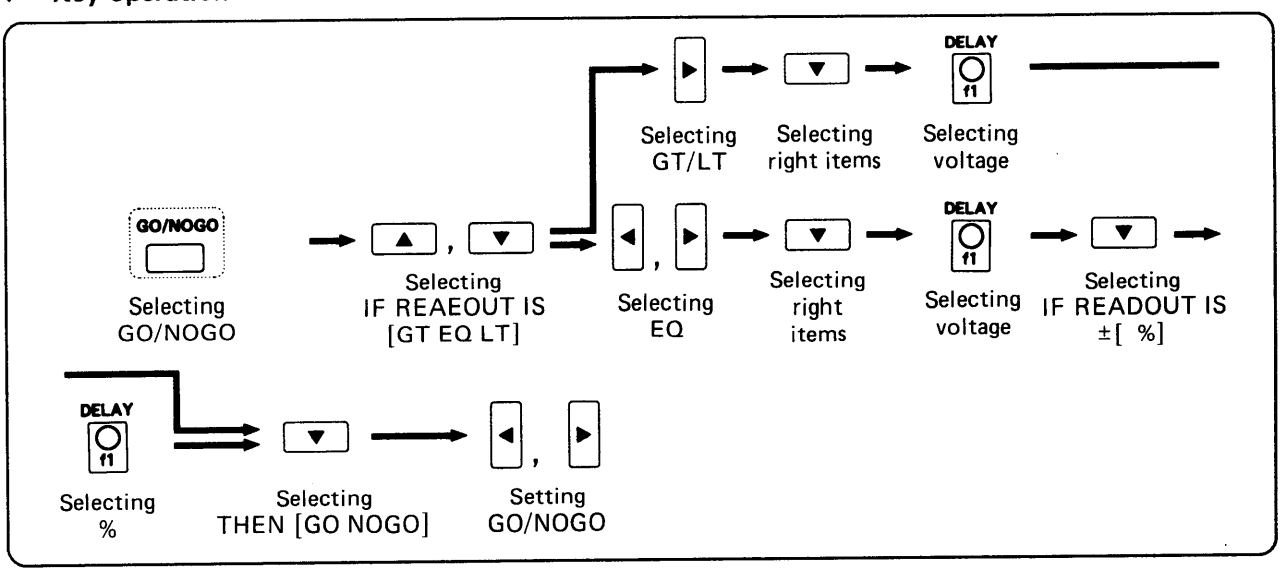


Sets the GO/NOGO decision range of input wave being based on the measurement result f V ATt, AMPL (amplitude), and P-P (total amplitude).

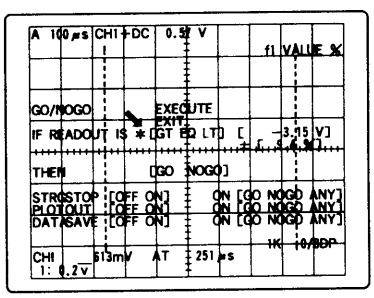
♦ **Preliminary operation**

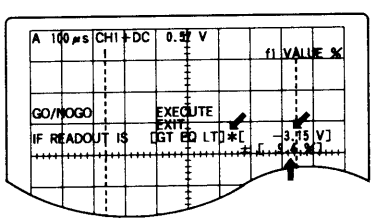
- Specifies the VATt, AMPL, or P-P of MEASUREMENT MENU.

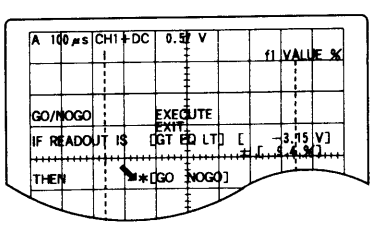
♦ **Key operation**



♦ **Operating procedure**







① Press the GO/NOGO key and set the GO/NOGO.

② Press the ▼ or ▲ key and select the IF READOUT IS [GT EQ LT].

- The "*" mark appears at the head of [GT EQ LT].

③ Press the ◀ or ▶ key to select the GT (greater than), EQ (equal), or LT (less than).

- The brightness of selected characters is intensified.

④ Press the ▼ to shift the "*" mark to the row of right items.

⑤ Turn the DELAY f1 control to select voltage.

- Go to ⑧ when you select GT or EQ.
- The left figure shows an example where -3.15V is selected for voltage.

⑥ Press the ▼ key to select the IF READOUT IS ± [%].

- The "*" mark appears at the head of ± [ ].

⑦ Turn the DELAY f1 control to select %.

- The left figure shows an example where 9.4 is selected for %.

⑧ Press the ▼ key to select the THEN [GO NOGO].

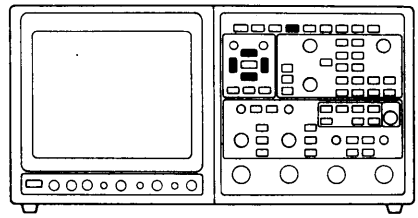
- The "*" mark appears at the head of [GO NOGO].

⑨ Press the ◀ or ▶ key to select the GO or NOGO.

- The brightness of selected characters is intensified.

3.29 GO/NOGO (only for STORAGE)

STRG STOP

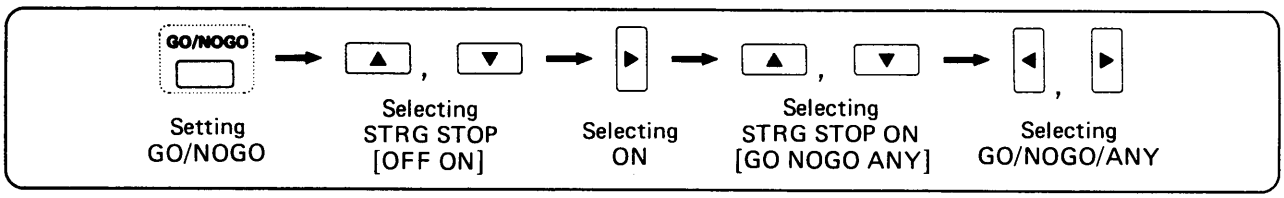


Allows to stop executing the GO/NOGO measurement if the GO or NOGO condition occurs, when the STRGSTOP is on.

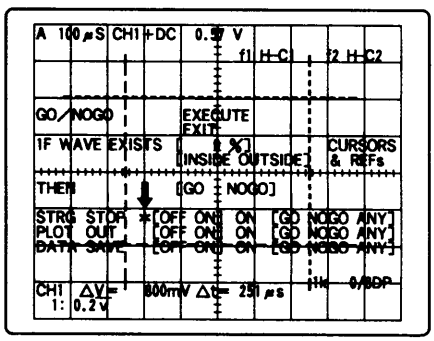
♦ **Preliminary operation**

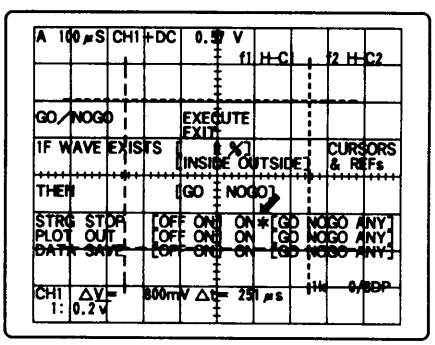
Specify the GO/NOGO range.

♦ **Key operation**



♦ **Operation procedure**





① Press the GO/NOGO key and specify the GO/NOGO.

② Press the ▼ or ▲ key and select the STRG STOP [OFF ON].

- The "*" appears at the top of [OFF ON].

③ Press the ▶ key and select ON.

- The brightness of "ON" characters is intensified.

④ Press the ▼ key and select the STRG STOP ON [GO NOGO ANY].

- THE "*" mark appears at the top of [GO NOGO ANY].

⑤ Press the ◀ or ▶ key and select the GO, NOGO, or ANY.

- The brightness of selected characters is intensified.

GO : allows to stop executing the GO/NOGO measurement when GO condition occurs.

NOGO : allows to stop executing the GO/NOGO measurement when NOGO condition occurs.

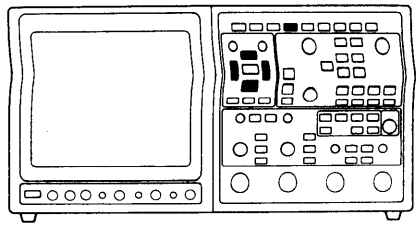
ANY : allows to stop executing the GO/NOGO measurement in any case.

◇ **When ending STRG STOP**

① Press the ▲ key and select the STRG STOP [OFF ON].

② Press the ◀ key and select OFF.

PLOT OUT

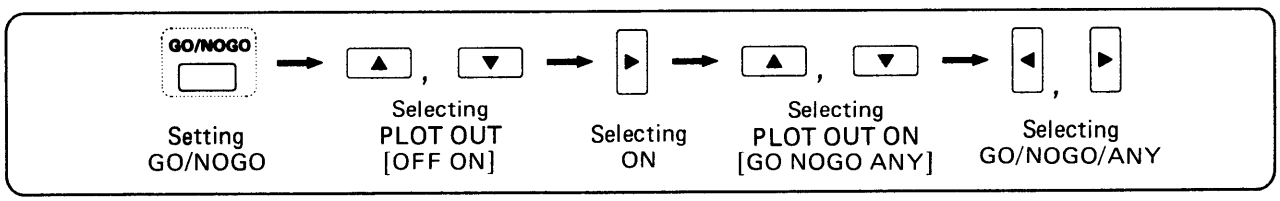


Allows to output the signal to the plotter if the GO or NOGO condition occurs, when the PLOTOUT is on. The GO/NOGO measurement is suspended while outputting the signal, and resumes at the end of drawing.

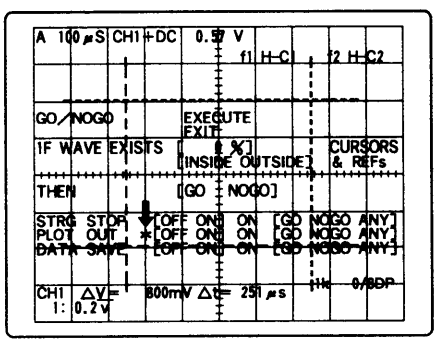
♦ **Preliminary operation**

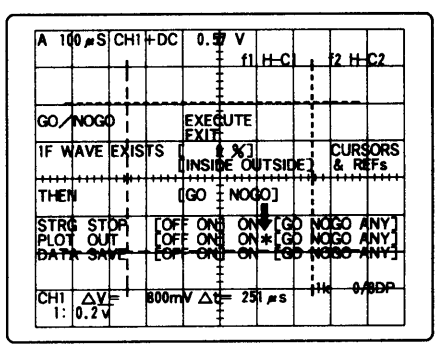
Specify the GO/NOGO range.

♦ **Key peration**



♦ **Operation procedure**





① Press the GO/NOGO key and set the GO/NOGO.

② Press the ▼ or ▲ key and select the PLOT OUT [OFF ON].

- The "*" appears at the top of [OFF ON].

③ Press the ▶ key and select ON.

- The brightness of "ON" characters is intensified.

④ Press the ▼ key and select the PLOT OUT ON [GO NOGO ANY].

- The "*" mark appears at the top of [GO NOGO ANY].

⑤ Press the ◀ or ▶ key and select the GO, NOGO, or ANY.

- The brightness of selected characters is intensified.

GO : allows to output the signal when GO condition occurs.

NOGO : allows to output the signal when NOGO condition occurs.

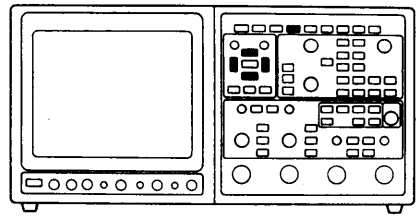
ANY : allows to output the signal in any case.

◇ **When ending PLOT OUT**

① Press the ▲ key and select the PLOT OUT [OFF ON].

② Press the ◀ key and select OFF.

DATA SAVE

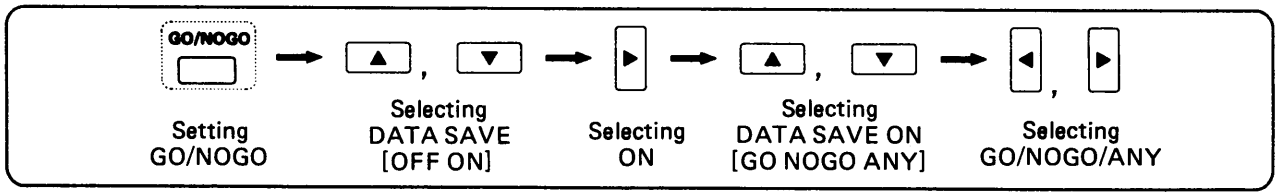


Allows to save the signal in the memory if the GO or NOGO condition occurs, when the DATASAVE is on.

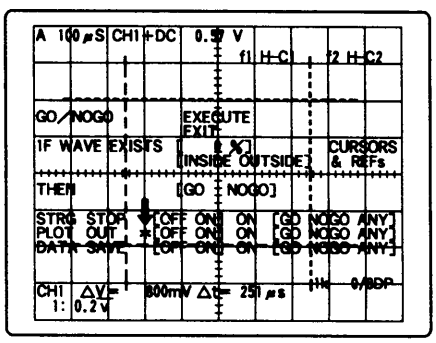
♦ **Preliminary operation**

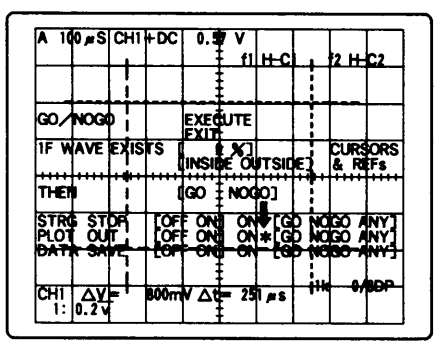
Specify the GO/NOGO range.

♦ **Key operation**



♦ **Operation procedure**





① Press the GO/NOGO key and set the GO/NOGO.

② Press the ▼ or ▲ key and select the DATA SAVE [OFF ON].

- The "*" appears at the top of [OFF ON].

③ Press the ▶ key and select ON.

- The brightness of "ON" characters is intensified.

④ Press the ▼ key and select the DATA SAVE ON [GO NOGO ANY].

- The "*" mark appears at the top of [GO NOGO ANY].

⑤ Press the ◀ or ▶ key and select the GO, NOGO, or ANY.

- The brightness of selected characters is intensified.

GO : allows to save the signal when GO condition occurs.

NOGO : allows to save the signal when NOGO condition occurs.

ANY : allows to save the signal in any case.

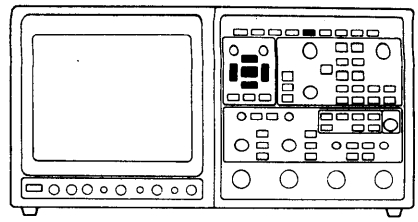
◇ **When ending DATA SAVE**

① Press the ▲ key and select the DATA SAVE [OFF ON].

② Press the ◀ key and select OFF.

DUMMY PLOT

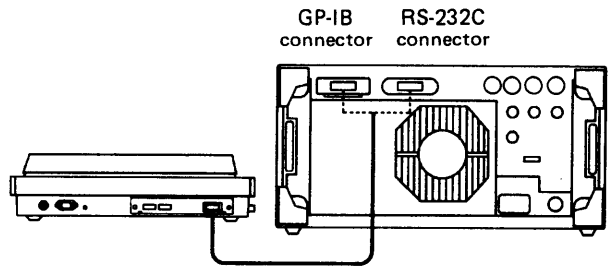
COPY ENTER



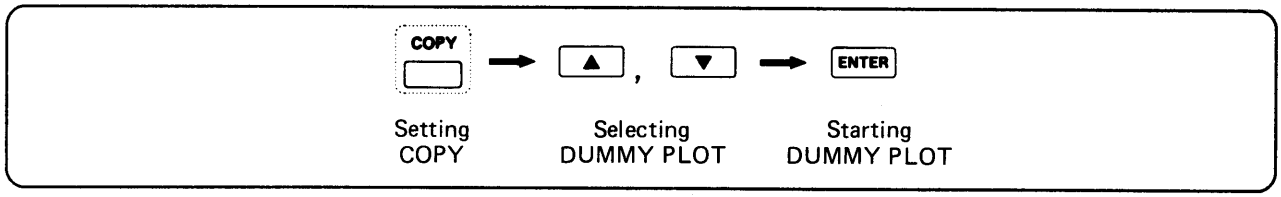
Allows to check the drawing area by outputting the upper right and lower left corner of the drawing area to the plotter.

♦ **Preliminary operation**

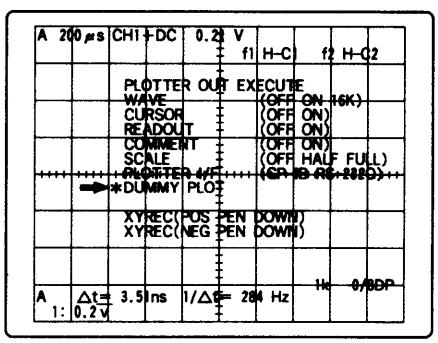
- Connect the GP-IB or RS-232C connector of DS -8623 to the plotter connector with a cable.

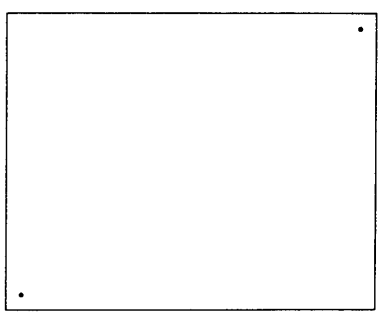


♦ **Key operation**



♦ **Operating procedure**





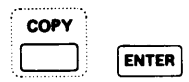
① Press the COPY key and set the COPY.

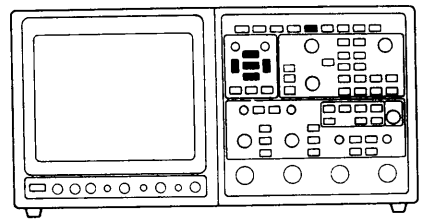
② Press the ▲ key or ▼ key and select the DUMMY PLOT.

- The "*" appears at the top of DUMMY PLOT.

③ Press the ENTER key and plot the upper right and lower left corner of drawing area.

PLOTTER OUT EXECUTE

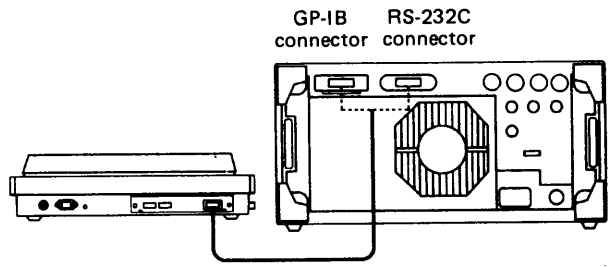




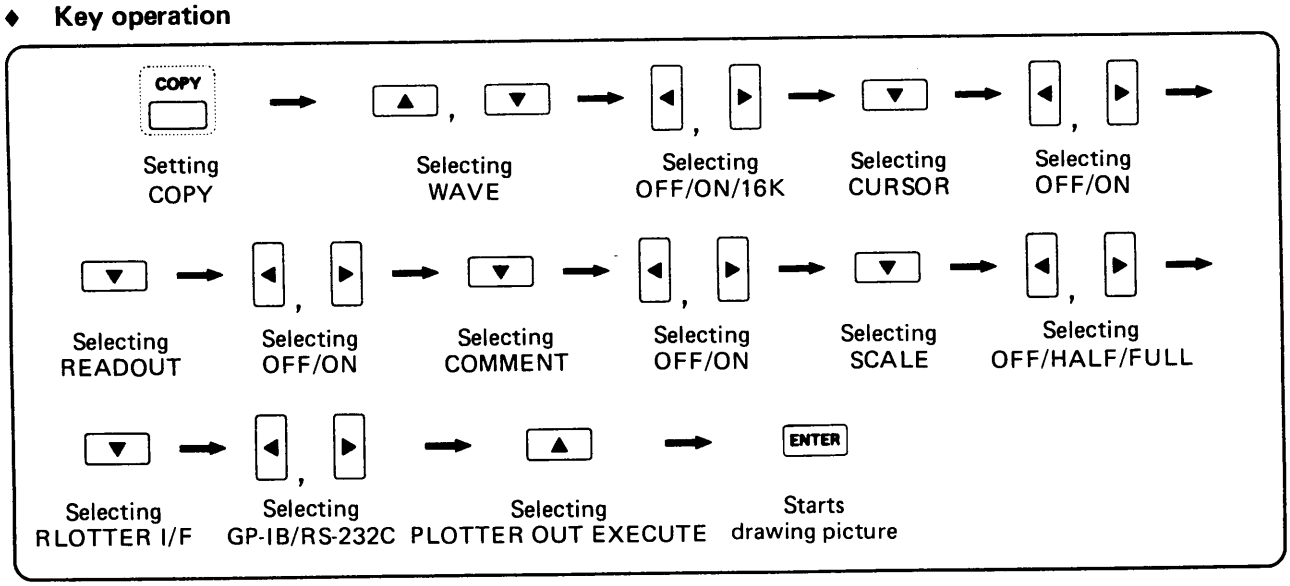
Allows to execute the drawing of the waveform display without controller or special program.

♦ Preliminary operation

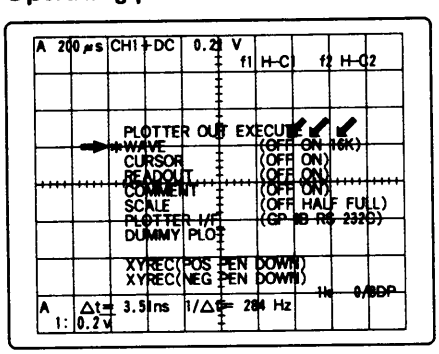
- Connect the GP-IB or RS-232C connector of DS -8623 to the plotter connector with a cable.



♦ Key operation



♦ Operating procedure



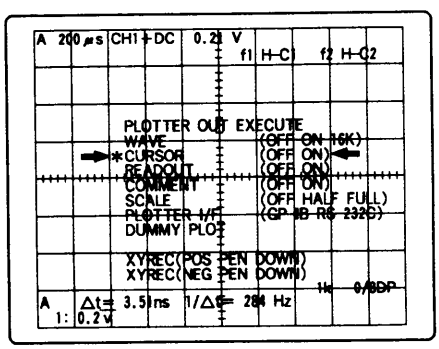
① Press the COPY key and set the COPY.

② Press the ▲ key or ▼ key and select the WAVE.

- The "*" appears at the top of WAVE.

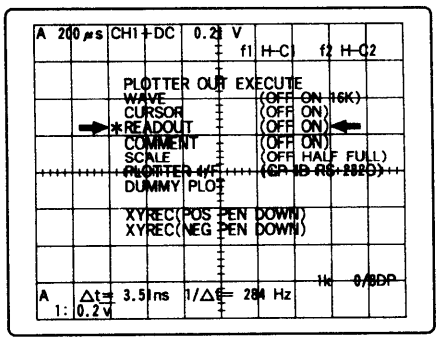
③ Press the ◀ or ▶ key and select the ON, OFF, or 16K.

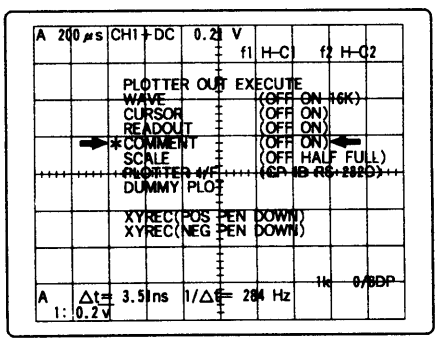
- The brightness of selected characters is intensified.
- Select the ON and start drawing.
- Select the 16K to draw the whole waveform of the 16K memory length.

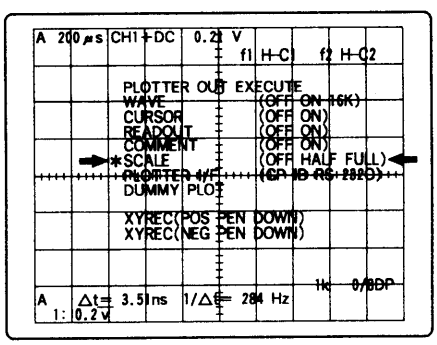


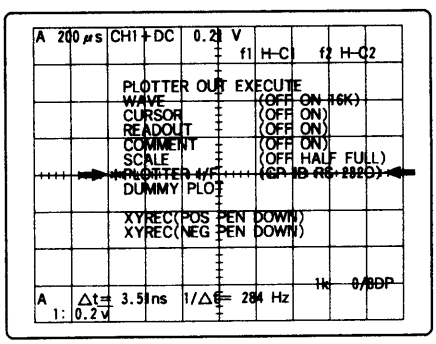
④ Press the ▼ key and select the CURSOR.

- The "*" appears at the top of CURSOR.
- The brightness of CURSOR is intensified.









⑤ Press the ◄ or ► key and select the ON or OFF.

- The brightness of selected characters is intensified.
- Selecting the ON enables to draw the cursors.

⑥ Press the ▼ key and select the READOUT.

- The "*" appears at the top of READOUT.

⑦ Press the ◄ or ► key and select the ON or OFF.

- The brightness of selected characters is intensified.
- Selecting the ON enables to draw the character readouts.

⑧ Press the ▼ key and select the COMMENT.

- The "*" mark appears at the top of COMMENT.

⑨ Press the ◄ or ► key and select the ON or OFF.

- The brightness of selected characters is intensified.
- Selecting the ON enables to draw the comment.

⑩ Press the ▼ key and select the SCALE.

- The "*" mark appears at the top of SCALE.

⑪ Press the ◄ or ► key and select the FULL, HALF, or OFF.

- The brightness of selected characters is intensified.

⑫ Press the ▼ key and select the PLOTTER I/F.

- The "*" mark appears at the top of PLOTTER I/F.

⑬ Press the ◄ or ► key and select the GP-IB or RS-232C.

- The brightness of selected characters is intensified.

⑭ Press the ▲ key and select the PLOTTER OUT EXECUTE.

- The "*" mark appears at the top of PLOTTER OUT EXECUTE.

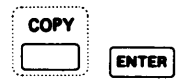
⑮ Press the ENTER key and start drawing.

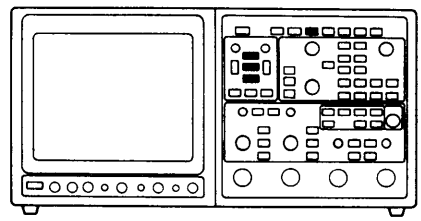
One-point advice

- The LENGTH must be selected to 16K for drawing 16K memory length by selecting 16K at WAVE.
- The drawing area for the whole waveform of the 16K memory length is wider than that for the normal drawing.
- When you select HALF at SCALE, only the voltage and time main axes and the frame are drawn.
- A waveform, a scale and a cursor may be drawn by a plotter in the position different from that where the waveform is displayed on the screen.

3.30 COPY (only for STORAGE)

XY-REC

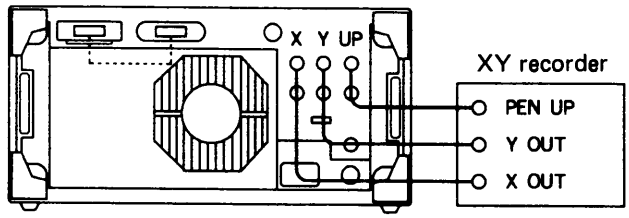




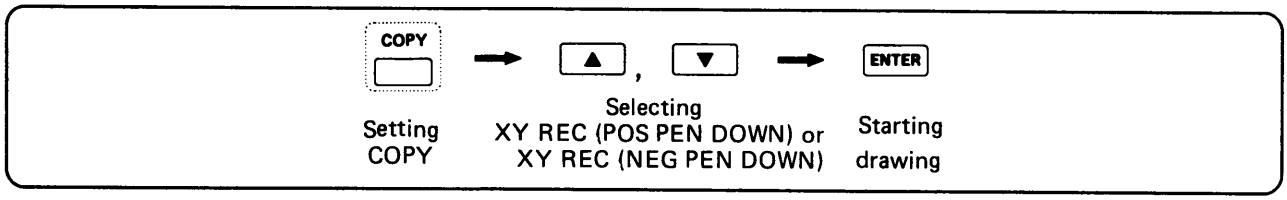
Draws picture using an XY recorder.

♦ **Preliminary setup**

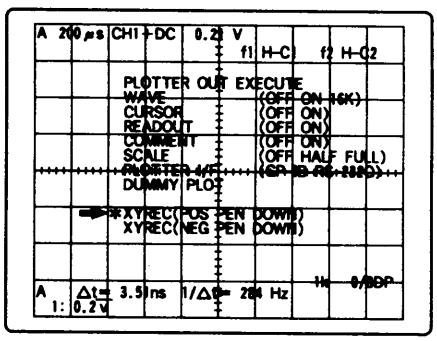
- Connects the X OUT, Y OUT, and PEN UP at the rear panel of DS-8623 to the X input, Y input, and PEN UP of XY recorder using a cable.



♦ **Key operation**



♦ **Operating procedure**



① Press the COPY key and set the COPY.

② Press the ▼ or ▲ key and set either the XYREC (POS PEN DOWN) or XYREC (NEG PEN DOWN).

- The "*" mark appears at the head of XYREC (POS PEN DOWN) or XYREC (NEG PEN DOWN).

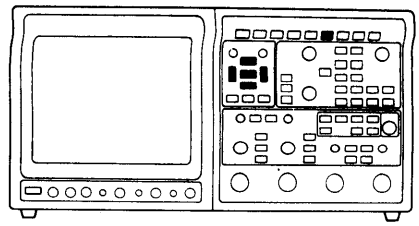
③ Press the ENTER key and start drawing using an XY recorder.

One-point advice

- When you select Full, the SCALE is drawn.
- When you select HALF to SCALE, only the voltage axis of SCALE, the center line of time axis, and the outer frame are drawn.
- When selecting 16K for WAVE, select 16K also for LENGTH.
- If you select 16K for WAVE, the screen for plotting appears sideways in A4 size.

3.31 Measurement
(only for REAL)

DVM (DC)

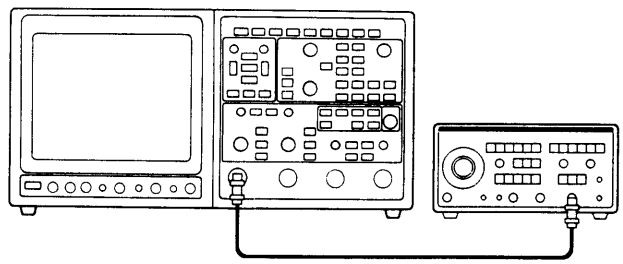


Activates the automatic DC voltage measurement of the CH1 INPUT.

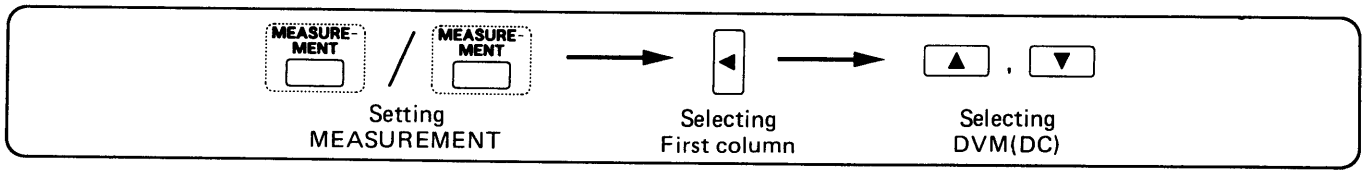
♦ **Preliminary setup**

Apply the DC voltage from the generator (e.g Iwatsu FG-350) to the CH1 input.

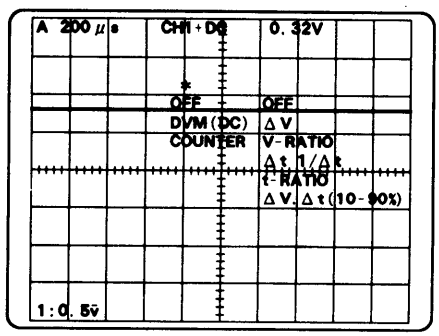
Function : DC
DC voltage : 0.8V

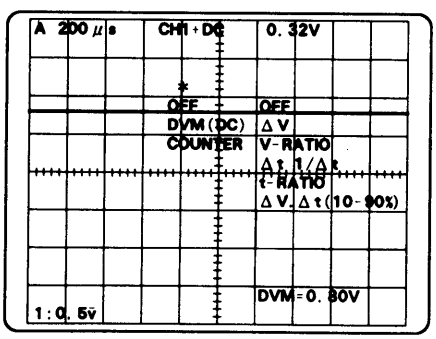


♦ **Key operation**



♦ **Operating procedure**





① Press the MEASURE-MENT key and set the MEASUREMENT menu.

② Press the ◄ key and select the first column.

- The selected column is indicated by the "*" mark at the top of the line.

③ Press the ▲ or ▼ key and select the DVM(DC).

- The selected function is indicated by the high intensity.
- The measurement result is displayed at the bottom-right corner of the screen.

◇ Pressing the MEASURE-MENT key turns the **MEASUREMENT** menu on and off.

◇ For quitting the **DVM(DC)** measurement:

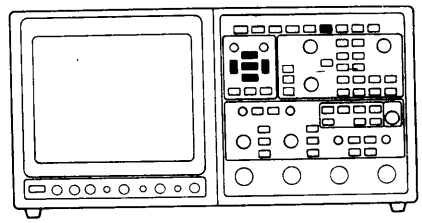
④ Press the ▲ key and select the OFF in the MEASUREMENT menu.

One-point advice

- The DVM(DC) measurement is only available when the VERT MODE is set to the CH1.
- Select DC COUPLING for the DVM(DC) measurement.

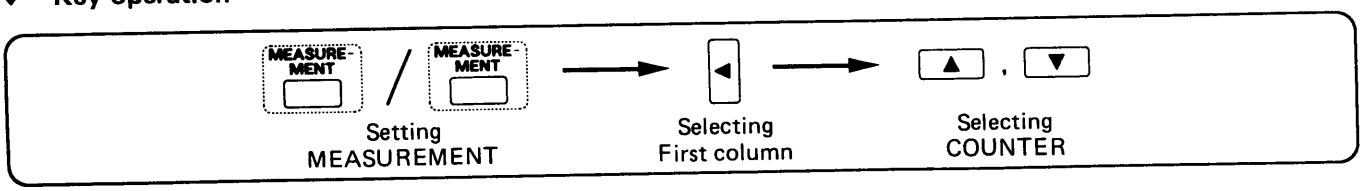
3.31 Measurement
(only for REAL)

COUNTER

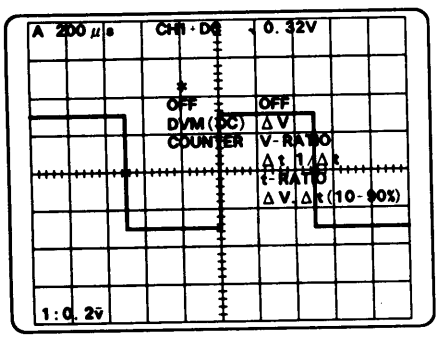


Activates the accurate frequency measurement of the input signal selected by the A trigger source by using the built-in counter.

◆ **Key operation**



◆ **Operating procedure**

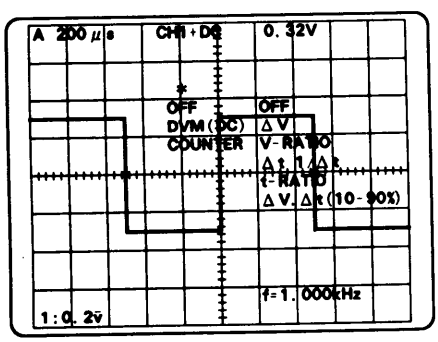


① Press the MEASURE-MENT key and set the MEASUREMENT menu.

② Press the ◀ key and select the first column.

- The selected column is indicated by the "*" mark at the top of the line.

③ Press the ▲ or ▼ key and select the COUNTER.



- The selected function is indicated by the high intensity.
- The measurement result is displayed at the bottom-right corner of the screen.

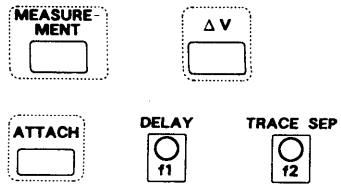
◇ Pressing the MEASURE-MENT key turns the **MEASUREMENT** menu on and off.

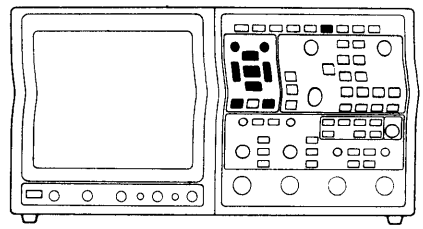
◇ For quitting the **COUNTER** measurement:

④ Press the ▲ key and select the OFF in the MEASUREMENT menu.

One-point advice • The A trigger source selects the counter measurement channel.
• Triggering the oscilloscope is necessary for the counter measurement.

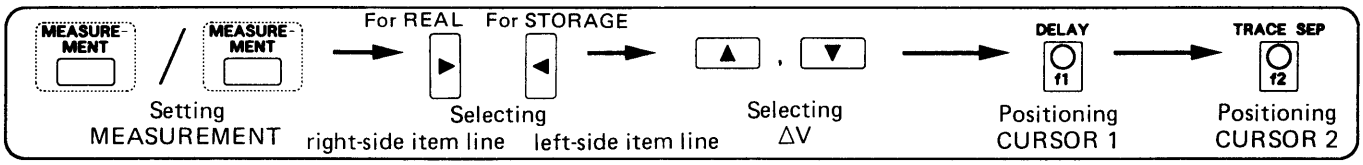
ΔV



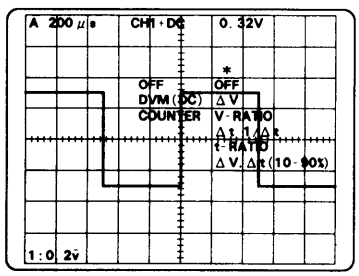


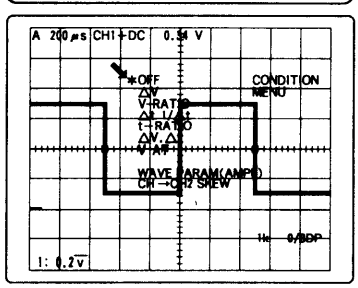
Activates voltage measurement.

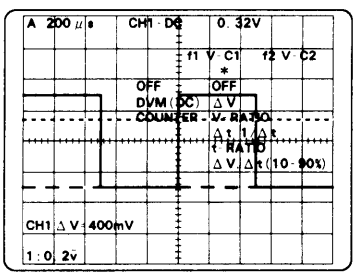
♦ Key operation



♦ Operating procedure







① Press the MEASURE MENT key and setting MEASUREMENT.

② Press the ▶ key and select the right line of measurement items on screen.

- The "*" mark appears at the head of the selected line.
- In STORAGE, press the ◀ key to select the left line of measurement items on the screen.

③ Press the ▲ or ▼ key and select the ΔV.

- The brightness of "ΔV" characters is highlighted.

◇ **Press the MEASURE MENT key to allow the MEASUREMENT display on screen to be turned on or off.**

④ Turn the DELAY f1 knob and make the cursor 1 (--) match the base line of waveform.

⑤ Turn the TRACE SEP f2 knob and make the cursor 2 (····) match the measuring point.

- Voltage between cursors appears at the lower left corner of screen.

◇ **When suspending measurement:**

⑥ Press the ▲ key and select OFF or press the ΔV key.

One-point advice

- When the "—" appears as the measurement result, the cursor 2 is located below the cursor 1.
- Press the ATTACH key to change the measurement channel in multi-trace display.

◇ Cursor operation and shifting range

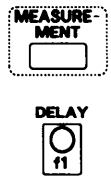
- Range near the center of knob: approximately 4 div shift
- Elastic part at right or left edge of knob 4 div shift, Left repeat, Right repeat:

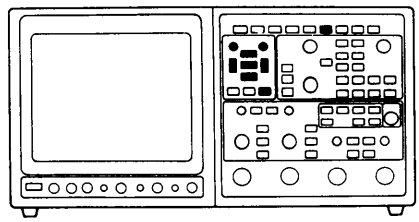
The cursor moves over the entire screen by repeat operation. (Shifting stop if hands are released.)

- Press the ΔV key, and steps ① to ③ will be completed at a time.
- Turn the DELAY f1 knob after pressing the DELAY f1 knob for shifting while keeping the interval between the cursors 1 and 2. Press the DELAY f1 knob again to cancel it.

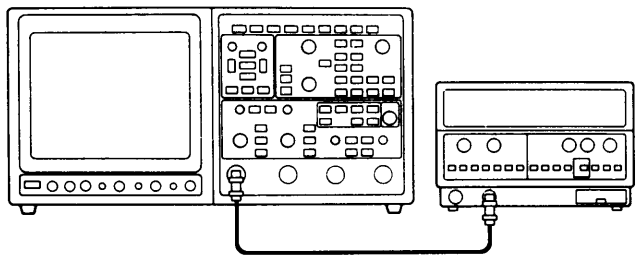
3.31 MEASUREMENT

V-RATIO





Activates voltage ratio to the reference voltage.



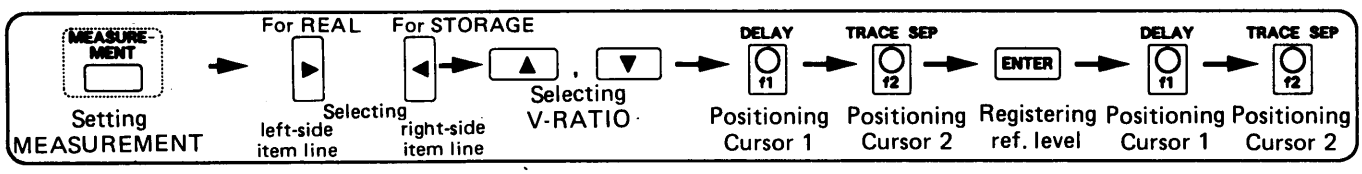
♦ **Preliminary setup**

Apply signal from the generator (e.g., Iwatsu SG -4111) into the CH1 input.

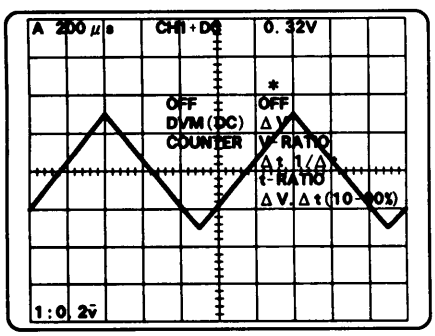
Frequency : 1 kHz

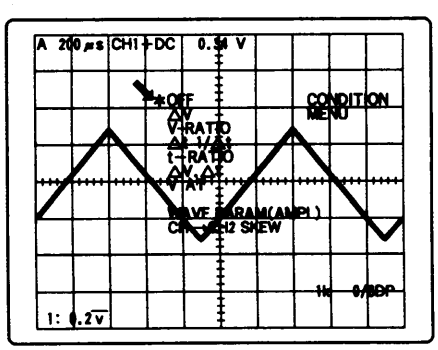
Amplitude : 0.6 Vp-p

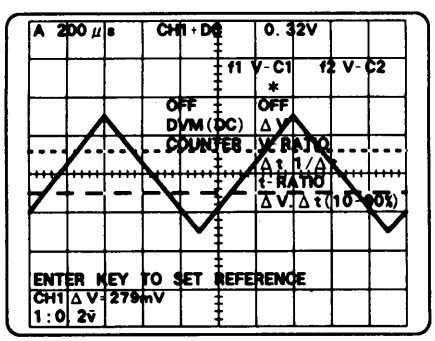
♦ **Key operation**



♦ **Operating procedure**







① Press the MEASURE-MENT key and set the MEASUREMENT.

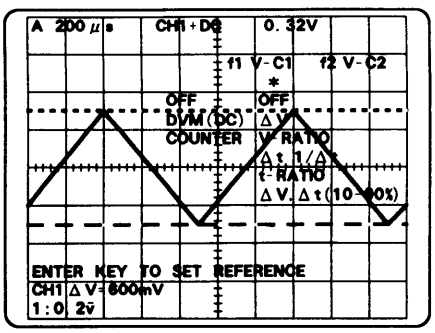
- In STORAGE, press the ◀ key to select the left line of measurement items on the screen.

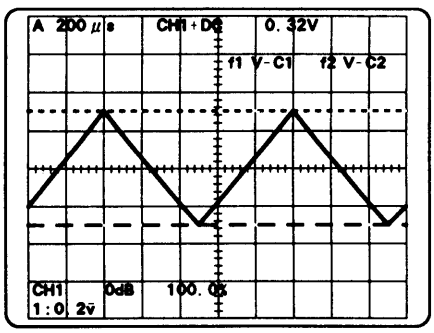
② Press the ▶ key and select the right line of measurement items on screen.

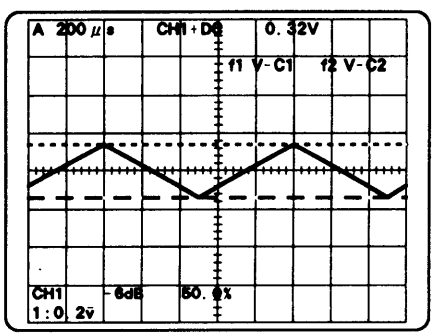
- The "*" appears at the head of the selected line.

③ Press the ▲ or ▼ key and select the V-RATIO.

- The brightness of "V-RATIO" characters is highlighted.
- The "ENTER KEY TO SET REFERENCE" appears at the lower side of screen.







④ Turn the DELAY f1 knob to match the cursor 1 to the –PEAK of reference signal.

⑤ Turn the TRACE SEP f2 knob to match the cursor 2 to the +PEAK of reference signal.

⑥ Press the ENTER key.

- The area between cursors is set to 100% and 0 dB (Adjust the amplitude of input signal to 0.3 Vp-p for measurement signal).

⑦ Turn the DELAY f1 knob to make the cursor 1 match the –PEAK of signal.

⑧ Turn the TRACE SEP f2 knob to make the cursor 2 match the +PEAK of signal.

- Voltage ratio of measurement signal for reference signal appears at the lower left corner of screen.
- To set the area between cursors again to 100% and 0 dB, press the MEASURE-MENT key.

◇ **When suspending the V-RATIO measurement:**

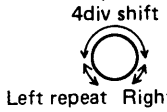
⑨ Press the ▲ key to select OFF.

One-point advice

- Press the ATTACH key to change the measurement channel.

◇ Cursor operation and shifting range:

- Range near the center of knob: approximately 4 div shift
- Elastic part at right or left edge of knob:

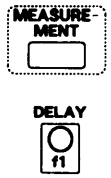


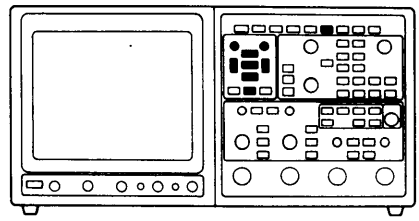
The cursor moves over the entire screen by repeat operation. (Shifting stop if hands are released)

- Turn the DELAY f1 knob after pressing the DELAY f1 knob for shifting while keeping the interval between the cursors 1 and 2. Press the DELAY f1 knob again to cancel it.

3.31 MEASUREMENT

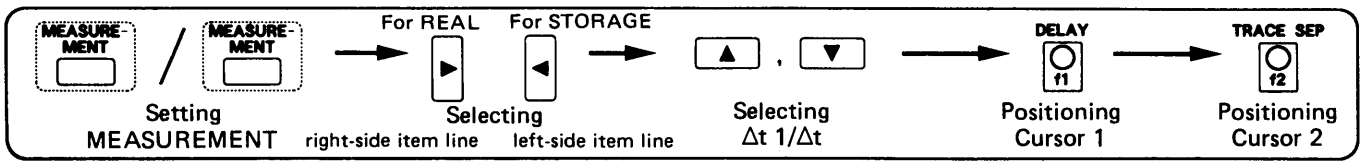
Δt 1/Δt



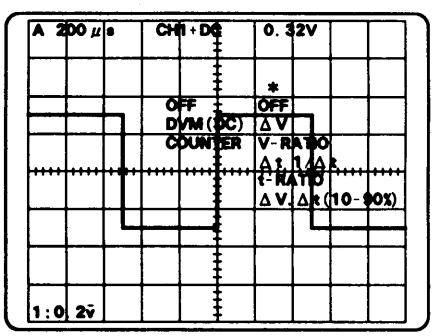


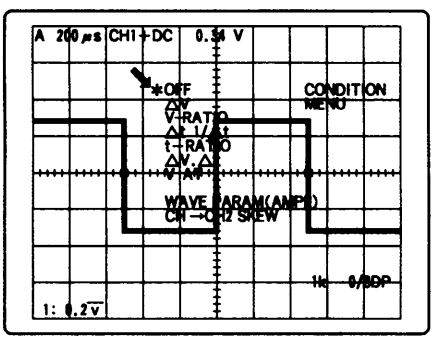
Measures the time interval (Δt) and cycle frequency (1/Δt) of input signal.

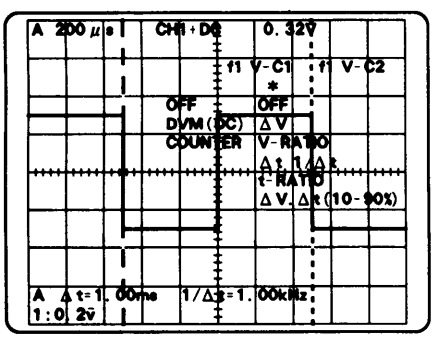
- **Key operation**



- **Operating procedure**







① Press the MEASURE-MENT key and set the MEASUREMENT.

- In STORAGE, press the ◀ key to select the left line of measurement items on the screen.

② Press the ▶ key to select the right line of measurement items on screen.

- The "*" appears at the head of the selected line.

③ Press the ▲ or ▼ key and select the Δt 1/Δt.

- The brightness of "Δt 1/Δt" characters is highlighted.

◇ Pressing the [MEASUREMENT] key turns the **MEASUREMENT** menu on and off.

④ Using the [DELAY f1] knob, position the cursor 1 (¦) to the measurement start point of the signal.

⑤ Using the [TRACE SEP f2] knob, position the cursor 2 (⋮) to the measurement stop point of the signal.

- The measurement result is displayed at the bottom-left corner of the screen.

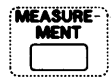
◇ For quitting the Δt, 1/Δt measurement:

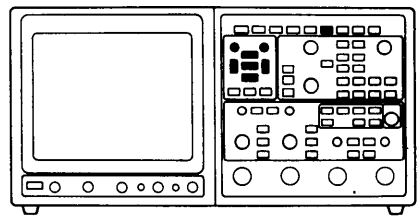
⑥ Press the [▲] key and select the OFF in the MEASUREMENT menu.

One-point advice

- If you position the CURSOR 2 left to the CURSOR 1, the measurement result will be a negative value.
- For the easy access of the Δt, 1/Δt measurement, simply press the [Δt·1/Δt] key and the two time cursors will be displayed on the screen. Pressing the [Δt·1/Δt] key again allows to quit the Δt, 1/Δt measurement.
- Turning the cursor knob back and forth moves the cursor about 4 divisions. When you turn the cursor knob further and hold it, the cursor goes on moving to the same direction. Freeing the cursor knob stops the cursor move.
- Pressing the [DELAY f1] knob sets the cursor tracking mode, in which the two cursors move together in keeping the same span. Pressing the [DELAY f1] knob again sets the cursor independent mode, in which the two cursors move freely.

t-RATIO





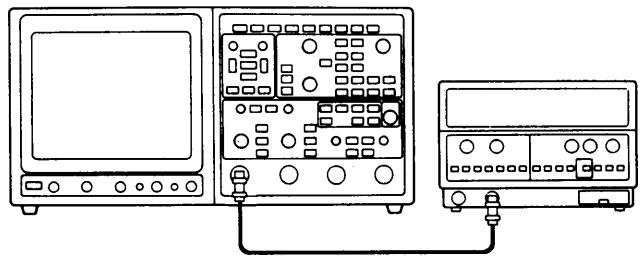
Measures the phase (degrees) and period ratio (%) of measurement signal for 1 period of reference signal.

♦ **Preliminary setup**

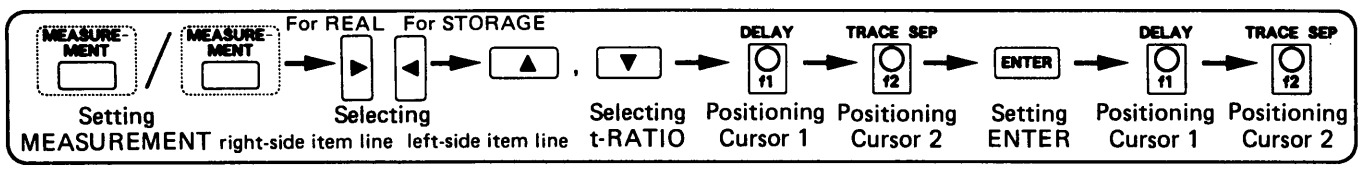
Apply signal from the generator (e.g., Iwatsu SG -4111) into the CH1 input.

Frequency : 1 kHz

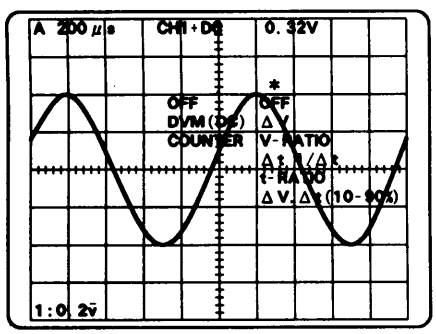
Amplitude : 0.8 Vp-p

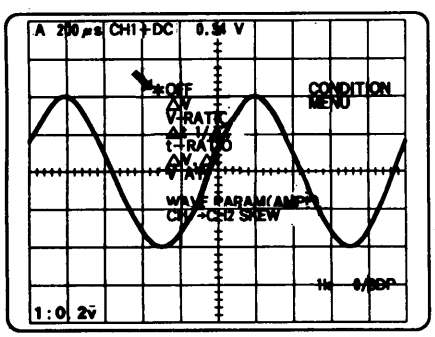


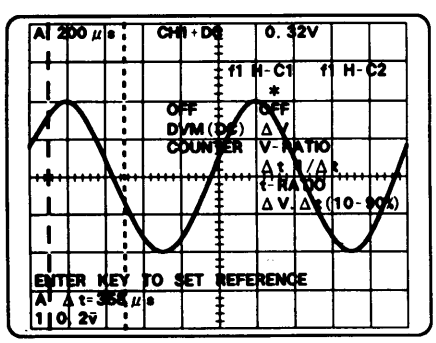
♦ **Key operation**



♦ **Operating procedure**







① Press the MEASURE-MENT key and set the MEASUREMENT.

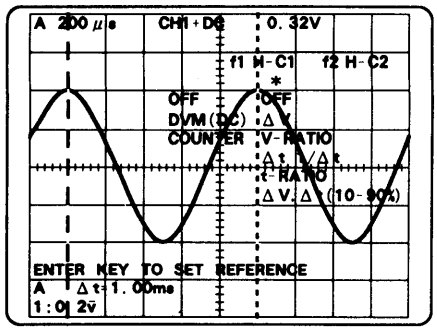
- In STORAGE, press the ◀ key to select the left line of measurement items on the screen.

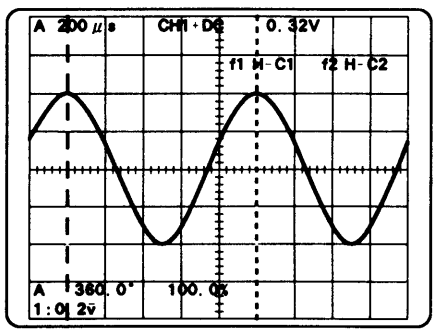
② Press the ▶ key and select the right line of measurement items on screen.

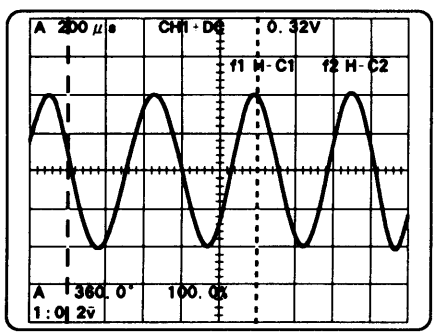
- The "*" appears at the head of the selected line.

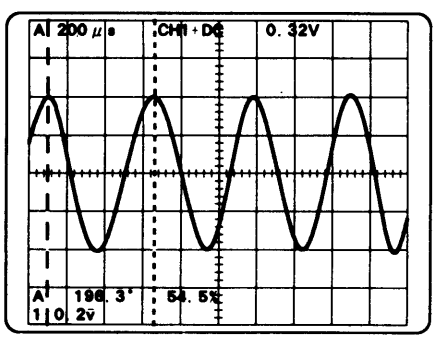
③ Press the ▲ or ▼ to select the t-RATIO.

- The brightness of "t-RATIO" characters is highlighted.
- The "ENTER KEY TO SET REFERENCE" appears at the lower side of screen.









④ Turn the DELAY f1 knob to match the cursor 1 to the start point of reference period.

⑤ Turn the TRACE SEP f2 knob to match the cursor 2 to the end point of reference period.

⑥ Press the [ENTER] key.

- The area between cursors is set to 360 degrees and 100% (Increase frequency of input signal for an example of measurement signal).

⑦ Turn the DELAY f1 knob to match the cursor 1 to the start point of measurement period.

⑧ Turn the TRACE SEP f2 knob to match the cursor 2 to the end point of measurement period.

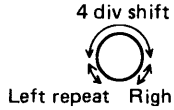
- Period ratio (%) and phase (degrees) of measurement signal for one cycle of a reference signal appear at the lower side of screen.
- To set the area between cursors again to 360 degrees and 100%, press the [MEASUREMENT] key.

◇ **When suspending the t-RATIO measurement:**

⑨ Press the [▲] key and select OFF.

One-point advice ◇ Operation of cursor and position range:

- Range near the center of knob: approximately 4 div shift
- Elastic part at the right or left edge of knob:

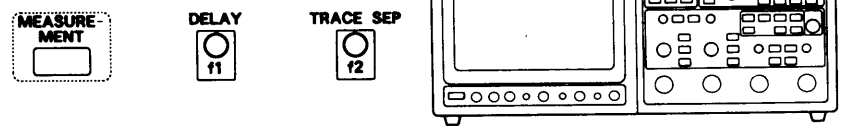


The cursor moves over the entire screen by repeat operation. (Shifting stop if hands are released)

- Turn the DELAY f1 knob after pressing the DELAY f1 knob for shifting while keeping the interval between the cursors 1 and 2. Press the DELAY f1 knob again to cancel it.

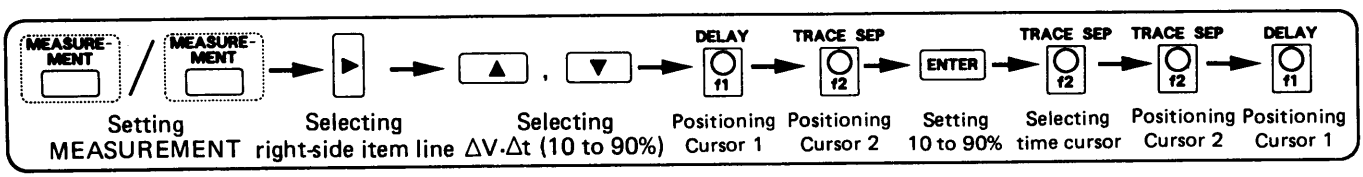
3.31 MEASUREMENT (only for REAL)

ΔV · Δt

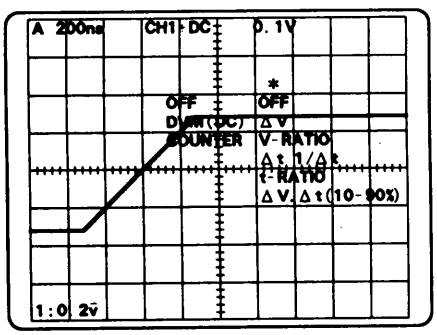


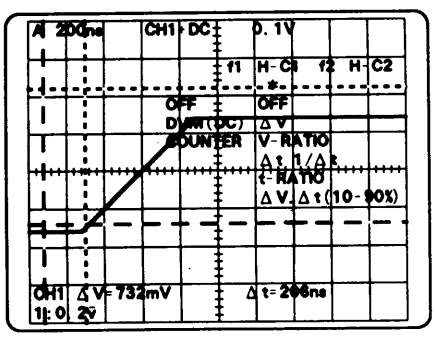
Allows to activate the voltage and time cursors on the screen simultaneously. The (10–90%) function automatically sets the two voltage cursors to the 10% and 90% position of the last voltage cursor span, respectively. The (10–90%) function helps to measure the rise or fall time of the pulse.

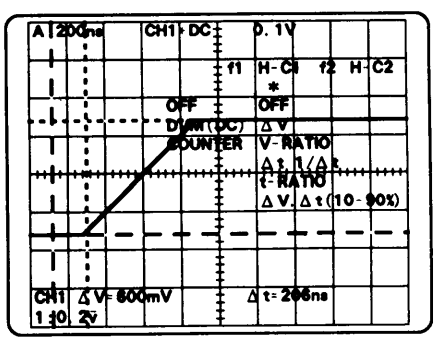
♦ Key operation



♦ Operating procedure







① Press the MEASURE-MENT key and set the MEASUREMENT.

② Press the ▶ key to select the right line of measurement items on screen.

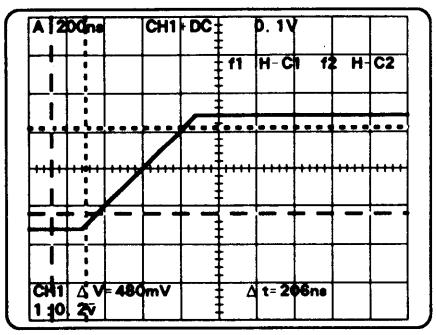
- The "*" appears at the head of the selected line.

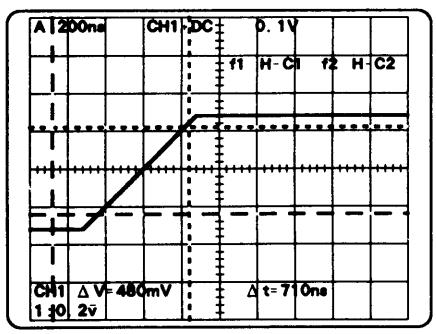
③ Press the ▲ or ▼ key and select the ΔV·Δt (10 to 90%).

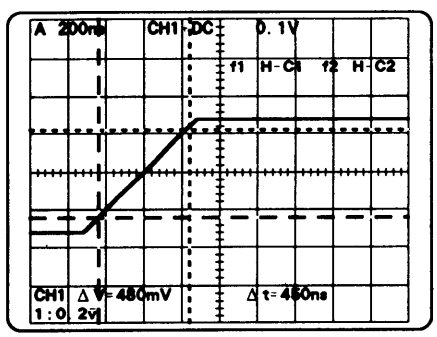
- The brightness of "ΔV·Δt (10 to 90%)" characters is highlighted.
- The "ENTER KEY FOR 10–90%" message is displayed at bottom screen.
- The voltage and time cursors are displayed on the screen simultaneously.

④ Turn the DELAY f1 knob to make the cursor 1 (- -) for measuring voltage match the base line of waveform.

⑤ Turn the TRACE SEP f2 knob to make the cursor 2(····) match the top line of waveform.







⑥ Press the [ENTER] key and set the voltage cursors to the 10—90% position of the signal amplitude, respectively.

- The voltage cursor 1 is automatically set to the 10% position of the signal amplitude, and the voltage cursor 2 is set to the 90% of the signal of the amplitude.

⑦ Press the TRACE SEP f2 knob and select the cursor for measuring time.

⑧ Using the TRACE SEP f2 knob, position the horizontal cursor 2 to the 90% amplitude of the signal.

⑨ Using the DELAY f1 knob, position the horizontal cursor 1 to the 10% amplitude of the signal.

- The measurement result is displayed at the bottom screen.

◇ **When suspending ΔV·Δt (10 to 90%) measurement:**

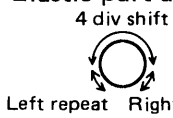
⑩ Press the MEASUREMENT key to set the MEASUREMENT.

⑪ Press the [▲] key and select OFF.

One-point advice • Press the ATTACH key to change the measurement channel.

◇ Operation of cursor and shifting range:

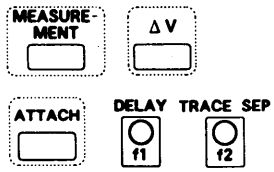
- Range near the center of knob: approximately 4 div shift
- Elastic part at the right or left edge of knob:

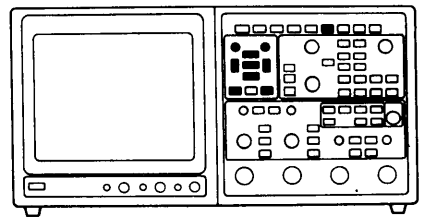


The cursor moves over the entire screen by repeat operation. (Shifting stop if hands are released).

3.31 MEASUREMENT (only for STORAGE)

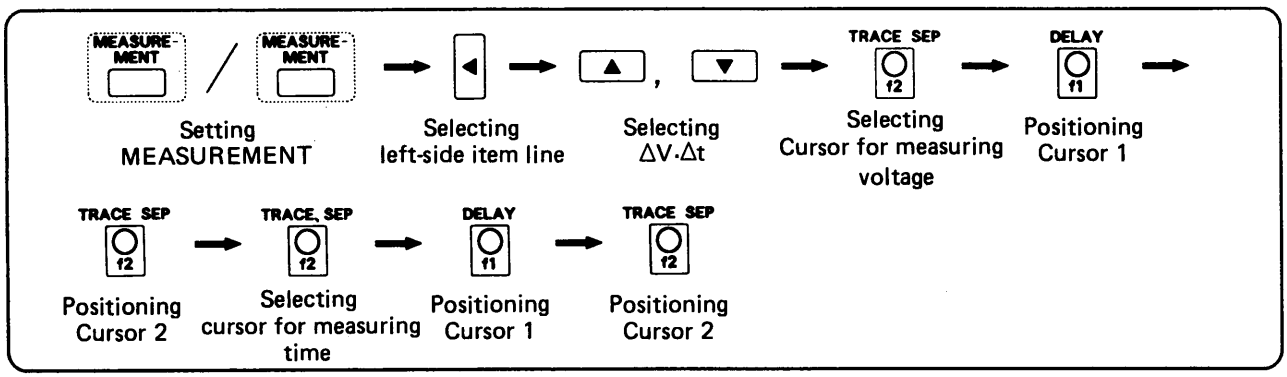
ΔV · Δt



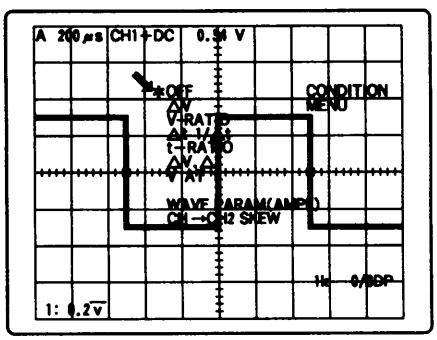


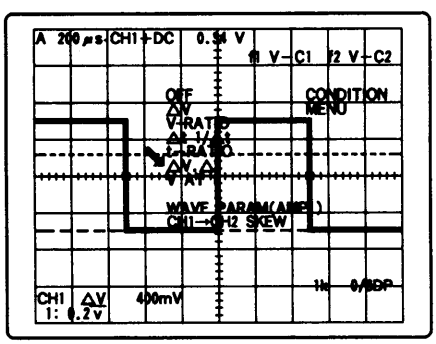
Measures the potential (ΔV) and time interval (Δt)of input signal.

♦ **Key operation**



♦ **Operating procedure**





① Press the MEASURE-MENT key and set the MEASUREMENT.

② Press the ◀ key to select the left line of measurement items on screen.

- The "*" appears at the head of the selected line.

③ Press the ▲ or ▼ key and select the ΔV·Δt.

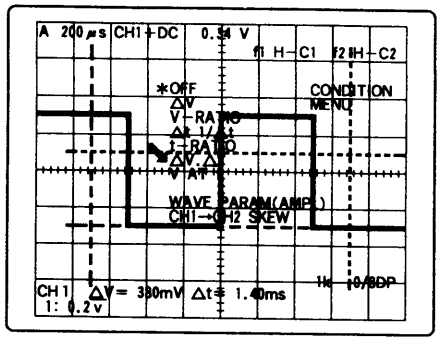
- The brightness of "ΔV·Δt" characters is highlighted.

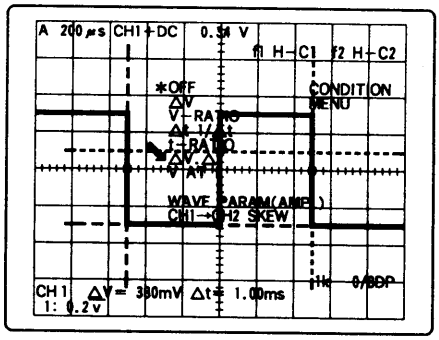
④ Press the TRACE SEP f2 knob and select the cursor for measuring voltage.

⑤ Turn the DELAY f1 knob to make the cursor 1 (---) for measuring voltage match the base line of waveform.

⑥ Turn the TRACE SEP f2 knob to make the cursor 2 (·····) match the top line of waveform.

- Voltage between cursors appear at the lower left corner of screen.





⑦ Press the TRACE SEP f2 knob and select the cursor for measuring time.

⑧ Turn the DELAY f1 knob to make the cursor 1 (¦) for measuring time match the reference point.

⑨ Turn the TRACE SEP f2 knob to make the cursor 2 (¦) for measuring time match the reference point.

- Time between cursors appears at the lower side of screen.

◇ **When suspending ΔV·Δt measurement:**

① Press the MEASUREMENT key to set the MEASUREMENT.

② Press the ▲ key and select OFF or press the ΔV key and Δt key.

3

One-point advice

- When "—" appears as the measurement result in ΔV measurement, the cursor 2 is located below the cursor 1.
- When "—" appears as the measurement result in Δt measurement, the cursor 2 is located at the left side of the cursor 1.
- Press the ATTACH key to change the measurement channel.

◇ Operation of cursor and shifting range:

- Range near the center of knob: approximately 4 div shift
- Elastic part at the right or left edge of knob:

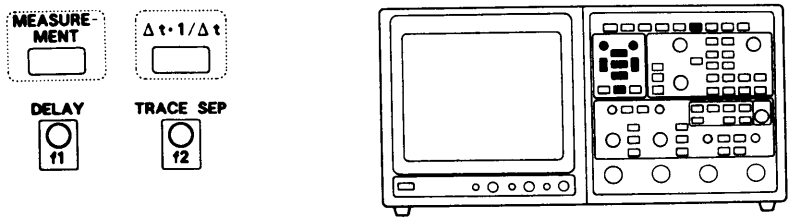
The cursor moves over the entire screen by repeat operation. (Shifting stop if hands are released)

- Turn the DELAY f1 knob after pressing the DELAY f1 knob for shifting while keeping the interval between the cursors 1 and 2.

Press the DELAY f1 knob again to cancel it.

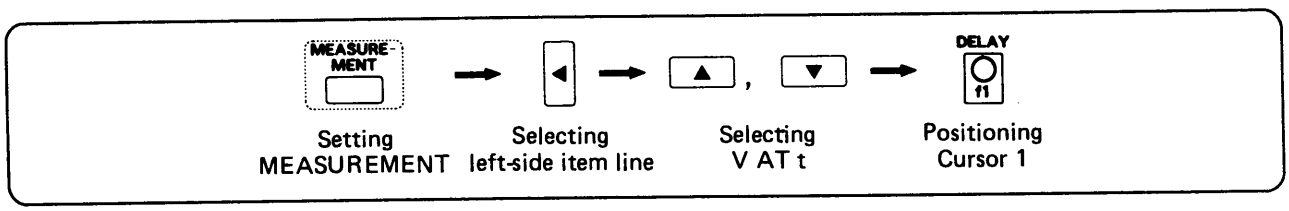
3.31 MEASUREMENT (only for STORAGE)

V AT t

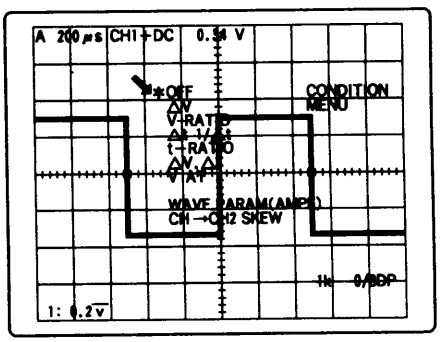


Measures the time from trigger point and the voltage of specified point at cursor from GND.
Shifts the cursor to the measurement point (t) and measures voltage of waveform.

♦ **Key operation**



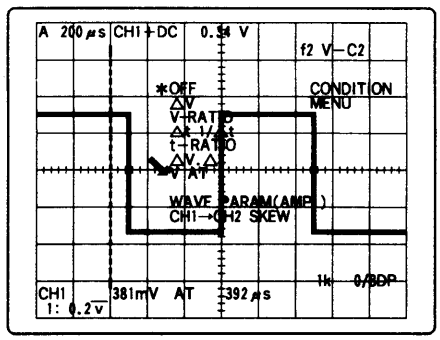
♦ **Operating procedure**



① Press the MEASURE-MENT key and set the MEASUREMENT.

② Press the ◀ key and select the left line of measurement items on screen.

- The "*" appears at the head of the selected line.



③ Press the [▲] or [▼] key and select the V AT t.

- The brightness of "V AT t" characters is highlighted.

④ Turn the DELAY [f1] knob to make the cursor (¦) match the measurement point.

- The time (t) from the trigger point and voltage (V) at cursor point appears.

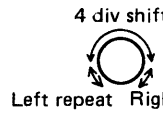
◊ **When suspending measurement of V AT t:**

⑤ Press the [▲] key and select OFF.

3

One-point advice ◊ Operation of cursor and shifting range:

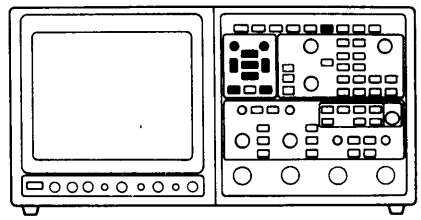
- Range near the center of knob: approximately 4 div shift
- Elastic part at the right or left edge of knob:



The cursor moves over the entire screen by repeat operation. (Shifting stop if hands are released)

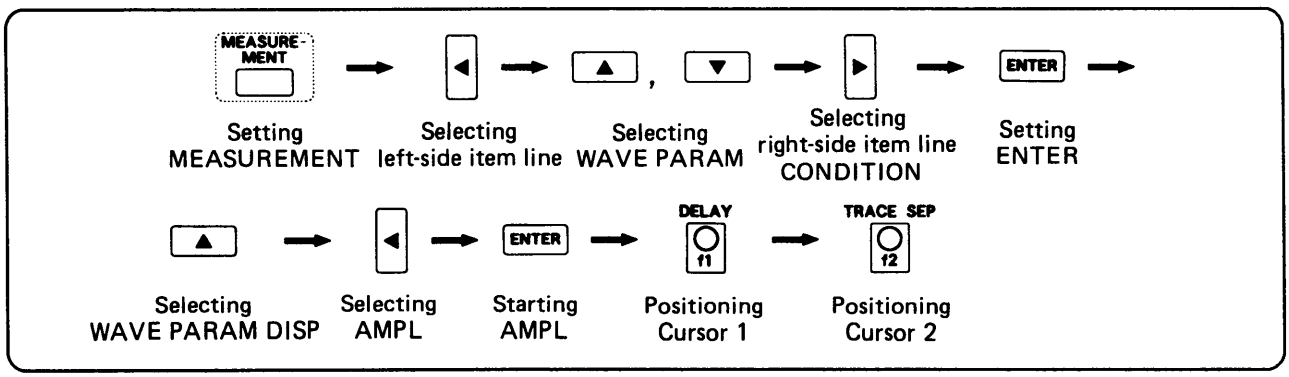
3.31 MEASUREMENT
(only for STORAGE)

WAVE PARAM
AMPL

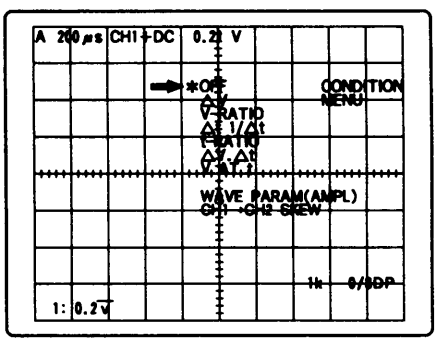


The AMPL (amplitude) automatically allows the amplitude of waveform within the range specified by the cursor for measuring time to be measured.

♦ **Key operation**



♦ **Operating procedure**

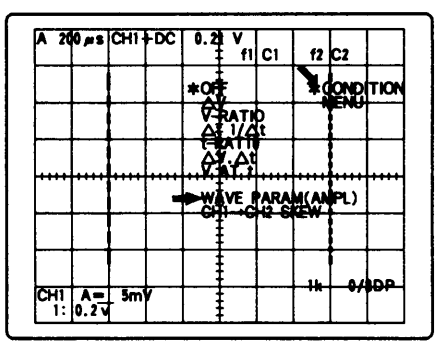


◇ **When executing AMPL:**

① Press the MEASURE-MENT key and set the MEASUREMENT.

② Press the ◀ key and select the left line of measurement items on screen.

- The "*" appears at the head of OFF.

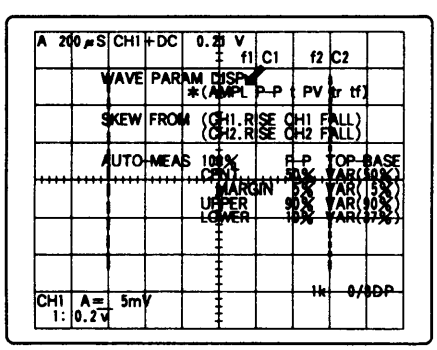


③ Press the ▲ or ▼ key and select the WAVE PARAM.

- The brightness of characters within parentheses of WAVE PARAM is highlighted.
- The Cursors 1 and 2 appear on the screen.

④ Press the ▶ and shift the * mark to the right item line and select the CONDITION.

⑤ Press the ENTER key.

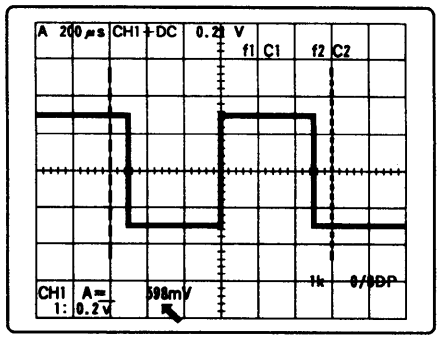


⑥ Press the ▲ key and select the WAVE PARAM DISP.

- The "*" mark appears at the head of (AMPL P-P f PW Tr Tf).

⑦ Press the ◀ key and select the AMPL.

- The brightness of characters of AMPL is highlighted.



⑧ Press the [ENTER] key and allow the menu screen to disappear and to initiate the AMPL.

- Enter the waveform to be measured.

⑨ Turn the DELAY [f1] knob and position the cursor 1 (¦) to the reference point.

⑩ Turn the TRACE SEP [f2] knob and position the cursor 2 (⋮) to the measurement point.

- The amplitude value of waveform within the range specified by the cursors 1 and 2 appears at the bottom of screen.

◇ **When ending AMPL:**

① Press the [MEASURE-MENT] key and set the MEASUREMENT.

② Press the [▲] key and select OFF.

◇ **When erasing the menu screen:**

① Press the [MEASURE-MENT] key.

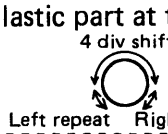
3

One-point advice ◇ Press the [ATTACH] key to change the measurement channel.

Switches to a waveform of channel where the display waveform was changed.

◇ Cursor operation and shifting range:

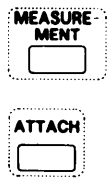
- Range near the center of knob: approximately 4 div shift
- Elastic part at the right or left edge of knob:

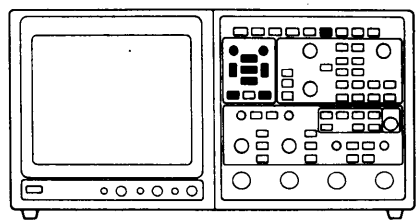


The cursor moves over the entire screen by repeat operation.
(Shifting stop if hands are released)

3.31 MEASUREMENT
(only for STORAGE)

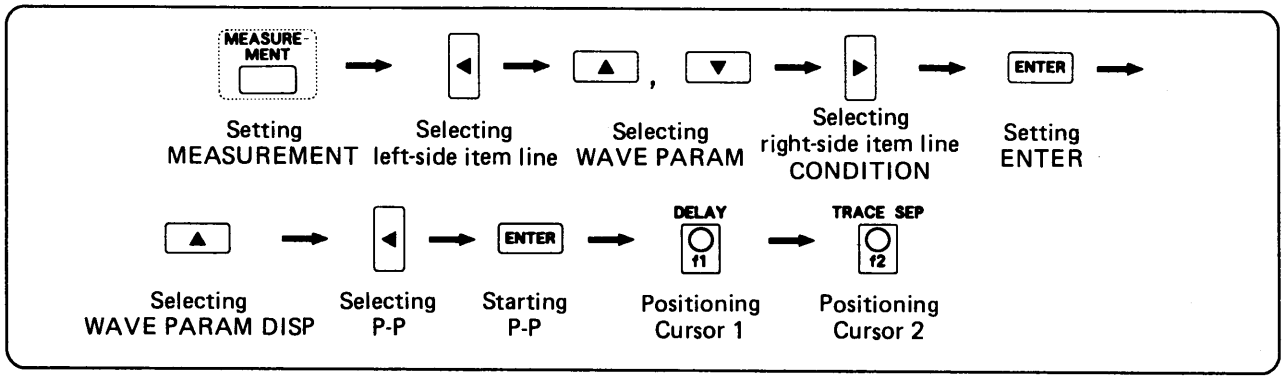
WAVE PARAM
P-P



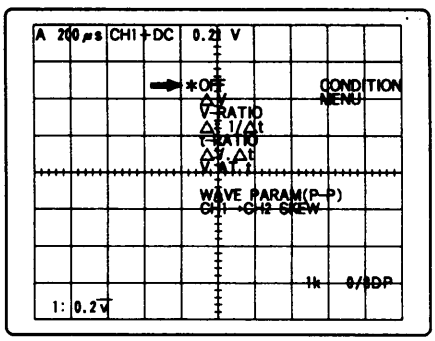


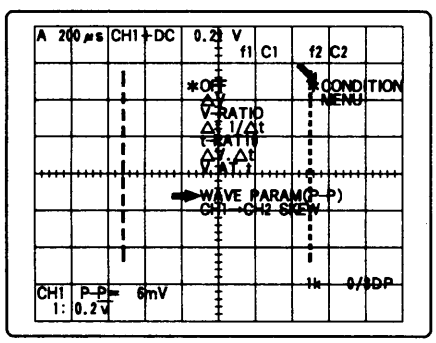
Activates the peak value of waveform within the range specified by the cursor for measuring time to be measured automatically.

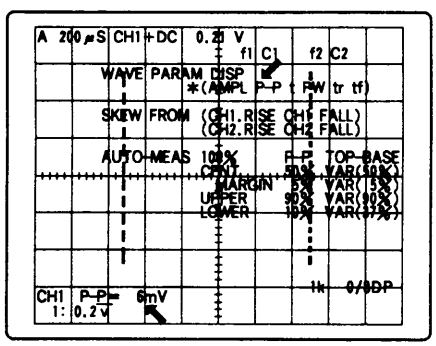
♦ **Key operation**



♦ **Operating procedure**







◇ **When executing P-P:**

① Press the MEASURE MENT key and set the MEASUREMENT.

② Press the ◀ key and select the left line of measurement items on screen.

- The "*" appears at the head of OFF.

③ Press the ▲ or ▼ key and select the WAVE PARAM.

- The brightness of characters within parentheses of WAVE PARAM is highlighted.
- The Cursors 1 and 2 appear on the screen.

④ Press the ▶ and shift the * mark to the right item line and select the CONDITION.

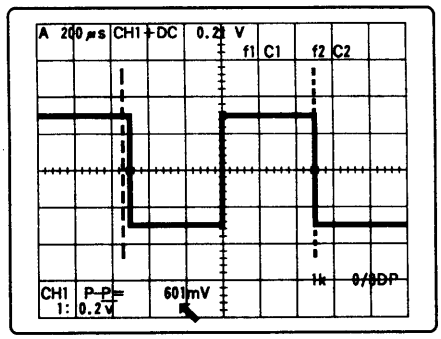
⑤ Press the ENTER key.

⑥ Press the ▲ key and select the WAVE PARAM DISP.

- The "*" mark appears at the head of (AMPL P-P f PW Tr Tf).

⑦ Press the ◀ or ▶ key and select the P-P.

- The brightness of P-P is highlighted.



⑧ Press the [ENTER] key and allow the menu screen to disappear and to initiate the P-P.

- Enter the waveform to be measured.

⑨ Turn the DELAY [f1] knob and position the cursor 1 (¦) to the reference point.

⑩ Turn the TRACE SEP [f2] knob and position the cursor 2 (¦) to the measurement point.

- The P-P value of waveform within the range specified by the cursors 1 and 2 appears at the bottom of screen.

◇ **When ending P-P:**

① Press the [MEASUREMENT] key and set the MEASUREMENT.

② Press the [▲] key and select OFF.

◇ **When erasing the menu screen:**

① Press the [MEASUREMENT] key.

One-point advice ◇ Press the [ATTACH] key to change the measurement channel.

Switches to a waveform of channel where the display waveform was changed.

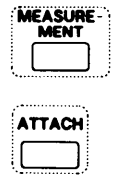
◇ Cursor operation and shifting range:

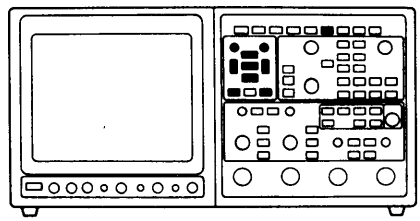
- Range near the center of knob: approximately 4 div shift
- Elastic part at the right or left edge of knob:

The cursor moves over the entire screen by repeat operation.
(Shifting stop if hands are released)

3.31 MEASUREMENT
(only for STORAGE)

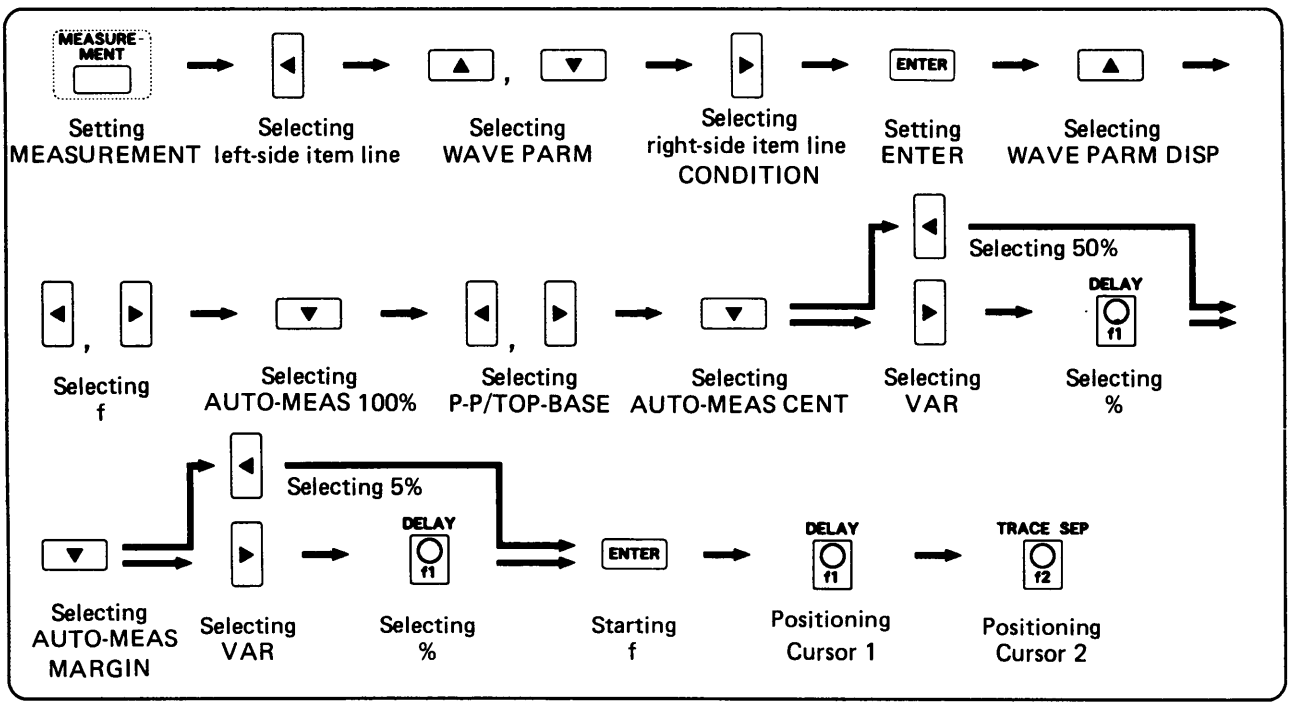
WAVE PARAM
f



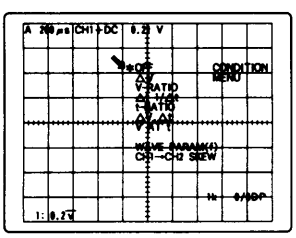


Activates the frequency of waveform within the range specified by the cursor for measuring time to be measured automatically.

♦ **Key operation**



♦ **Operating procedure**

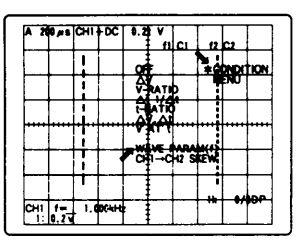


◇ **When executing f.**

① Press the MEASURE-MENT key and set the MEASUREMENT.

② Press the ◀ key and select the left line of measurement items on screen.

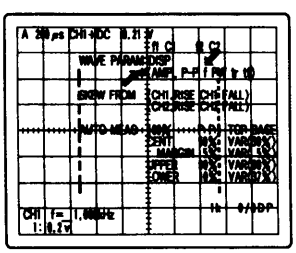
- The "✱" appears at the head of OFF.



③ Press the ▲ or ▼ key and select the WAVE PARAM.

- The brightness of characters within parentheses of WAVE PARAM is highlighted.
- The Cursors 1 and 2 appear on the screen.

④ Press the ▶ key and shift the ✱ mark to the right item line to select the CONDITION.



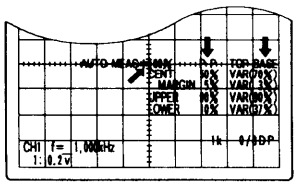
⑤ Press the ENTER key.

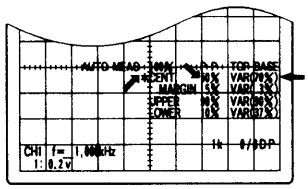
⑥ Press the ▲ key and select the WAV PARAM DISP.

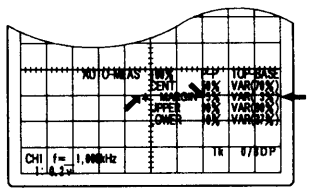
- The "✱" mark appears at the head of (AMPL P-P f PW Tr Tf).

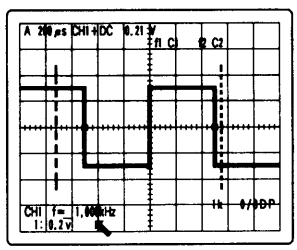
⑦ Press the ◀ or ▶ key and select the f.

- The brightness of f is highlighted.









⑧ Press the [▼] key and select the AUTO-MEAS 100% items.

⑨ Press the [◄] or [►] key and select the P-P or TOP-BASE.

⑩ Press the [▼] key and select the AUTO-MEAS CENT items.

⑪ Press the [◄] or [►] key and select the 50% or VAR.

- Advances to ⑬ when selecting 50%.

⑫ Turn the DELAY [f1] knob and select the value of %.

⑬ Press the [▼] key and select the AUTO-MEAS MARGIN.

⑭ Press the [◄] or [►] key and select the 5% or VAR.

- The brightness of selected characters is highlighted.
- Advances to ⑯ when the 5% is selected.

⑮ Turn the DELAY [f1] knob and select the value of MARGIN.

⑯ Press the [ENTER] key and allow the menu screen to disappear and to start f.

- Enter signal to be measured.

⑰ Turn the DELAY [f1] knob and shift the cursor 1 (¦) to the reference point.

⑱ Turn the TRACE SEP [f2] knob and shift the cursor 2 (¦)to the measurement point.

- The frequency of waveform within the range specified by the cursors 1 and 2 appears at the bottom of screen.

◇ **When ending f.**

① Press the [MEASUREMENT] key and set the MEASUREMENT.

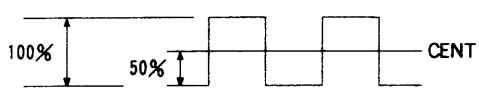
② Press the [▲] key and select OFF.

◇ **When erasing the menu screen:**

① Press the [MEASUREMENT] key.

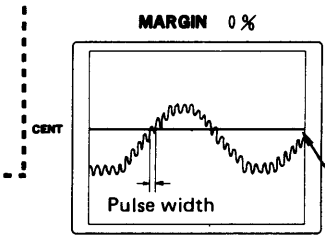
One-point advice

- Press the [ATTACH] key and change the measurement channel. Now, the measured value on the selected channel is displayed.
- It indicates the % of value specified by the P-P or TOP-BASE for AUTO-MEAS CENT.

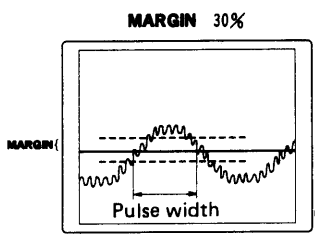


- MARGIN works when noises overlap the waveform to be measured, and is intended for preventing an erroneous measurement by noises around on the threshold level. A value of MARGIN stands for the amplitude in percent of MARGIN with the amplitude of TOP-BASE or of P-P regarded as 100%.

◇ Measuring Pulse width of a signal.



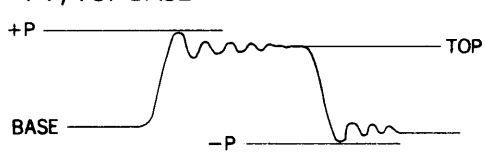
When the value of MARGIN is 0%, the pulse width of a noise may be measured if the noise overlaps as shown in the figure.



If you set MARGIN at 30%, e.g., to prevent an erroneous measurement as mentioned above, the noise would not affect any more as shown in the figure when the amplitude of the noise is within 30% of the maximum amplitude of the signal (of TOP-BASE or of P-P).

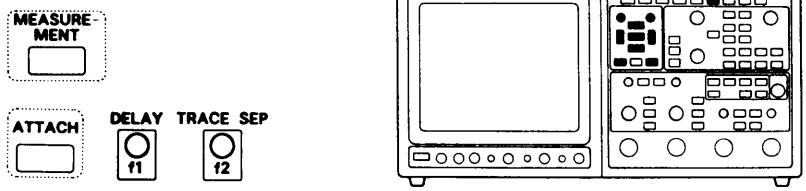
MARGIN reads the amplitude of the noise out of the screen, and adjusts the amplitude.

- P-P, TOP-BASE



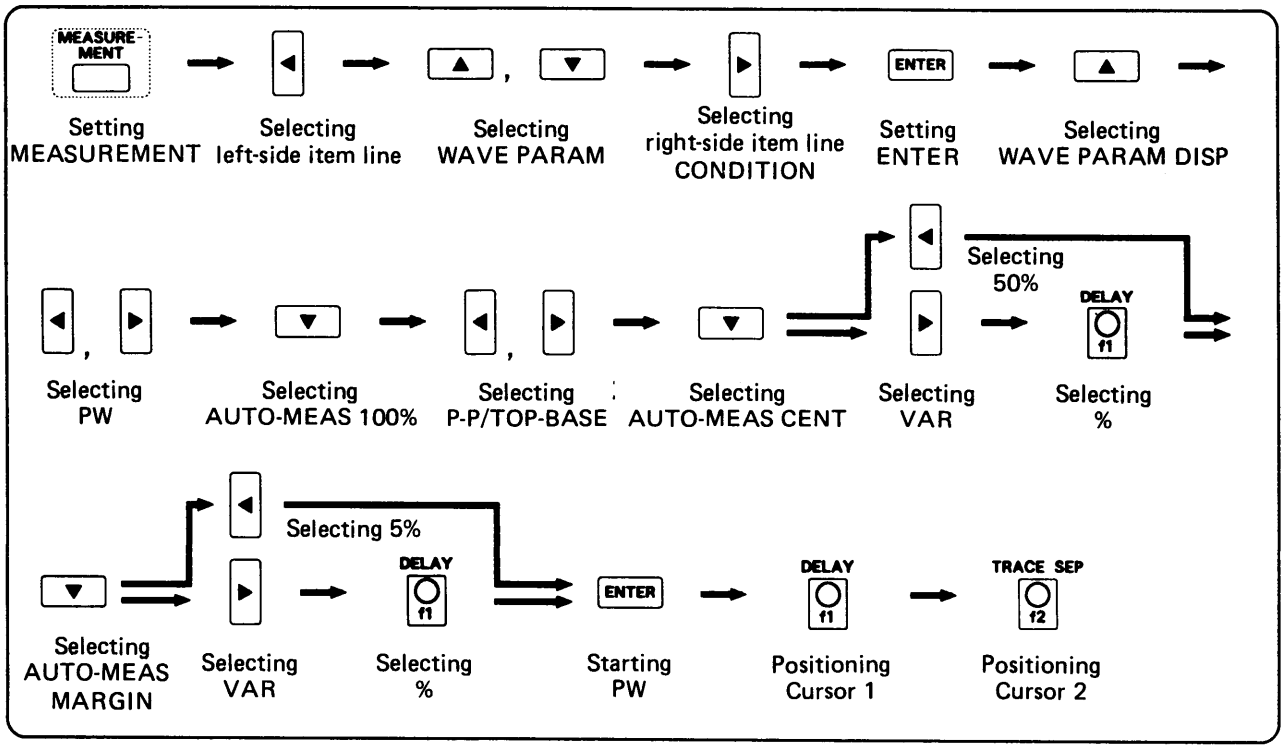
3.31 MEASUREMENT
(only for STORAGE)

WAVE PARAM
PW

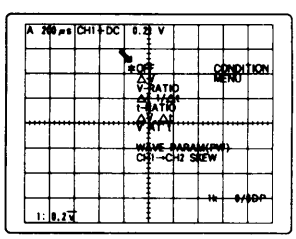


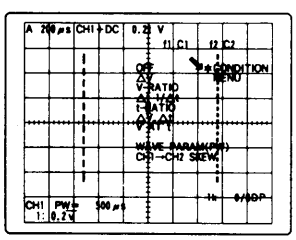
Activates the pulse width of waveform within the range specified by the cursor for measuring time to be measured automatically.

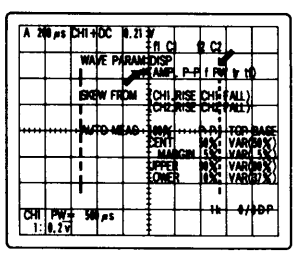
♦ **Key operation**



♦ **Operating procedure**







◇ **When executing PW.**

① Press the MEASURE MENT key and set the MEASUREMENT.

② Press the ◀ key and select the left line of measurement items on screen.
- The "*" appears at the head of OFF.

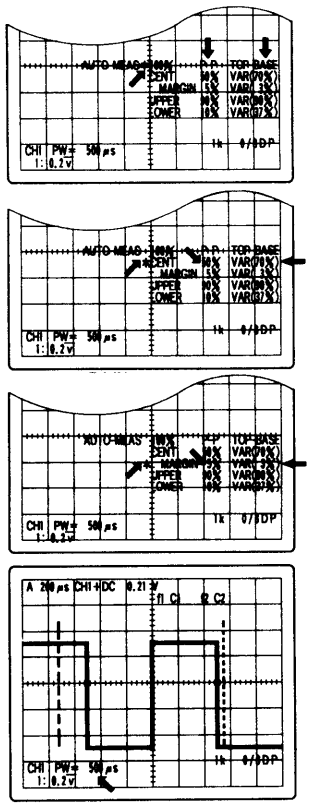
③ Press the ▲ or ▼ key and select the WAVE PARAM.
- The brightness of characters within parentheses of WAVE PARAM is highlighted.
- The Cursors 1 and 2 appear on the screen.

④ Press the ▶ key and shift the * mark to the right item line to select the CONDITION.

⑤ Press the ENTER key.

⑥ Press the ▲ key and select the WAVE PARAM DISP.
- The "*" mark appears at the head of (AMPL P-P f PW Tr Tf).

⑦ Press the ◀ or ▶ key and select the PW.
- The brightness of PW is highlighted.



⑧ Press the [▼] key and select the AUTO-MEAS 100% items.

⑨ Press the [◄] or [►] key and select the P-P or TOP-BASE.

⑩ Press the [▼] key and select the AUTO-MEAS CENT items.

⑪ Press the [◄] or [►] key and select the 50% or VAR.

- Advances to ⑬ when selecting 50%.

⑫ Turn the DELAY [f1] knob and select the value of %.

⑬ Press the [▼] key and select the AUTO-MEAS MARGIN.

⑭ Press the [◄] or [►] key and select the 5% or VAR.

- Advances to ⑯ when the 5% is selected.

⑮ Turn the DELAY [f1] knob and select the value of MARGIN.

⑯ Press the [ENTER] key and allow the menu screen to disappear and to start PW.

- Enter signal to be measured.

⑰ Turn the DELAY [f1] knob and shift the cursor 1 (¦) to the reference point.

⑱ Turn the TRACE SEP [f2] knob and shift the cursor 2 (¦)to the measurement point.

- The frequency of waveform within the range specified by the cursors 1 and 2 appears at the bottom of screen.

◇ **When ending PW.**

① Press the MEASUREMENT [ ] key and set the MEASUREMENT.

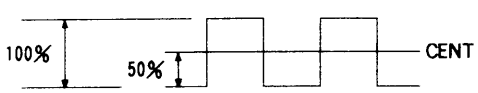
② Press the [▲] key and select OFF.

◇ **When erasing the menu screen:**

① Press the MEASUREMENT [ ] key.

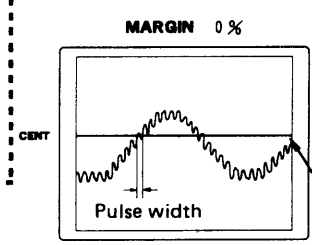
One-point advice

- Press the ATTACH [ ] key and change the measurement channel. Now, the measured value on the selected channel is displayed.
- It indicates the % of value specified by the P-P or TOP-BASE for AUTO-MEAS CENT.



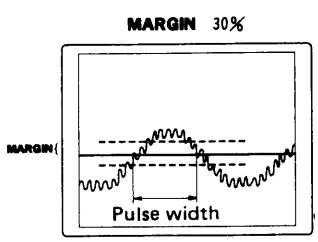
- MARGIN works when noises overlap the waveform to be measured, and is intended for preventing an erroneous measurement by noises around on the threshold level. A value of MARGIN stands for the amplitude in percent of MARGIN with the amplitude of TOP-BASE or of P-P regarded as 100%.

◇ Measuring Pulse width of a signal.



When the value of MARGIN is 0%, the pulse width of a noise may be measured if the noise overlaps as shown in the figure.

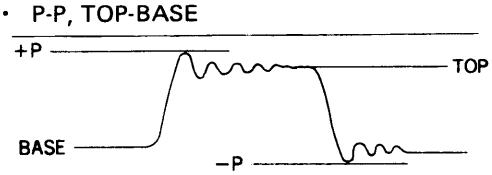
Threshold level



If you set MARGIN at 30%, e.g., to prevent an erroneous measurement as mentioned above, the noise would not affect any more as shown in the figure when the amplitude of the noise is within 30% of the maximum amplitude of the signal (of TOP-BASE or of P-P).

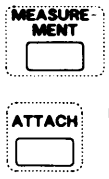
MARGIN reads the amplitude of the noise out of the screen, and adjusts the amplitude.

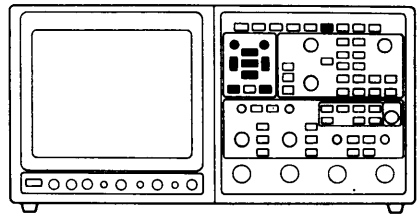
- P-P, TOP-BASE



3.31 MEASUREMENT
(only for STORAGE)

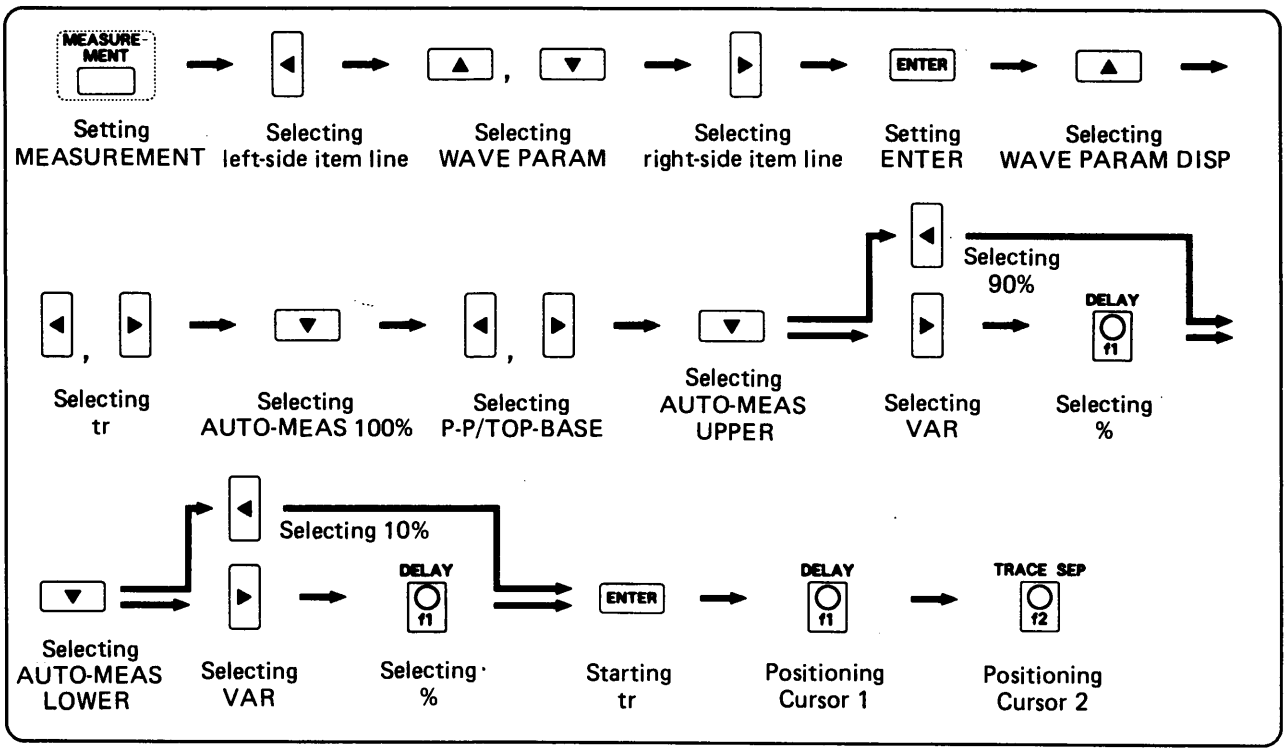
WAVE PARAM
tr



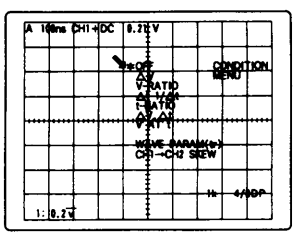


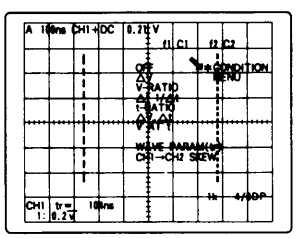
Activates the leading time of waveform within the range specified by the cursor for measuring time to be measured automatically.

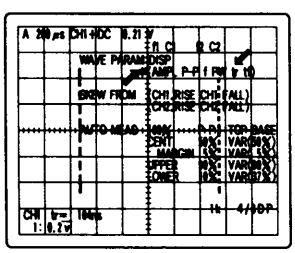
♦ **Key operation**



♦ **Operating procedure**







◇ **When executing tr:**

① Press the MEASURE MENT key and set the MEASUREMENT.

② Press the ◄ and select the left line of measurement items on screen.

- The "*" appears at the head of OFF.

③ Press the ▲ or ▼ key and select the WAVE PARAM.

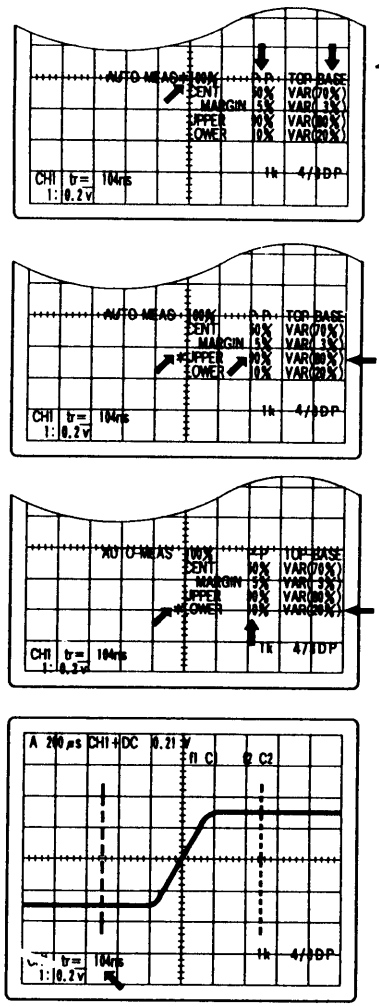
- The brightness of characters within parentheses of WAVE PARAM is highlighted.
- The Cursors 1 and 2 appear on the screen.

④ Press the ► key and shift the * mark to the right item line to select the CONDITION.

⑤ Press the ENTER key.

⑥ Press the ▲ key and select the WAVE PARAM DISP.

⑦ Press the ◄ or ► key and select the tr.



⑧ Press the [▼] key and select the AUTO-MEAS 100% items.

⑨ Press the [◄] or [►] key and select the P-P or TOP-BASE.

⑩ Press the [▼] key and select the AUTO-MEAS UPPER items.

⑪ Press the [◄] or [►] key and select the 90% or VAR.

- Advances to ⑬ when selecting 90%.

⑫ Turn the DELAY [f1] knob and select the value of %.

⑬ Press the [▼] key and select the AUTO-MEAS LOWER.

⑭ Press the [◄] or [►] key and select the 10% or VAR.

- Advances to ⑯ when the 10% is selected.

⑮ Turn the DELAY [f1] knob and select the % value.

⑯ Press the [ENTER] key and allow the menu screen to disappear and to start tr.

- Enter signal to be measured.

⑰ Turn the DELAY [f1] knob and shift the cursor 1 (¦) to the reference point.

⑱ Turn the TRACE SEP [f2] knob and shift the cursor 2 (⋮) to the measurement point.

- The tf of waveform within the range specified by the cursors 1 and 2 appears at the bottom of screen.

◇ **When ending tr:**

① Press the MEASUREMENT key and set the MEASUREMENT.

② Press the [▲] key and select OFF.

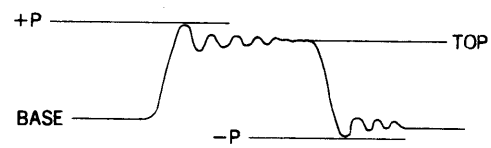
◇ **When erasing the menu screen:**

① Press the MEASUREMENT key.

One-point advice ◇ Press the ATTACH key and change the measurement channel. Now, the measured value on the selected channel is displayed.

◇ Generally, set the AUTO-MEAS UPPER to 90% and LOWER to 10% when measuring tr.

◇ P-P, TOP-BASE

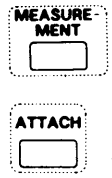


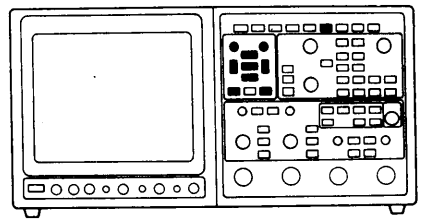
◇ Cursor operation and shifting range:

- Range near the center of knob: approximately 4-div shift
- Elastic part at the right or left edge of knob: The cursor moves over the entire screen by repeat operation. (Shifting stop if hands are released).

3.31 MEASUREMENT
(only for STORAGE)

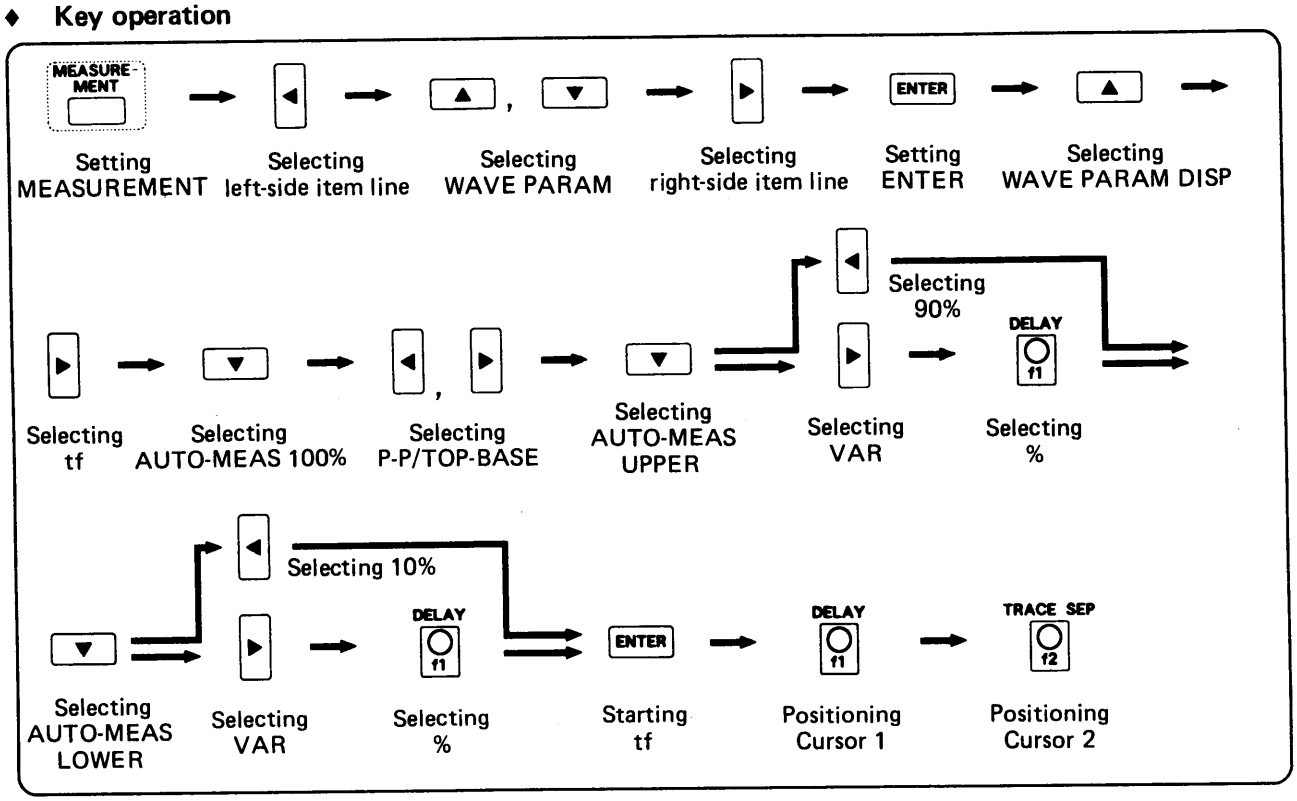
WAVE PARAM
tf



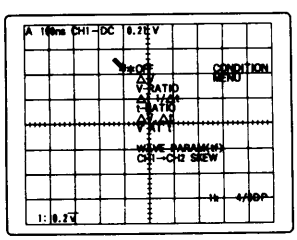


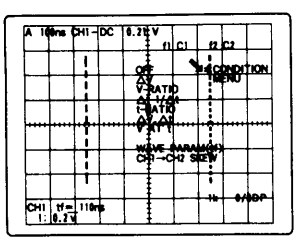
Activates the trailing time of waveform within the range specified by the cursor for measuring time to be measured automatically.

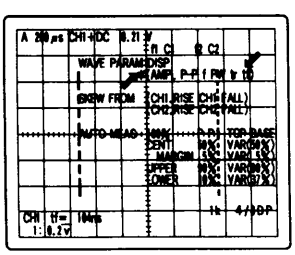
♦ **Key operation**



♦ **Operating procedure**







◇ **When executing tf:**

① Press the MEASURE-MENT key and set the MEASUREMENT.

② Press the ◀ and select the left line of measurement items on screen.
- The "*" appears at the head of OFF.

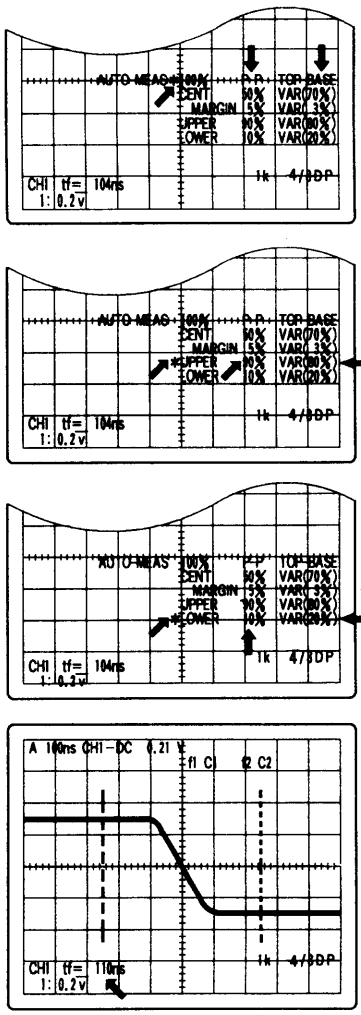
③ Press the ▲ or ▼ key and select the WAVE PARAM.
- The brightness of characters within parentheses of WAVE PARAM is highlighted.
- The Cursors 1 and 2 appear on the screen.

④ Press the ▶ key and shift the * mark to the right item line to select the CONDITION.

⑤ Press the ENTER key.

⑥ Press the ▲ key and select the WAVE PARAM DISP.

⑦ Press the ◀ or ▶ key and select the tf.



⑧ Press the [▼] key and select the AUTO-MEAS 100% items.

⑨ Press the [◄] or [►] key and select the P-P or TOP-BASE.

⑩ Press the [▼] key and select the AUTO-MEAS UPPER items.

⑪ Press the [◄] or [►] key and select the 90% or VAR.

- Advances to ⑬ when selecting 90%.

⑫ Turn the DELAY [f1] knob and select the value of %.

⑬ Press the [▼] key and select the AUTO-MEAS LOWER.

⑭ Press the [◄] or [►] key and select the 10% or VAR.

- Advances to ⑯ when the 10% is selected.

⑮ Turn the DELAY [f1] knob and select the % value.

⑯ Press the [ENTER] key and allow the menu screen to disappear and to start tf.

- Enter signal to be measured.

⑰ Turn the DELAY [f1] knob and shift the cursor 1 (¦) to the reference point.

⑱ Turn the TRACE SEP [f2] knob and shift the cursor 2 (⋮) to the measurement point.

- The tf of waveform within the range specified by the cursors 1 and 2 appears at the bottom of screen.

◇ **When ending tf:**

① Press the [MEASUREMENT] key and set the MEASUREMENT.

② Press the [▲] key and select OFF.

◇ **When erasing the menu screen:**

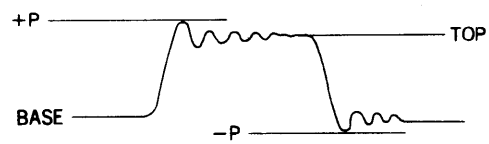
① Press the [MEASUREMENT] key.

One-point advice

◇ Press the [ATTACH] key and change the measurement channel. Now, the measured value on the selected channel is displayed.

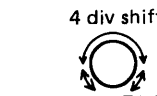
◇ Generally, set the AUTO-MEAS UPPER to 90% and LOWER to 10% when measuring leading time.

◇ P-P, TOP-BASE



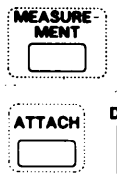
◇ Cursor operation and shifting range:

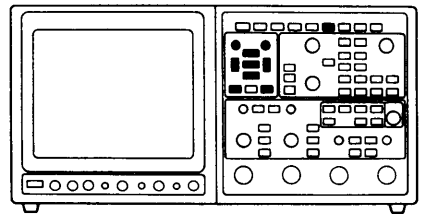
- Range near the center of knob: approximately 4 div shift
- Elastic part at the right or left edge of knob: The cursor moves over the entire screen by repeat operation. (Shifting stop if hands are released).



3.31 MEASUREMENT
(only for STORAGE)

WAVE PARAM
CH1→CH2 SKEW

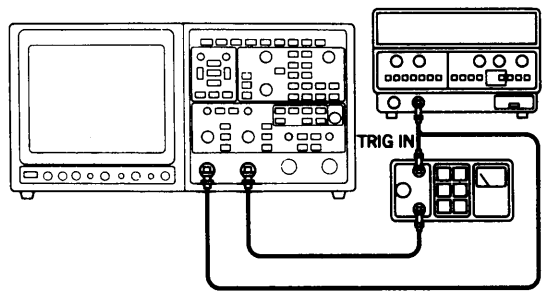




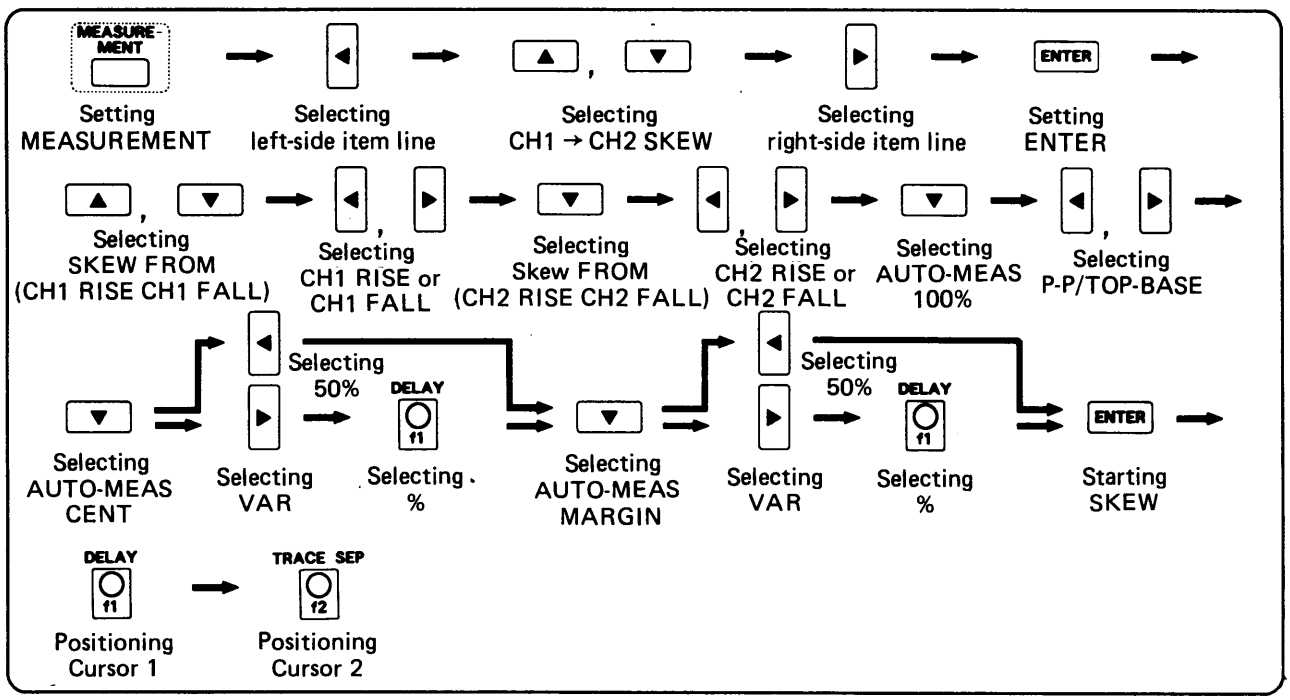
Activates the SKEW (time deviation) of CH1 and CH2 waveforms within the range specified by the cursor for measuring time to be measured automatically. The SKEW includes the leading and trailing of CH1 and those of CH2.

♦ **Preliminary setup**

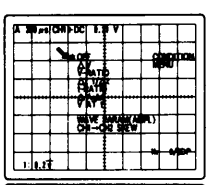
- CH1 input
  - Signal generator (for example, Iwatsu FG-350)
  - Frequency : 1 kHz
  - Output voltage : 0.6 Vp-p
- CH2 input Inputs signal of signal generator for enabling phase to be changed for external trigger signal.
  - Frequency : 1 kHz
  - Output voltage : 0.6 Vp-p

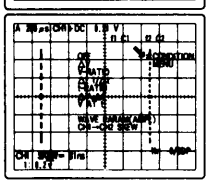


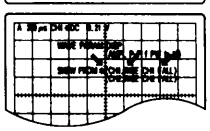
♦ **Key operation**



♦ **Operating procedure**







◇ **When executing SKEW:**

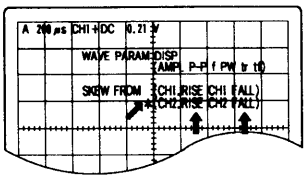
① Press the MEASURE-MENT key and set the MEASUREMENT.

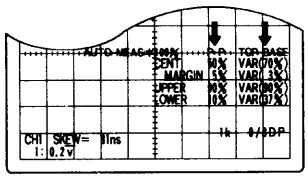
② Press the ◄ key and select the left line of measurement items on screen.
- The "*" appears at the head of OFF.

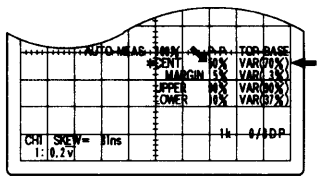
③ Press the ▲ or ▼ key and select the CH1 → CH2 SKEW.
- The brightness of characters within parentheses of CH1 → CH2 SKEW is highlighted.
- The Cursors 1 and 2 appear on the screen.

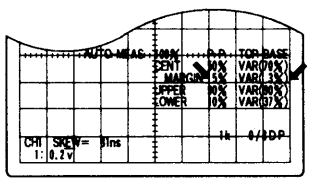
④ Press the ► key and shift the * mark to the right item line to select the CONDITION.

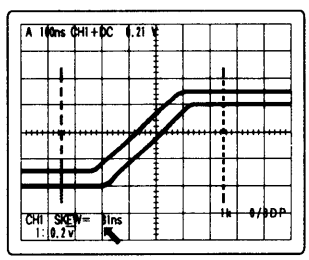
⑤ Press the ENTER key.











⑥ Press the [▲] key and select the (CH1.RISE CH1.FALL).

⑦ Press the [◄] or [►] key and select the CH1.RISE or CH1.FALL.

⑧ Press the [▼] key and select the (CH2.RISE CH2.FALL).

⑨ Press the [◄] or [►] key and select the CH2.RISE or CH2.FALL.

⑩ Press the [▼] key and select the AUTO-MEAS 100% items.

⑪ Press the [◄] or [►] key and select the P-P or TOP-BASE.

⑫ Press the [▼] key and select the AUTO-MEAS CENT items.

⑬ Press the [◄] or [►] key and select 50% or VAR.

- Advances to ⑮ when selecting 50%.

⑭ Turn the DELAY f1 knob and select the value of %.

⑮ Press the [▼] key and select the AUTO-MEAS MARGIN.

⑯ Press the [◄] or [►] key and select the 5% or VAR.

- Advances to ⑱ when the 5% is selected.

⑰ Turn the DELAY f1 knob and select the % value.

- The left Figure shows an example where the MARGIN is set to 3%.

⑱ Press the [ENTER] key and allow the menu screen to disappear and to start SKEW.

- Enter signal to be measured.

⑲ Turn the DELAY f1 knob and shift the cursor 1 (¦) to the reference point.

⑳ Turn the TRACE SEP f2 knob and shift the cursor 2 (¦) to the measurement point.

- The SKEW time of CH1 and CH2 waveforms within the range specified by the cursors 1 and 2 appears at the bottom of screen.

◇ **When ending SKEW:**

① Press the [MEASUREMENT] key and set the MEASUREMENT.

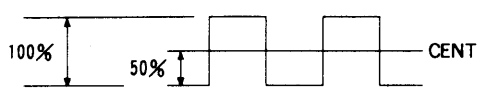
② Press the [▲] key and select OFF.

◇ **When erasing the menu screen:**

① Press the [MEASUREMENT] key.

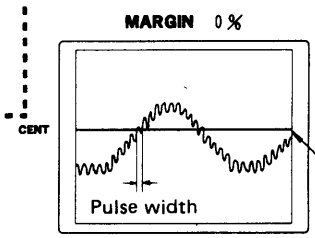
One-point advice

- It indicates the % of value specified by the P-P or TOP-BASE for AUTO-MEAS CENT.



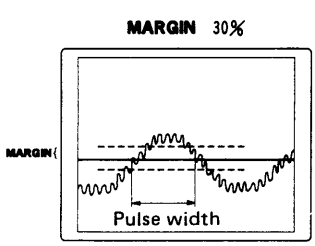
- MARGIN works when noises overlap the waveform to be measured, and is intended for preventing an erroneous measurement by noises around on the threshold level.
  A value of MARGIN stands for the amplitude in percent of MARGIN with the amplitude of TOP-BASE or of P-P regarded as 100%.

◇ Measuring Pulse width of a signal



When the value of MARGIN is 0%, the pulse width of a noise may be measured if the noise overlaps as shown in the figure.

Threshold level

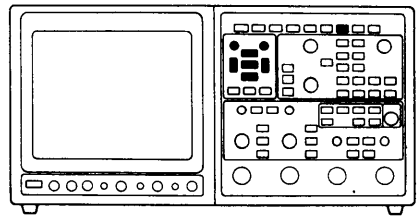


If you set MARGIN at 30%, e.g., to prevent an erroneous measurement as mentioned above, the noise would not affect any more as shown in the figure when the amplitude of the noise is within 30% of the maximum amplitude of the signal (of TOP-BASE or of P-P).

MARGIN reads the amplitude of the noise out of the screen, and adjusts the amplitude.

3.32 SAVE RECALL
(only for STORAGE)

SAVE SET UP

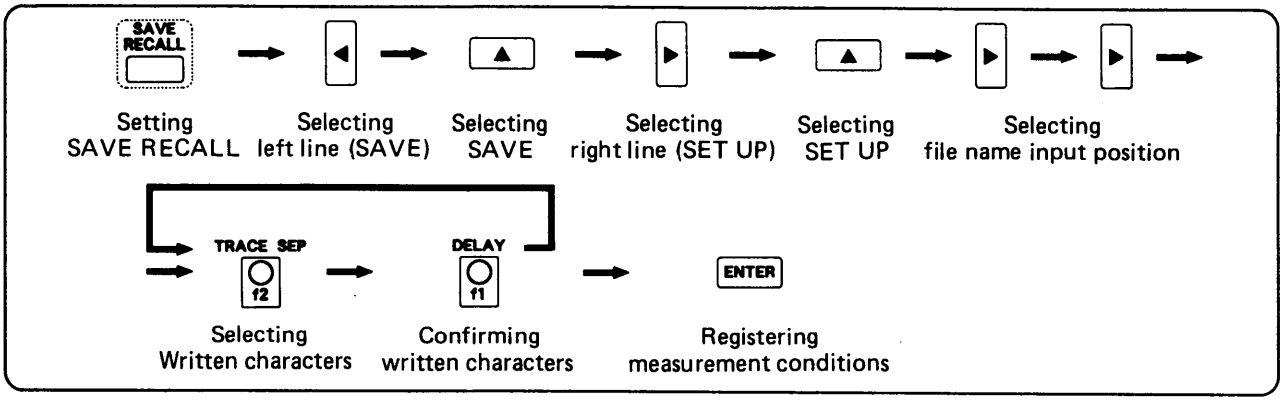


Allows you to save the setup conditions in the file.

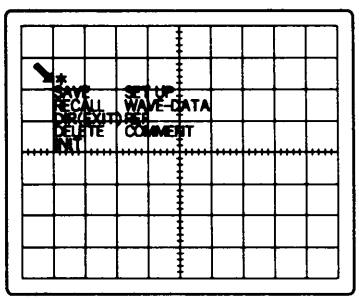
♦ **Preliminary setup**

Set the digital storage scope to the desired setup to save.

♦ **Key operation**



♦ **Operating procedure**

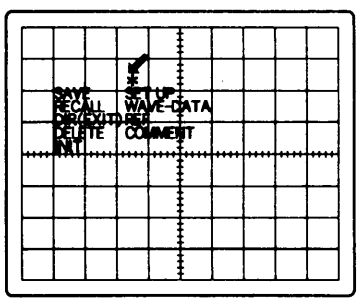


◇ **Saving the new file:**

① Press the SAVE RECALL key and select the SAVE RECALL.
- The left figure is typical in STORAGE.

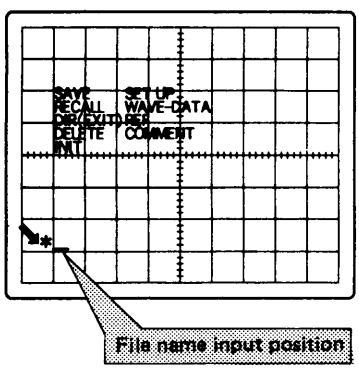
② Press the ◀ key and select the left line (SAVE) of items on screen.
- The "*" mark appears at the head of the selected line.

③ Press the ▲ key and select the SAVE.
- The brightness of SAVE is highlighted.

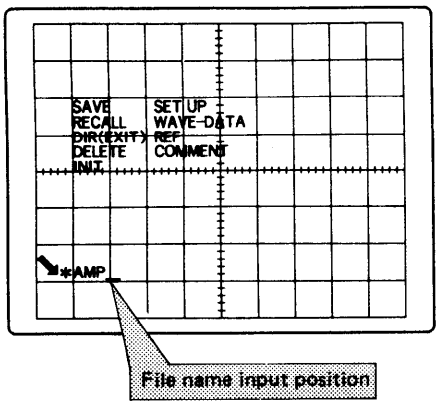


④ Press the ▶ key and select the right line (SET UP) of items on screen.
- The "*" mark appears at the head of the selected line.

⑤ Press the ▲ key and select the SETUP.
- The brightness of SETUP is highlighted.



⑥ Press the ▶ key and shift the "*" mark to the file name input position at the lowest stage.
- An underline appears at a position where the file name is written.



⑦ Turn the TRACE SEP f2 knob and select characters to be written.

⑧ If the target characters are found, turn the DELAY f1 knob to confirm the characters.

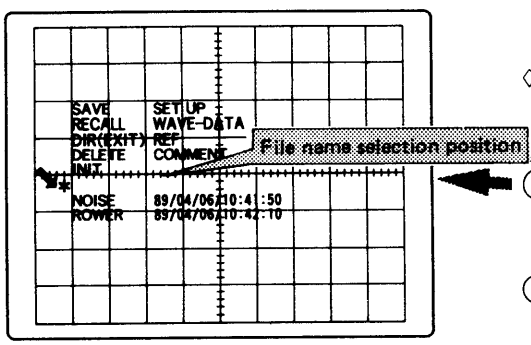
- The position of underline shifts to the right.

⑨ Repeat Step ⑦ and ⑧ to write two characters or more.

- The left figure shows an example where the AMP characters are written.

⑩ Press the ENTER key and allow the menu screen to disappear and to end writing.

- Press the SAVE RECALL key again to confirm the registered file name.



◇ **When changing the measurement conditions of a file which was already registered:**

① Press the ◀ key and shift the "*" mark to the file name selection position.

② Press the ▲ or ▼ key and select the file name.

- The brightness of selected file is highlighted.

③ Press the ENTER key and complete renewing the file.

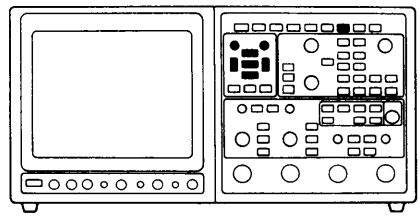
- New measurement conditions are written.

One-point advice

- Available characters for the file name
  !"#$%&'()*+,−./0123456789:;⇔?
  @ABCDFEGHIJKLMNOPQRSTUVWXYZ
- Date and time are automatically added to the file name.
- Up to 8 characters can be registered to a file name.
- Conditions which cannot be registered: INTEN, FOCUS, PROBE SENS, GP-IB conditions, RS-232C conditions, infrared rays remote control ID, SELF TEST conditions, and XY RECORDER conditions.
- The "INVALID FILE NAME" error message will be displayed when you enter invalid character "*" or ".".
- The SET UP can be registered up to the number satisfying the following two methods:
  1. Number of SET UP (32 max.) + number of comment (32 max.) + [number of registered waveforms (14 max. when setting 1 kW to LENGTH, 7 max. when setting 2 kW to LENGTH and 1 max. when setting 16 kW to LENGTH)] ≦32
  2. (Number of SET UP X 2) + (number of comment X 2) + [number of registered waveforms (number of waveforms X 9 when setting 1 kW to LENGTH, number of waveforms X 17 when setting 2 kW to LENGTH, number of waveforms X 129 when setting 16 kW to LENGTH)] ≦129

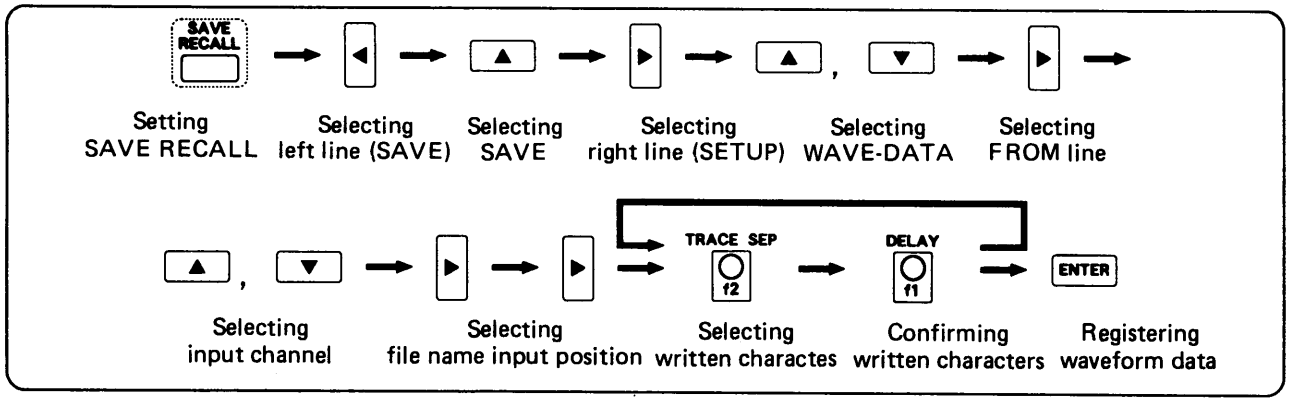
3.32 SAVE RECALL
(only for STORAGE)

SAVE WAVE-DATA

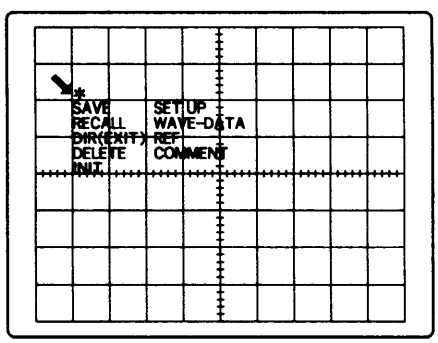


Allows you to record waveforms during measurement of CH1, CH2, CH3, or CH4 or the display fixed (STOP) waveforms. The recorded waveform is displayed to the screen again or is hard-copied to a plotter (optional) for performing comparison and analysis.

♦ **Key operation**



♦ **Operating procedure**

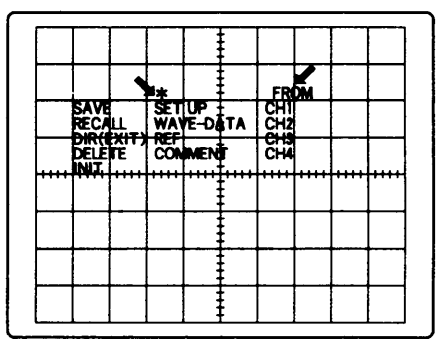


◇ **Saving new file:**

① Press the SAVE RECALL key and select the SAVE RECALL.
- The left figure is typical in STORAGE.

② Press the ◀ key and select the left line (SAVE) of items on screen.
- The "*" mark appears at the head of the selected line.

③ Press the ▲ key and select the SAVE.
- The brightness of SAVE is highlighted.

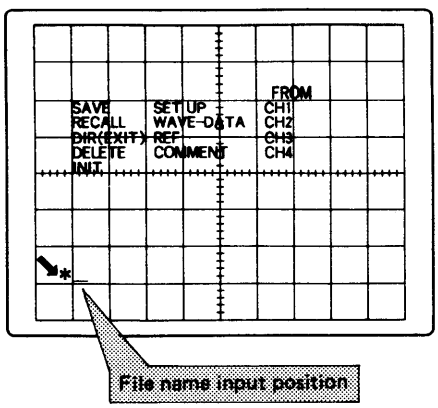


④ Press the ▶ key and select the right line (SET UP) of items on screen.
- The "*" mark appears at the head of the selected line.

⑤ Press the ▲ and ▼ key and select the WAVE-DATA.
- The brightness of WAVE-DATA is highlighted.
- The FROM line appears.

⑥ Press the ▶ key and select the FROM line of items on screen.
- The "*" mark appears at the head of selected line.

⑦ Press the ▲ or ▼ key and select the channel for registering waveform data.



⑧ Press the ▶ key and shift the "*" mark to the file name input position at the lowest stage.

- An underline appears at a position where the file name is written.

⑨ Turn the TRACE SEP f2 knob and select characters to be written.

⑩ If the target characters are found, turn the DELAY f1 knob to confirm the characters.

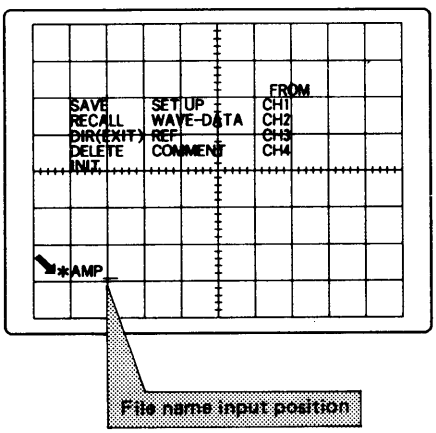
- The position of underline shifts to the right.

⑪ Repeat ⑨ and ⑩ to write two characters or more.

- The left figure shows an example where the AMP characters are written.

⑫ Press the ENTER key to allow the menu screen to disappear and to end writing.

- Press the SAVE RECALL key again and confirm the registered file name.



◇ **When changing waveform data of a file which has already been registered:**

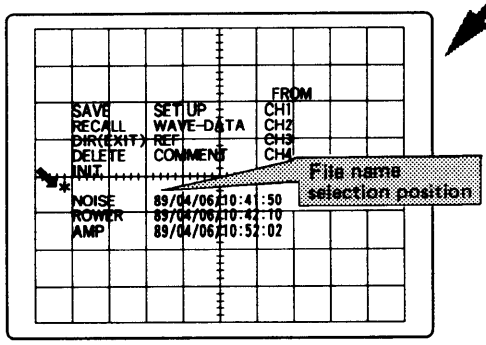
① Press the ▶ key and shift the "*" mark to the file name selection position.

② Press the ▲ or ▼ key and select the file name.

- The brightness of selected file is highlighted.

③ Press the ENTER key and end writing.

- New measurement conditions are written.

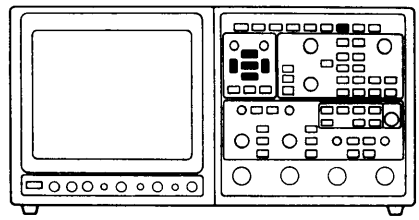


One-point advice

- Available characters for the file name
  ! "#$%&'()*+,–./0123456789:;⇔?
  @ABCDEFGHIJKLMNOPQRSTUVWXYZ
- Date and time are automatically added to the file name.
- Up to 8 characters can be registered to a file name.
- The SET UP can be registered up to the number satisfying the following two methods:
  1. Number of SET UP (32 max.) + number of comment (32 max.) + [number of registered waveforms (14 max. when setting 1 kW to LENGTH, 7 max. when setting 2 kW to LENGTH and 1 max. when setting 16 kW to LENGTH)] ≦ 32
  2. (Number of SET UP X 2) + (number of comment X 2) + [number of registered waveforms (number of waveforms X 9 when setting 1 kW to LENGTH, number of waveforms X 17 when setting 2 kW to LENGTH, number of waveforms X 129 when setting 16 kW to LENGTH)] ≦ 129

3.32 SAVE RECALL
(only for STORAGE)

SAVE REF

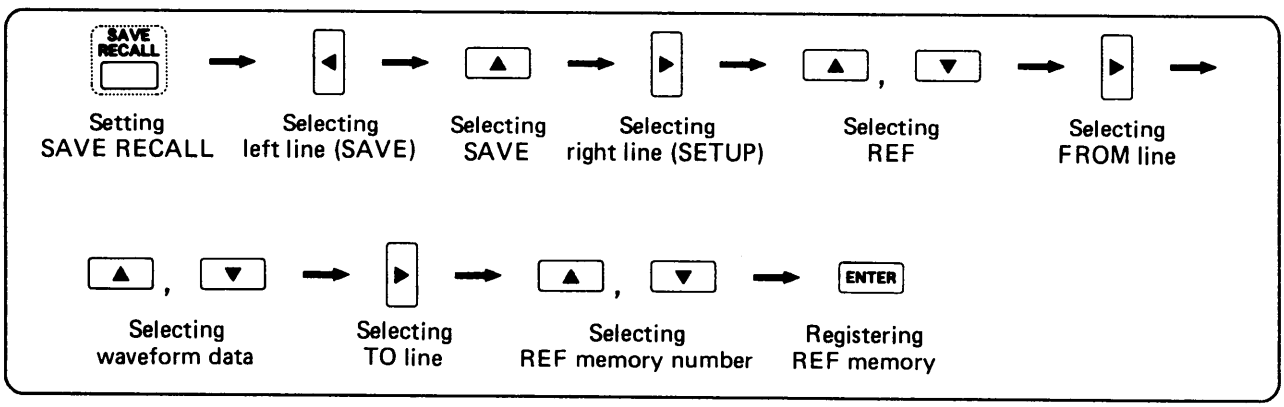


It is used to register (SAVE) the waveform which becomes the reference for GO/NOGO judgment into the REF memory.

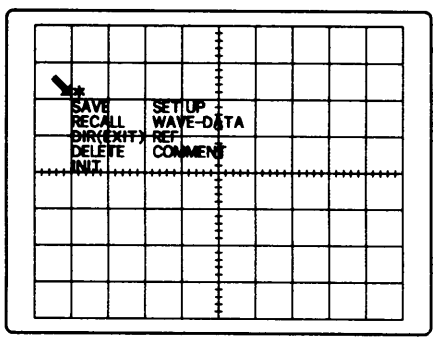
♦ **Preliminary setup**

Call the waveform on a screen momentarily for registering the recorded (SAVE) waveform in REF memory. See the RECALL WAVEDATA at page 136.

♦ **Key operation**



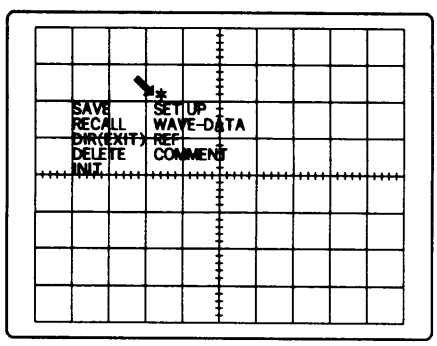
♦ **Operating procedure**



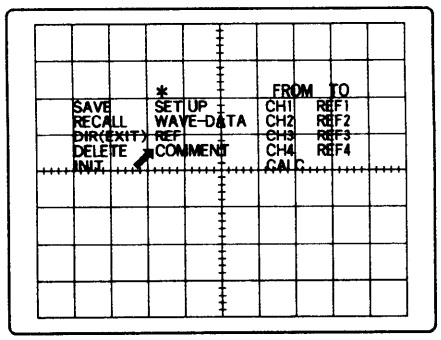
① Press the SAVE RECALL key and select the SAVE RECALL.
- The left figure is typical in STORAGE.

② Press the ◀ key and select the left line (SAVE) of items on screen.
- The "*" mark appears at the head of the selected line.

③ Press the ▲ key and select the SAVE.
- The brightness of SAVE is highlighted.



④ Press the ▶ key and select the right line (SET UP) of items on screen.
- The "*" mark appears at the head of the selected line.



⑤ Press the [▲] or [▼] key and select the REF.

- The brightness of REF is highlighted.
- The FROM and TO item lines appear.

⑥ Press the [►] key and select the FROM line of items on screen.

- The "*" mark appears at the head of selected line.

⑦ Press the [▲] or [▼] key and select a channel for registering into the REF memory.

- The brightness of selected characters is highlighted.

⑧ Press the [►] key and select the TO line of items on screen.

⑨ Press the [▲] or [▼] key and select the REF memory number.

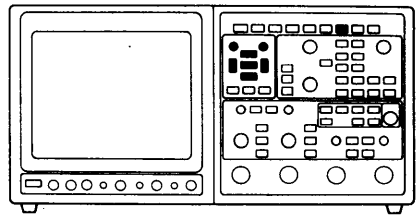
- The brightness of selected characters is highlighted.

⑩ Press the [ENTER] key to allow the screen to disappear and to end registration.
(initial conditions) on shipment.

3

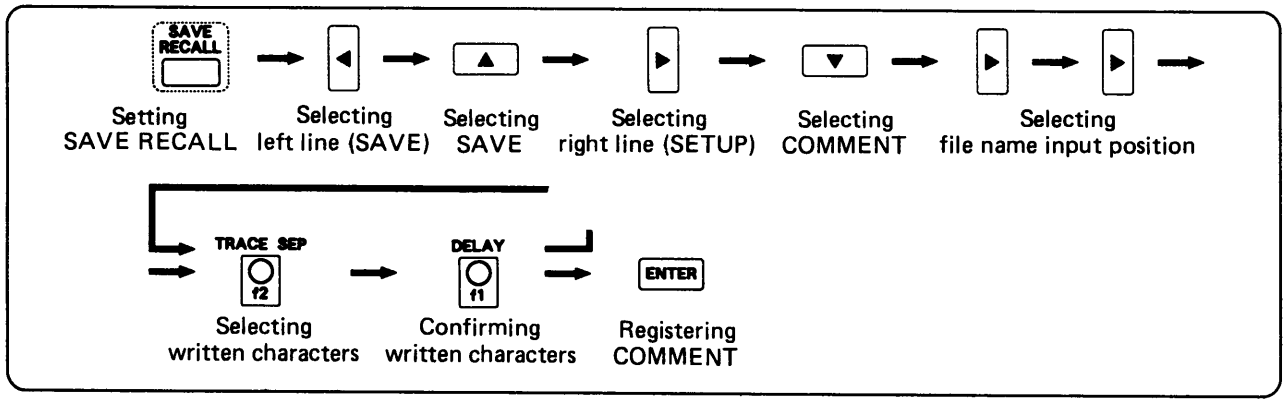
One-point advice • The number of REF memories is 4 (REF1, REF2, REF3, and REF4).

SAVE COMMENT

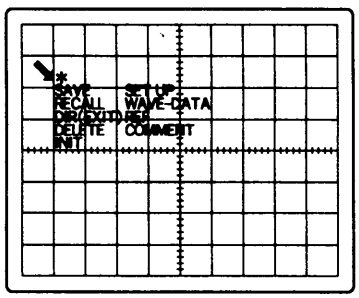


Registering comment on screen is convenient for outputting a waveform data to a plotter, an XY recorder, or a photo. It registers comments created by the COMMENT menu.

♦ **Key operation**



♦ **Operating procedure**

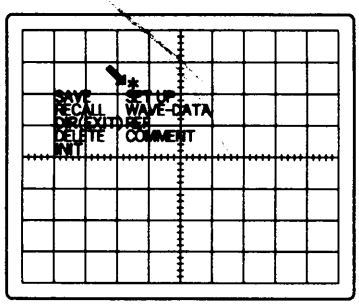


◇ **Saving new file.**

① Press the SAVE RECALL key and select the SAVE RECALL.
- The left figure is typical in STORAGE.

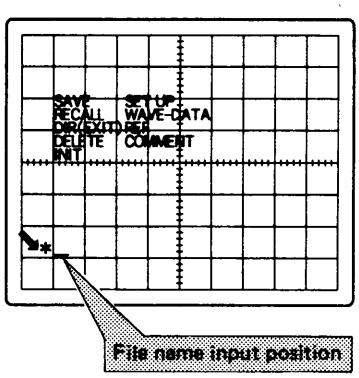
② Press the ◀ key and select the left line (SAVE) of items on screen.
- The "*" mark appears at the head of the selected line.

③ Press the ▲ key and select the SAVE.
- The brightness of SAVE is highlighted.

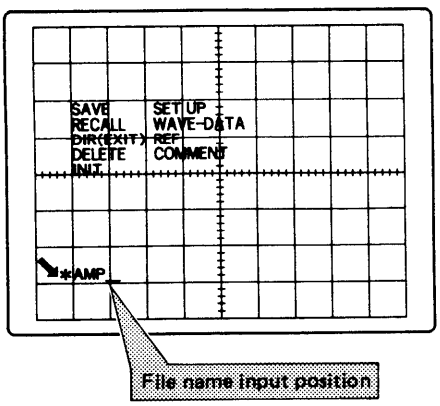


④ Press the ▶ key and select the right line (SETUP) of items on screen.
- The "*" mark appears at the head of the selected line.

⑤ Press the ▼ key and select the COMMENT.
- The brightness of COMMENT is highlighted.



⑥ Press the ▶ key and shift the "*" mark to the file name input position at the lowest stage.
- An underline appears at a position where a file name is to be written.



⑦ Turn the TRACE SEP f2 knob to select the characters to be written.

⑧ Turn the DELAY f1 knob to confirm characters if the target characters are found.

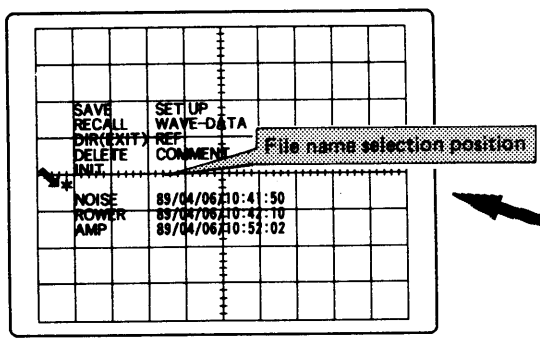
- The position of underline moves to the right.

⑨ Repeat ⑦ and ⑧ to write two or more characters.

- The left Figure shows an example where the AMP characters were written.

⑩ Press the [ENTER] key and end writing.

- Press the [SAVE RECALL] key again and confirm the registered file name.



◇ **When registering comment into a file which was already registered:**

① Press the [◀] key and shift the "*" mark to the file name selection position.

② Press the [▲] or [▼] key and select the file name.

- The brightness of selected file is highlighted.

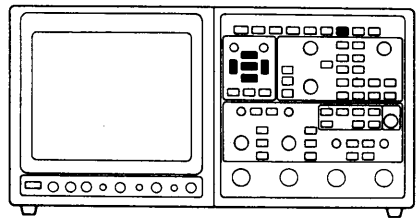
③ Press the [ENTER] key and end writing.

- A new waveform data is replaced.

One-point advice

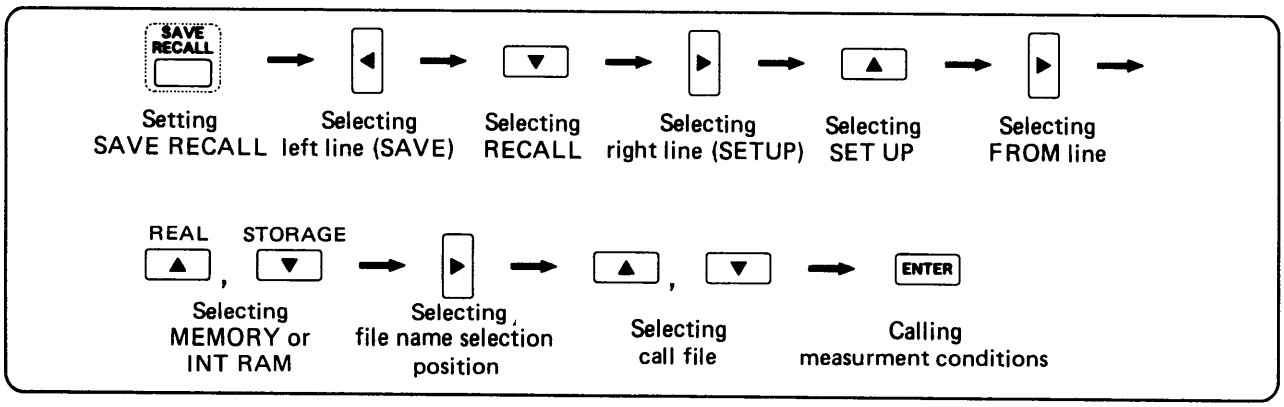
- Available characters for the file name
  ! "#$%&'()*+,–./0123456789:;⇔?
  @ABCDEFGHIJKLMNOPQRSTUVWXYZ
- Date and time are automatically added to the file name.
- Up to 8 characters can be registered to a file name.
- The SET UP can be registered up to the number satisfying the following two methods:
  1. Number of SET UP (32 max.) + number of comment (32 max.) + [number of registered waveforms (14 max. when setting 1 kW to LENGTH, 7 max. when setting 2 kW to LENGTH and 1 max. when setting 16 kW to LENGTH)] $\leqq$32
  2. (Number of SET UP X 2) + (number of comment screens X 2) + [number of registered waveforms (number of waveforms X 9 when setting 1 kW to LENGTH, number of waveforms X17 when settng 2 kW to LENGT, number of waveforms X 129 when setting 16 kW to LENGTH)] $\leqq$129
- The "INVALID FILE NAME" error message will be displayed when you enter invalid character "*" or ".".

RECALL SETUP INT RAM,MEMORY

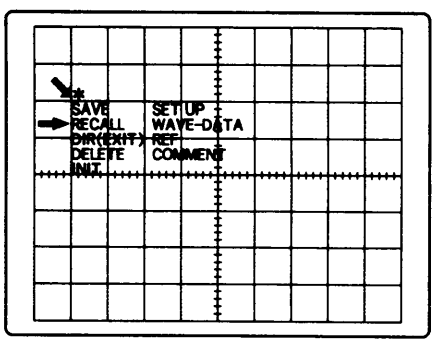


It is convenient for setting to measurement conditions which are registered previously when performing measurement repeatedly.

♦ **Key operation**



♦ **Operating procedure**



◇ **Saving new file:**

① Press the SAVE RECALL key and select the SAVE RECALL.

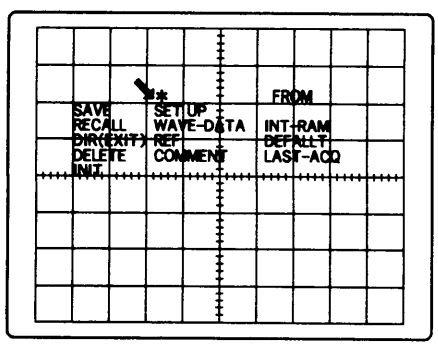
- The left figure is typical in STORAGE.

② Press the ◀ key and select the left line (SAVE) of items on screen.

- The "*" mark appears at the head of the selected line.

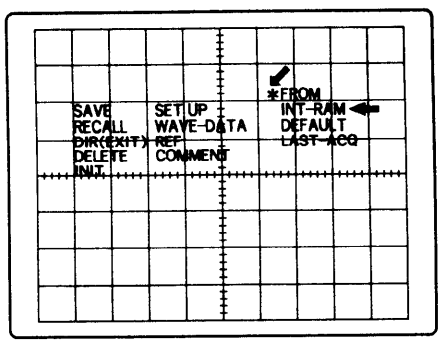
③ Press the ▼ key and select the RECALL.

- The brightness of RECALL is highlighted.



④ Press the ▶ key and select the right line (SETUP) of items on screen.

- The "*" mark appears at the head of the selected line.



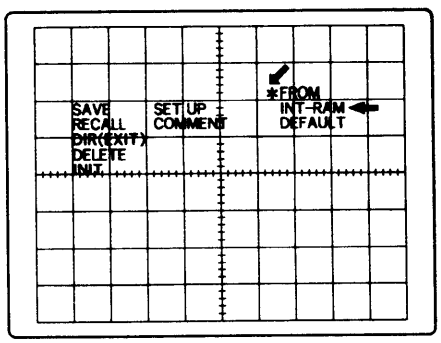
⑤ Press the [▲] key and select the SET UP.

- The brightness of SET UP is highlighted.
- The item line of FROM appears.

⑥ Press the [▶] key and select the FROM line of items.

- The "*" mark appears at the head of the selected line.

⑦ Press the [▲] key and select the INT RAM or MEMORY.



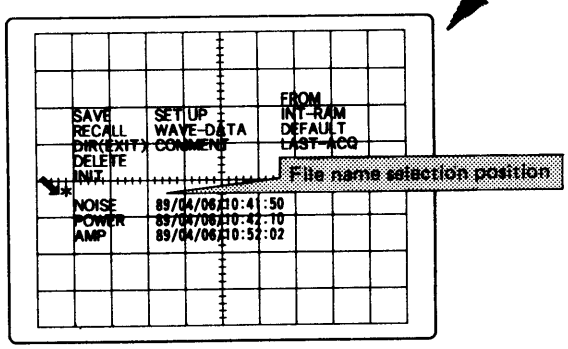
- In STORAGE mode, INT RAM is selected.
- In REAL mode, MEMORY is selected.
- The brightness of INT RAM or MEMORY is highlighted.

⑧ Press the [▶] key and move the "*" to the file name selection position.

⑨ Press the [▲] or [▼] key and select the file to be called.

- The brightness of selected file is highlighted.

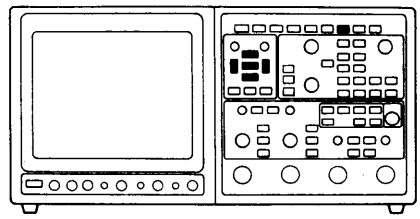
⑩ Press the [ENTER] key and end calling.



One-point advice

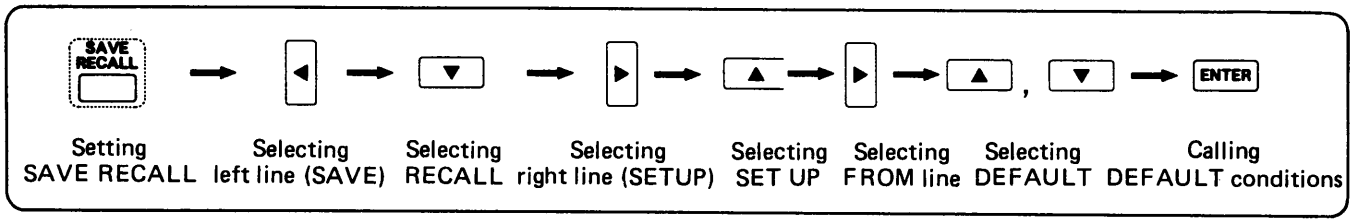
- Press the [▶] key and shift the "*" to the file name input position to allow the file name to be input and the file to be called.
- The files are sorted in the ASCII cord order in the file directory.

RECALL SETUP DEFAULT

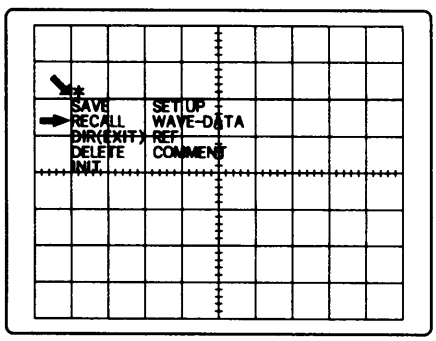


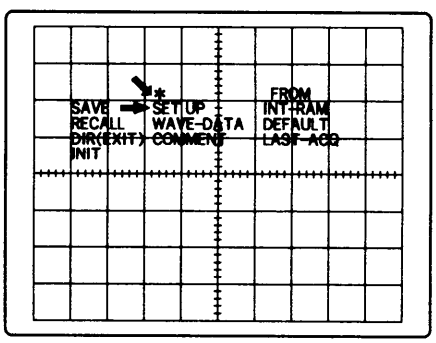
Calls up measurement conditions (initial conditions) on shipment.
It can be utilized for measurement conditions until a beginner can get used to the handling.

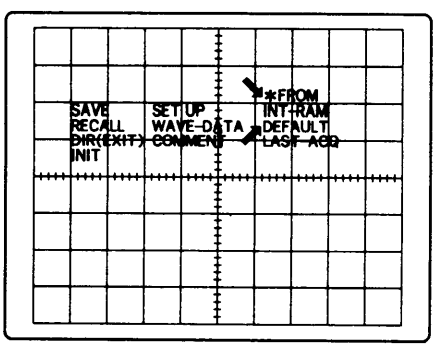
♦ **Key operation**



♦ **Operating procedure**







◇ **Saving new file.**

① Press the SAVE RECALL key and select the SAVE RECALL.
- The left figure is typical in STORAGE.

② Press the ◀ key and select the left line (SAVE) of items on screen.
- The "*" mark appears at the head of the selected line.

③ Press the ▼ key and select the RECALL.
- The brightness of RECALL is highlighted.

④ Press the ▶ key and select the right line (SETUP) of items on screen.
- The "*" mark appears at the head of the selected line.

⑤ Press the ▲ key and select the SET UP.
- The brightness of SET UP is highlighted.
- The item line of FROM appears.

⑥ Press the ▶ key and select the FROM line of items.
- The "*" mark appears at the head of the selected line.

⑦ Press the ▲ or ▼ key and select the DEFAULT.
- The brightness of DEFAULT is highlighted.

⑧ Press the ENTER key and end calling.

◆ SETUP DEFAULT

1. Vertical deflection system

• VERT MODE		: CH1
• COUPLING	CH1 ~ CH4	: DC
• GND	CH1, CH2	: OFF
• INPUT IMPEDANCE	CH1, CH2	: 1MΩ
• VARIABLE	CH1, CH2	: CALIB
• VOLTS/DIV	CH1, CH2	: 1V
	CH3, CH4	: 0.1V
• BANDWIDTH		: FULL
• CH2 INVERT		: OFF
• ADD		: OFF
• CALC		: OFF
• CH2 DELAY		: CENTER
• POSITION		: CENTER

2. SWEEP TIME

• SWEEP MODE	: AUTO
• HORIZ DISPLAY	: A
• VARIABLE	: OFF
• A SEC/DIV	: 10 μs
• B SEC/DIV	: 10 μs
• X 10MAG	: OFF
• DELAY TIME	: 0
• TRACE SEPARATION	: CENTER
• POSITION	: CENTER

3. TRIGGER

• A SOURCE	: CH1
• COUPL	: DC
• SLOPE	: +
• LEVEL	: CENTER
• B SOURCE	: CH1
• COUPL	: DC
• SLOPE	: +
• LEVEL	: CENTER
• TV FIELD	: ODD
• LINE SELECT	: OFF
• LINE NUMBER	: 0
• EVENT MODE	: OFF
• COUNT	: 2
• HOLD OFF	: 0%

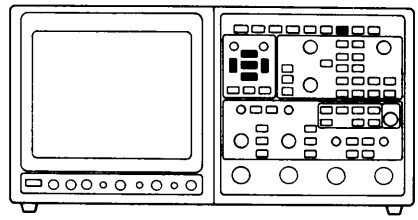
4. Readout and cursors

• Cursor 1 for measuring time	: from center to −2.5div
• Cursor 2 for measuring time	: from center to +2.5div
• Cursor 1 for measuring voltage	: from center to −2div
• Cursor 2 for measuring voltage	: from center to +2div
• Cursor tracking	: OFF
• Counter	: OFF
• DVM	: OFF
• Comment	: OFF
• MENU ON PERIOD	: 2s
• A INTEN	: appropriate brightness
• B INTEN	: appropriate brightness
• READOUT INTEN	: appropriate brightness

5. Others

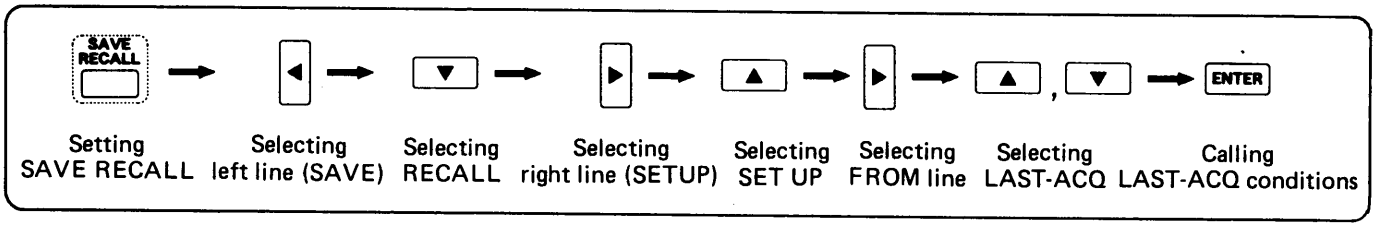
• STORAGE MODE	: All OFF
• Number of AVG and MAX-HOLD	: 2
• LENGTH	: 1k
• INPLT	: PLS

RECALL SETUP LAST-ACQ

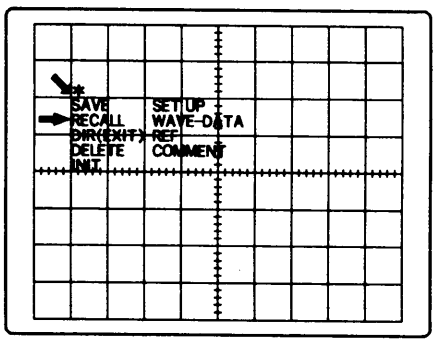


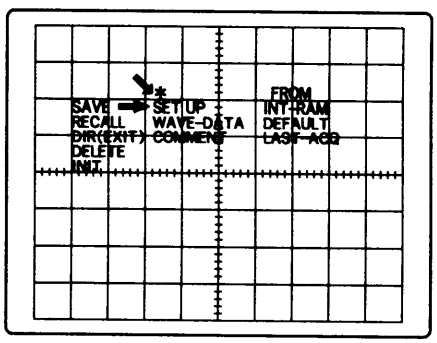
Calls up measurement conditions when the power is turned off.

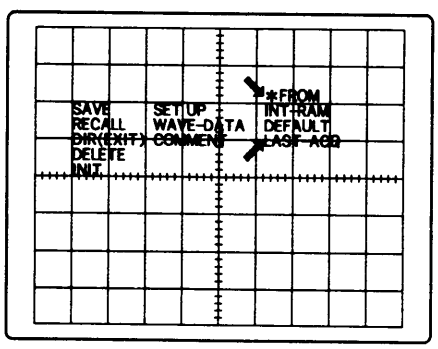
♦ **Key operation**



♦ **Operating procedure**







① Press the SAVE RECALL key and select the SAVE RECALL.

② Press the ◀ key and select the left line (SAVE) of items on screen.

- The "*" mark appears at the head of the selected line.

③ Press the ▼ key and select the RECALL.

- The brightness of RECALL is highlighted.

④ Press the ▶ key and select the right line (SETUP) of items on screen.

- The "*" mark appears at the head of the selected line.

⑤ Press the ▲ key and select the SET UP.

- The brightness of SET UP is highlighted.
- The item line of FROM appears.

⑥ Press the ▶ key and select the FROM line of items.

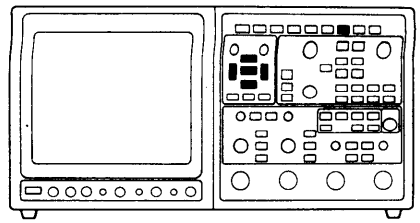
- The "*" mark appears at the head of the selected line.

⑦ Press the ▲ or ▼ key and select the LAST-ACQ.

- The brightness of LAST-ACQ is highlighted.

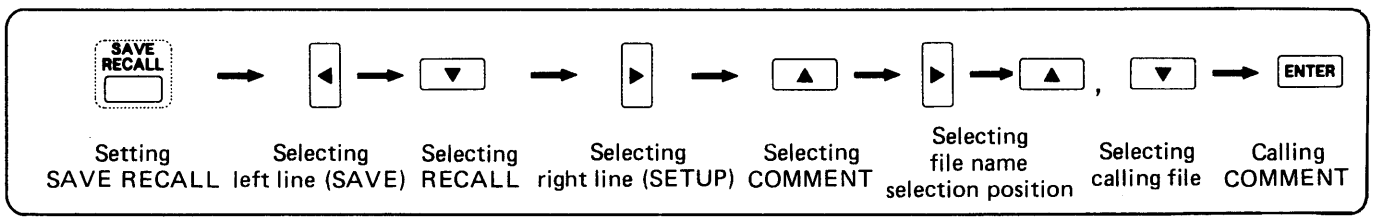
⑧ Press the ENTER key and end calling.

RECALL COMMENT

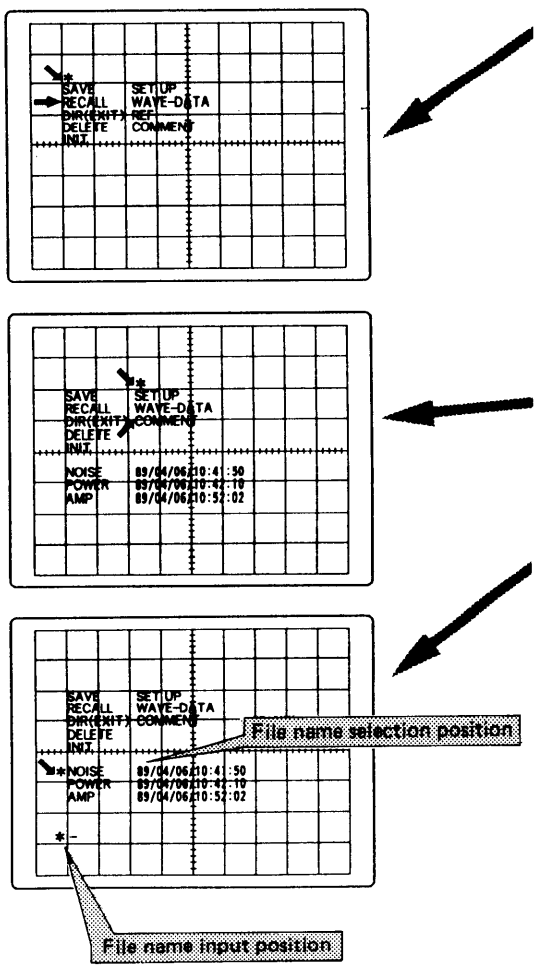


Calls up a comment which was already registered.

◆ **Key operation**



◆ **Operating procedure**



① Press the SAVE RECALL key and set the SAVE RECALL.
- The left figure is typical in STORAGE.

② Press the ◀ key and select the left line (SAVE) of items on screen.
- The "*" mark appears at the head of the selected line.

③ Press the ▼ key and select the RECALL.
- The brightness of RECALL is highlighted.

④ Press the ▶ key and select the right line (SETUP) of items on screen.
- The "*" mark appears at the head of the selected line.

⑤ Press the ▲ key and select the COMMENT.
- The brightness of COMMENT is highlighted.

⑥ Press the ▶ key and shift the "*" mark to the file name selection position.
- The "*" mark appears at the head of the selected line.

⑦ Press the ▲ or ▼ key and select a file to be called.
- The brightness of selected file is highlighted.

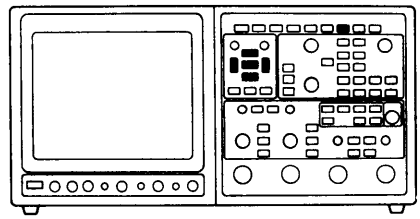
⑧ Press the ENTER key and end calling.

One-point advice

- Press the ▶ key and move the "*" mark to the file neme input position to allow the file name to be input and the file to be called.
- The files are sorted in the ASCII cord order in the file directory.

3.32 SAVE RECALL
(only for STORAGE)

RECALL WAVE-DATA

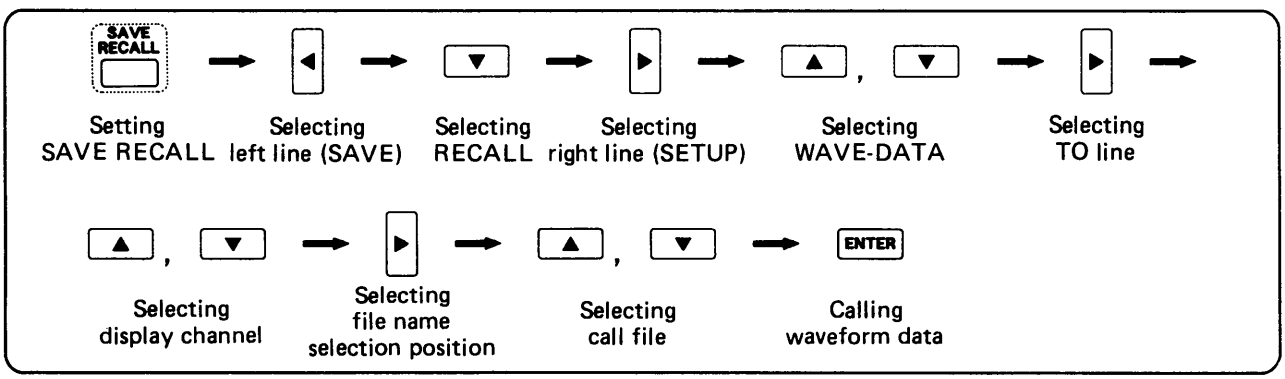


Calls up a WAVE-DATA which was already registered. Used for judgment of GO/NOGO, comparison of waveform, etc.

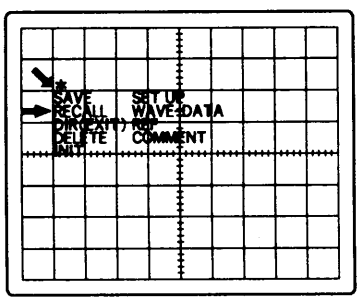
♦ **Preliminary setup**

Press the STOP / SGL key and set the SINGLE.

♦ **Key operation**



♦ **Operating procedure**



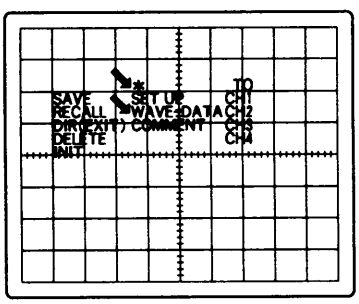
① Press the SAVE RECALL key and select the SAVE RECALL.

② Press the ◀ key and select the left line (SAVE) of items on screen.

- The "*" mark appears at the head of the selected line.

③ Press the ▼ key and select the RECALL.

- The brightness of RECALL is highlighted.

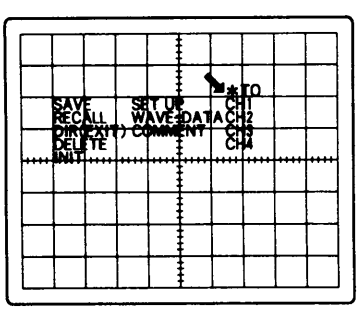


④ Press the ▶ key and select the right line (SETUP) of items on screen.

- The "*" mark appears at the head of the selected line.

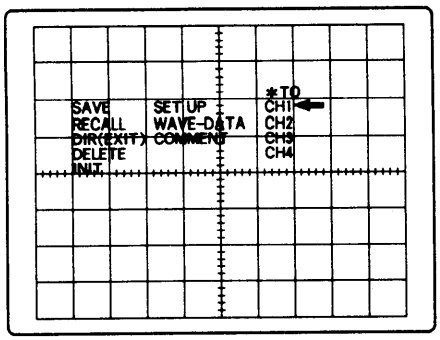
⑤ Press the ▲ key and select the WAVE-DATA.

- The brightness of WAVE-DATA is highlighted.
- The TO item line appears.



⑥ Press the ▶ key and select the TO line of items.

- The "*" mark appears at the head of the selected line.



⑦ Press the ▲ or ▼ key and select a channel to be displayed.

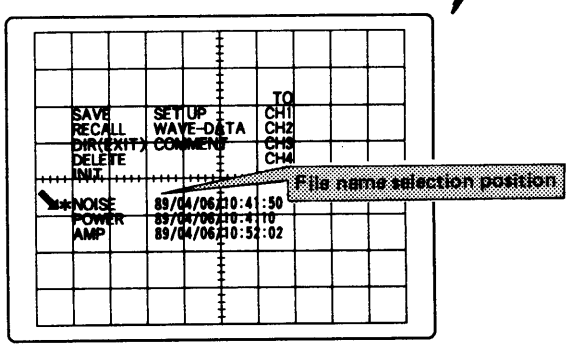
- The brightness of a selected channel is highlighted.

⑧ Press the ▶ key and shift the "*" mark to the file name selection position.

⑨ Press the ▲ or ▼ key and select a calling file.

- The brightness of a selected file is highlighted.

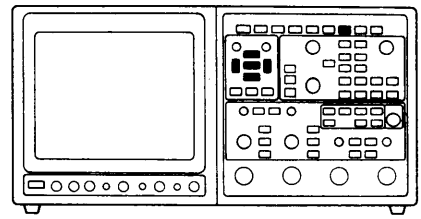
⑩ Press the ENTER key and end calling.



One-point advice

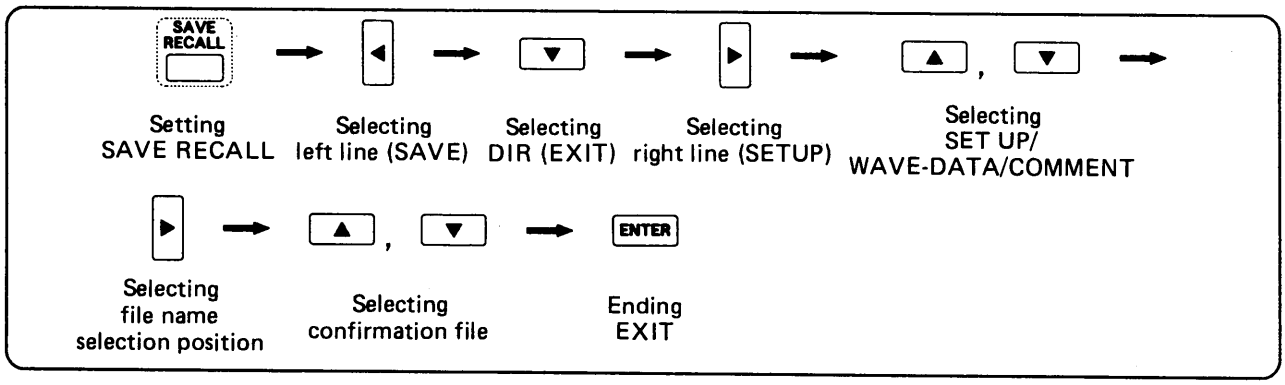
- Press the ▶ key and move the "*" mark to the file neme input position to allow the file name to be input and the file to be called.
- Press the STOP SGL key and set the STOP before calling up at a WAVE-DATA.

DIR (EXIT)

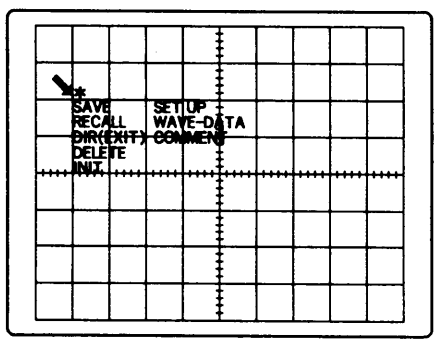


Allows a SET-UP, WAVE-DATA, or COMMENT which was already registered to be confirmed.

♦ **Key operation**



♦ **Operating procedure**



① Press the SAVE RECALL key and select the SAVE RECALL.

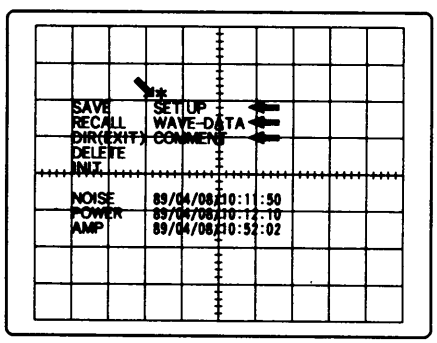
- The left figure is typical in STORAGE.

② Press the ◀ key and select the left line (SAVE) of items on screen.

- The "*" mark appears at the head of the selected line.

③ Press the ▼ key and select the DIR (EXIT).

- The brightness of DIR (EXIT) is highlighted.



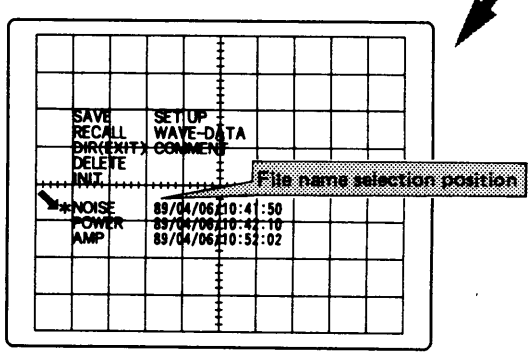
④ Press the ▶ key and select the right line (SETUP) of items on screen.

- The "*" mark appears at the head of the selected line.

⑤ Press the ▲ or ▼ key and select the SET UP, WAVE-DATA, or COMMENT.

- The brightness of selected items is highlighted.

⑥ Press the ▶ key and shift the "*" mark to the file name selection position.

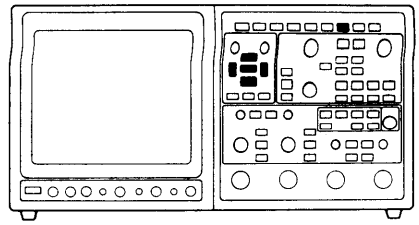


⑦ Press the ▲ or ▼ key and select a file to be confirmed.

- The brightness of a selected file is highlighted.

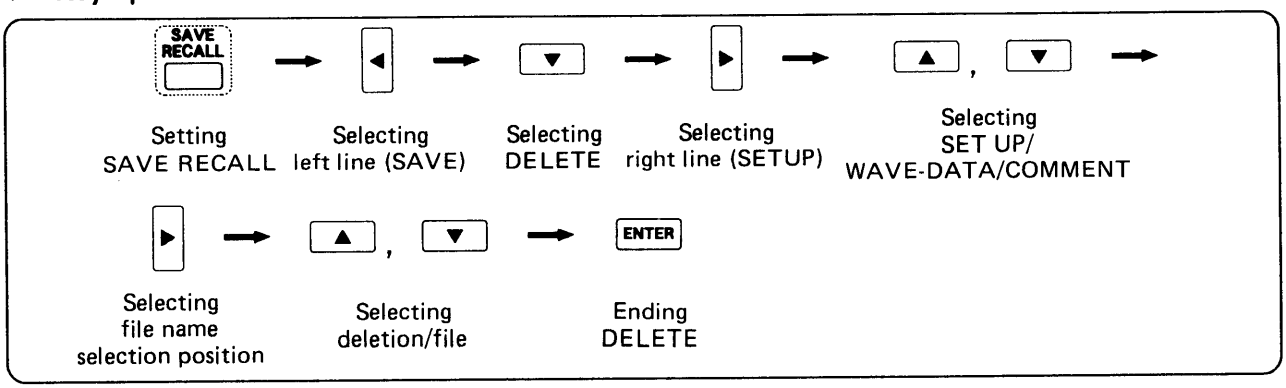
⑧ Press the ENTER key and end confirmation.

DELETE

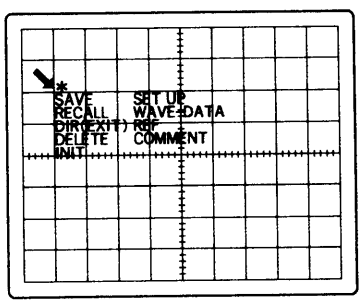


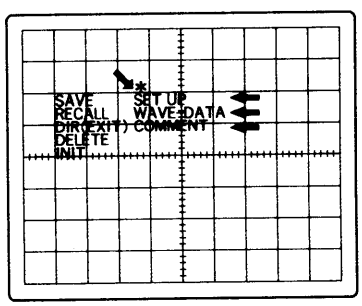
Allows SET-UP, WAVE-DATA, or COMMENT which was already registered to be deleted.

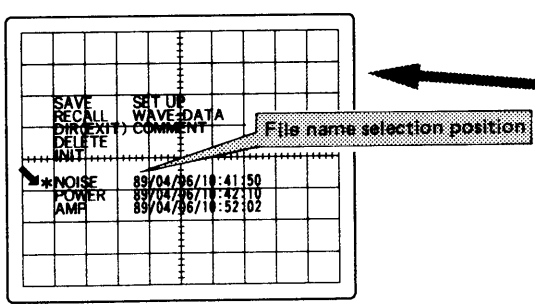
♦ **Key operation**



♦ **Operating procedure**







① Press the SAVE RECALL key and select the SAVE RECALL.
- The left figure is typical in STORAGE.

② Press the ◀ key and select the left line (SAVE) of items on screen.
- The "*" mark appears at the head of the selected line.

③ Press the ▼ key and select the DELETE.
- The brightness of DELETE is highlighted.

④ Press the ▶ key and select the right line (SETUP) of items on screen.
- The "*" mark appears at the head of the selected line.

⑤ Press the ▲ or ▼ key and select the SET UP, WAVE-DATA, or COMMENT.
- The brightness of selected items is highlighted.

⑥ Press the ▶ key and shift the "*" mark to the file name selection position.

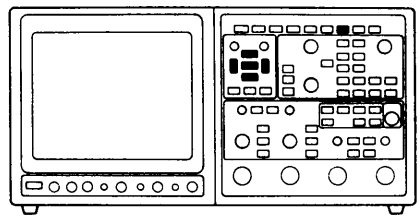
⑦ Press the ▲ or ▼ key and select a file to be deleted.
- The brightness of a selected file is highlighted.

⑧ Press the ENTER key and end deletion.

One-point advice

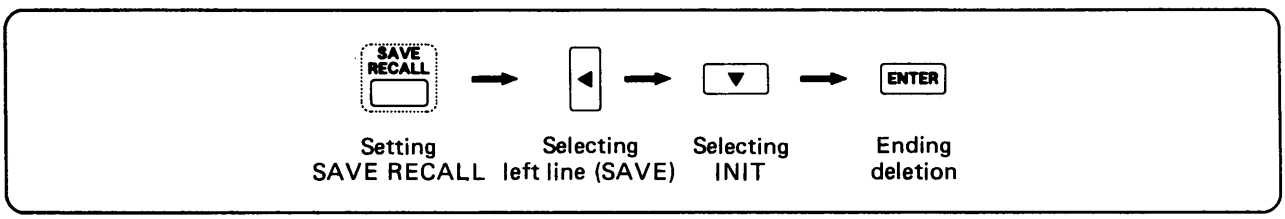
- Press the ▶ key to shift the "*" mark to the file name input position to allow the file name to be input and the file to be called.

INIT

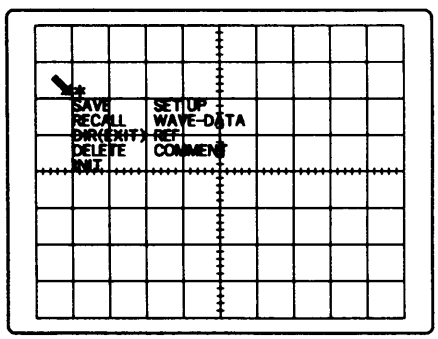


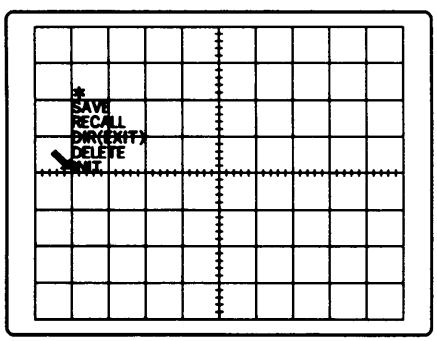
Allows you to delete all the SET-UP, WAVE-DATA and COMMENT files.

♦ **Key operation**



♦ **Operating procedure**





① Press the SAVE RECALL key and select the SAVE RECALL.

② Press the ◀ key and select the left line (SAVE) of items on screen.

- The "*" mark appears at the head of the selected line.

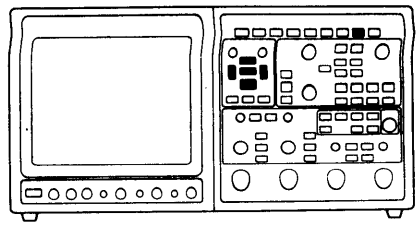
③ Press the ▼ key and select the INIT.

- The brightness of INIT is highlighted.

④ Press the ENTER key and end deletion.

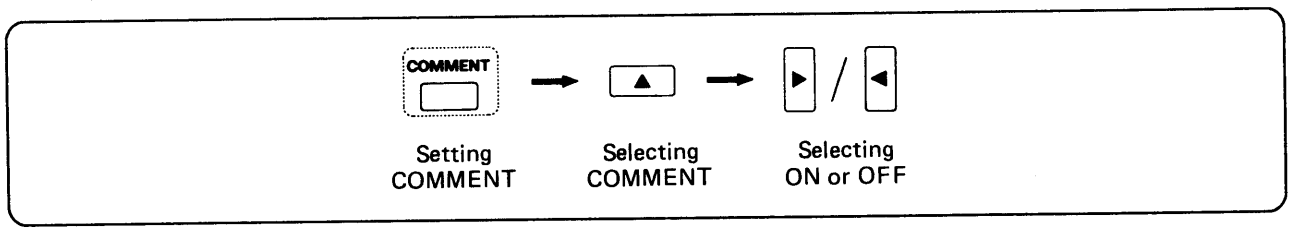
3.33 COMMENT

COMMENT OFF ON

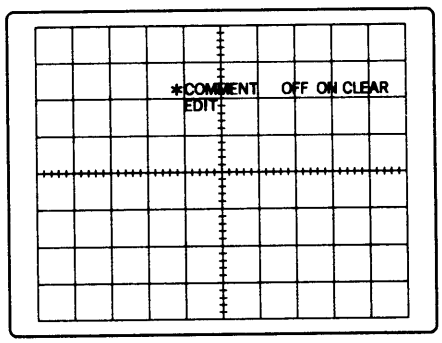


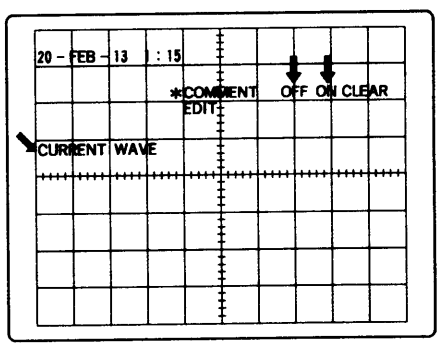
Switches display ON/OFF of comment. The date and time are displayed when the comment is turned on.

♦ Key operation



♦ Operating procedure





① Press the COMMENT key and set the COMMENT.

② Press the ▲ key and select the COMMENT line.

- The "*" mark appears at the head of the selected line.

③ Press the ▶ key and select ON or OFF.

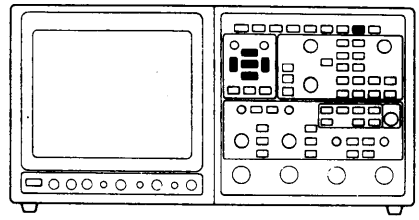
- The brightness of INIT is highlighted.
- The brightness of selected characters is highlighted.

  ON : Data and time appear on screen.
  A comment appears on screen when it is written.

  OFF : A comment on screen disappears.
  The date, the time and COMMENT disappear.

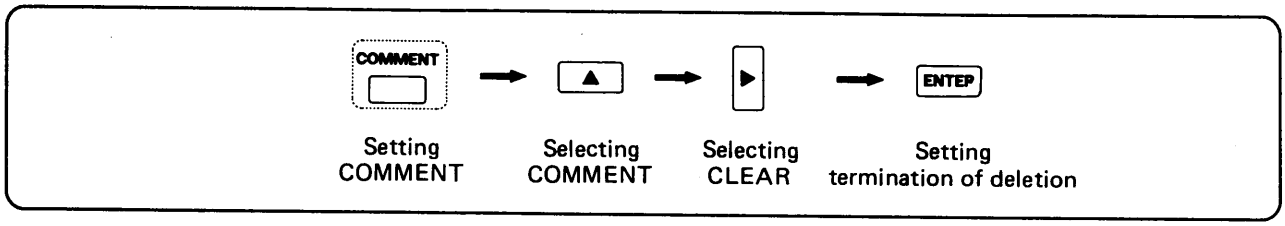
- The left figure shows an example where the "CURRENT WAVE" characters are displayed.

COMMENT CLEAR

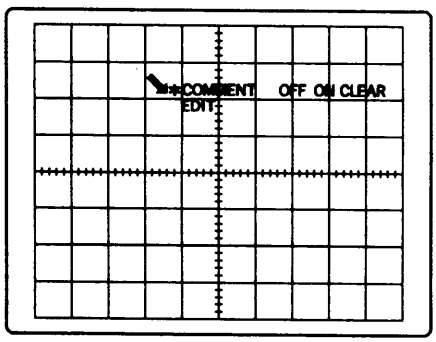


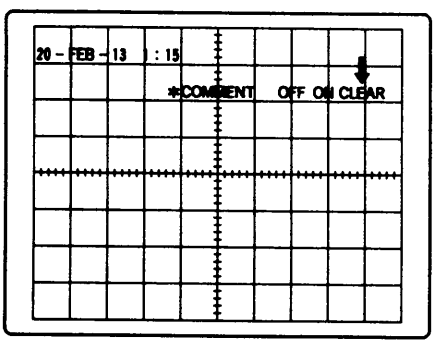
It is used to delete all of input comments.

♦ Key operation



♦ Operating procedure





① Press the COMMENT key and set the COMMENT.

② Press the ▲ key and select the COMMENT line.

- The "*" mark appears at the head of the selected line.

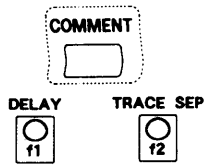
③ Press the ▶ key and select the CLEAR.

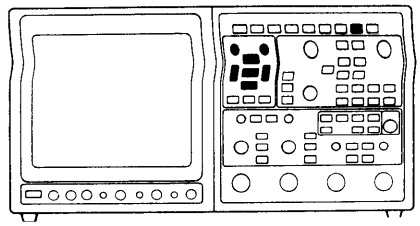
- The brightness of "CLEAR" characters is highlighted.

④ Press the ENTER key and terminate the deletion of comment.

One-point advice · The deletion of comment can be confirmed using the "COMMENT OFF ON" described at the previous page.

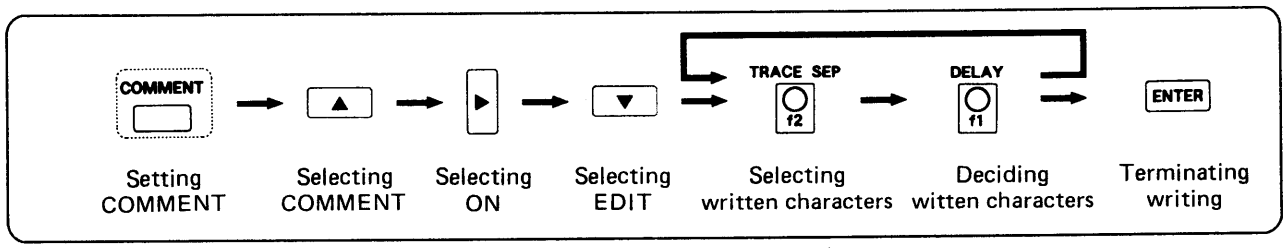
COMMENT EDIT



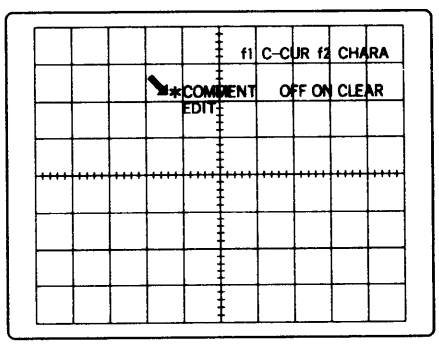


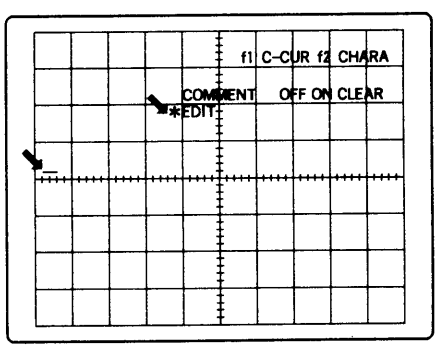
Writes the COMMENT on screen. It is convenient to record the COMMENT on screen when you wish to output waveforms and data into a plotter, X-Y recorder, and photo.

♦ Key operation



♦ Operating procedure





◇ **Saving new file:**

① Press the COMMENT key and set the COMMENT.

② Press the ▲ key and select the COMMENT line.

- The "*" mark appears at the head of the selected line.

③ Press the ▶ key and select ON.

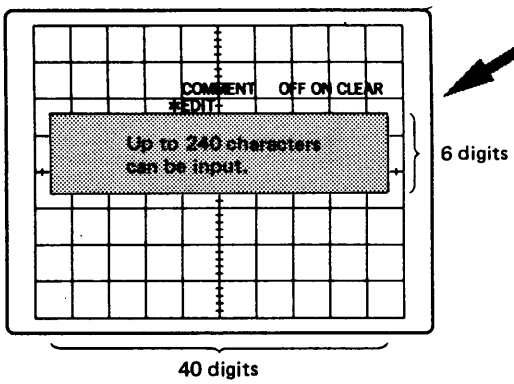
- The brightness of "ON" characters is highlighted.

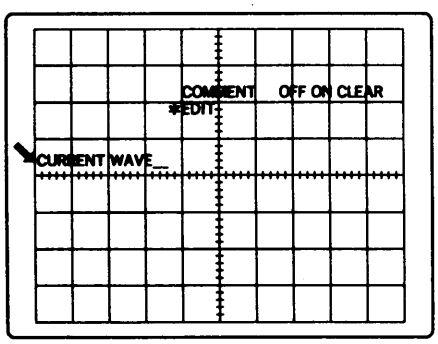
④ Press the ▼ key and select EDIT.

- The "*" mark appears at the head of the selected line.
- The underline appears at a location where the comment is written.

⑤ Turn the DELAY f1 knob and select a position where the comment is written.

- Up to 240 characters can be written as a comment into the range from approximately +1.5 div to −0.5 div from the center scale on screen.





⑥ Turn the TRACE SEP f2 knob and select characters to be written.

⑦ Turn the DELAY f1 knob and decide the target characters when you find them.

- The characters are decided and the underline moves to the right by turning the DELAY f1 knob.

⑧ Repeat procedures ⑥ and ⑦ above to write two characters or more.

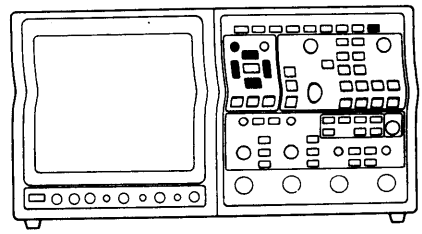
- The left figure shows an example where the "CURRENT WAVE" characters are written.

⑨ Press the ENTER key and complete writing.

One-point advice

- Usable characters:
  ! "#$%&'()*+,–,/0123456789:;⇔?
  @ABCDEFGHIJKLMNOPQRSTUVWXYZ
- Move the cursor to a character which has been decided to change it (the cursor disappears and the brightness of the character is highlighted).
- Turn the TRACE SEP f2 knob and select characters.
- Up to 240 characters can be recorded onto screen.

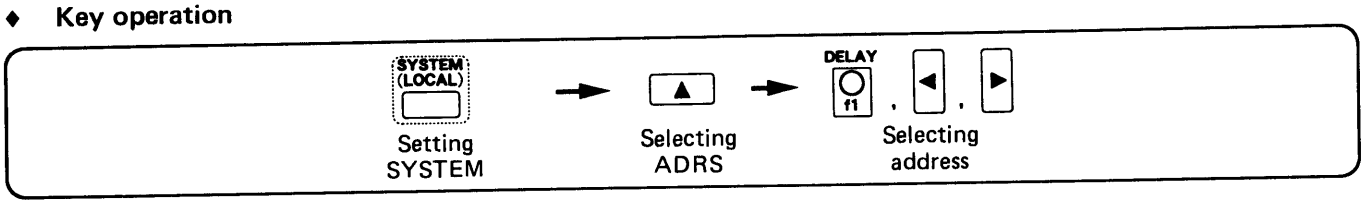
GP-IB
ADRS DELIM



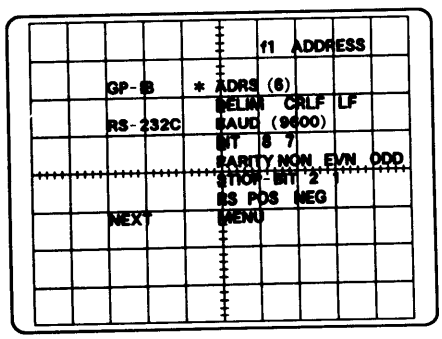
When a communication between the DS-8623 and external devices is performed, the ADRS (address) number used to identify the devices and DELIM (delimiter) used to indicate the delimiter of data are required.

ADRS (address)

◆ **Key operation**



◆ **Operating procedure**



① Press the SYSTEM (LOCAL) key and set the SYSTEM.

② Press the ▲ key and select the ADRS.

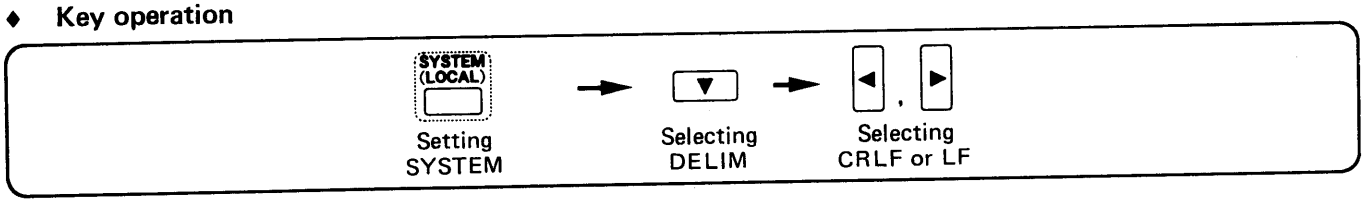
- The "*" mark appears at the head of the selected line.

③ Press the ◀ or ▶ key and select the address number.

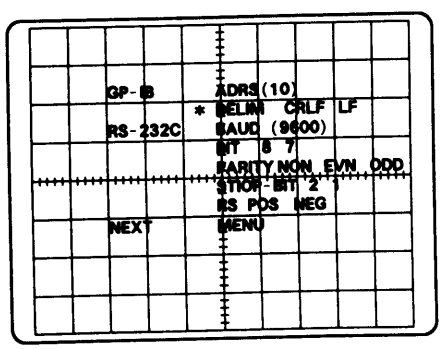
- The selection of address can also be made by turning the DELAY f1 knob.
- The address is indicated on the right side of ADRS.

DELIM (delimiter)

◆ **Key operation**



◆ **Operating procedure**



① Press the SYSTEM (LOCAL) key and set the SYSTEM.

② Press the ▼ key and select the DELIM.

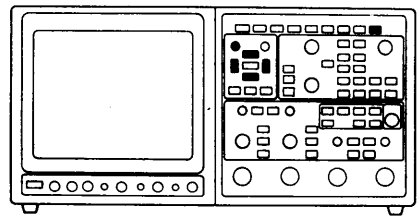
- The "*" mark appears at the top of the selected line.

③ Press the ◀ or ▶ key and select the CALF or LF.

- The brightness of characters "CRLF" or "LF" is highlighted.

One-point advice · The address should range from 00 to 30.

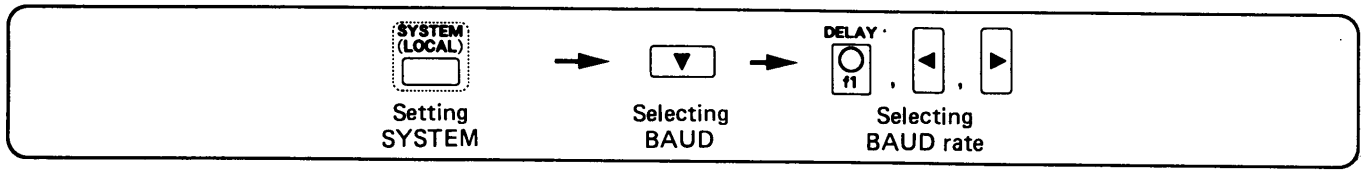
RS-232C BAUD BIT



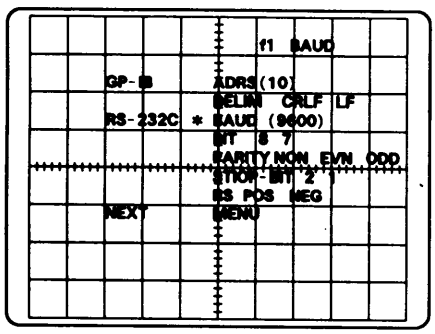
When communication between the DS-8623 and external devices is performed, it is required that the BAUD rate and transfer unit (bit) of data should be set appropriately.

BAUD (baud rate)

♦ **Key operation**



♦ **Operating procedure**



① Press the SYSTEM (LOCAL) key and set the SYSTEM.

② Press the ▼ key and select the BAUD.

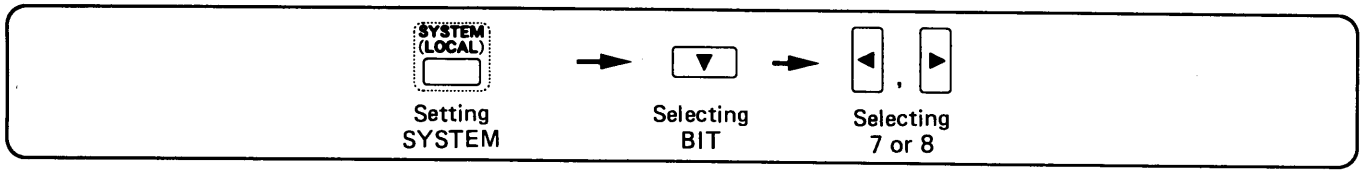
- The "*" mark appears at the head of the selected line.

③ Press the ◀ or ▶ key and select the BAUD rate.

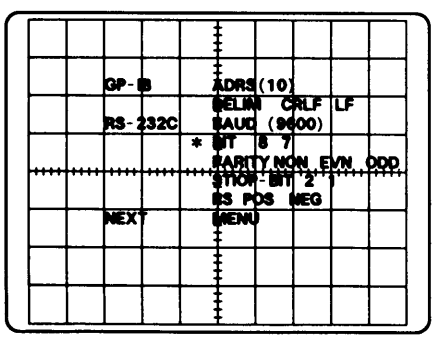
- The selection of BAUD rate can also be made by turning the DELAY f1 knob.
- The BAUD rate is indicated on the right side of BAUD.

BIT (bit)

♦ **Key operation**



♦ **Operating procedure**



① Press the SYSTEM (LOCAL) key and set the SYSTEM.

② Press the ▼ key and select the BIT.

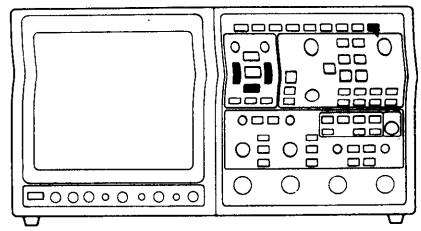
- The "*" mark appears at the top of the selected line.

③ Press the ◀ or ▶ key and select 7 or 8.

- The brightness of characters "7" or "8" is highlighted.

One-point advice · The BAUD rate should be 300, 600, 1200, 2400, 4800, or 9600.

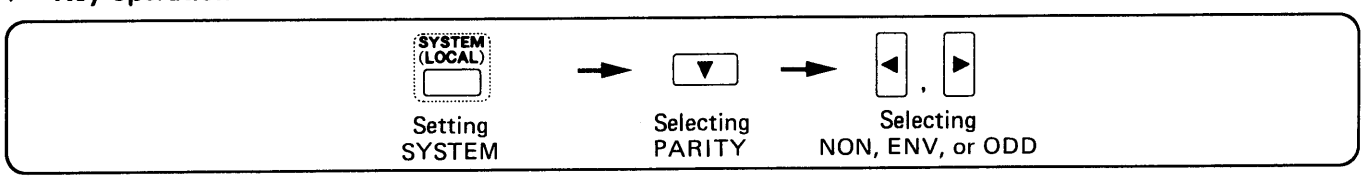
RS-232C PARITY STOP-BIT



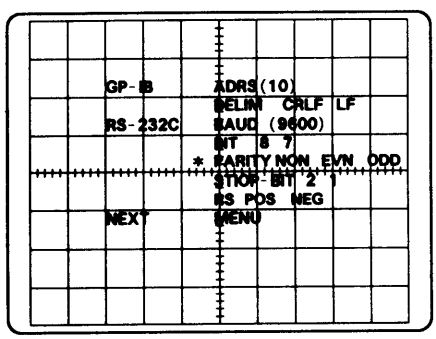
When communication between the DS-8623 and external devices is performed, the parity for checking to see if data is transferred properly and the stop bit which indicates a delimiter of data are required.

PARITY (parity)

♦ **Key operation**



♦ **Operating procedure**



① Press the SYSTEM (LOCAL) key and set the SYSTEM.

② Press the ▼ key and select the PARITY.

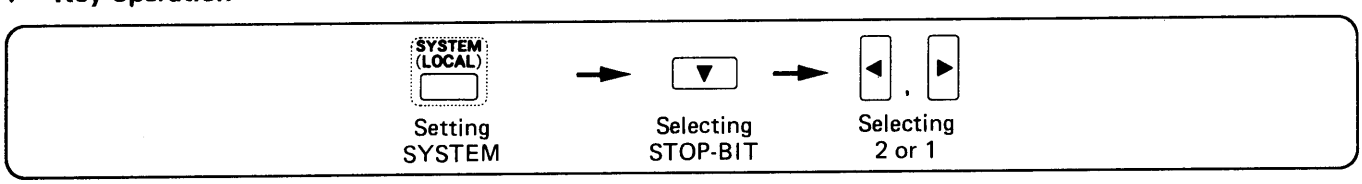
- The "*" mark appears at the head of the selected line.

③ Press the ◀ or ▶ key and select the NON, EVN, or ODD.

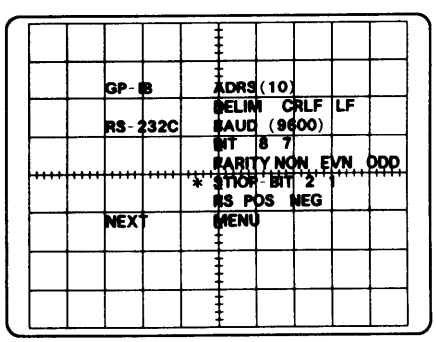
- The brightness of selected characters is highlighted.

STOP-BIT (stop bit)

♦ **Key operation**



♦ **Operating procedure**



① Press the SYSTEM (LOCAL) key and set the SYSTEM.

② Press the ▼ key and select the STOP-BIT.

- The "*" mark appears at the top of the selected line.

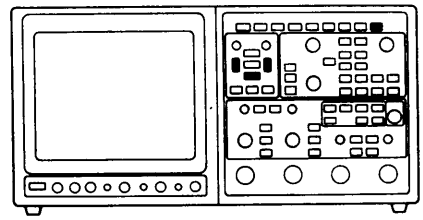
③ Press the ◀ or ▶ key and select 2 or 1.

- The brightness of selected characters is highlighted.

One-point advice · The follwoing types can be selected as a parity:

NON : No parity
ODD : Odd parity
EVEN : Even parity

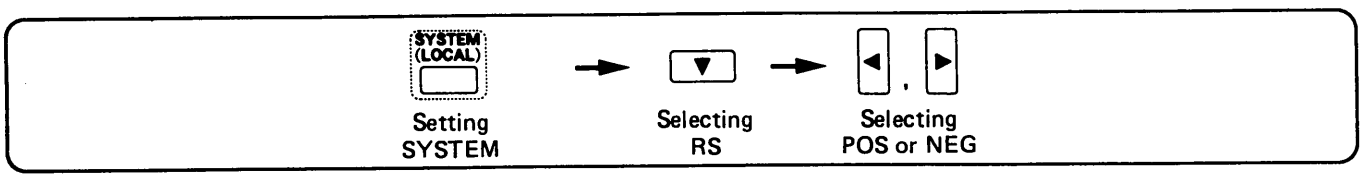
RS-232C
RS



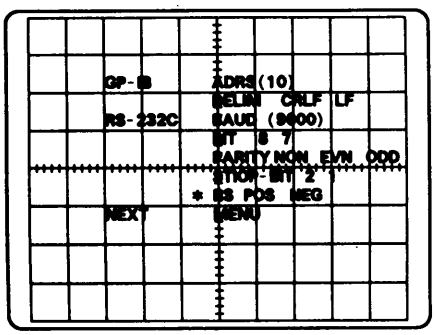
When communcation between the DS-8623 and external devices is performed, signal used to transfer data is required. The RS allows the positive and negative logics of this signal to be selected.

RS

- **Key operation**



- **Operating procedure**



① Press the SYSTEM (LOCAL) key and set the SYSTEM.

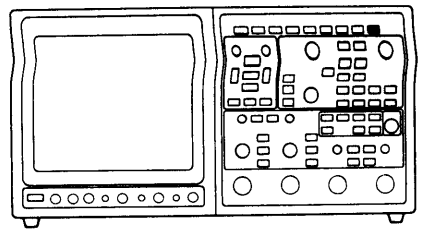
② Press the ▼ key and select the RS.

- The "*" mark appears at the head of the selected line.

③ Press the ◀ or ▶ key and select the POS or NEG.

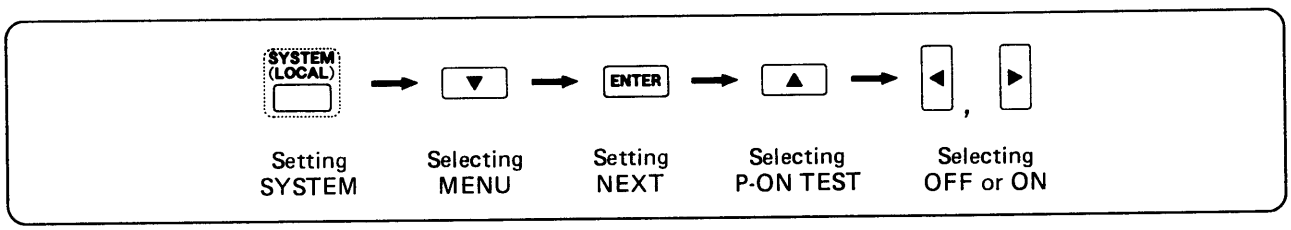
- The brightness of selected characters is highlighted.

P-ON TEST

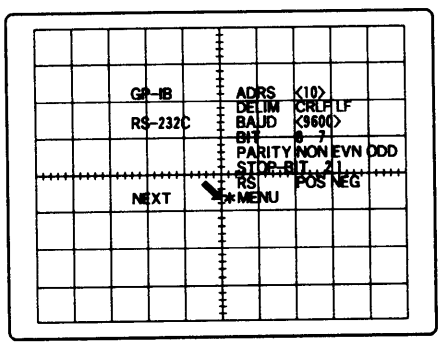


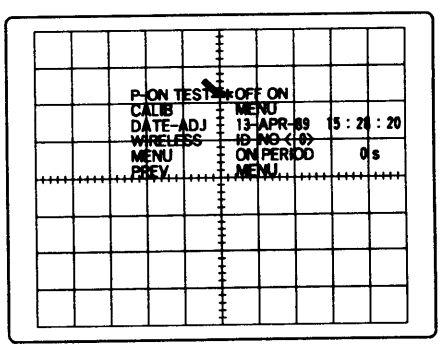
Checks to see if the RAM and ROM of DS-8623 malfunction immediately after turning on the power. If there is an error, an error message appears.

♦ **Key operation**



♦ **Operating procedure**





① Press the SYSTEM (LOCAL) key and set the SYSTEM.

② Press the ▼ key and select the MENU.

- The "*" mark appears at the head of selected line.

③ Press the ENTER key and set the NEXT.

④ Press the ▲ key and select the P-ON TEST.

⑤ Press the ◀ or ▶ key and turn off or on the P-ON TEST.

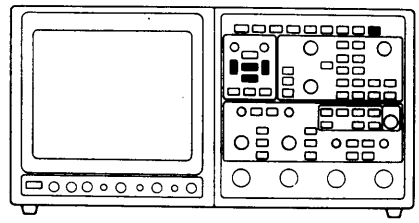
- The brightness of selected characters is highlighted.
  Check details:
  ON : BACK-UP RAM
  OFF : RAM, ROM

One-point advice • Select the PREV MENU to return from the P-ON TEST screen to the previous screen and then press the ENTER key.

• Turn on the P-ON TEST to allow the BACK-UP RAM test to be added.

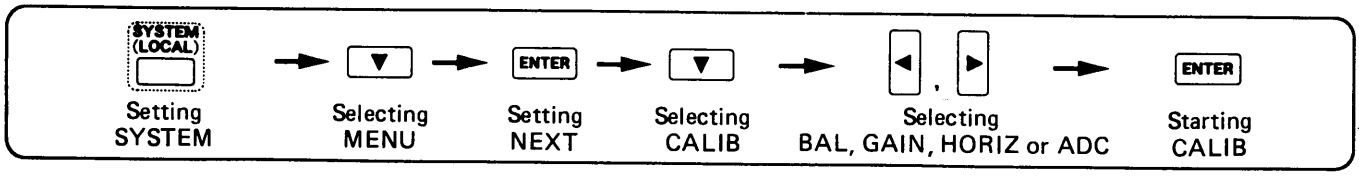
CALIB

SYSTEM (LOCAL)

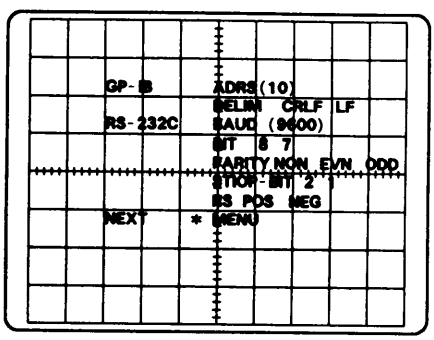


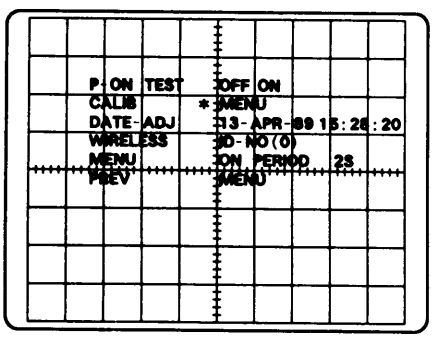
The accuracy of signal amplitude or of sweep rate, or the vertical position of wave when switching the amplitude may change. This deviation is adjusted automatically.

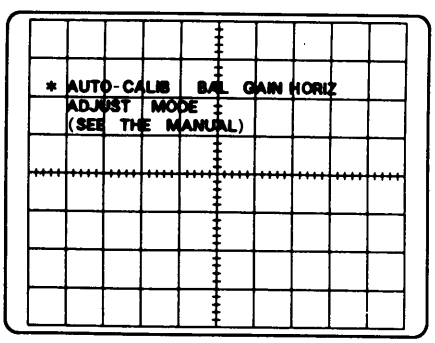
♦ **Key operation**



♦ **Operating procedure**







① Press the SYSTEM (LOCAL) key and set the SYSTEM.

② Press the ▼ key and select the MENU.
- The "*" mark appears at the head of selected line.

③ Press the ENTER key and set the NEXT.

④ Press the ▼ key and select the CALIB (MENU).
- The "*" mark appears at the head of selected line.

⑤ Press the ENTER key and set the AUTO-CALIB.

⑥ Press the ◀ or ▶ key and select the BAL, GAIN, HORIZ (REAL) or ADC (STORAGE) of AUTO-CALIB.
- The brightness of selected characters is highlighted.

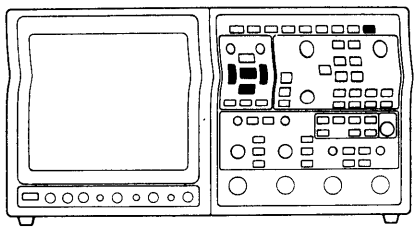
  BAL : Vertical dc balance adjustment
  GAIN : Vertical gain adjustment
  HORIZ : Horizontal sweep rate adjustment
  ADC : ADC gain and offset adjustment (STORAGE) at 0.5μ sec/div to 10nsec/div, only on CH1

⑦ Press the ENTER key and start automatic adjustment.
- The AUTO CALIB STATUS and AUTO CALIB COMPLETED appear on screen to end automatic adjustment.

⑧ Repeat ⑥ and ⑦ to adjust other items.

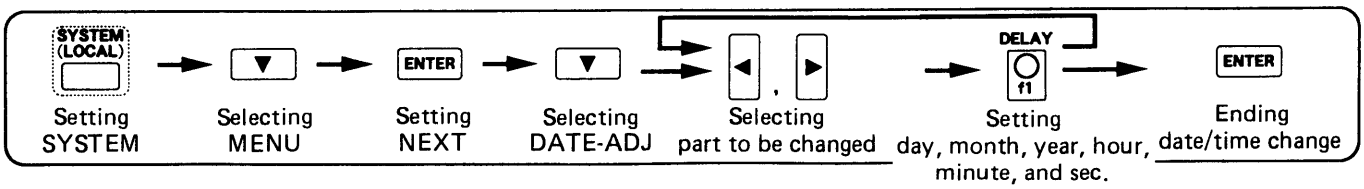
One-point advice
- Perform CALIB again when NG appears at the AUTO CALIB STATUS.
- Select the PREV MENU and press the ENTER key to return to the previous screen from the step screen in ④

DATE-ADJ

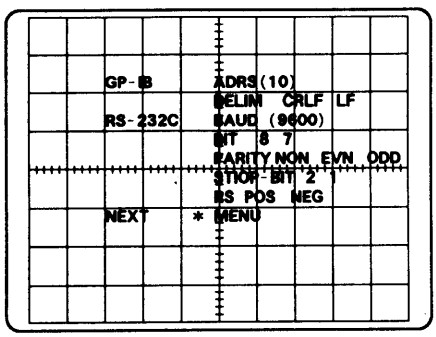


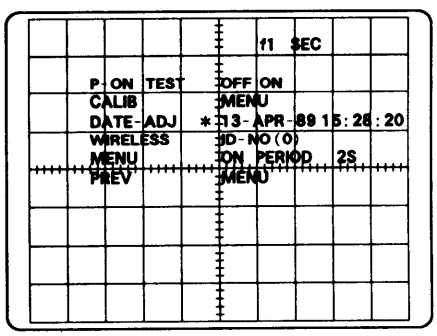
Adjusts the date and time. The date and time are added to the file name of measurement conditions and comment.

♦ **Key operation**



♦ **Operating procedure**





① Press the SYSTEM (LOCAL) key and set the SYSTEM.

② Press the ▼ key and select the MENU.
- The "*" mark appears at the head of selected line.

③ Press the ENTER key and set the NEXT.

④ Press the ▼ or ▲ key and select the DATE-ADJ.
- The "*" mark appears at the head of MENU.

⑤ Press the ◄ key or ► key and select day, month, year, hour, minute, or sec to be matched.
- The brightness of date and time of selected target is highlighted.

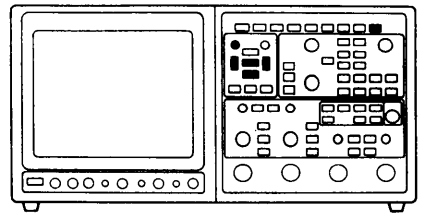
⑥ Turn the DELAY f1 knob and then press the key and set the day, month, year, hour, minute, and sec.
- Repeat procedures ⑤ and ⑥ to set the next target.

⑦ Press the ENTER key and end adjustment of date and time.

One-point advice

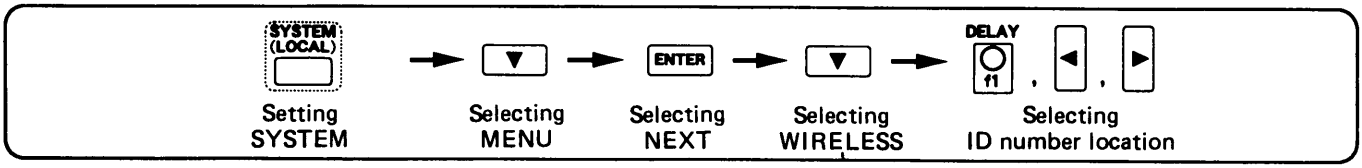
- Turn the DELAY f1 knob and the elastic part at the left edge and release your hands when the clock strikes 0 sec for accurately setting sec.
- Select the PREV MENU and then press the ENTER to return to the previous screen from the DATE-ADJ screen.

WIRELESS

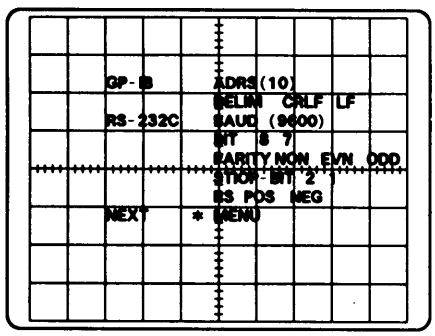


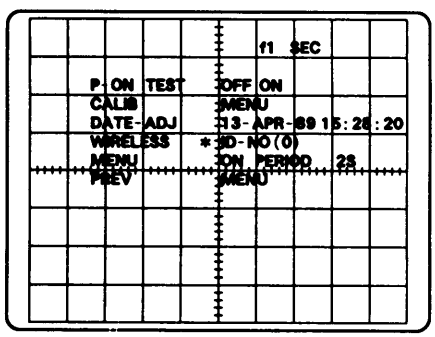
Adjusts the identification number (ID) of DS-8623 and a remote controller when operating with the remote controller.

♦ **Key operation**



♦ **Operation procedure**





① Press the SYSTEM (LOCAL) key and set the SYSTEM.

② Press the ▼ key and select the MENU.

- The "*" mark appears at the head of selected line.

③ Press the ENTER key and set the NEXT.

④ Press the ▼ key and select the WIRELESS.

- The "*" mark appears at the head of MENU.

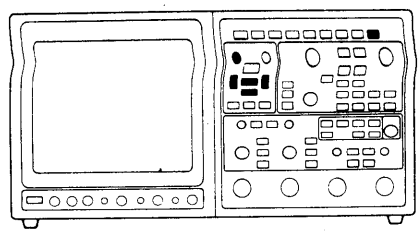
⑤ Press the ◀ key or ▶ key and select the ID number.

One-point advice

- The range for enabling ID number to be selected is 0 to 79.
- See ID CONFIRM on page 157 for selecting ID number of remote controller.
- The ID number is displayed on the right side of ID-NO.
- Select the PREV MENU and then press the ENTER to return to the previous screen from the WIRELESS screen.
- Turn the DELAY f1 knob and select the ID number.

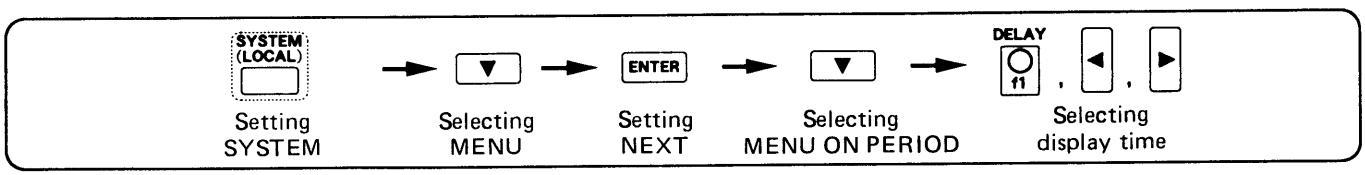
MENU ON PERIOD

SYSTEM (LOCAL)



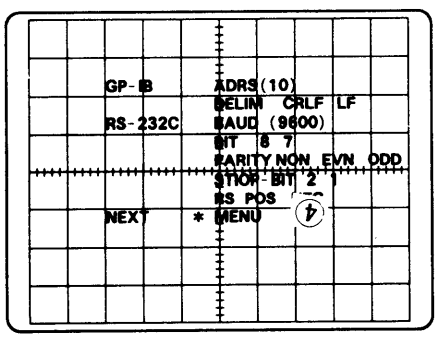
The entire range of measuring conditions which can be switched are displayed for a short time when switching the EVENT/TV LINE, triggering source, triggering input coupling, sweep time, and voltage sensitivity. It allows the display time of measuring conditions to be changed.

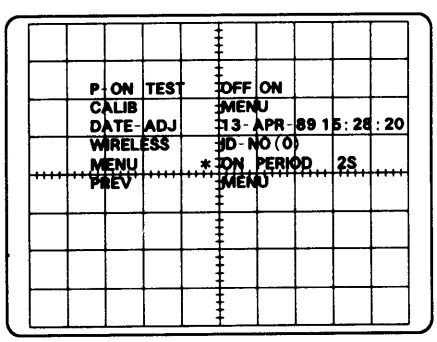
♦ **Key operation**



3

♦ **Operating procedure**





① Press the SYSTEM (LOCAL) key and set the SYSTEM.

② Press the ▼ key and select the MENU.

③ Press the ENTER key and set the NEXT.

④ Press the ▼ key and select the MENU ON PERIOD.

⑤ Press the ◀ key or ▶ key and select the display time.

One-point advice

- No measuring conditions are displayed if the display time is set to 0 sec.
- The display time is displayed on the right side of PERIOD.
- Conditions are displayed for 0 to 10 sec.
- Select the PREV MENU and then press the ENTER to return to the previous screen from the MENU ON PERIOD screen.
- Turn the DELAY 11 knob and select the display time.

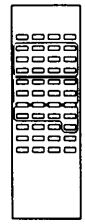
MEMO

3

1 2 3 4 4 5 6 7 8 9

Remote Controller (Option)

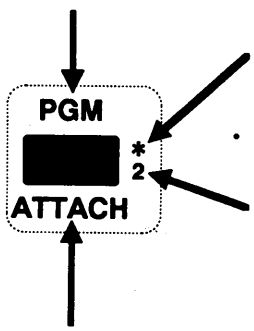
Getting to Use the Remote Controller



The infrared remote controller allows you to control the instrument from the remote position, or control the several instruments at the same time.

♦ **How to select the function**

- Selecting the function labeled at the key top or above the key.
  Push the 1ST key first, then push the key you want to select.



- Selecting the function labeled below the key.
  Push the 2ND key first, then push the key you want to select.

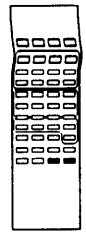
- Selecting the character labeled upper right of the key.
  Push the 2ND, the CPL ASCII and the 1ST key first to select the ASCII mode, then push the key you want to select for the character.
- Selecting the character labeled lower right of the key.
  Push the 2ND and the CPL ASCII key first to select the ASCII mode, then push the key you want to select for the character.

- For exiting the ASCII mode, push the ENT key.

One-point advice • For the detailed function information, see the section 3 "Functions and Operations."

REMOTE CONTROLLER

ID CONFIRM



It is required that the ID number of DS-8623 should agree with that of remote controller.
It is easy to confirm ID numbers of DS-8623 and remote controller.

♦ **Key operation**

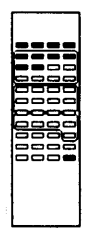
[ID] + [ENT]
Selecting
ID number (identification number)

♦ **Operating procedure**

① Press the [ID] key while pressing the [ENT] key. The TX ID and RX ID and identification numbers appear at the lower-side of screen.
TX ID : indicates an ID number of remote controller.
RX ID : indicates an ID number of DS-8623.

4

ID NUMBER

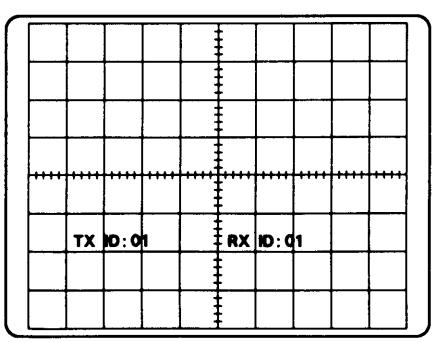


It is required that the ID number of DS-8623 should agree with that of remote controller.
Make the ID number of DS-8623 match that of remote controller if they are not the same.

♦ **Key operation**

[ID] + ([DEC] ~ [ON/OFF REF])
Selecting
ID (identification number)

♦ **Operating procedure**



① Press the [DEC] to [ON/OFF REF] numerical keys while pressing the [ID] key.

- This is an example where 01 is input by pressing the [DEC] and then [INC] keys.

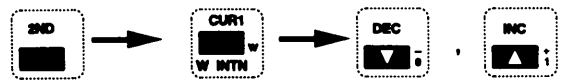
One-point advice • ID numbers should be two digits (00 ~ 79).

REMOTE CONTROLLER

W INTN

It is used to adjust the brightness of waveform trace (TRACE) of A sweep.

♦ **Key operation**



♦ **Operating procedure**

① Press the 2ND key and set the 2ND.

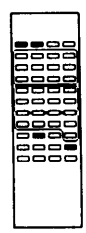
② Press the CUR1 W INTN key and set the WINTEN.

③ Press the INC or DEC key and adjust the WINTEN (brightness).

- Keep pressing the INC or DEC key to increase the rate of changing brightness.

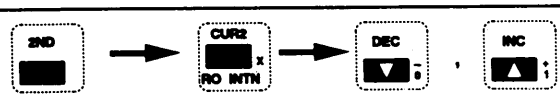
4

RO INTN



It is used to adjust brightness of characters indicated.

♦ **Key operation**



♦ **Operating procedure**

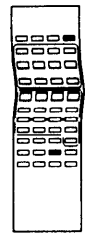
① Press the 2ND key and set the 2ND.

② Press the CUR2 RO INTN key and set the ROINTEN.

③ Press the INC or DEC key and adjust the ROINTEN (brightness.)

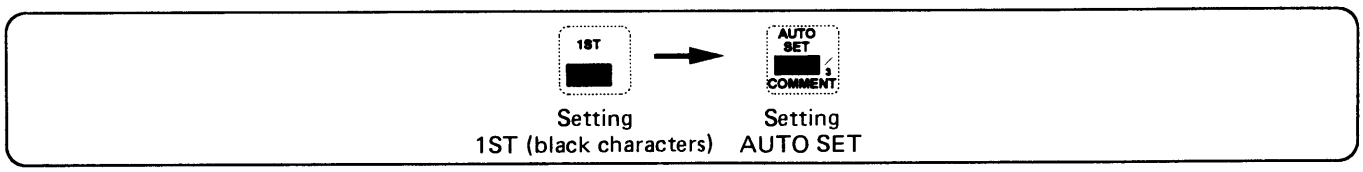
- Keep pressing the INC or DEC key and increase the rate of changing brightness.

AUTO SET

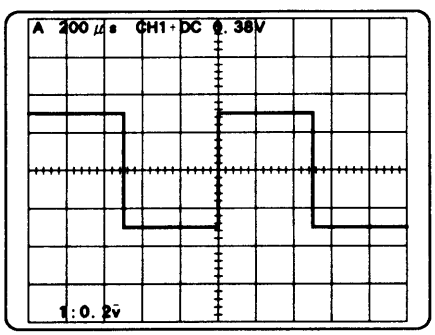


It is used to observe a signal with unknown cycle or amplitude. It automatically sets cycle, position, etc. for input signal and displays waveform on the screen.

♦ **Key operation**



♦ **Operating procedure**

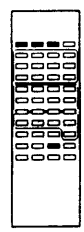


① Press the 1ST key and set the 1ST.

② Press the AUTO SET / COMMENT key and set AUTO SET.

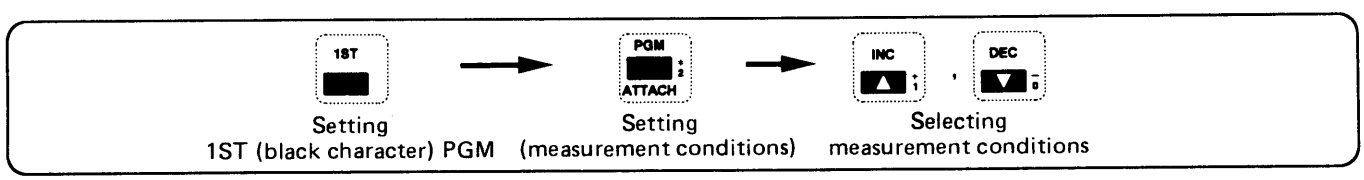
4

PGM



Allows measurement conditions which have already been registered to be called easily.

♦ **Key operation**



♦ **Operating procedure**

① Press the 1ST key and set the 1ST.

② Press the PGM / ATTACH key and set the PGM.

③ Press the INC or DEC key and select the measurement conditions.

One-point advice

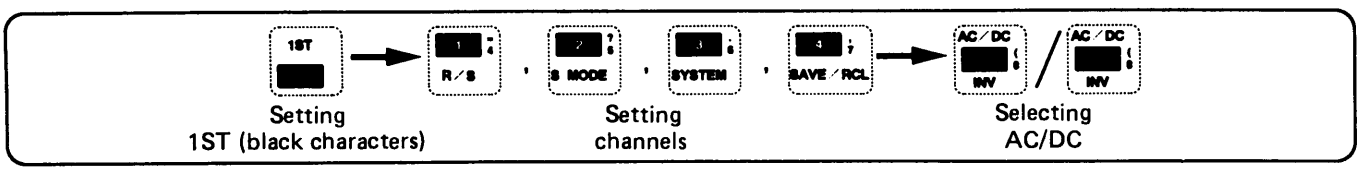
- Files are registered in the order of symbol, numeric, and alphabet.
- When plural files are registered, they are compared with one after another from the first character of their names, and they are arranged again according to the order of ASCII codes.

REMOTE CONTROLLER

AC/DC

Selects a coupling method suitable for observation according to types of input signal. In many cases, the DC coupling which displays the entire signal correctly is selected. However, the detailed observation for changing of signal waveform may be interrupted by the DC element of signal. At that time, the AC coupling is effective.

♦ **Key operation**



4

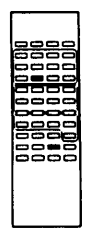
♦ **Operating procedure**

① Press the 1ST key and set the 1ST.

② Press the R/S to SAVE/RCL keys and set a channel.

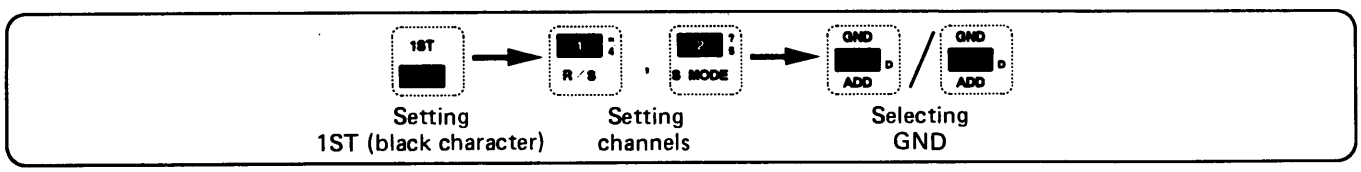
③ Press the AC/DC INV key and switch input coupling to AC or DC.

GND



The GND is used to confirm ground reference level when the DC voltage of signal is measured.

♦ **Key operation**



♦ **Operating procedure**

① Press the 1ST key and set the 1ST.

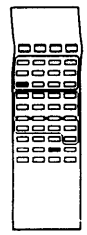
② Press the R/S or S MODE key and set a channel.

③ Press the GND ADD key and select the GND.

One-point advice · The specified channel can be held until a different channel is set again.

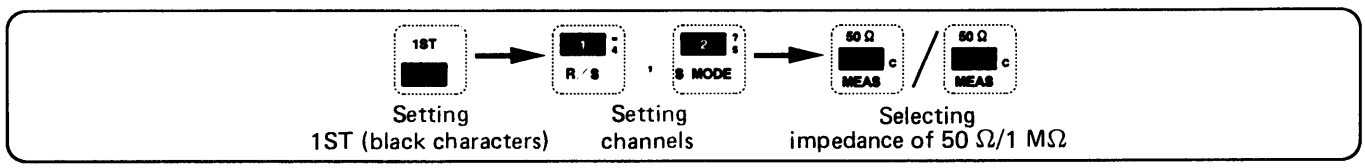
REMOTE CONTROLLER

1MΩ
50Ω



Selects the input impedance.

♦ **Key operation**



♦ **Operating procedure**

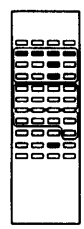
① Press the  key and set the 1ST.

② Press the  or  key and set a channel.

③ Press the  key and select either 1 MΩ or 50 Ω.

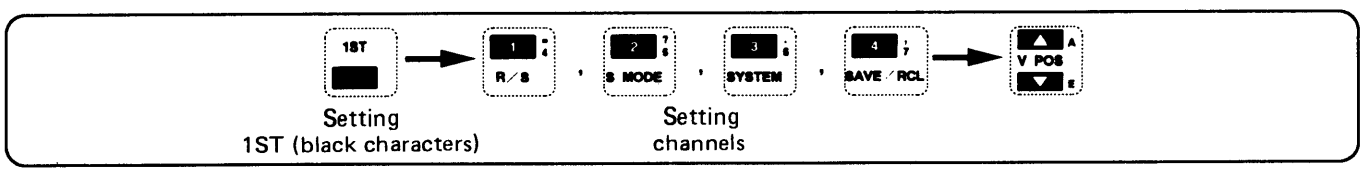
4

POSITION



It is used to move up and down waveforms displayed on screen. Use this for moving to a position where it is easy to observe or for superposing waveforms to make comparison.

♦ **Key operation**



♦ **Operating procedure**

① Press the  and set the 1ST.

② Press the  to  keys and set a channel.

③ Press the  key to move up and down waveforms.

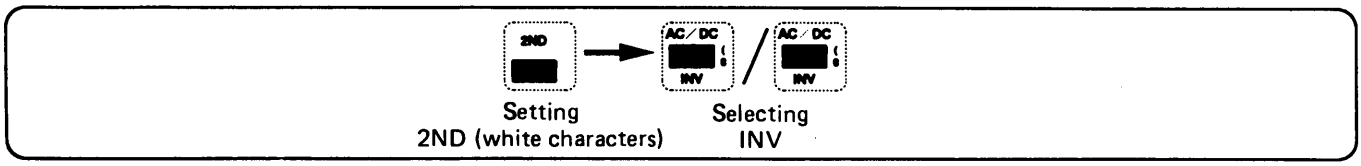
- Keep pressing the  key and increase the UP /DOWN moving rate.

REMOTE CONTROLLER

CH2 INV

It is used to display in reverse the polarity of wavefor on CH2.

♦ **Key operation**



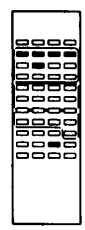
♦ **Operating procedure**

① Press the 2ND key and set the 2ND.

② Press the AC/DC INV key and select the INV.

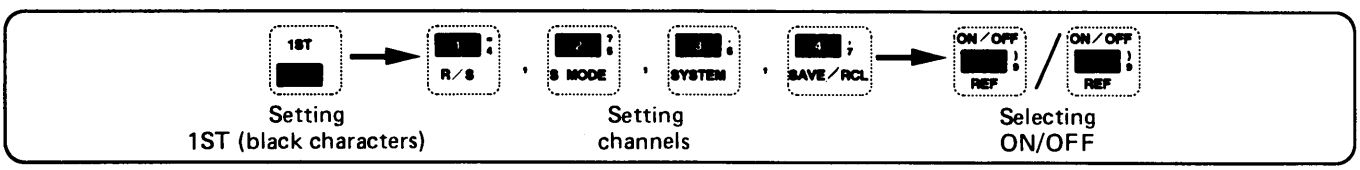
4

CH1 · CH2
CH3 · CH4



Sets any channel from CH1, CH2, CH3 and CH4 as an indication channel.

♦ **Key operation**



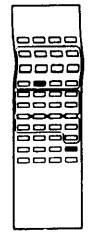
♦ **Operating procedure**

① Press the 1ST key and set the 1ST.

② Press the 1 R/S to 4 SAVE/RCL keys and set a channel.

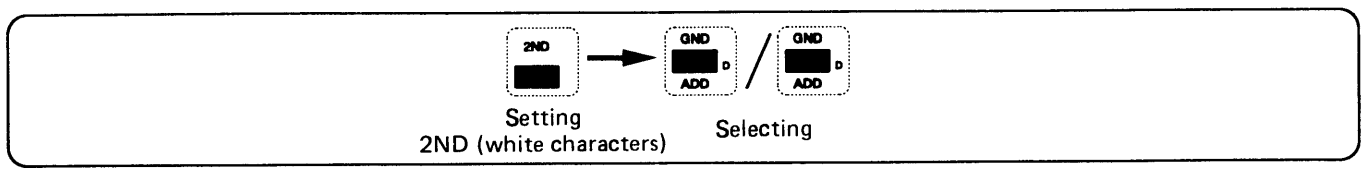
③ Press the ON/OFF REF key and select on or off.

ADD



Indicates the algebraic sum ADD (CH1 + CH2 or product CH1 X CH2 for STORAGE).

♦ **Key operation**



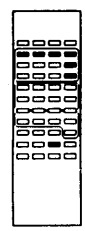
♦ **Operating procedure**

① Press the  key and set the 2ND.

② Press the  key and select ADD.

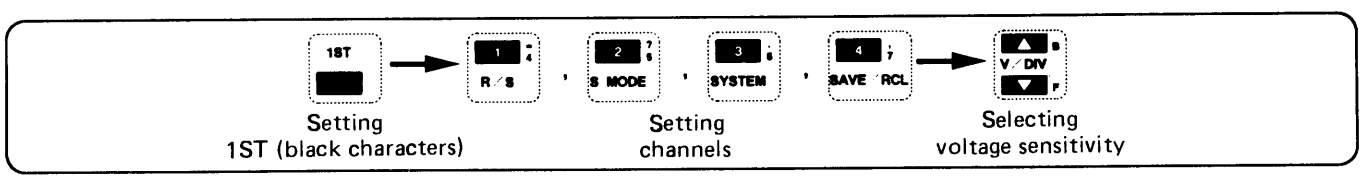
- For STORAGE, "CH1 + CH2" or "CH1 X CH2" is selected.

VOLTS/DIV



It is used to properly adjust the screen amplitude of waveform observed by switching voltage per 1DIV (VOLTS/DIV: voltage sensitivity). Voltage sensitivity is displayed on the lower screen.

♦ **Key operation**



♦ **Operating procedure**

① Press the  key and set the 1ST.

② Press the  to  keys and set a channel.

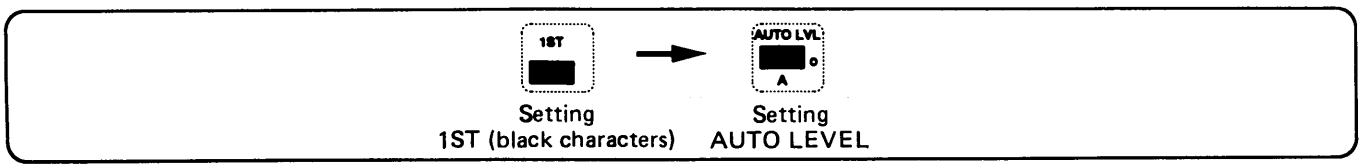
③ Press the  key to select voltage sensitivity.

REMOTE CONTROLLER

AUTO LEVEL

Automatically adjusts the trigger level depending on the amplitude of input signal.

♦ **Key operation**



♦ **Operating procedure**

① Press the  key and set the 1ST.

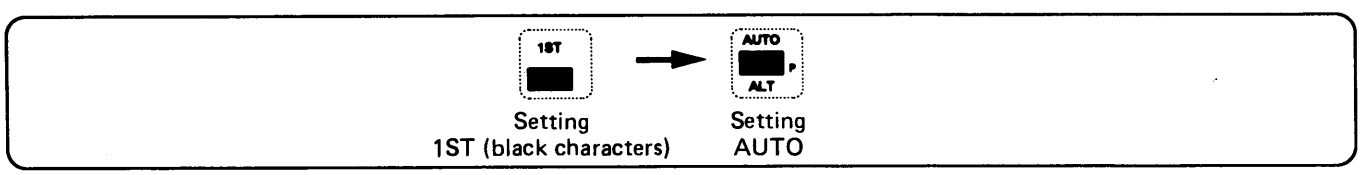
② Press the  key and set the AUTO LVL.

4

AUTO

When the amplitude of trigger signal is insufficient or the trigger level (TRIG LEVEL) is not properly adjusted so that no triggering can be made, the sweep starts automatically (AUTO SWEEP) and trace (TRACE) appears. It is also used to observe DC signal, to confirm the ground reference level, or to check and see if the observation signal is input.

♦ **Key operation**



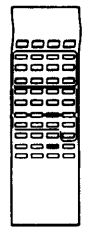
♦ **Operating procedure**

① Press the  key and set the 1ST.

② Press the  key and set the AUTO.

REMOTE CONTROLLER

NORM



The NORMAL SWEEP initiates sweeping for the first time when the trigger (TRIG) signal is input. Use it when the frequency is low and signal is out of AUTO SWEEP standard.

♦ **Key operation**

Setting 1ST (black characters) — Setting NORM

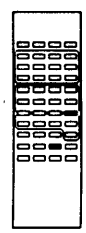
♦ **Operating procedure**

① Press the  key and set the 1ST.

② Press the  key and set the NORM.

4

SINGLE



Sweeping is performed once in SINGLE when a trigger signal is input.

♦ **Key operation**

Setting 1ST (black characters) — Setting SGL

♦ **Operating procedure**

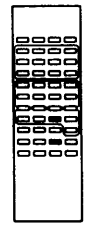
① Press the  key and set the 1ST.

② Press the  key and set the SGL.

One-point advice · In the SINGLE mode specified in REAL, the scale illumination and the character readout are not available, and those flicker once for photographing after the sweep ends when the oscilloscope is triggered.

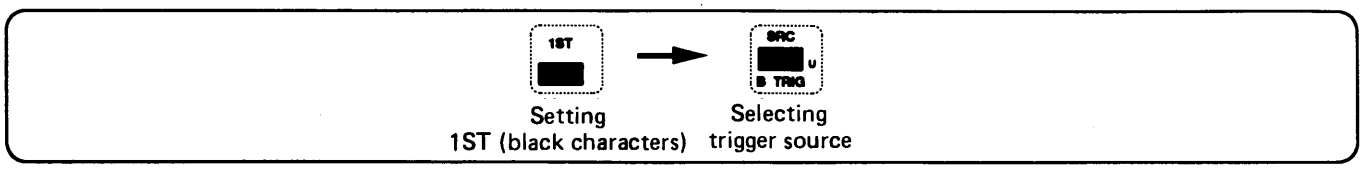
REMOTE CONTROLLER

SOURCE



Switches a triggering source.

♦ **Key operation**



♦ **Operating procedure**

① Press the 

key and set the 1ST.

② Press the 

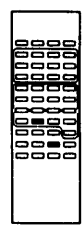
or 

key and select a trigger source.

- The VERT, CH1, CH2, CH3, CH4, LINE and COMB can be selected.

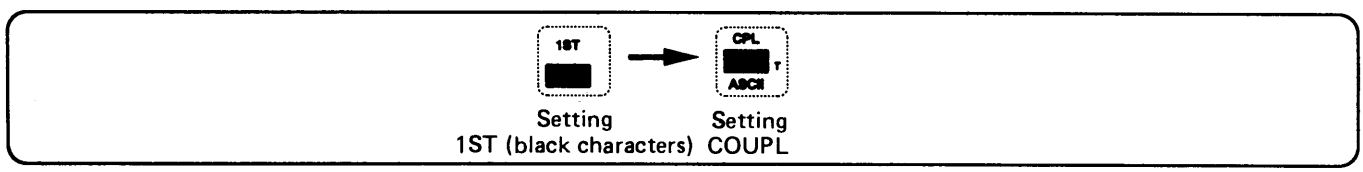
4

COUPL



It is used to switch a triggering coupling.

♦ **Key operation**



♦ **Operating procedure**

① Press the 

key and set the 1ST.

② Press the 

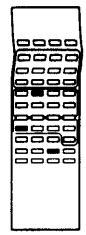
or 

key and select a triggering coupling.

- The DC, DC HFREJ, DC NOISE-REJ, AC HFREJ, AC LFREJ, AC, TV-H, and TV-V (FIELD) can be selected.

REMOTE CONTROLLER

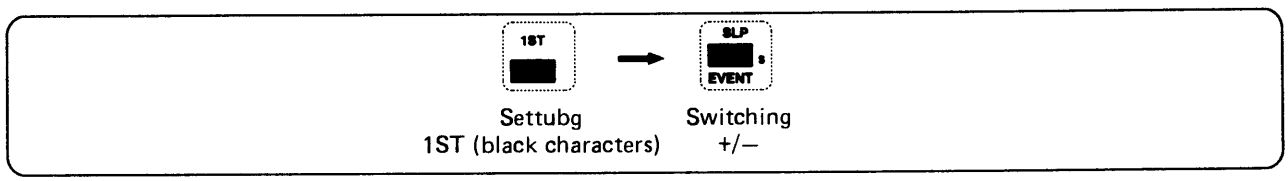
SLOPE



Selects the slope for starting point of waveform displayed on screen.
The slope has positive (+) and negative (—) directions.

Slope of A sweep

♦ **Key operation**



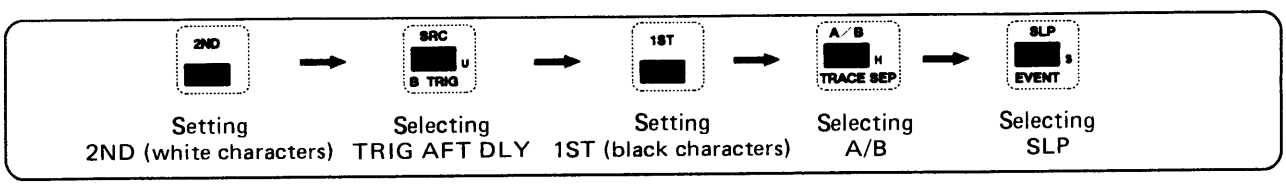
♦ **Operating procedure**

① Press the 1ST key and set the 1ST.

② Press the SLP EVENT key and select the + or — direction.

Slope of B sweep

♦ **Key operation**



♦ **Operating procedure**

① Press the 2ND key and set the 2ND function.

② Press the SRC B TRIG key and select the TRIG AFT DLY.

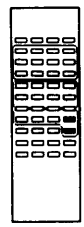
③ Press the 1ST key and set the 1ST function.

④ Press the A/B TRACE SEP key and select the triggering conditions of B sweep.

⑤ Press the SLP EVENT key and select + or —.

REMOTE CONTROLLER

TRIG LEVEL



Adjusts the trigger level to obtain a stable trigger.
The trigger level of B sweep, found when EVENT is selected for STORAGE, can be also adjusted.

Trigger level of A sweep

♦ **Key operation**

Adjusting
trigger level

4

♦ **Operating procedure**

① Press the  key and set the trigger level.

Trigger level of B sweep

♦ **Key operation**

Setting 2ND (white characters) → Selecting TRIG AFT DLY → Setting 1ST (black characters) → Selecting A/B → Adjusting trigger level

① Press the  key and set the 2ND.

② Press the  key and select the TRIG AFT DLY.

③ Press the  key and set the 1ST.

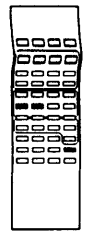
④ Press the  key and select the triggering conditions of B sweep.

⑤ Press the  key and adjust the trigger level of B sweep.

- Keep pressing the  key to increase the rate of changing trigger level.

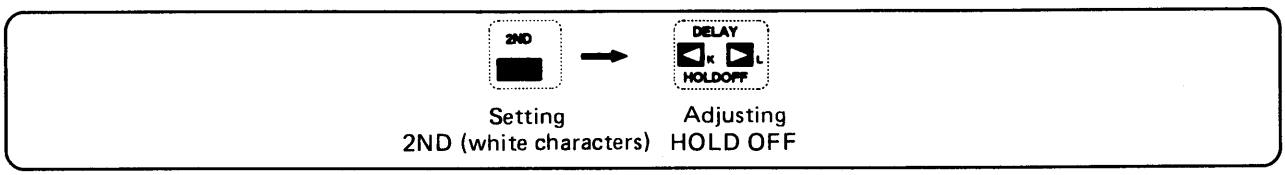
REMOTE CONTROLLER

HOLD OFF



The pulse train in complex combination may be displayed in duplex.
The pulse train can be stably displayed on screen by adjusting the OLD OFF time.
In STORAGE, the distance at which signals are taken can be varied.

♦ **Key operation**



♦ **Operating procedure**

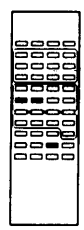
① Press the 2ND key and set the 2ND.

② Press the DELAY HOLDOFF key and adjust the HOLD OFF time.

- Keep pressing the DELAY HOLDOFF key to increase the changing rate of sweep pause period.

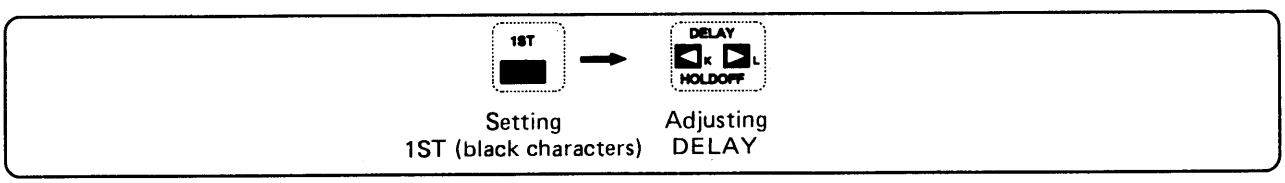
4

DLY



It is used to set a part to be enlarged when a waveform displayed on screen is enlarged by delay sweep.

♦ **Key operation**



♦ **Operating procedure**

① Press the 1ST key and set the 1ST.

② Press the DELAY HOLDOFF key and increase the changing rate of delay time.

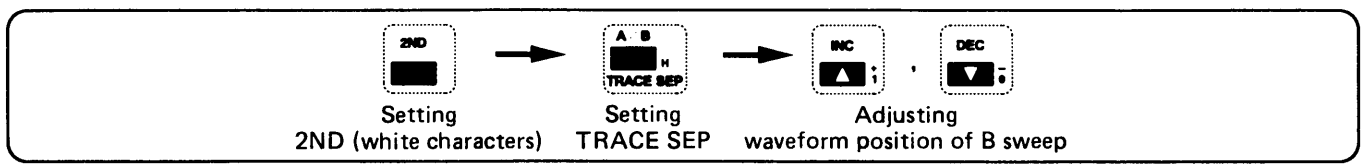
- Keep pressing the DELAY HOLDOFF key to increase the changing rate of delay time.

REMOTE CONTROLLER

TRACE SEP

Allows A and B sweep waveforms to be separated in ALT.

♦ **Key operation**



♦ **Operating procedure**

① Press the 2ND key and set the 2ND.

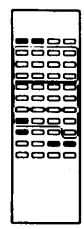
② Press the A/B H TRACE SEP key and set the TRACE SEP.

③ Press the INC ; or DEC - key and adjust the waveform position of B sweep.

- Keep pressing the INC ; or DEC - key to increase the changing rate of position.

4

EVENT/ TV LINE

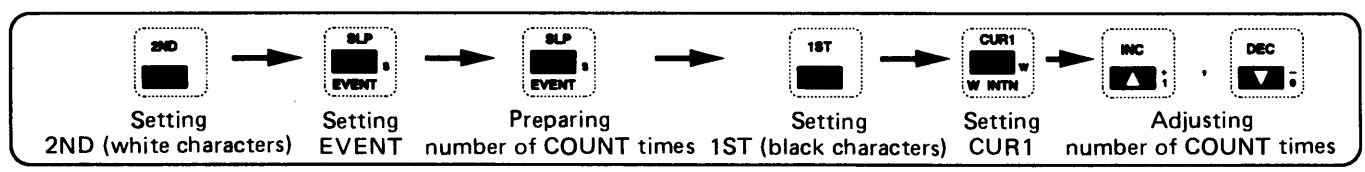


The EVENT trigger initiates the A sweep after counting the number of trigger signals set by the event counter from the trigger starting position of A sweep.

♦ **Preliminary setup**

- Press the CPL T ASCII key to select trigger coupling other than TV-V and TV-H.

♦ **Key operation**



♦ **Operating procedure**

① Press the 2ND key and set the 2ND.

② Press the SLP S EVENT key and adjust the EVENT.

③ Press the SLP S EVENT key and initiate preparation for setting the count.

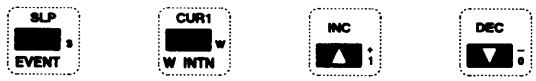
④ Press the 1ST key and set the 1ST.

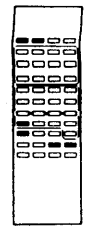
⑤ Press the CUR1 W W INTN key and set the CUR1.

⑥ Press the INC ; or DEC - key and adjust the COUNT.

REMOTE CONTROLLER

EVENT/ TV LINE



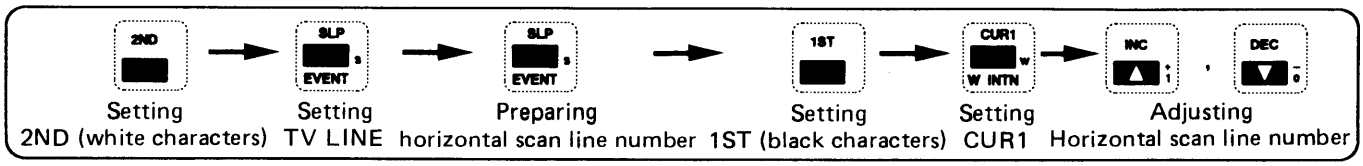


Signal can be triggered in any scan line of television by setting the TV LINE.

♦ **Preliminary setup**

· Press the A COUPL B key to select TV-V.

♦ **Key operation**



♦ **Operating procedure**

① Press the 2ND key and set the 2ND.

② Press the SLP EVENT key and set the TV LINE.

③ Press the SLP EVENT key and initiate preparation for setting the horizontal scan line number.

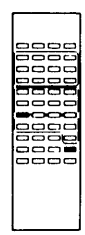
④ Press the 1ST key and set the 1ST.

⑤ Press the CUR1 W INTN key.

⑥ Press the INC or DEC key and adjust the horizontal scan line number.

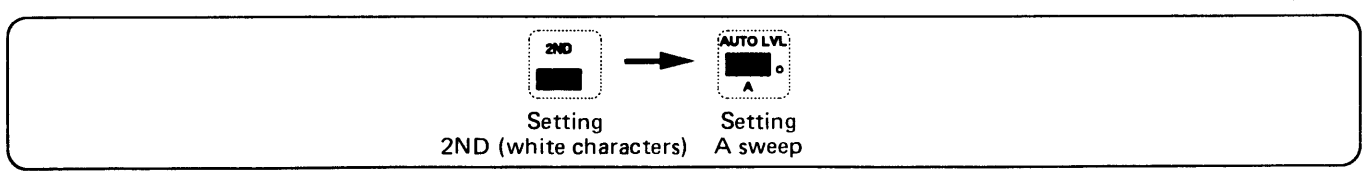
4

A



Provides the primaty time base.

♦ **Key operation**



♦ **Operating procedure**

① Press the 2ND key and set the 2ND.

② Press the AUTO LVL A key and adjust the A sweep.

REMOTE CONTROLLER
(only for STORAGE)

DATA POSITION

Selects a position of trigger point.

♦ **Key operation**

Setting 2ND (white characters) — Setting D POS

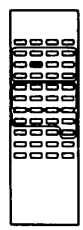
♦ **Operating procedure**

① Press the 2ND key and set the 2ND.

② Press the MAG D POS key and select a trigger point.

4

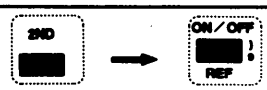
REF



(only for STORAGE)

Specifies the REF channel.

♦ **Key operation**



Setting 2ND (white characters) — Setting REF

♦ **Operating procedure**

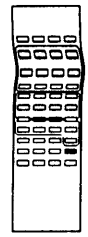
① Press the 2ND key and set the 2ND.

② Press the ON/OFF REF key and set the REF.

- Press the key corresponding to the REF CH to be displayed.

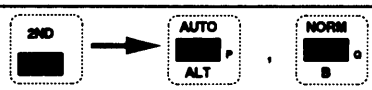
REMOTE CONTROLLER

ALT, B



Provide the delayed time base. The B mode provides only the delayed sweep, while the ALT mode provides the A primary sweep intensified by the delayed sweep and the delayed sweep on the same screen.

♦ **Key operation**



Setting 2ND (white characters) — Setting ALT or B

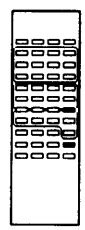
♦ **Operating procedure**

① Press the 2ND key and set the 2ND.

② Press the AUTO ALT or NORM B key and set the ALT or B sweep.

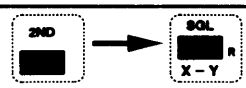
4

X-Y



Allows you to display the signal in the X-Y fomat.

♦ **Key operation**



Setting 2ND (white characters) — Setting X-Y

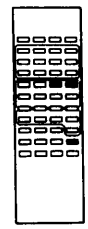
♦ **Operating procedure**

① Press the 2ND key and set the 2ND.

② Press the SGL X-Y key and set the X-Y.

REMOTE CONTROLLER

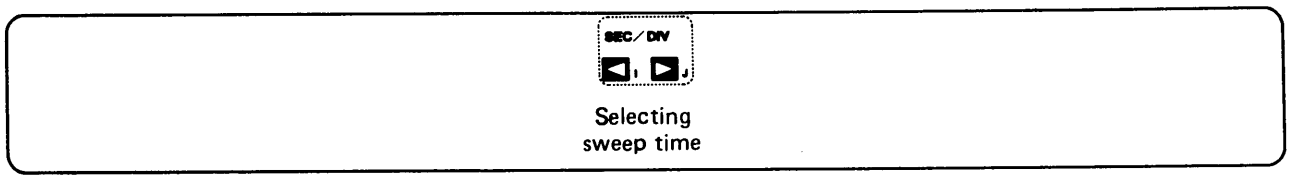
SEC/DIV



It is used to enlarge or reduce waveforms displayed on screen in the horizontal direction (time-base direction) for observing input signal in optimum conditions. Use it to observe the entire waveform or the details of one part.

Sweep time of A sweep

♦ **Key operation**



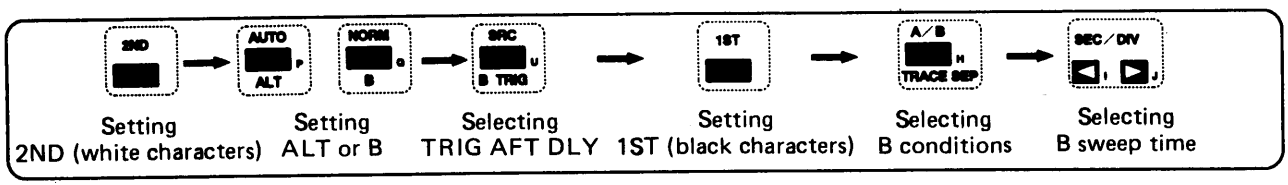
4

♦ **Operating procedure**

① Press the SEC/DIV key and select the sweep time of A sweep.

Sweep time of B sweep

♦ **Key operation**



① Press the 2ND key and set the 2ND.

② Press the AUTO ALT or NORM B key and select the ALT or B.

③ Press the SRC B TRIG key and select the TRIG AFT DLY.

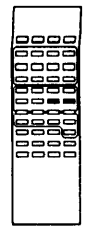
④ Press the 1ST key and set the 1ST.

⑤ Press the A/B TRACE SEP key and select the B sweep time.

⑥ Press the SEC/DIV key and select the sweep time of B sweep.

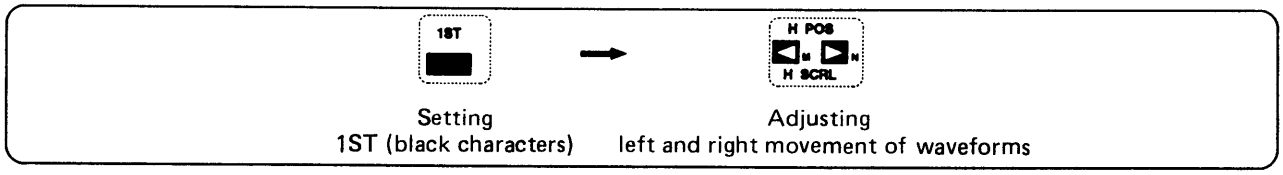
REMOTE CONTROLLER

POSITION



Moves left and right the waveform displayed on screen. It is used to move waveforms for easily observing them.

♦ **Key operation**



♦ **Operating procedure**

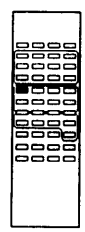
① Press the 1ST key and set the 1ST.

② Press the H POS / H SCRL key and move waveforms.

- Keep pressing the H POS / H SCRL key to increase the moving rate of waveforms.

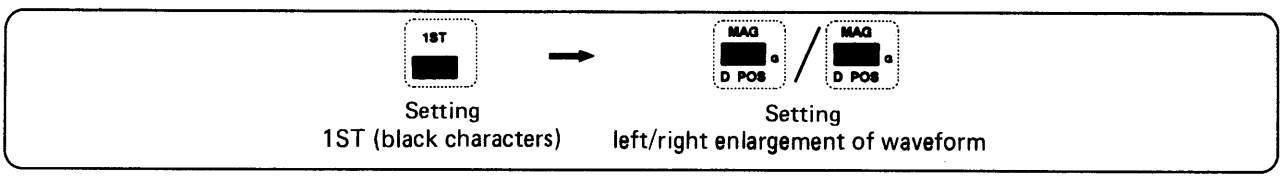
4

x 10



It is used to magnify waveforms displayed on screen by 10 times in the time-base direction in reference to the center of screen.

♦ **Key operation**



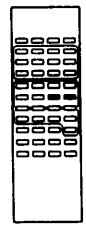
♦ **Operating procedure**

① Press the 1ST key and set the 1ST.

② Press the MAG / D POS key and set the left/right magnification of waveform.

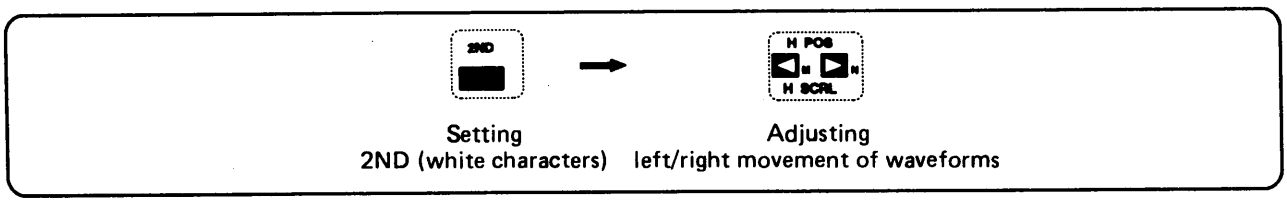
REMOTE CONTROLLER
(only for STORAGE)

H SCRL



Moves the waveform displayed on screen in the left and right directions. When 2K and 16K are selected for LENGTH, waveforms located at the outside of screen can be moved for confirmation.

♦ **Key operation**



4

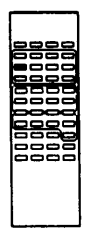
♦ **Operating procedure**

① Press the 2ND key and set the 2ND.

② Press the H POS / H SCRL key and move waveforms.

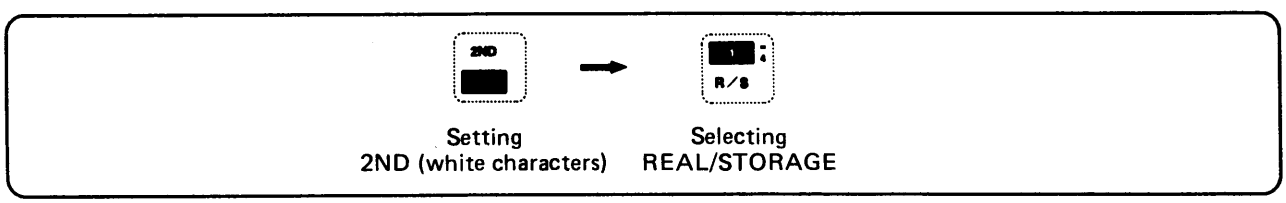
- Keep pressing the H POS / H SCRL key to increase the moving rate of waveform.

R/S



Selects REAL or STORAGE.

♦ **Key operation**



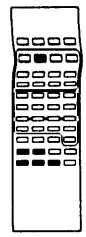
♦ **Operating procedure**

① Press the 2ND key to set 2ND.

② Press the R/S key to select REAL or STORAGE.

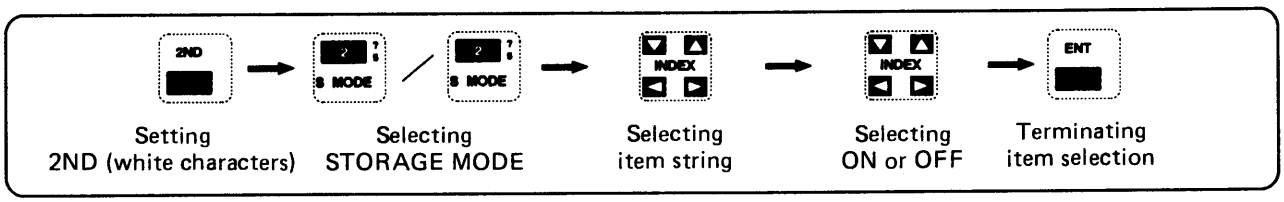
REMOTE CONTROLLER
(only for STORAGE)

STORAGE MODE



It is used to select the items of STORAGE MODE.

♦ **Key operation**



♦ **Operating procedure**

① Press the 2ND key and set the 2ND.

② Press the 8 MODE key and set the STORAGE MODE.

③ Press the INDEX key and select a string of items.

- The "*" mark appears at the top of selected string.

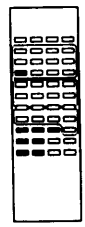
④ Press the INDEX key and select ON or OFF.

- The brightness of selected characters is highlighted.

⑤ Press the ENT key and terminate the selection of items.

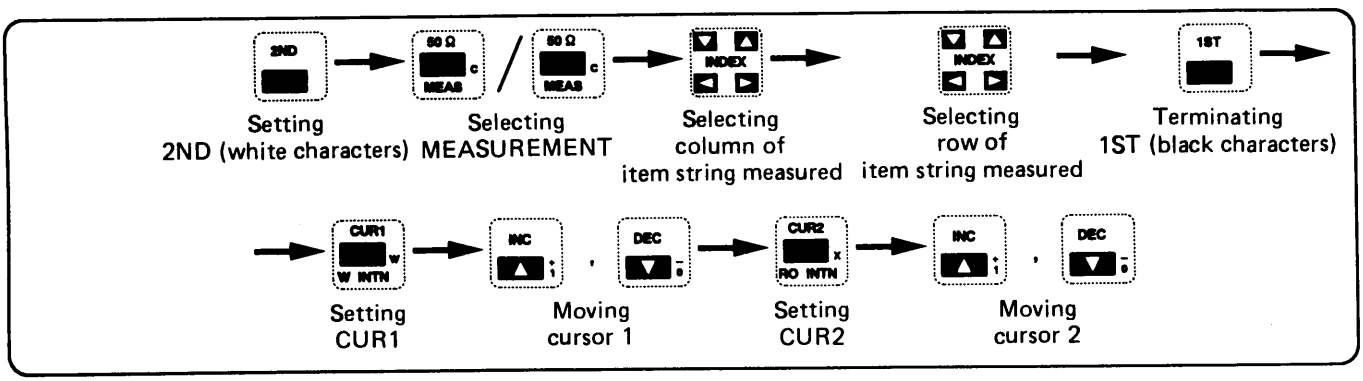
4

MEASUREMENT



It is used to select the measurement items of MEASUREMENT menu or to move a cursor.

♦ **Key operation**



4

♦ **Operating procedure**

① Press the 2ND key and set the 2ND.

② Press the 50 Ω MEAS key and set the MEASUREMENT.

③ Press the INDEX key and select the column of item string measured on screen.

The "*" mark appears at the top of selected string.

④ Press the INDEX key and select the row of item line measured on screen.

- The brightness of selected item characters is highlighted.

◇ **When a cursor is moved:**

⑤ Press the 1ST key and set the 1ST.

⑥ Press the CUR1 W INTN key and set the cursor 1.

⑦ Press the INC or DEC key and move the cursor 1.

⑧ Press the CUR2 RO INTN key and set the cursor 2.

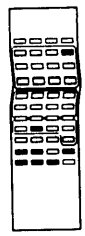
⑨ Press the INC or DEC key and move the cursor 2.

One-point advice

- Press the Δ V / Δ T key to complete the operations ① to ④ above.
- Press the 2ND key and then the PGM ATTACH key to switch the channel to be measured.

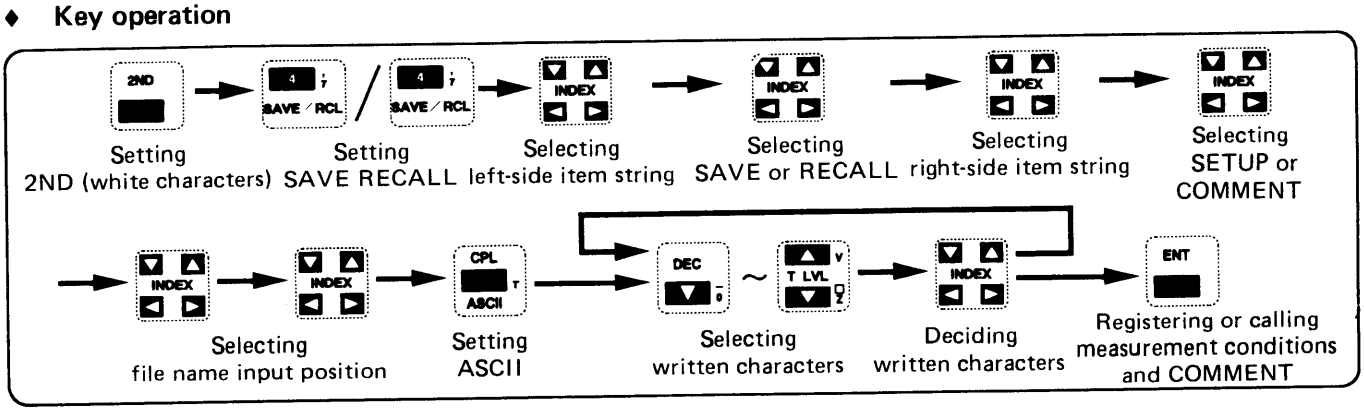
REMOTE CONTROLLER
(only for STORAGE)

SAVE/RECALL SETUP, COMMENT



It is useful to register (SAVE) them when you wish to perform measurement repeatedly under the same conditions. The COMMENT registered on screen is useful for saving waveforms and data in photo.
Registers or calls the COMMENT created in the COMMENT menu.

♦ Key operation



♦ Operating procedure

◇ For new registration

① Press the 2ND key and set the 2ND.

② Press the SAVE/RCL key and set the SAVE RECALL.

③ Press the INDEX key and select the left item string displayed on screen.
- The "*" mark appears at the top of selected string.

④ Press the INDEX key and select SAVE or RECALL.

⑤ Press the INDEX key and select the right item string displayed on screen.

⑥ Press the INDEX key and select the SETUP or COMMENT.

⑦ Press the INDEX key and move the "*" mark to the bottom stage of file name input position.

⑧ Press the CPL ASCII key and set the ASCII.

⑨ Press the DEC to T LVL keys and select the characters to be written.

⑩ Press the INDEX key and decide the targer characters when you find them.
- The position of underline moves to the right.

⑪ Repeat the procedures ⑨ and ⑩ above when two characters or more are written.

⑫ Press the ENT key to terminate writing or calling by erasing the screen.
- Press the SAVE/RCL key again to confirm the registered file name.

◇ For rewriting measurement conditions of file which has already been registered:

⑬ Press the INDEX key and move the "*" mark to the file name selection position.

⑭ Press the INDEX key and select a file name.
- The brightness of selected file is highlighted.

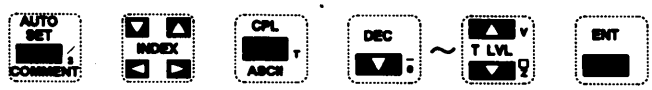
⑮ Press the ENT key and complete writing.
- The new measurement conditions are written.

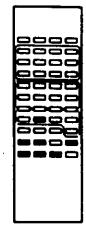
One-point advice

- Press the 1ST key and then ΔV/ΔT key to delete the written characters and move the cursor to the left.
- Press the 1ST key and then T LVL key to write a space.
- Press the INDEX key and then move the "*" mark to the file name selection position to select and call the file from the file name which has already been registered.

REMOTE CONTROLLER

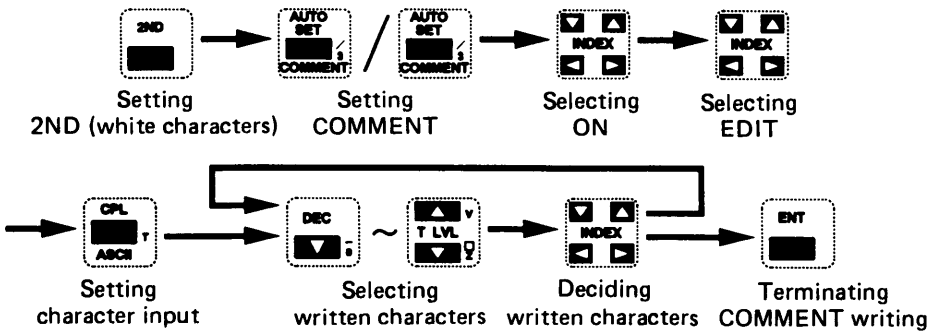
COMMENT EDIT





It is useful to write the COMMENT onto screen.

♦ **Key operation**



♦ **Operating procedure**

① Press the 2ND key and set the 2ND.

② Press the AUTO SET / COMMENT key and set the COMMENT.

③ Press the INDEX key and select ON.

④ Press the INDEX key and select the EDIT.

⑤ Press the CPL / ASCII key and set the character input.

⑥ Press the DEC key to T LVL keys and select the character written.

⑦ Press the INDEX key and decide the objected characters if any.

- The position of underline moves to the right.

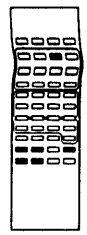
⑧ Repeat procedures ⑥ and ⑦ above when two characters or more are written.

⑨ Press the ENT key to complete writing by deleting screen.

One-point advice

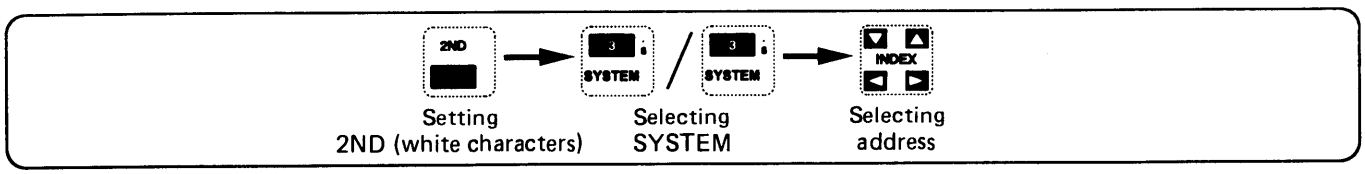
- The T LVL key indicates a space.
- The ΔV / ΔT key indicates a back space where the characters displayed by the cursor are deleted and the cursor is returned to the previous string.

GP-IB ADRS



When communication between the DS-8623 and external devices is performed, the ADRS (address) and DELIM (delimiter) used to identify devices and to indicate the delimiter of data are required.

♦ **Key operation**



♦ **Operating procedure**

① Press the 2ND key and set the 2ND.

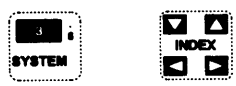
② Press the SYSTEM key and select the SYSTEM.

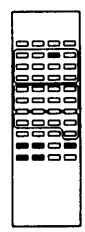
- The "*" mark appears at the top of selected line of menu displayed on screen.

③ Press the INDEX key and select the address.

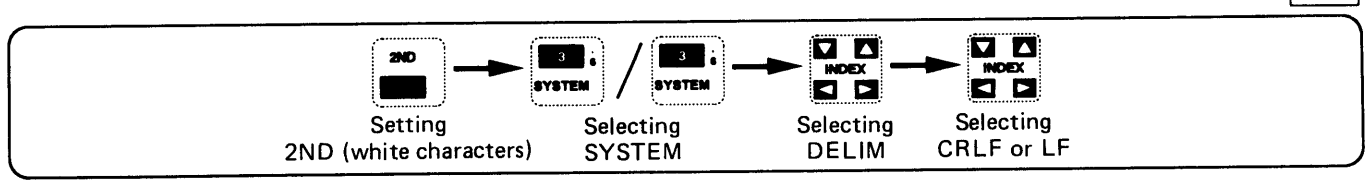
4

DELIM





♦ **Key operation**



♦ **Operating procedure**

① Press the 2ND key and set the 2ND.

② Press the SYSTEM key and select the SYSTEM.

- The "*" mark appears at the head of sleected line of menu displayed on screen.

③ Press the INDEX key and select the delimiter.

④ Press the INDEX key and select the CRLF or LF.

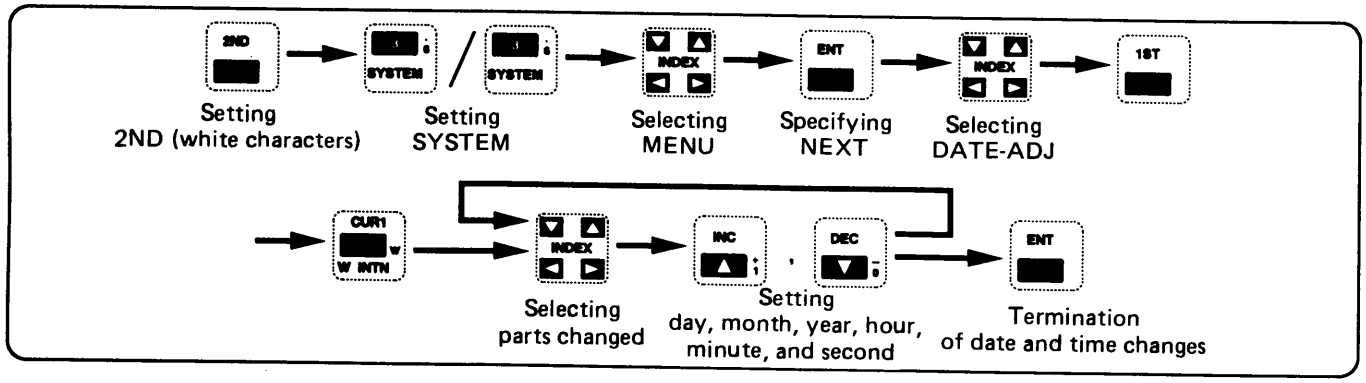
- The brightness of CRLF or LF is highlighted.

REMOTE CONTROLLER

SYSTEM DATE-ADJ

It is used to adjust the date and time. The date and time are added to the measurement conditions and file name of comment.

♦ **Key operation**



♦ **Operating procedure**

① Press the 2ND key and set the 2ND.

② Press the SYSTEM key and specify the SYSTEM.

③ Press the INDEX key and select the MENU.

- The "*" mark appears at the top of selected line of menu displayed on screen.

④ Press the ENT key and select the EDIT.

⑤ Press the INDEX key and select the NEXT.

- The "*" mark appears at the top of selected line.

⑥ Press the 1ST key.

⑦ Press the CUR1 W INTN key.

⑧ Press the INDEX key and select the target day, month, year, time, minute, and second.

- The brightness of selected target is highlighted.

⑨ Press the INC or DEC key and adjust the day, month, year, hour, minute, and second.

⑩ Repeat procedures ⑧ and ⑨ above to adjust the next object.

⑪ Press the ENT key and complete the adjustment of date and time.

1 2 3 4 5 6 7 8 9

GP-IB RS-232C

GP-IB Introduction Connection Requirements

◇ **GP-IB introduction**

The IEEE488-1978 standard defines the general purpose interface bus, generally called GP-IB, for the mesurement system.

The test and measurement instrument which supports the GP-IB capability will be remotely controlled by the controller through the GP-IB interface bus.

◇ **GP-IB connection requirements**

- A maximum 15 instruments connected to the bus.
- A maximum total cable length of 20 meters.
- A linear or a star configuration is allowed for the instrument linking.
- Use the GP-IB shielded 24-conductor cable.
- No more than three connectors stacked at the same position is recommended for the physical strength.

One-point advice · Turn all the instruments' power off when adding or deleting the GP-IB cable.
· Turn all instruments' power on in the system while using the GP-IB interface.

GP-IB Characteristics, Interface Functions, Address and Delimiter (EOS), EOL, LOCAL LOCKOUT

◇ **GP-IB characteristics**

The physical and the electrical characteristics are conformed to the IEEE 88-1978 standard.

◇ **GP-IB interface functions**

The interface functions are :

Subset		Description
SH1	(Source handshake)	Provides asychronized message transmission
AH1	(Acceptor handshake)	Provides asynchronized message reception
T5/6	(Talker)	T5(Talker capability provided) for STORAGE and T6(No talker capability provided) for REAL
L4	(Listener)	Listener capability provided
SR1	(Service request)	Requests service from controller
RL1	(Remote/local)	Allows instrument to select front panel control (local) or interface control (remote)
PP0	(Parallel poll)	Provides no parallel poll capability
DC0/1	(Device clear)	Allows instrument to be cleared or initialized
DT0/1	(Device trigger)	DT1(Allowing instrument to be triggered) for STORAGE and DT0 (Not allowing it to be triggered) for REAL
C0	(Controller)	Provides no controller capability
E2	(Electrical interface)	Shows three-state interface drivers

◇ **Address and delimiter (EOS)**

- Address setting
  The GP-IB address is selectable between 0 and 30. For the address setting, see the "GP-IB ADRS DELIM" in the section 3.

- Delimiter (or EOS: End of string) setting
  CRLF or LF character is available as a delimiter. For the delimiter setting, see the "GP-IB ADRS DELIM" in the section 3.

- EOI
  Asserting the EOI line in the interface bus (sending END) allows the instrument to terminate a data message reception.
  The instrument asserts the EOI line at the end character of the delimiter.

◇ **LOCAL LOCKOUT**

- Setting the instrument from remote mode to local mode.
  a. Setting the REN line false in the inter face bus.
  b. Push the SYSTEM (LOCAL) key.
  c. Sending the GTL message.
- The LOCAL LOCKOUT mode disables the SYSTEM (LOCAL) key to prevent the instrument from exiting remote mode.

5

GP-IB Service Request Status Byte Error Reporting

◊ **Service request (SRQ)**

The SRQ allows instrument to request service asynchronously from the controller. When receiving the SRQ from the instrument, the controller executes the serial polls and receives the details of the service. The instrument asserts the SRQ when:

- The instrument has received the invalid command from the controller as followings (bit 5 in status byte):
  - A semantic error has occurred showing an unrecognized header or parameter was received.
  - A syntax error has occurred showing an command was received in an invalid format or type.
  - The received command was inexecutable.
- The overload voltage is applied to the input channel at 50Ω input impedance. (bit 3 in status byte)
- All the data transmission has been completed. (bit 2 in status byte)
- The instrument is ready for the triggering. (bit 1 in status byte)
- The instrument has completed the AUTO SET or CALIB operation. (bit 0 in status byte)

◊ **Status bus**

The status byte is a 8-bit information about the instrument conditions responding the serial poll.
For the detailed message of the error indicated by the bit 5 in the status byte, see "Error reporting" in this page.

Bit	Description
7	Not used, always 0.
6	Asserting SRQ, high indicates SRQ active.
5	Reporting error, high indicates error occurred.
4	Not used, always 0.
3	Reporting overload alarm at signal input, high indicates overload occurred.
2	Completing data transmission, high indicates transmission completed.
1	Indicating trigger ready, high indicates ready condition.
0	Completing operation, high indicates operation completed.

◊ **Error reporting**

ERRN? command allows the instrument to report the detailed message of the error indicated by the bit 5 in the status byte.
Sending ERRN? command is recommended when bit 5 and/or 3 is high, since ERRN? command clears the error status of the bit 5 and overload alarm of the bit 3 in the status byte.

Error number	Description
0	Overload error
10	Header error
11	Parameter error
12	EOS error
13	Too long command length (256 bytes maximum)
20	Invalid file name
21	No more file memory (MEDIA FULL)
22	No more file (FILE FULL)
23	File memory error
24	File not found
30	AUTO SET operation error
31	CALIB operation error
40	Invalid data format or data type mismatch
41	Plot busy error
42	GO/NOGO busy error

RS-232C Introduction Connection Requirements Characteristics

◇ **RS-232C introduction**

The RS-232C interface is defined by the Electronic Industries Association for the communication between data terminal equipment (DTE) and data communication equipment (DCE). The RS-232C is widely used to connect personal computers to peripheral devices.

◇ **RS-232C connecting requirements**

- A maximum transmission rate of 20,000 bit/sec.
- A maximum distance of 15m or 50 feet between DTE and DCE.
- DB-25P (pin) and DB-25S (socket) connectors are used commonly for a specified 25-pin connector.

◇ **RS-232C characteristics**

The physical and the electrical characteristics are conformed to the requirements of EIA standard RS-232C.

◇ **RS-232C communication setting**

- Baud rate (transmission speed)
  Valid speeds are 300, 600, 1200, 2400, 4800, and 9600 baud rate. For selecting the speed, see "3.30 Setting Up the System RS-232C BAUD BIT" in the section three.
- Data bits
  Valid values are 8-bit and 7-bit. For selecting the data bits, see "3.30 setting Up the System RS-232C BUAD BIT" in the section three.
- Parity
  Valid parities are even, odd, and non parities. For selecting the parity, see "3.30 Setting Up the System RS-232C PARITY STOP-BIT" in the section three.
- Stop bit
  Valid values are 2-bit and 1-bit. For selecting the stop bit, see "3.30 Setting Up the System RS-232C PARITY STOP BIT" in the section three.
- RS line polarity
  Positive and negative polarities are available for the RS line. For selecting the polarity, see "3.30 Setting Up the System RS-232C RS" in the section three.

RS-232C Error Reporting Signal Lines

◇ **Error reporting**

For confirming the communication, the instrument responds with the ACK (acknowledge, 6 hexadecimal code) or NAK (negative acknowledge, 15 hexadecimal code) in ASCII code set when the instrument receives the command. The ACK code represents the command was successfully received, while the NAK code represents the error occurred during receiving the command.

◇ **RS-232C signal lines**

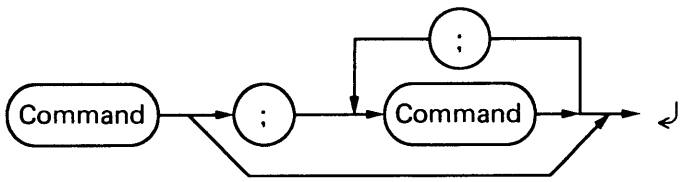
The following lists the RS-232-C signal lines and connector pin assignments of the instrument.

Pin number	Signal mnemonic	Signal Name	Signal direction
1	CH.GND	Chassis ground	
2	TXD	Transmit data	Output
3	RXD	Receive data	Input
4	RS(RTS)	Request to send	Output
5	CTS	Clear to send	Input
6	DSR	Data set ready	Input
7	SG	Signal ground	
8	DCD	Carrier detect	Input
9 to 19	NC	Not connected	
20	DTR	Data terminal ready	Output
21 to 25	NC	NC	

GP-IB RS-232C
Message Format
Command Format

◇ **Message format**

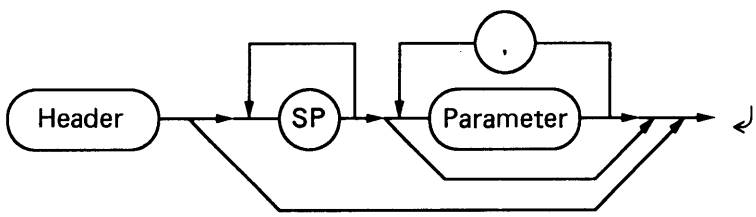
The message consists of the string of the commands separated by the separator with the delimiter at the end of string.



command : allows the controller to control the instrument.
; : separates each command in the message.
↵ : shows the delimiter which terminates the message.

◇ **Command format**

The command consists of the header and the string of the parameters separated by the separator. The one or more white space charactor is necessary between the header and the first parameter.



header : represents a function or operation of the instrument.
SP : shows the white space character, and is indicated the ␣ mark in this section.
, : separates each parameter.
parameter : is used to convey an information related to the program header.

One-point advice • The ASCII characters are used for the header and the parameter fields.
• The maximum length of message is 255 characters.

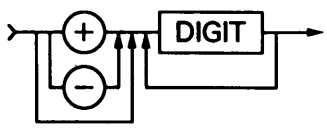
GP-IB RS-232C Parameter Format

◇ **Parameter format**

- There are two types of data in the parameter field. One is a string data type and the other is a numeric data type.
  A parameter field having a string data type is normally called string data field (STDF). The STDF allows any ASCII character to be carried as a message. A numeric data type is further subdivided into three forms called numeric representations (NR) of NR1, NR2, and NR3. When receiving the numeric data from the controller, the instrument accepts numeric data in any type of the three and /or data length, and interprets it into valid form.
- The < and > marks shown in the command set only represent the boundary of the parameter and are excluded when sending the message.
- The ␣ mark shown in the command set represents the space.
- The | mark between < and > marks shown in the command set represents that the any one which is separated by the | mark is valid and the other (s) is optional.

NR1

The syntax is shown below and this data type is useful for conveying numeric data of integer value.

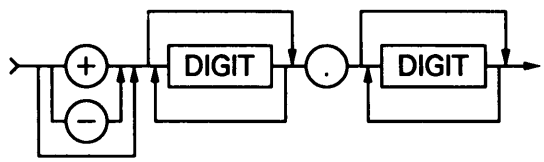


a. Receiving the data from controller
- Leading spaces are not necessary but allowed.
- Unsigned numeric data is interpreted as a value equal to or greater than zero.
- A zero value with minus sign is interpreted as a zero with plus sign.

b. Sending the data to controller
- Always six characters in length.
- A plus or minus sign is always placed at the top of digits.

NR2

The syntax is shown below and this data type is useful for conveying numeric data which contains a fraction.

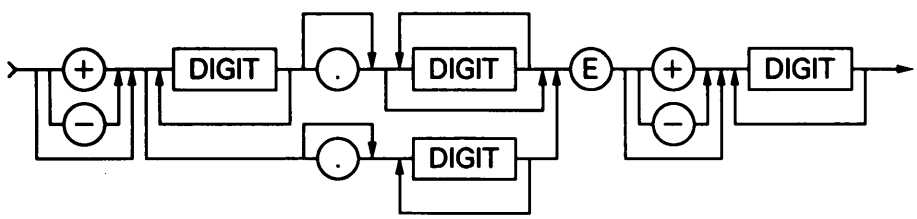


a. Receiving the data from controller
- Leading spaces are not necessary but allowed.
- Unsigned numeric data is interpreted as a value equal to or greater than zero.
- A zero value with minus sign is interpreted as a zero with plus sign.

b. Sending the data to controller
- Not available

NR3

The syntax is shown below and this data type includes exponent notation.



a. Receiving the data from controller
- Leading spaces are not necessary but allowed.
- Unsigned mantissa or exponent is interpreted as a value equal to or greater than zero.
- A zero value mantissa with minus sign is interpreted as a zero mantissa with plus sign.
- A zero value mantissa with a non - zero exponent is interpreted as a zero value.
- A decimal point of the mantissa is not necessary for an integer.

b. Sending the data to controller
- Always twelve characters, i.e. eight characters mantissa including sign and decimal point, one characters of E and three characters exponent including sign.
- An exponent value is a multiple of three.
- A mantissa is always expressed as a decimal fraction. A plus or minus sign is always placed for a mantissa and exponent.

GP-IB RS-232C Command

Automatic setting

ASET

Sets the AUTO SET

CRT controls

ENHA ␣ < ON >

OFF

Enhances the intensity when the parameter is ON. The OFF sets the normal intensity mode.

ENHA?

The instrument responds in STDF data type with the intensity mode of ON or OFF.

Screen display format

For STORAGE	For STORAGE	For REAL
INMD ␣ <CH1>, <ON>	INMD ␣ <CALC>, <OFF>	INMD ␣ <CH1>, <ON>
CH2 OFF	ADD	CH2
CH3	MULT	CH3
CH4		CH4
		ADD

Sets the display channel on or off.

INMD?

The instrument responds whether the each display channel is on or off.

Format : <P1>, <P2>, <P3>, <P4>, <P5>

P1 : returns ON or OFF for CH1 display.
P2 : returns ON or OFF for CH2 display.
P3 : returns ON or OFF for CH3 display.
P4 : returns ON or OFF for CH4 display.
P5 : returns ADD or MULT or OFF for CALC display.

Example : The string of "ON, OFF, ON, OFF, ADD" shows that CH1, CH3 and CALC display is on.

DIRV ␣ <CH1>

CH2

CH3

CH4

Sets the destination channel for the channel commands which follow. The channel commands are:

VDIV[?], VVAR[?], VPOS[?], VCPL[?], VIMP[?], PROB?

where [?] shows that the ? mark is optional.

Only for STORAGE

RFMD ␣ <REF1>, <ON>
REF2 OFF
REF3
REF4

Sets the reference channel on or off.

RFMD?

The instrument responds whether the each reference channel is on or off.

Format : <P1>, <P2>, <P3>, <P4>
P1 : returns ON or OFF for REF1
P2 : returns ON or OFF for REF2
P3 : returns ON or OFF for REF3
P4 : returns ON or OFF for REF4

Vertical system

VDIV ␣ <NR1|NR2|NR3>

Sets the VOLTS/DIV setting of the channel designated by DIRV command. The VOLTS/DIV setting includes the probe factor, e.g. the actual VOLTS/DIV setting of the instrument is set to 50mV/div by sending "0.5" (v/div) as a parameter when you are using the 10:1 standard accessory probe. The data is represented in volts/div and rounded to the appropriate valid value if it is within the valid range.

Example: 0.05: shows 50mV/div.
"2.05E-1" is rounded to 0.2V/div.

VDIV?

The instrument responds in NR3 data type with the VOLTS/DIV range setting of the channel designated by DIRV command.

VVAR ␣ <NR1|NR2|NR3>

Sets the variable of the channel designated by DIRV command. The valid value is from 0 to 100.0 in %. The 0 (zero) represents variable off position.

VVAR?

The instrument responds in NR3 data type with the variable position of the channel designated by DIRV command.

VPOS ␣ <NR1|NR2|NR3>

Sets the vertical trace position of the channel designated by DIRV command. The valid is from −12.5 to +12.5 in division. The 0 (zero) represents the center screen.

VPOS?

The instrument responds in NR3 data type with the trace position of the channel designated by DIRV command.

VCPL ␣ <AC>, <GNDON>
DC GNDOFF

Selects the coupling of the channel designated by DIRV command. The first parameter selects the AC or DC coupling when the second parameter is GNDOFF. Sending the GNDON sets the instrument to GND.
The second parameter is not available for the CH3 and CH4.

VCPL?

The instrument responds with the coupling of the channel designated by DIRV command.
Format : <P1>, <P2>
P1 : returns AC or DC in STDF data type.
P2 : returns GNDON or GNDOFF for the CH1 and CH2, and one white space for the CH3 CH4 in STDF data type.

VIMP ␣ <1M>
50

Selects the 1MΩ or 50Ω input impedance of the channel designated by DIRV command. Available only for the CH1 and CH2.

VIMP?

The instrument responds in STDF data type with the input impedance setting of the channel designated by DIRV command.
Available only for the CH1 and CH2.

PROB?

The instrument responds in STDF data type with the probe factor of the probe connected to the input channel designated by DIRV command.

INVT ␣ <ON>
OFF

Sets the CH2 inverted polarity on or off.

INVT?

The instrument responds with the CH2 polarity setting.
Format : <STDF>
STDF : returns ON (inverted polarity) or OFF (normal polarity).

Only for REAL

BNDW ␣ <ON>
OFF

Sets the bandwidth limiter on or off.

BNDW?

The instrument responds with the bandwidth limiter setting.
Format : <STDF>
STDF : returns ON or OFF (full or normal bandwidth).

Only for REAL

VMOD ␣ <ALT>
CHOP

Sets the multiple display mode to ALT or CHOP.

VMOD?

The instrument responds with the multiple display mode setting.
Format: <STDF>
STDF : returns ALT or CHOP multiple display mode.

DIRT ␣ <A>
B

Sets the A or B destination for triggering and time base commands which follow.
The triggering commands which is designated by DIRT are:
TSRC, TCPL, TSLP, TLVL, TMDV

For STORAGE
TSRC ␣ <CH1>
CH2
CH3
CH4
LINE (A triggering only)
COMB

For REAL
TSRC ␣ <VERT>
CH1
CH2
CH3
CH4
LINE
COMB

Selects the trigger source of A or B triggering designated by DIRT command.

TSRC?

The instrument responds in STDF data type with the trigger source setting of A or B triggering designated by DIRT command.

5

TCPL ␣ <DC>
DC-HFREJ
DC-NOISEREJ
AC-HFREJ
AC-LFREJ (A triggering only)
AC
TV-V (A triggering only)
TV-H (A triggering only)

Selects the trigger coupling of A or B triggering designated by DIRT command. AC-LFREJ, TV-V and TV-H parameters are only available for A triggering.

TCPL?

The instrument responds is STDF data type with the trigger coupling setting of A or B triggering designated by DIRT command.

TSLP ␣ <+>
–

Selects plus or minus trigger slope of A or B triggering designated by DIRT command.

TSLP?

The instrument responds in STDF data type with the trigger slope of A or B triggering designated by DIRT command.

TLVL ␣ <NR1|NR2|NR3>

Sets the trigger level of A or B triggering designated by DIRT command in any sweep mode but AUTO LVL. The valid value is from −18.00 to +18.00 in division. The 0 (zero) represents the center screen trigger level at DC trigger coupling.

TLVL?

The instrument responds in NR3 data type with the trigger level value of A or B triggering designated by DIRT command in any sweep mode but AUTO LVL.

ATLV ␣ <NR1|NR2|NR3>

Sets the trigger level of A or B triggering designated by DIRT command in AUTO LVL sweep mode. The valid value is from −100.0 to 100.0 in percent of peak - to - peak value of the trigger signal.

ATLV?

The instrument repsonds in NR3 data type with the trigger level value of A or B triggering designated by DIRT command in AUTO LVL sweep mode.

Format : <P1>, <P2>, <P3>

P1 : returns trigger level value in percent.

P2 : returns plus peak of trigger signal in division.

P3 : returns minus peak of trigger signal in division.

TVFL ␣ <ODD>, <LINE>, <NR1|NR2|NR3>

EVEN OFF

BOTH

Selects the TV field and line in the TV-V coupling. The first parameter selects ODD, EVEN or BOTH TV field. The second parameter LINE sets the TV line selector on. The third parameter sets the line number when the TV line selector is on. The valid line number is from 1 to 9999.

TVFL?

The instrument responds with the TV field and line setting.

Format : <P1>, <P2>, <NR1>

P1 : returns TV field setting in STDF data type.

P2 : returns TV field setting in STDF data type.

NR1 : returns TV line number setting.

Only for REAL

BTMD ␣ <B-RUNS-AFT>

B-TRIGD

Sets the B trigger mode to B-RUNS-AFT (B runs after delay) or B-TRIGD (B runs after triggered).

BTMD?

The instrument responds in STDF data type with the B trigger mode.

EVNT ␣ <OFF>,<NR1|NR2|NR3>

BURST (only for STORAGE)
MISSING (only for STORAGE)
EXTRA (only for STORAGE)
COUNT

Sets the event count value in the counter measurement. The first parameter sets the counter measurement on or off, i.e., COUNT sets the counter on and OFF sets the counter off. The second parameter sets the event count value or time. The valid count value is from 1 to 65535.

EVNT?

The instrument responds with the counter measurement setting and the event count setting value.
Format : <STDF>, <NR1>

STDF : returns the counter measurement setting, or COUNT for on and OFF for measurement off.
NR1 : returns the event count setting value.

Time base

SWMD ␣ <AUTO>

NORM
SINGLE
LEVEL

Selects the A sweep mode.

SWMD?

The instrument responds with the A sweep mode setting.
Format : <STDF>

STDF : returns AUTO, NORM, SINGLE, or LEVEL

HMOD ␣ <A>

ALT
B
X-Y

Sets the horizontal display to A, ALT, B or X-Y.

HMOD?

The instrument responds with the horizontal display setting.
Format : <STDF>

STDF : returns the A, ALT, B or X-Y mode setting.

TMDV␣ <NR1|NR2|NR3>

Sets the sweep rate of A or B time base designated by DIRT command. The parameters is represented in SEC/DIV and rounded to the appropriate valid value if it is within the valid range.
example: "0.05" shows 50ms/div.
"2.05E-6" is rounded to 2μs/div.

TMDV?

The instrument responds with the sweep rate of A or B time base designated by DIRT command. The horizontal magnification has no effect to the sweep rate returned.
Format : <NR3>

Only for REAL
TVAR␣ <NR1|NR2|NR3>

Sets the A sweep variable. The valid value is from 100 to 300 in percent. The 100 (zero) represents variable off position.

5

TVAR?

The instrument responds with the variable position.
Format : <NR3>

Only for STORAGE
DATP␣ <NR1>

Sets the DATA POSITION. The parameters from 0 to 7 are used and each of them corresponds to 0/8 to 7/8.

DATP?

The instrument responds with DATA POSITION.
Format : <NR1>

DELY␣ <NR1|NR2|NR3>

Sets the delay time for the B time base. The parameter represents the delay time value in second. The valid time value is:

Valid time value = (A sweep rate) × (Delay range)
where Delay range is between 0.2 and 10.2 (divisions).

DELY?

The instrument responds with the delay time value in second.
Format : <NR3>

HOLD ␣ <NR1|NR2|NR3>

Sets the holdoff time. The valid value is from 0 (zero) to 100.0 in percent. The 0 (zero) represents the minimum holdoff time or normal setting. Placing over 100.1 up to 999.9 in REAL sets B ENDS A mode.

HOLD?

The instrument responds with the holdoff time setting. When the B ENDS A is set, 110.0 is returned.
Format : <NR3>

TSEP ␣ <NR1|NR2|NR3>

Separates the B sweep trace from the A sweep trace. The valid value is from 0 (zero) to 100.0 in percent.
The 100.0 represents the maximum separation.

TSEP?

The instrument responds with the trace separation value.
Format : <NR3>

Only for STORAGE
WSGL

When a trigger signal is input, only one sequence data is recorded. The data transfer can be made without any waiting time after the end of WSGL command.

TMAG ␣ <ON>
OFF

Sets the horizontal magnification on or off.

TMAG?

The instrument responds with the magnification setting.
Format : <STDF>
STDF : returns ON or OFF.

SKEW <NR1|NR2|NR3>

Adjusts the CH2 time skew against the other channel signal in 5ns/div of TIME/DIV setting to minimize the delay difference between the channels. The valid value is from −100.0 to +100.0 in percent. The 0 (zero) is the normal value.

SKEW?

The instrument responds with the CH2 time skew setting.

Format : <NR1>

REAL/STORAGE

RLST ␣ <REAL>
STORAGE

Selects REAL or STORAGE.

RLST?

The instrument responds with REAL/STORAGE selecting.

Format : <STDF>

STORAGE MODE (only for STORAGE)

AVRG ␣ <ON>, <NR1|NR2|NR3>
OFF

Sets the AVG (averaging). The second parameter sets the number of AVG times (2 to 256).

AVRG?

The instrument responds with the AVG on or off and AVG times.

MHLD ␣ <ON>, <NR1|NR2|NR3>
OFF

Sets the MAX-HOLD. The second parameters set the number of MAX-HOLD times (2 to 256). Set 256 for infinity.

MHLD ?

The instrument responds with the MAX-HOLD on or off and MAX-HOLD times.
Format : <STDF>, <NR1>
STDF : returns ON or OFF
NR1 : returns MAX-HOLD times.

ENVL ␣ <ON>
OFF

Sets the ENV.

ENVL?

The instrument responds with the ENVL on or off.
Format : <STDF>

ETSM ␣ <ON>
OFF

Sets the EQ-SAMPL.

ETSM?

The instrument responds with the EQ-SAMPL on or off.
Format : <STDF>

ROLL ␣ <ON>
OFF

Sets the ROLL

ROLL?

The instrument responds with the ROLL on or off.

Format : <STDF>

CADV ␣ <ON>
OFF

Sets the CH1-ADV.

CADV?

The instrument responds with the CH1-ADV on or off.
Format : <STDF>

MADV ␣ <ON>
OFF

Sets the MEM-ADV.

MADV?

The instrument responds with the MEM-ADV on or off.

Format : <STDF>

LGTH ␣ 1K
2K
16K

Sets the LENGTH.

LGTH?

The instrument responds with the LENGTH on or off.

Format : <STDF>

VCTR ␣ <ON>
OFF

Sets the VECTOR.

VCTR?

The instrument responds with the VECTOR on or off.
Format : <STDF>

INTP ␣ LIN
PLS
SIN

Sets the INTPLT.

INTP?

The instrument responds with the INTPLT on or off.
Format : <STDF>

SMTH ␣ <ON>, <NR1|NR2|NR3>
OFF

Sets the SMOOTHING. The second parameter set the number of SMOOTHING (1 to 99).

SMTH?

The instrument responds with the SMOOTHING on or off and SMOOTHING times.
Format : <STDF>, <NR1>
STDF : returns ON or OFF
NR1 : returns SMOOTHING times.

GONG ␣ <EXECUTE>
EXIT

Sets the execution/non-execution of GO/NOGO.

GONG?

The instrument responds with the GO/NOGO execution or non-execution.
Format : <STDF>

GNRO ␣ <GT>, <NR1|NR2|NR3>, <NR1|NR2|NR3>, <NR1|NR2|NR3>
EQ
LT

Sets the GO/NOGO judgement conditions. The second parameter should be the values of IF READOUT IS [GO EQ LT] [▨] (0.1 to 100.0%) when the WAVE PARAM is AMPL, P-P, f PW, tr or tf. When the WAVE PARAM is AMPL or P-P, 100% corresponds to 8 div. When it is f, PW, tr or tf, 100% corressponds to 10.24 div. The third parameter is the values of IF READOUT IS [GT EQ LT] [▨] (0.1 to 100.0%) when the WAVE PARAM is VATt or SKEW. When it is VATt, 100% corresponds to ±10.24 div, and when it is SKEW, 100% corresponds to ±16 div. The fourth parameter should be the values of IF READOUT IS [GO EQ LT] [▨%] (0 to 100.0%).

GNRO?

The instrument responds with the GO/NOGO judgment.

GNCR ␣ <INSIDE>, <NR1|NR2|NR3>
OUTSIDE

Sets the cursor located at the GO/NOGO range. The second parameter adjusts the IF WAVE EXISTS (0 to 100.0%).

GNCR?

The instrument responds with the GO/NOGO range of cursor locate.
Format : <STDF>, <NR1>
STDT : returns INSIDE or OUTSIDE
NR1 : returns values of IF WAVE EXISTS

GNJG ␣ <GO>
NOGO

Sets the THEN GO or NOGO.

GNJG?

The instrument responds with the THEN.
Format : <STDF>
STDF : returns GO or NOGO

GNJS ␣ <ON>, <GO>
OFF NOGO
ANY

Sets the STORG STOP GO or NOGO or ANY.

GNJS?

The instrument responds with the STORG STOP.

Format : <P1>, <P2>
P1 : returns ON or OFF in STDF data type
P2 : returns GO or NOGO or ANY in STDF data type.

GSTS?

The instrument responds with NR1 to the result of GO/NOGO judgement.

+00000 Both GO and NOGO set to OFF
+00001 GO set to ON
+00002 NOGO set to ON
+00003 Both GO and NOGO set to ON

When you execute the GSTS? command, only "+00000" appears.

GNJP ␣ <ON>, <GO>
OFF NOGO
ANY

Sets the PLOT OUT.

GNJP?

The instrument responds with the PLOT OUT.

Format : <P1>, <P2>
P1 : returns ON or OFF
P2 : returns GO or NOGO or ANY

GNJD ␣ <ON>, <GO>
OFF NOGO
ANY

Sets the DATA SAVE.

GNJD?

The instrument responds with the DATA SAVE.

Format : <P1>, <P2>

COPY

Starts plotting.

PLOT ␣ <WAVE>, <ON>
CUR OFF
READ
CMNT

PLOT ␣ <SCALE>, <FULL>
HALF
OFF

Sets the PLOTTER OUT EXECUTE.

PLOT?

The instrument responds with the PLOTTER OUT EXECUTE.
Format : <P1>, <P2>
P1 : returns WAVE, CUR, READ, CMNT or SCALE in STDF data type.
P2 : returns ON, OFF, FULL or HALF in STDF data type.

PLIF ␣ <GP-IB>
RS-232C

Sets the PLOTTER I/F.

PLIF?

The instrument responds with the PLOTTER I/F.
Format : <STDF>
STDF : returns GP-IB or RS-232C.

DMPL

Executes the DUMMY PLOT.

XYRC ␣ POS
NEG

Sends signals to XY-REC.

	Description	
CMOD ␣ <OFF>	Cursor measurement off	
V	Delta voltage measurement	
V-RATIO	Voltage ratio measurement	
T	Delta time measurement	
T-RATIO	Time ratio measurement	
VT	Voltage and time measurement	
V-AT-T	AT-t measurement	(only for STORAGE)
PARAM	WAVE PARAM measurement	(only for STORAGE)
CH2-SKEW	SKEW	(only for STORAGE)

CMOD?

The instrument responds with the measurement setting.

Format : <STDF>

STDF : returns OFF, V, V-RATIO, T, T-RATIO, VT, V-AT-T, PARAM or CH2-SKEW.

MVAL?

The instrument responds with the measurement value.

Format : <P1>, <P2>

P1 : returns first measurement value in NR3 data type.

P2 : returns second measurement value in NR3 data type. When the second measurement value is not available for the measurement, e.g. delta voltage or peak measurement, the P2 returns the string of NOTHING.

Only for STORAGE

ICMD ␣ <FREQ>

AMPL

P-P

TR

TF

PW

Selects the WAVE PARAM measurement.

ICMD?

The instrument responds with the WAVE PARAM measurement.

ATCH ␣ <CH1>
CH2
CH3
CH4

Sets the measurement channel when the multiple measurement channels are available. The instrument responds with the error when the instrument receives the ATCH command at the single measurement channel.

ATCH?

The instrument responds with the current measurement channel.
Format : <STDF>
STDF : returns CH1, CH2, CH3, or CH4.

VCUR ␣ <NR1|NR2|NR3>, <NR1|NR2|NR3>

Sets the voltage cursor position. The first parameter sets the cursor 1, and the second parameter sets the cursor 2. The valid values of the parameters 1 and 2 are from −4,000 to 3.999 in division.

VCUR?

The instrument responds with the two voltage cursor positions.
Format : <P1>, <P2>
P1 and P2 : return the each cursor position in NR3 data type.

TCUR ␣ <NR1|NR2|NR3>, <NR1|NR2|NR3>

Sets the time cursor position. The first parameter sets the cursor 1, and the second parameter sets the cursor 2. The valid values of the parameters 1 and 2 are from 0 to 10.23 in division.

TCUR?

The instrument responds with the two time cursor positions.
Format : <P1>, <P2>
P1 and P2 : return the each cursor position in NR3 data type.

RFST
Sets the current cursor positions as the reference for the voltage or time ratio measurement.

Only for REAL
MSDV ␣ <OFF>
COUNTER

Sets the DVM or COUNTER measurement. The parameter OFF sets the DVM or COUNTER measurement off.

MSDV?

The instrument responds in STDF data type with the DVM or COUNTER measurement setting.

Only for REAL

DVAL?

The instrument responds in NR3 data type with the DVM or COUNTER measurement value.

Only for STORAGE

MCND ␣ <P-P>　　P-P

　　T-B　　TOP-BASE

Sets the AUTO-MEAS 100% P-P or TOP-BASE.

MCND?

The instrument responds with the AUTO-MEAS 100%.

Format : <STDF>

　　STDF : returns P-P or T-B

Only for STORAGE

CELV ␣ <VAR>, <NR1|NR2|NR3>

　　DEF

Sets the AUTO-MEAS CENT. The second parameter sets the values of VARIABLE (0~99%).

CELV?

The instrument responds with the AUTO-MEAS CENT.

Format : <STDF>, <NR1>

　　STDF : returns VAR or DEF

　　NR1 : returns VARIABLE values

Only for STORAGE

CMLV ␣ <VAR>, <NR1|NR2|NR3>

　　DEF

Sets the AUTO-MEAS MARGIN.

The second parameter sets the values of VARIABLE (0~99%).

CMLV?

The instrument responds with the AUTO-MEAS MARGIN.

Format : <STDF>, <NR1>

　　STDF : returns VAR of DFF

　　NR1 : returns VARIABLE values.

Only for STORAGE

UPLV ␣ <VAR>, <NR1|NR2|NR3>
DEF

Sets the AUTO-MEAS UPPER. The second parameter sets the values of VARIABLE (1~99%)

UPLV?

The instrument responds with the AUTO-MEAS UPPER.

Format : <STDF>, <NR1>
STDF : returns VAR or DFF
NR1 : returns VARIABLE values

Only for STORAGE

LOLV ␣ <VAR>, <NR1|NR2|NR3>
DEF

Sets the AUTO-MEAS LOWER.

The second parameter sets the values of VARIABLE (1~99%)

LOLV?

The instrument responds with the AUTO-MEAS LOWER.

Format : <STDF>, <NR1>
STDF : returns VAR or DFF
NR1 : returns VARIABLE values

Only for STORAGE

EDGE ␣ <RISE>, <RISE>
FALL FALL

Sets the SKEW FROM. The first parameter sets the CH1 RISE or FALL.
The second parameter sets the CH2 RISE or FALL.

EDGE?

The instrument responds with the SKEW FROM.

Format : <STDF>
STDF : returns CH1 RISE or FALL and CH2 RISE or FALL.

◇ **REAL Mode**

- FILE ␣ <SAVE>, <SETUP> , , , <FILE NAME>
  COMMENT

  Measuring conditions or comments are registered.

- FILE ␣ <RECALL>, <SETUP>, <FILE NAME>
  COMMENT DEFAULT

  Measuring conditions or comments are called.

- FILE ␣ <DELETE>, <SETUP> , , , <FILE NAME>
  COMMENT

  Measuring conditions or comments are deleted.

- FILE ␣ <INIT>

  Files are initialized.

◇ **STORAGE MODE**

- FILE ␣ <SAVE>, <REF>, <CH1>, <REF1>
  CH2 REF2
  CH3 REF3
  CH4 REF4
  CALC

  Waveforms of CH1 to CALC are registered for REF1 to REF4.

- FILE ␣ <SAVE>, <SETUP> , , , <FILE NAME>
  COMMENT

  Measuring conditions or comments are registered.

- FILE ␣ <SAVE>, <WAVE>, <CH1> , , <FILE NAME>
  CH2
  CH3
  CH4

  Waveforms of CH1 to CH4 are registered.

- FILE ␣ <RECALL>, <SETUP>, <INT-RAM> , , <FILE NAME>
  DEFAULT
  LAST-ACQ

  INT-RAM, DEFAULT and LAST-ACQ are called.

- FILE ␣ <RECALL>, <WAVE> , , <CH1>, <FILE NAME>
  CH2
  CH3
  CH4

  Registered waveforms are called.

- FILE ␣ <RECALL>, <COMMENT> , , , <FILE NAME>

  Registered comments are called.

- FILE ␣ <DELETE>, <SETUP> , , , <FILE NAME>
  WAVE
  COMMENT

  Registered measuring conditions, waveforms and comments are deleted.

- FILE ␣ <INIT>

  Files are initialized.

Only for STORAGE

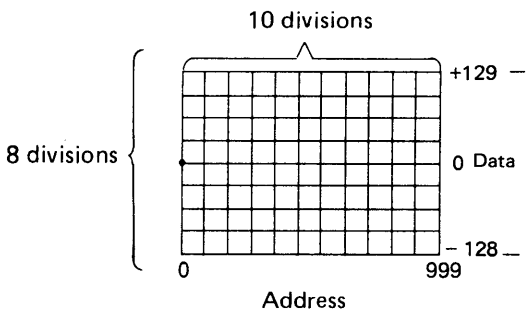
MEMR ␣ <CH1>, <0>, <NR1>, <NR1>

CH2	1
CH3	2
CH4	
CALC	
REF1	
REF2	
REF3	
REF4	

Returns waveform data. By using this command together with MSTR command, you can employ the memory device of the external controller as you can the external memory device of this instrument. (The waveform data can be used for direct computation through a controller and only by the MEMR command.) To return the data from the controller to this instrument, prepare the MEMW command and the MSTW command. The first, second, third, and fourth parameters indicate data source, data format (0:ASCII, 1:binary outputting the upper byte, 2:binary outputting the lower byte), start address (0 to 16383), and number of data to be transferred (1 to 16384), respectively.

The contents of the data are as follows.

With the data length and the data position set to 1K and 0/8 respectively;



Wave form data		Value of voltage applied to waveform data (1V/DIV)
ASCII	Binary	
+32512	01111111 00000000	3.96875V
+256	00000001 00000000	0.03125V
0	00000000 00000000	0.00000V
−256	11111111 00000000	−0.03125V
−32768	10000000 00000000	−4.00000V

- Therefore, the value of voltage applied to the waveform data when GND equals 0 can be given by the following equation;

$$\text{Voltage} = \frac{\text{waveform data}}{65536\ \text{(The value of data to the full scale)}} \times 8\,\text{DIV} \times \text{Voltage range}$$

(The voltage range are given by the VDIV? command.)

MSTR ␣ <CH1>

CH2	REF2
CH3	REF3
CH4	REF4
CALC	

Sends the internal information accompanying the waveform data, and is required for making the waveform appear again on the screen of this instrument. This command is used together with the MSTW command to be mentioned later. Parameters serve as data sources. The data are returned by ASCII.

Ex. (PC-9801)

```
PRINT @ DS8623 ; "MSTR CH1"
LINE INPUT @ DS8623 ; WINF $
```

Internal information is entered into the character line WINF $.

Only for STORAGE

MEMW ␣ <CH1>, <0>, <NR1>, <NR1>

CH2	1
CH3	2
CH4	
CALC	
REF1	
REF2	
REF3	
REF4	

Transfers waveform data from the controller to this instrument. The details are the same as those of MEMR.

MSTW ␣ <CH1>

CH2
CH3
CH4
CALC
REF1
REF2
REF3
REF4

Transforms from the controller the internal information accompanied by this instrument. A parameter serves as a data source.

Ex. (PC-9801)

```
PRINT @ DS8623 ; "MSTW CH1"
PRINT @ DS8623 ; WINF $
```

The contents of the character line WINF $ are sent to the internal memory for CH1 waveform information.

COMMENT

CMTW <NR1|NR2|NR3>, <NR1|NR2|NR3>, <NR1|NR2|NR3>

Allows to transfer the string of comment to the comment buffer memory from the controller. The comment written in the comment buffer memory will be displayed on the screen by the CMCL command. The first parameter sets the start row position between 7 and 12. The second parameter sets the start column position between 0 (zero) and 39. The third parameter sets the number of characters for the comment up to 80 characters. After sending the CMTW command delimited by the EOS character(s), send the string of comment to the instrument.

CMTR ␣<NR1>, <NR1>, <NR1>

The instrument responds with the comment written in the comment buffer memory. The first parameter represents the start row position between 7 and 12. The second parameter represents the start column position between 0 (zero) and 39. The third parameter represents the number of character(s). Retrieve this string of comment in the comment buffer memory from the instrument.

CMCL ␣<ON>
OFF
CLEAR

Sets the comment display on or off and clears the comment.

System setting

WRID ␣<NR1|NR2|NR3>

Registers the ID number for the infrared remote controller. The valid number is between 0 (zero) and 79.

WRID?

The instrument responds with the ID number for the infrared remote controller.
Format : <NR1>

PTST ␣<ON>
OFF

Sets the power-on test on or off.

PTST?

The instrument responds with the power-on test setting.
Format : <STDF>
STDF : returns ON or OFF.

DATE ␣ <NR1|NR2|NR3>, <NR1|NR2|NR3>, <NR1|NR2|NR3>

Sets the date counter. The first parameter sets the year between 00 and 19, or 89 and 99. The second parameter sets the month between 1 and 12. The third parameter sets the day between 1 and 31.

DATE?

The instrument responds with the date setting.
Format : <P1>, <P2>, <P3>

P1 : returns the year in NR1 data type.
P2 : returns the month in NR1 data type.
P3 : returns the day in NR1 data type.

TIME ␣ <NR1|NR2|NR3>, <NR1|NR2|NR3>, <NR1|NR2|NR3>

Sets the time counter. The first parameter sets the hour between 0 (zero) and 23. The second parameter sets the minute between 0 (zero) and 59. The third parameter sets the seocnd between 0 (zero) and 59.

5

TIME?

The instrument responds with the time setting.
Format : <P1>, <P2>, <P3>

P1 : returns the hour in NR1 data type.
P2 : returns the minute in NR1 data type.
P3 : returns the second in NR1 data type.

For REAL	For STORAGE
CALB ␣ <BAL>	CALB ␣ <BAL>
GAIN	GAIN
HORIZ	ADC

Activates the balance, gain, HORIZ or ADC calibration.

SRQE ␣<NR1|NR2|NR3>

Allows to enable or disable the service request when the following condition occurs. The parameter represents the serive request mask and shows whether its service request is active or inactive.

Service request mask

Bit	Description	Weighted value
5	Error.	32
4	Not used.	16
3	Overload alarm at 50Ω input impedance.	8
2	Data transmission completed.	4
1	Trigger ready.	2
0	Operation completed.	1

Setting the certain bit on (or one) in the status byte enables its service request. Setting the bit off (or zero) disables its service request. Add all the weighted values for enabling the service request necessary, e.g. the parameter 44 shows that the bit 5, bit 3 and bit 2 are enabled. Power on default is 40, or bit 5 and bit 3 are enabled. This command is only available for the GP-IB interface.

ERRN?

The instrument responds in NR1 data type with the error number which reports the detailed error message for the bit 5 in the status byte.

Error number	Description
10	Header error
11	Parameter error
12	EOS error
13	Too long command length (256 bytes maximum)
20	Invalid file name
21	No more file memory (MEDIA FULL)
22	No more file (FILE FULL)
23	File memory
24	File not found
30	AUTO SET operation error
31	CALIB operation error
40	Invaild data format or data type mismatch
41	PLOT busy error (only for STORAGE)
42	GO/NOGO busy error (only for STORAGE)

GP-IB Sample Program (PC-9801)

The following sample program shows how to send or receive various commands which control computers and DS-8623 in REAL mode.

```
10 '*****************************************************
20 '*   GP-IB Sample program                             *
30 '*   Copyright(c) 1989 by IWATSU ELECTRIC CO.,LTD..   *
40 '*     Ver 1.00  '89-Apr-28                           *
50 '*****************************************************
60 '------------------------ Initialize -------------------------
70    CONSOLE ,,0,1
80    SCREEN 3,0   :CLS 3
90    GOSUB *GPINIT
100 '======================== Main ================================
110 *MAIN
120    GOSUB *W.MCMOT
130    GOTO *MAIN
140 '====================== Manual Command Out ====================
150 *W.MCMOT
160    CLS :R=0 :PRINT "   === Manual Command OUT ===" :PRINT
170    LINE INPUT " Input Command = "; CM$
180    GOSUB *CMDOUT
190    FOR WT= 0 TO 2000:NEXT WT
200    IF R AND &H20 THEN PRINT "Command error": GOTO 240
210    C$=MID$(CM$,1,4)
220    IF C$="CMTR" OR C$="CMTW" THEN GOSUB *COMMENT  :GOTO 240
230    IF INSTR(CM$,"?")<>0 THEN GOSUB *CMDRD
240    PRINT :PRINT " F1   --- Again"
250    GOSUB *F.KEY
260    IF IKEY<>1 THEN 250
270    RETURN
280 '------------------ Command responce read -------------------
290 *CMDRD
300    LINE INPUT@ DS-8623ICM$
310    PRINT " Read  Command = "; :COLOR 5
320    PRINT ICM$ :COLOR 7
330    RETURN
340 '---------------------- Comment handler ---------------------
350 *COMMENT
360    IF C$="CMTR" THEN 390
370       INPUT " Input Comment ";CMNT$
380       CM$=CMNT$ : GOSUB *CMDOUT :GOTO 420
390    LINE INPUT@ DS8623;CMNT$
400    PRINT " Read Comment = "; :COLOR 5
410    PRINT CMNT$ :COLOR 7
420    RETURN
430 '********************** GP-IB initialize *********************
440 *GPINIT
450    DS8623=10'Address of DS-8623
460    SRQ OFF'interrupt off
470    CMD DELIM=0'delim = CRLF
480    CMD TIMEOUT=10
490    ISET IFC'IFC
500    IRESET REN : ISET REN'remote enable
510    WBYTE &H3F,&H20+DS8623,&H4;'UNL,LA,SDC
520    ON SRQ GOSUB *INTSRQ
530    SRQ ON'interrupt on
540    FOR I=0 TO 3500 :NEXT I
550    RETURN
```

Line number	Details	(Line number)	Description
10 to 50:	Title		
60to 90:	Initialization	70 to 80:	Sets CRT mode
		90:	Initializes GP-IB port (450~)
100 to 130:	Main routines		Performs infinite loop while calling the W. MCMOT
140 to 270:	Sending out GP-IB	160:	display title
		170:	input GP-IB message into variable CM$
		180:	CALL *CMDOUT routine
		190:	elapse about 2 seconds
		200:	if bit 5 in status byte of variable R is high, go to line 240
		210:	copy first four characters from CM$ to C$
		220:	if C$ is "CMTR" or "CMTW", call *COMMENT routine
		230:	if CM$ includes„? ", call *CMDRD routine
		240:	display message for another try
		250:	call *F.KEY routine for another try
		260 to 270	if KEY is "1", quit the routine, otherwise go to line 250
280 to 330	Receiving data	300:	receiving data from GP-IB interface
		310 to 320:	display the data received
		330:	quit the routine
340 to 420:	Handling comment data	360:	if C$ is "CMTR", go to 390 for receiving the comment
		370:	input the comment into variable CMNT$ to send for "CMTW" message
		380:	copy CMNT$ to CM$, and call *CMDOUT routine, then go the 430
		400 to 410:	display the comment received
		420:	quit the routine
430 to 550:	Initializing GP-IB interface	450:	set GP-IB address to 10
		460:	set SRQ interrupt off
		470:	set controller delimiter to CRLF
		480:	set controller time out to 10 seconds
		490:	sent GP-IB interface clear
		500:	set GP-IB interface to remote
		510:	send device clear
		520:	make SRQ interrupt call *INTSRQ routine
		530:	enable SRQ interrupt
		540:	elapse about 3.5 seconds
		550:	quit the routine

```
560 '********************** Command Output ************************
570 *CMDOUT
580     PRINT@ DS8623;CM$
590     PRINT " Output Command  "; :COLOR 6
600     PRINT CM$ :COLOR 7
610     RETURN
620 '************************ SRQ INT **************************
630 *INTSRQ
640     POLL DS8623,R
650     PRINT "#####SRQ INT STATUS =";RIGHT$("0"+HEX$(R),2);"H"
660     SRQ ON
670     PRINT@ DS8623;"ERRN?"
680     LINE INPUT@ DS8623;ERRN$
690     PRINT "#####ERROR NO. =";ERRN$
700     RETURN
710 '********************** Function Key ***************************
720 *F.KEY
730     KEY ON
740     IKEY=0
750     ON KEY GOSUB *F1,,,,,,,,,*F10
760     IF IKEY=0 THEN 760
770     KEY OFF
780     RETURN
790 *F1
800     IKEY=1 :RETURN
810 *F10
820     IKEY=10:RETURN
830 END
```

560 to 610:	Sending out command	580:	Sending CM$ to GP-IB interface
		590 to 600:	display the command sent
		610:	quit the routine
620 to 700:	Handling SRQ interrupt	640:	execute serial poll and read status byte into variable R
		650:	display status byte R
		660:	enable SRQ interrupt again
		670:	send "ERRN? " for receiving detailed error message
		680:	receive error message into variable ERRN$
		690:	display error message
		700:	quit the routine
710 to 820:	Waiting for function key input	730:	enable function key trapping
		740:	set IKEY to 0
		750:	set F1 key trapping to *F1 routine call and F10 key trapping to *F10
		760:	wait for F1 or F10 key input
		770:	disable function key trapping
		780:	quit the routine
830	End of programing		

Note)

The number on lines, digits, and characters of character position such as "CMTW ␣ 10 15 10" should be set by CMTW. When no specification is performed and the number of lines, digits, and characters are set from turning on the power to sending this command, that value is used. No operation is guaranteed if it is not set at all.

RS-232C Sample Program (PC-9801)

The following sample program shows how to send or receive various commands which control computers and DS-8623 in REAL mode.

```
10 '*****************************************************
20 '*   RS232C Sample program                           *
30 '*   Copyright(c) 1989 by IWATSU ELECTRIC CO.,LTD..  *
40 '*     Ver 1.00  '89-Apr-28                          *
50 '*****************************************************
60 '------------------------ Initialize --------------------------
70    CONSOLE ,,0,1
80    SCREEN 3,0   :CLS 3
90    GOSUB *RSINIT
100 '======================== Main ================================
110 *MAIN
120    GOSUB *W.MCMOT
130    GOTO *MAIN
140 '====================== Manual Command Out ==================
150 *W.MCMOT
160    CLS :PRINT "    === Manual Command OUT ===" :PRINT
170    LINE INPUT " Input Command = "; CM$
180    GOSUB *CMDOUT
190    IF RSP=&H15 THEN GOSUB *N.ERR :GOTO 180
200    IF RSP<>6 THEN GOSUB *T.ERR :GOTO 250
210    FOR WT= 0 TO 1000:NEXT WT
220    C$=MID$(CM$,1,4)
230    IF C$="CMTR" OR C$="CMTW" THEN GOSUB *COMMENT  :GOTO 250
240    IF INSTR(CM$,"?")<>0 THEN GOSUB *CMDRD
250    PRINT :PRINT " F1    --- Again"
260    GOSUB *F.KEY
270    IF IKEY<>1 THEN 260
280    RETURN
290 '------------------ Command responce read -------------------
300 *CMDRD
310    LINE INPUT #1,ICM$
320    PRINT " Read  Command = "; :COLOR 5
330    PRINT ICM$ :COLOR 7
340    RETURN
350 '---------------------- Comment handler ---------------------
360 *COMMENT
370    IF C$="CMTR" THEN 400
380       INPUT " Input Comment ";CMNT$
390       CM$=CMNT$ : GOSUB *CMDOUT :GOTO 430
400    LINE INPUT #1,CMNT$
410    PRINT " Read Comment = "; :COLOR 5
420    PRINT CMNT$ :COLOR 7
430    RETURN
440 '********************** RS-232C initialize **********************
450 *RSINIT
460    OPEN "COM:N81NN" AS #1
470    COLOR 5
480    PRINT "        *** RS-232C ***
490    PRINT "       PARITY        : NON"
500    PRINT "       BIT LENGTH    : 8 BIT"
510    PRINT "       STOP BIT      : 1 BIT"
520    PRINT "       X PARAMETER   : OFF"
530    PRINT "       S PARAMETER   : OFF"
540    COLOR 7
```

Line number	Details	(Line number)	Description
10 to 50:	Title		
60 to 90:	Initialization	70 to 80:	Sets CRT mode
		90:	Initializes RS-232C port (450~)
100 to 130:	Main routines		Main routine and call *W.MCMOT routine while looping (150~)
140 to 280	Sending out RS-232C message	160:	display title
		170:	input RS-232C message into variable CM$
		180:	call *CMDOUT routine
		190:	if NAK is returned (RSP=&H15), call*N.ERR routine and go to line 180
		200:	if ACK is not returned (RSP< >&H6), call *T.ERR and go to line 250
		210:	elapse about 1 second
		220:	copy first four characters from CM$ to C$
		230:	if C$ is "CMTR" or "CMTW" call *COMMENT routine and go to line 250
		240:	if CM$ includes "? ", call *CMDRD routine
		250:	display message for another try
		260:	call *F.KEY routine for another try
		270:	if KEY is "1", quit the routine, otherwise go to line 260
290 to 340:	Receiving data	310:	receiving data from RS-232C interface
		320 to 330	display the data received
		340:	quit the routine
350 to 430:	Handling comment data	370	if C$ is "CMTR", go to 400 for receiving the comment
		380:	input the comment into variable CMNT$ to send for "CMTW" message
		390:	Copy CMNT$ to CM$, and call *CMDOUT routine, then go to 430
		400:	receiving the comment
		410 to 420	display the comment received
		430:	quit the routine
440 to 560	Initializing RS-232C interface	460:	open the RS-232C interface in following conditions
		470:	non-parity
		480:	8-bit data length
		500:	X control off
		510:	Y control off

```
550     FOR I=0 TO 3500 :NEXT I
560     RETURN
570 '********************** Command Output ************************
580 *CMDOUT
590     PRINT #1,CM$
600     RSP$=INPUT$ (1,#1) :RSP = ASC(RSP$) :R$= HEX$(RSP)
610     PRINT " Output Command  "; :COLOR 6
620     PRINT CM$ :COLOR 7
630     RETURN
640 '********************** Transfer Error ************************
650 *T.ERR
660     CLS :COLOR 2 :PRINT " *** Transfer Error ***  RSP = ";R$;" H";
670     COLOR 7
680     RETURN
690 '********************** Nack process **************************
700 *N.ERR
710     COLOR 2 :PRINT " *** Nack recieved ***"
720     CM$="ERRN?"
730     COLOR 7
740     RETURN
750 '********************** Function Key **************************
760 *F.KEY
770     KEY ON
780     IKEY=0
790     ON KEY GOSUB *F1,,,,,,,,,*F10
800     IF IKEY=0 THEN 800
810     KEY OFF
820     RETURN
830 *F1
840     IKEY=1 :RETURN
850 *F10
860     IKEY=10:RETURN
870 END
```

		550:	elapse about 3.5 seconds
		560:	quit the routine
570 to 630:	*Sending out command*	*590:*	*Sending CM$ to RS-232C interface*
		600:	receive communication confirmation and stores it into RSP in hexadecimal code
		610 to 620:	display the command sent
		630:	quit the routine
		640:	Displaying transfer error
690 to 740:	Handling NAK error	710:	Displaying NAK error
		720:	set CM$ to "ERRN? " and send it for receiving detailed error message
		730 to 740	quit the routine
750 to 860:	Waiting for funton key input	770:	enable function key trapping
		780:	set IKEY to 0
		790:	set F1 key trapping to *F1 routine call and F10 key trapping to *F10
		800:	wait for F1 or F10 key input
		810:	disable function key trapping
		820:	quit the routine
		840:	F1 keytrapping and set IKEY to 1
		860:	F10 key trapping and set IKEY to 10
870:	End of programing		

Note)

The number of lines, digits, and character of character position such as "CMTW 10 15 10" should be set by CMTW. When no specification is performed and the number of lines, digits, and characters are set from turning on the power to sending this command, that value is used. No operation is guaranteed if it is not set at all.

GB-IB Sample Program (PC-9801)

The following sample program shows how to send or receive various commands which control computers and DS-8623 in STORAGE mode.

```
10 '*****************************************************
20 '*   GP-IB Sample program                            *
30 '*   Copyright(c) 1989 by IWATSU ELECTRIC CO.,LTD..  *
40 '*     Ver 1.00  '89-jun-19                          *
50 '*****************************************************
60 '------------------------ Initialize --------------------------
70     DIM    A%(1023)
80     CONSOLE ,,0,1
90     SCREEN 3,0   :CLS 3
100    GOSUB *GPINIT
110 '======================== Main ================================
120 *MAIN
130    CLS 3:PRINT "   ---  DS8623 GP-IB Test Program  ---"
140    PRINT :COLOR 6
150    PRINT " 1.Manual Command Out         --- F1":PRINT
160    PRINT " 2.Wave Transfer              --- F2":PRINT
170    GOSUB *F.KEY
180    ON IKEY GOSUB *W.MCMOT,*W.TRNS
190    GOTO *MAIN
200 '====================== Manual Command Out ==================
210 *W.MCMOT
220    CLS :R=0 :PRINT "   === Manual Command OUT ===" :PRINT
230    LINE INPUT " Input Command = "; CM$
240    GOSUB *CMDOUT
250    FOR WT= 0 TO 2000:NEXT WT
260    IF R AND &H20 THEN PRINT "Command error": GOTO 300
270    C$=MID$(CM$,1,4)
280    IF C$="CMTR" OR C$="CMTW" THEN GOSUB *COMMENT  :GOTO 300
290    IF INSTR(CM$,"?")<>0 THEN GOSUB *CMDRD
300    PRINT :PRINT " F1   --- Again"
310    GOSUB *F.KEY
320    IF IKEY<>1 THEN 310
330    RETURN
340 '------------------ Command responce read -------------------
350 *CMDRD
360    LINE INPUT@ DS8623;ICM$
370    PRINT " Read  Command = "; :COLOR 5
380    PRINT ICM$ :COLOR 7
390    RETURN
400 '---------------------- Comment handler ---------------------
410 *COMMENT
420    IF C$="CMTR" THEN 450
430       INPUT " Input Comment ";CMNT$
440       CM$=CMNT$ : GOSUB *CMDOUT :GOTO 480
450    LINE INPUT@ DS8623;CMNT$
460    PRINT " Read Comment = "; :COLOR 5
470    PRINT CMNT$ :COLOR 7
480    RETURN
490 '********************** GP-IB initialize *********************
500 *GPINIT
510    DS8623=10'Address of DS-8623
520    SRQ OFF'interrupt off
530    CMD DELIM=0'delim = CRLF
540    CMD TIMEOUT=10
```

Line number	Details	(Line number)	Description
10 to 50:	Title		
60 to 100:	Initialization	70:	Sets waveform data area
		80 to 90:	Sets CRT mode
		100:	Initializes GP-IB port (510)
110 to 190.	Main routines	180:	Performs infinite loop while calling the W.MCMOT (manual command out) and W.TRMS (waveform transfer)
200 to 330.	Sending out GP-IB message	220:	display title
		230:	input GP-IB message into variable CM$
		240:	CALL *CMDOUT routine
		250:	elapse about 2 seconds
		260:	if bit 5 in status byte of variable R is high, go to line 300
		270:	copy first four characters from CM$ to C$
		280:	if C$ is "CMTR" or "CMTW", call *COMMENT routine
		290:	if CM$ includes "? ", call *CMDRD routine
		300:	display message for another try
		310:	call *F.KEY routine for another try
		320 to 330:	if IKEY is "1", quit the routine, otherwise go to line 310
340 to 390:	Receiving data	360:	receiving data from GP-IB interface
		370 to 380:	display the data received
		390:	quit the routine
400 to 480:	Handling comment data	420:	if C$ is "CMTR", go to 450 for receiving the comment
		430:	input the comment into variable CMNT$ to send for "CMTW" message
		440:	copy CMNT$ to CM$, and call *CMDOUT routine, then go the 480
		460 to 470:	display the comment received
		480:	quit the routine
490 to 610:	Initializing GP-IB interface	510:	set GP-IB address to 10
		520:	set SRQ interrupt off
		530:	set controller delimiter to CRLF
		540:	set controller time out to 10 seconds

```
    ISET IFC'IFC
    IRESET REN : ISET REN'remote enable
    WBYTE &H3F,&H20+DS8623,&H4;'UNL,LA,SDC
    ON SRQ GOSUB *INTSRQ
    SRQ ON'interrupt on
    FOR I=0 TO 3500 :NEXT I
    RETURN
'********************** Command Output ************************
*CMDOUT
    PRINT@ DS8623;CM$
    PRINT " Output Command  "; :COLOR 6
    PRINT CM$ :COLOR 7
    RETURN
'********************** SRQ INT ************************
*INTSRQ
    POLL DS8623,R
    PRINT "#####SRQ INT STATUS =";RIGHT$("0"+HEX$(R),2);"H"
    SRQ ON
    PRINT@ DS8623;"ERRN?"
    LINE INPUT@ DS8623;ERRN$
    PRINT "#####ERROR NO. =";ERRN$
    RETURN
'********************** Function Key ************************
*F.KEY
    KEY ON
    IKEY=0
    ON KEY GOSUB *F1,*F2
    IF IKEY=0 THEN 820
    KEY OFF
    RETURN
*F1
    IKEY=1 :RETURN
*F2
    IKEY=2 :RETURN
'********************** wave transfer ************************
*W.TRNS
    CLS
    CM$="INMD CH2,OFF" :GOSUB *CMDOUT
    CM$="SWMD SINGLE" :GOSUB *CMDOUT
    CM$="MSTR CH1" :GOSUB *CMDOUT
    LINE INPUT@ DS8623;WINF$
    FOR I=0 TO 1023
     CM$="MEMR CH1,0,"+STR$(I)+",1"
     LOCATE 0,3 :GOSUB *CMDOUT
     INPUT@ DS8623;A%(I)
    NEXT I
    PRINT "WAVE RECIVE END (DS8623 --> PC9801) !!"
    CM$="MSTW CH2" :GOSUB *CMDOUT
    PRINT@ DS8623;WINF$
    FOR I=0 TO 1023
      CM$="MEMW CH2,0,"+STR$(I)+",1"
      LOCATE 0,6 :GOSUB *CMDOUT
      PRINT@ DS8623;A%(I)
    NEXT I
    PRINT "WAVE SEND END (PC9801 --> DS8623) !!"
    CM$="INMD CH2,ON" :GOSUB *CMDOUT
    PRINT :PRINT " F1    --- Again"
    GOSUB *F.KEY
    IF IKEY<>1 THEN 1120
    RETURN
END
```

		550:	sent GP-IB interface clear
		560:	set GP-IB interface to remote
		570:	send device clear
		580:	make SRQ interrupt call *INTSRQ routine
		590:	enable SRQ interrupt
		600:	elapse about 3.5 seconds
		610:	quit the routine
620 to 670:	Sending out command	640:	Sending CM$ to GP-IB interface
		650 to 660:	display the command sent
		670:	quit the routine
680 to 760:	Handling SRQ interrupt	700:	execute serial poll and read status byte into variable R
		710:	display status byte R
		720:	enable SRQ interrupt again
		730:	send "ERRN? " for receiving detailed error message
		740:	receive error message into variable ERRN$
		750:	display error message
		760:	quit the routine
770 to 880:	Waiting for function key input	790:	enablle function key trapping
		800:	set IKEY to 0
		810:	set F1 key trapping to *F1 routine call and F10 key trapping to *F10
		820:	wait for F1 or F10 key input
		830:	disable function key trapping
		840:	quit the routine
		850 to 860:	F1 key trapping and set IKEY to 1
		870 to 880:	F2 key trapping and set IKEY to 2
890 to 1140:	Waveform transfer	910:	Clears a screen
		920:	Sets a channel (CH2 OFF)
		930:	Sets sweep format SINGLE
		940 to 950:	Receive waveform information
		960 to 1000:	Receives waveform data
		1010:	Display transfer end
		1020 to 1030:	Transfers CH1 waveform information to CH2 wave form information area
		1040 to 1080:	Transfers CH1 waveform data to CH2 wave data area
		1090:	Displays transfer end
		1100:	Sets a channel (CH2 ON)
		1110 to 1140:	Returns to menu

Note)

The number on lines, digits, and characters of character position such as "CMTW 10 15 10" should be set by CMTW. When no specification is performed and the number of lines, digits, and characters are set from turning on the power to sending this command, that value is used. No operation is guaranteed if it is not set at all.

RS-232C Sample Program (PC-9801)

The following sample program shows how to send or receive various commands which control computers and DS-8623 in STORAGE mode.

```
10 '*****************************************************
20 '*   RS232C Sample program                           *
30 '*   Copyright(c) 1989 by IWATSU ELECTRIC CO.,LTD..  *
40 '*     Ver 1.00  '89-jun-19                          *
50 '*****************************************************
60 '------------------------ Initialize -------------------------
70     DIM    A%(1023)
80     CONSOLE ,,0,1
90     SCREEN 3,0   :CLS 3
100    GOSUB *RSINIT
110 '======================== Main ================================
120 *MAIN
130    CLS 3:PRINT "   ---  DS8623 RS-232C Test Program  ---"
140    PRINT :COLOR 6
150    PRINT " 1.Manual Command Out          --- F1":PRINT
160    PRINT " 2.Wave Transfer               --- F2":PRINT
170    GOSUB *F.KEY
180    ON IKEY GOSUB *W.MCMOT,*W.TRNS
190    GOTO *MAIN
200 '====================== Manual Command Out ====================
210 *W.MCMOT
220    CLS :PRINT "   === Manual Command OUT ===" :PRINT
230    LINE INPUT " Input Command = "; CM$
240    GOSUB *CMDOUT
250    IF RSP=&H15 THEN GOSUB *N.ERR :GOTO 240
260    IF RSP<>6 THEN GOSUB *T.ERR :GOTO 310
270    FOR WT= 0 TO 1000:NEXT WT
280    C$=MID$(CM$,1,4)
290    IF C$="CMTR" OR C$="CMTW" THEN GOSUB *COMMENT  :GOTO 310
300    IF INSTR(CM$,"?")<>0 THEN GOSUB *CMDRD
310    PRINT :PRINT " F1   --- Again"
320    GOSUB *F.KEY
330    IF IKEY<>1 THEN 320
340    RETURN
350 '------------------ Command responce read -------------------
360 *CMDRD
370    LINE INPUT #1,ICM$
380    PRINT " Read  Command = "; :COLOR 5
390    PRINT ICM$ :COLOR 7
400    RETURN
410 '---------------------- Comment handler ---------------------
420 *COMMENT
430    IF C$="CMTR" THEN 460
440       INPUT " Input Comment ";CMNT$
450       CM$=CMNT$ : GOSUB *CMDOUT :GOTO 490
460    LINE INPUT #1,CMNT$
470    PRINT " Read Comment = "; :COLOR 5
480    PRINT CMNT$ :COLOR 7
490    RETURN
500 '********************** RS-232C initialize **********************
510 *RSINIT
520    OPEN "COM:N81NN" AS #1
530    COLOR 5
540    PRINT "       *** RS-232C ***
```

Line number	Details	(Line number)	Description
10 to 50:	Title		
60 to 100:	Initialization	70:	Sets waveform data area
		80 to 90:	Sets CRT mode
		100:	Initializes RS232C port (510) . Enters limitless loop while calling W.MCMOT (190)
110 to 190:	Main routines	180:	Main routine and call *W.MCMOT and *W.TRNS routine while looping
200 to 340	Sending out RS-232C message	220:	display title
		230:	input RS-232C message into variable CM$
		240:	call *CMDOUT routine
		250:	if NAK is returned (RSP=&H15), call *N.ERR routine and go to line 240
		260:	if ACK is not returned (RSP<>&H6), call *T.ERR and go to line 310
		270:	elapse about 1 second
		280:	copy first four characters from CM$ to C$
		290:	if C$ is "CMTR" or "CMTW", call *COMMENT routine and go to line 310
		300:	if CM$ includes "? ", call *CMDRD routine
		310:	display message for another try
		320:	call *F.KEY routine for another try
		330:	if IKEY is "1", quit the routine, otherwise go to line 320
350 to 400:	Receiving data	370:	receiving data from RS-232C interface
		380 to 390:	display the data received
		400:	quit the routine
410 to 490:	Handling comment data	430:	if C$ is "CMTR", go to 460 for receiving the comment
		440:	input the comment into variable CMNT$ to send for "CMTW" message
		450:	Copy CMNT$ to CM$, and call *CMDOUT routine, then go to 490
		460:	receiving the comment
		470 to 480:	display the comment received
		490:	quit the routine
500 to 620:	Initializing RS-232C	520:	open the RS-232C interface in following conditions
		530:	non-parity
		540:	8-bit data length

```
550     PRINT "       PARITY        : NON"
560     PRINT "       BIT LENGTH    : 8 BIT"
570     PRINT "       STOP BIT      : 1 BIT"
580     PRINT "       X PARAMETER   : OFF"
590     PRINT "       S PARAMETER   : OFF"
600     COLOR 7
610     FOR I=0 TO 3500 :NEXT I
620     RETURN
630 '************************ Command Output ************************
640 *CMDOUT
650     PRINT #1,CM$
660     RSP$=INPUT$ (1,#1) :RSP = ASC(RSP$) :R$= HEX$(RSP)
670     PRINT " Output Command  "; :COLOR 6
680     PRINT CM$ :COLOR 7
690     RETURN
700 '************************ Transfer Error ************************
710 *T.ERR
720     CLS :COLOR 2 :PRINT " *** Transfer Error ***  RSP = ";R$;" H";
730     COLOR 7
740     RETURN
750 '************************ Nack process ************************
760 *N.ERR
770     COLOR 2 :PRINT " *** Nack recieved ***"
780     CM$="ERRN?"
790     COLOR 7
800     RETURN
810 '************************ Function Key ************************
820 *F.KEY
830     KEY ON
840     IKEY=0
850     ON KEY GOSUB *F1,*F2
860     IF IKEY=0 THEN 860
870     KEY OFF
880     RETURN
890 *F1
900     IKEY=1 :RETURN
910 *F2
920     IKEY=2 :RETURN
930 '************************ wave transfer ************************
940 *W.TRNS
950     CLS
960     CM$="INMD CH2,OFF" :GOSUB *CMDOUT
970     CM$="SWMD SINGLE" :GOSUB *CMDOUT
980     CM$="MSTR CH1" :GOSUB *CMDOUT
990     LINE INPUT #1,WINF$
1000    FOR I=0 TO 1023
1010      CM$="MEMR CH1,0,"+STR$(I)+",1"
1020      LOCATE 0,3 :GOSUB *CMDOUT
1030      INPUT #1,A%(I)
1040    NEXT I
1050    PRINT "WAVE RECIVE END (DS8623 --> PC9801) !!"
1060    CM$="MSTW CH2" :GOSUB *CMDOUT
1070    PRINT #1,WINF$
1080    FOR I=0 TO 1023
1090      CM$="MEMW CH2,0,"+STR$(I)+",1"
1100      LOCATE 0,6 :GOSUB *CMDOUT
1110      PRINT #1,A%(I)
1120      RSP$=INPUT$ (1,#1) :RSP = ASC(RSP$) :R$= HEX$(RSP)
1130    NEXT I
1140    PRINT "WAVE SEND END (PC9801 --> DS8623) !!"
1150    CM$="INMD CH2,ON" :GOSUB *CMDOUT
```

		610:	elapse about 3.5 seconds
		620:	quit the routine
630 to 690:	Sending out command	650:	Sending CM$ to RS-232C interface
		660:	receive communication confirmation and stores it into RSP in hexadecimal code
		670 to 680:	display the command sent
		690:	quit the routine
		700:	Displaying transfer error
750 to 800:	Handling NAK error	770:	Displaying NAK error
		780:	set CM$ to "ERRN?" and send it for receiving detailed error message
		800:	quit the routine
810 to 920:	Waiting for function key input	830:	enable function key trapping
		840:	set IKEY to 0
		850:	set F1 key trapping to *F1 routine call and F10 key trapping to *F10
		860:	wait for F1 or F10 key input
		870:	disable function key trapping
		880:	quit the routine
		900:	F1 key trapping and set IKEY to 1
		920:	F2 key trapping and set IKEY to 2
930 to 1190:	Waveform transfer	950:	Clears a screen
		960:	Sets a channel (CH2 OFF)
		970:	Specifies sweep format SINGLE
		980 to 990:	Receive waveform information
		1000 to 1040:	Receives waveform data
		1050:	Displays transfer end
		1060 to 1070:	Transfers CH1 waveform information to CH2 waveform information area
		1080 to 1130:	Transfers CH1 waveform data to CH2 wave data area
		1140:	Displays transfer end
		1150:	Sets a channel (CH2 ON)

```
1160    PRINT :PRINT " F1    --- Again"
1170    GOSUB *F.KEY
1180    IF !KEY<>1 THEN 1170
1190    RETURN
1200 END
```

Note)

The number of lines, digits, and character of character position such as "CMTW 10 15 10" should be set by CMTW. When no specification is performed and the number of lines, digits, and characters are set from turning on the power to sending this command, that value is used. No operation is guaranteed if it is not set at all.

Command List

Format	Description	Page
ASET	Executes AUTO SET	191
ENHA␣[X1]	Enhances brightness	191
ENHA ?		191
INMD␣[X1, X2]	Specifies the display channel at STORAGE mode	191
INMD␣[X1, X2]	Specifies the display channel at REAL mode	191
INMD ?		191
DIRV␣[X1]	Specifies the channel to be executed	191
RFMD␣[X1, X2]	Specifies the reference channel for the STORAGE mode only	192
RFMD ?		192
VDIV␣[X1]	Selects voltage deflection facter	192
VDIV ?		192
VVAR␣[X1]	Continuously adjusts voltage deflection facter for the channel	192
VVAR ?		192
VPOS␣[X1]	Adjusts the vertical position of the waveform for the specified channel	193
VPOS ?		193
VCPL␣[X1, X2]	Selects the input coupling for the specified channel	193
VCPL ?		193
VIMP␣[X1]	Selects either 1MΩ or 50Ω as an input resistance for the specified channel	193
VIMP ?		193
PROB ?	Returns a probe attenuation ratio	193
INVT␣[X1]	Inverses CH2 polarity	194
INVT ?		194
BNDW␣[X1]	Selects the frequency band width for the REAL mode only	194
BNDW ?		194
VMOD␣[X1]	Selects ALT or CHOP for the REAL mode only	194
VMOD ?		194
DIRT␣[X1]	Switches A-trigger/B-trigger and A-sweep/B-sweep	195
TSRC␣[X1]	Selects the specified A-trigger or B-trigger signal source	195
TSRC ?		195
TCPL␣[X1]	Selects the specified A-trigger or B-trigger input coupling	195
TCPL ?		195
TSLP␣[X1]	Selects the specified A-trigger or B-trigger slope	195
TSLP ?		195
TLVL␣[X1]	Adjusts the specified A-trigger or B-trigger level	196
TLVL ?		196
ATLV␣[X1]	Adjusts the specified A-trigger or B-trigger AUTO LVL trigger level	196
ATLV ?		196
TVFL␣[X1, X2, X3]	Selects the TV field and line	196
TVFL ?		196

Format	Description	Page
BTMD␣[X1]	Selects continuous delay sweep or synchronous delay sweep at delay sweep time in the REAL mode only	196
BTMD ?		196
EVNT␣[X1, X2]	Sets an event counter value	197
EVNT ?		197
SWMD␣[X1]	Selects the sweep mode	197
SWMD ?		197
HMOD␣[X1]	Selects the time axis width display mode	197
HMOD ?		198
TMDV␣[X1]	Selects the specified A-sweep or B-sweep time	198
TMDV ?		198
TVAR␣[X1]	Adjusts A-sweep VARIABLE for the REAL mode only	198
TVAR ?		198
DATP␣[X1]	Sets DATA POSITION for the STORAGE mode only	198
DATP ?		198
DELY␣[X1]	Adjusts the B-sweep delay time for the STORAGE mode	198
DELY ?		198
HOLD␣[X1]	Adjusts the HOLDOFF time	199
HOLD ?		199
TSEP␣[X1]	Adjusts trace separation	199
TSEP ?		199
WSGL	Records the data for only one sequence for the STORAGE mode only	199
TMAG␣[X1]	Magnifies the screen display waveform in the time axis direction	199
TMAG ?		199
SKEW␣[X1]	Adjusts the CH2 skew time	199
SKEW ?		199
RLST␣[X1]	Switches REAL and STORAGE	200
RLST ?		200
AVRG␣[X1, X2]	Sets AVG (averaging)	200
AVRG ?		200
MHLD␣[X1, X2]	Sets MAX-HOLD	200
MHLD ?		200
ENVL␣[X1]	Sets ENV	200
ENVL ?		200
ETSM␣[X1]	Sets EQ-SAMPL	201
ETSM ?		201
ROLL␣[X1]	Sets ROLL	201
ROLL ?		201
CADV␣[X1]	Sets CH1-ADV	201
CADV ?		201
MADV␣[X1]	Sets MEM-ADV	201
MADV ?		201
LGTH␣[X1]	Sets LENGTH	201
LGTH ?		201

Format	Description	Page
VCTR␣[X1]	Sets the VECTOR	202
VCTR ?		202
INTP␣[X1]	Sets INTPLT	202
INTP ?		202
SMTH␣[X1, X2]	Sets SMOOTHING	202
SMTH ?		202
GONG␣[X1]	Sets whether to execute GO/NOGO	203
GONG ?		203
GNRO␣[X1, X2, X3, X4]	Sets the GO/NOGO judgment condition	203
GNRO ?		203
GNCR␣[X1, X2]	Sets the cursor in the GO/NOGO range	203
GNCR ?		203
GNJG␣[X1]	Sets THEN GO or NOGO	203
GNJG ?		203
GNJS␣[X1, X2]	Sets STORG STOP	204
GNJS ?		204
GSTS ?	Returns the GO/NOGO judgment result	204
GNJP␣[X1, X2]	Sets PLOT OUT	204
GNJP ?		204
GNJD␣[X1, X2]	Sets DATA SAVE	204
GNJD ?		204
COPY	Starts plotting	205
PLOT␣[X1, X2]	Sets PLOTTER OUT EXECUTE	205
PLOT ?		205
PLIF␣[X1]	Sets PLOTTER I/F	205
PLIF ?		205
DMPL	Executes DUMMY PLOT	205
XYRC␣[X1]	Outputs to XY-REC	205
CMOD␣[X1]	Selects the MEASUREMENT measurement item	206
CMOD ?		206
MVAL ?	Returns the MEASUREMENT measured value	206
ICMD␣[X1]	Selects the WAVE PARAM measurement item for the STORAGE mode only	206
ICMD ?		206
ATCH␣[X1]	Selects the measurement channel	207
ATCH ?		207
VCUR␣[X1, X2]	Adjusts the voltage measuring cursor position	207
VCUR ?		207
TCUR␣[X1, X2]	Adjusts the time measuring cursor position	207
TCUR ?		207
RFST	Sets the cursor value to the reference of the voltage ratio and time ratio	207
MSDV␣[X1]	Selects DVM or COUNTER measured value for the REAL mode only	207

Format	Description	Page
MSDV ?		207
DVAL ?	Returns the DVM or COUNTER measured value for the REAL mode only	208
MCND␣[X1]	Sets AUTO-MEAS 100% for the STORAGE mode only	208
MCND ?		208
CELV␣[X1, X2]	Sets AUTO-MEAS CENT for the STORAGE mode only	208
CELV ?		208
CMLV␣[X1, X2]	Sets AUTO-MEAS MARGIN for the STORAGE mode only	208
CMLV ?		208
UPLV␣[X1, X2]	Sets AUTO-MEAS UPPER for the STORAGE mode only	209
UPLV ?		209
LOLV␣[X1, X2]	Sets AUTO-MEAS LOWER for the STORAGE mode only	209
LOLV ?		209
EDGE␣[X1, X2]	Sets SKEW FROM for the STORAGE mode only	209
EDGE ?		209
FILE␣[X1, X2, X3, X4]	Saves, calls, erases, or initializes the waveform, measurement condition, or comment	210 211
MEMR␣[X1, X2, X3, X4]	Sends the waveform data from this instrument to the controller	211
MSTR␣[X1]	Sends the internal information attendant upon the waveform data	212
MEMW␣[X1, X2, X3, X4]	Sends the waveform data from the controller to this instrument	212
MSTW␣[X1]	Sends the internal information attendant upon the waveform data from the controller to this instrrument	213
CMTW␣[X1, X2, X3]	Sends a comment string from the controller	213
CMTR␣[X1, X2, X3]	Sends the contents of the comment to the external device	213
CMCL␣[X1]	Selects to display the comment	213
WRID␣[X1]	Sets the ID number used to control through the remote controller	213
WRID ?		213
RTST␣[X1]	Selects P-ON TEST ON/OFF setting	213
PTST ?		213
DATE␣[X1, X2, X3]	Sets the date	214
DATE ?		214
TIME␣[X1, X2, X3]	Sets the time	214
TIME ?		214
CALB␣[X1]	Selects automatic calibration balance, gain, HORIZ, or ADC.	214
SRQE␣[X1]	Switches SRQ output/non-output	215
ERRN ?	Returns the details of the error warning	215

MEMO

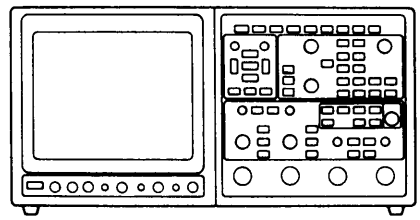
5

1 2 3 4 5 6 7 8 9

Applications

APPLICATIONS (only for REAL)

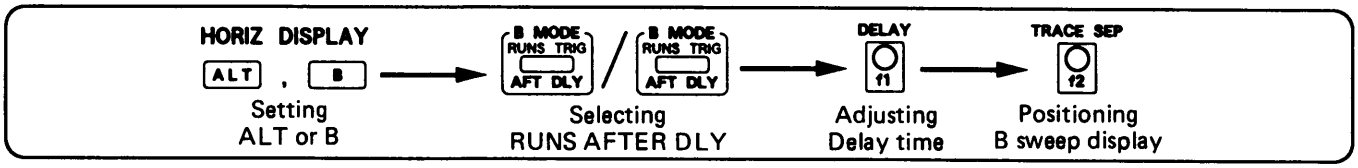
Delayed Sweep



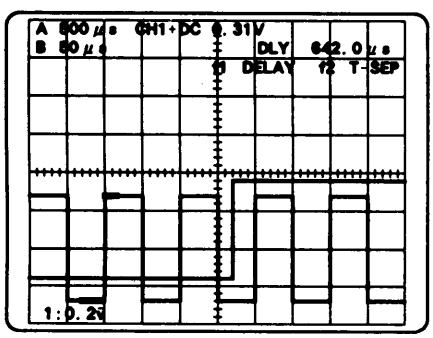
The continuous delay and triggered delay are available. The continuous delay called RUNS AFTER DLY allows to delay and display the signal continuously.
The triggered delay, TRIG AFTER DLY, allows to trigger the oscilloscope with the trigger signal after the certain delay time set by the DELAY time control.
The triggered delay has the advantage of the reduced delay jitter, but the disadvantage of the discrete delay time.

Continuous delay

♦ **Key operation**



♦ **Operating procedure**

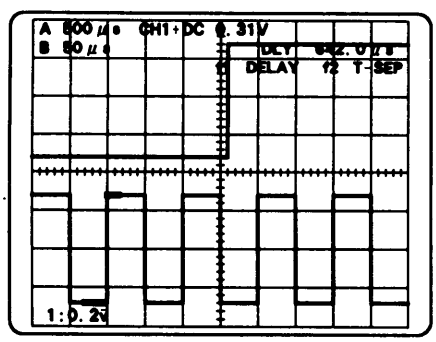


① Press the ALT or the B key and set the ALT or B display mode.
In this example, the ALT display mode is set.

② Press the B MODE RUNS TRIG AFT DLY key and select the RUNS AFT DLY or the continuous delay mode.

③ Using the DELAY f1 knob, adjust the delay time.

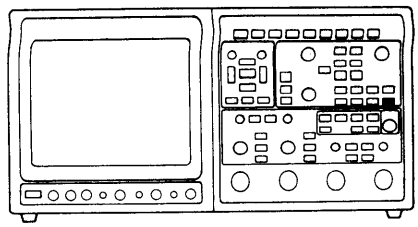
- The delay time is defined as the period from the A sweep start to the B sweep start.
- The intensified portion in the A sweep display corresponds to the B sweep display.



The following procedure shows how to separate the B sweep display from the A sweep display in the ALT sweep mode.

④ Using the TRACE SEP f2 knob, position the B sweep display.

Phase Difference Measurement
V (Y), V (X)
V (X), V (Y)



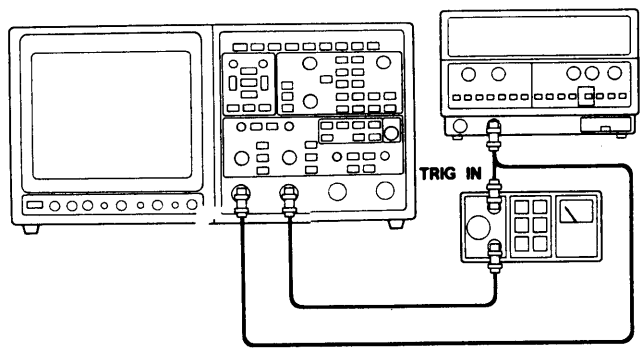
X-Y

Displaying the Lissajous pattern in the X-Y operation, you can measure the phase difference between two signals.

♦ **Preliminary setup**

- Apply a signal from a signal generator (e.g. Iwatsu SG-4111) into the CH1 input.
- Apply the signal from the signal generator into the CH2 input via the signal conditioner.

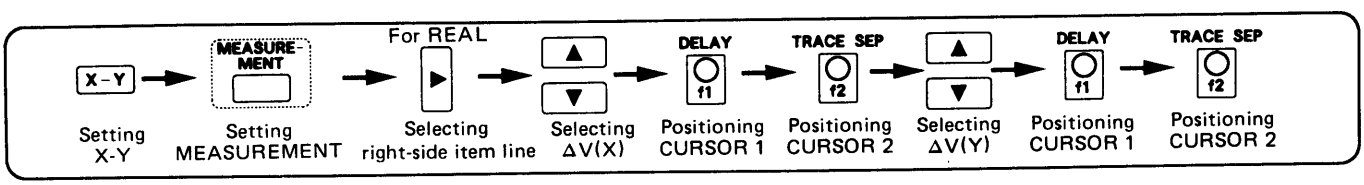
CH1 input	Frequency	: 1kHz
	Output voltage	: 0.7Vp-p
	Phase between the input and output	: Variable
	Frequency	: 1kHz
	Output voltage	: 1Vp-p

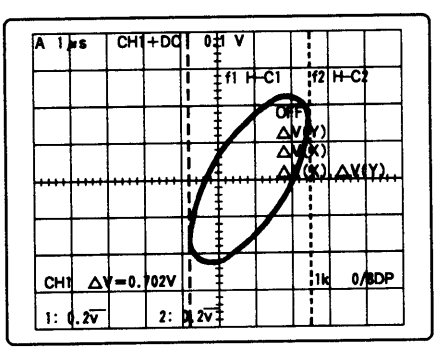


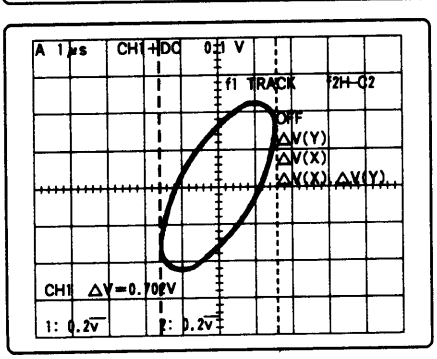
- DS-8623 setup

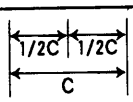
CH1 VOLTS/DIV	: 0.2V/div
CH2 VOLTS/DIV	: 0.2V/div
VERT MODE	: CH2 only

♦ **Key operation procedure**









① Press the X-Y key and set the X-Y operation.
- The Lissajous pattern will be displayed.

② Press MEASURE-MENT key and set the measurement menu.
- In REAL, press the ▶ key to select the right line of measurement items on the screen.

③ Press ▲ or ▼ key and set ΔV (X) measurement.
- The brightness of selected characters is intensified.

④ Using the DELAY f1 knob, position the vertical CURSOR 1 to the left end of display pattern.

⑤ Using the TRACE SEP f2 knob, position the vertical CURSOR 2 to the right end of display pattern.

⑥ Press the DELAY f1 knob and set the shift (TCK) while keeping the interval between the cursors 1 and 2.

6

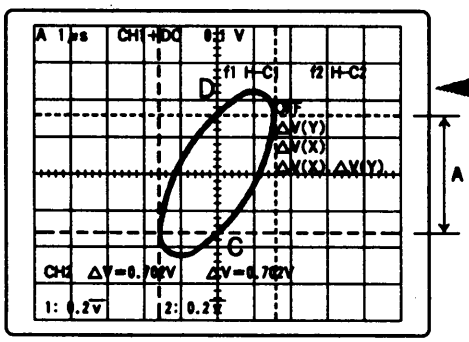
⑦ Using the DELAY f1 knob, position the waveform to the center of screen of vertical cursors 1 and 2.

⑧ Using the POSITION FINE ◄► knob, position the pattern to fit in between the vertical cursors 1 and 2.

⑨ Press the [▼] key and select ΔV(X), ΔV(Y).

⑩ Press the TRACE SEP f2 knob and set the horizontal CURSOR.

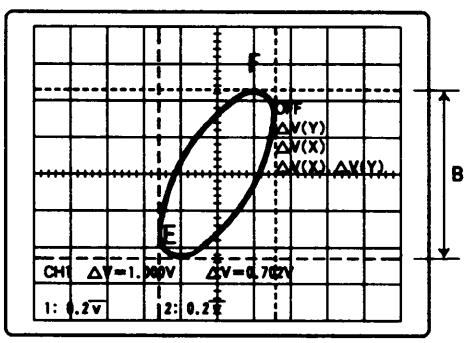
⑪ Press the DELAY f1 knob and cancel the shift (TCK) for keeping the interval between the cursors 1 and 2.



⑫ Using the DELAY f1 knob, position the horizontal cursor 1 to the lower crossing (point C) between the pattern and center vertical scale line.

⑬ Using the TRACE SEP f2 knob, position the horizontal cursor 2 to the upper crossing (point D) between the pattern and center vertical scale line.

- Write down the ΔV(Y) measurement value as A.



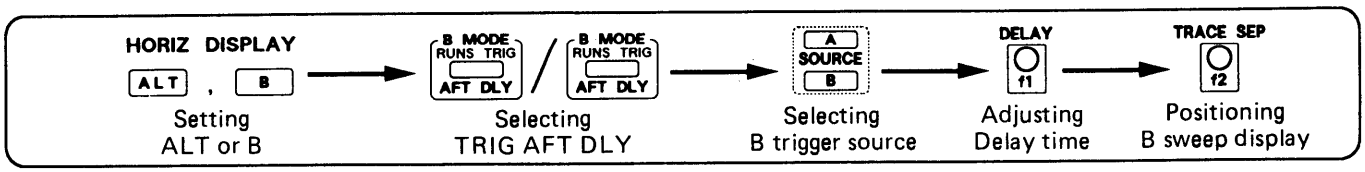
⑭ Using the TRACE SEP f2 knob, position the horizontal cursor 2 to the top end (point F) of pattern.

⑮ Using the DELAY f1 knob, position the vertical cursor 1 to the bottom end (point E) of the pattern.

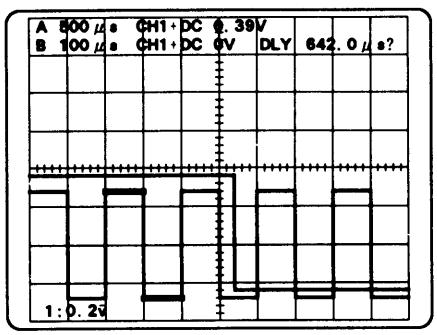
- Write down the ΔV(Y) measurement value as value B. Calculate the phase difference as: Phase difference $= \mathrm{SIN}^{-1} \frac{A}{B}$

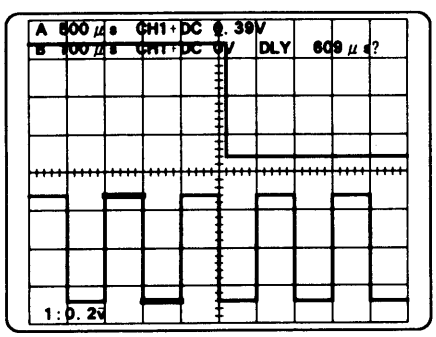
Triggered delay

♦ Key operation



♦ Operating procedure





① Press the [ALT] or the [B] key and set the ALT or B display mode.
In this example, the ALT display mode is set.

② Press the [B MODE RUNS TRIG / AFT DLY] key and select the TRIG AFT DLY or the triggered delay mode.

③ Press the [SOURCE B] key and select the B trigger source.
In this example, the CH1 trigger source is selected.

④ Using the [DELAY f1] knob, adjust the delay time.

The following procedure shows how to separate the B sweep display from the A sweep display in the ALT sweep mode.

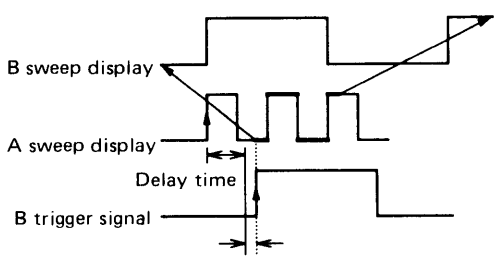
⑤ Using the [TRACE SEP f2] knob, position the B sweep display.

- The magnification ratio is calculated as:

$$\text{Magnification ratio} = \frac{\text{A sweep rate}}{\text{B sweep rate}}$$

One-point advice

- The following timing chart in triggered delay mode is illustrated under:
  A trigger signal : CH1
  B trigger signal : CH2



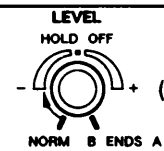
- As in the chart, the B sweep starts by the first B trigger signal after the certain delay time. Therefore, the DLY value on the screen does not show the actual delay time and it is stamped with the "?" mark alongside.

B ENDS A

Terminates the A sweep when the B sweep ends. This allows to increase the sweep repetiion rate and the intensity for the better viewing.

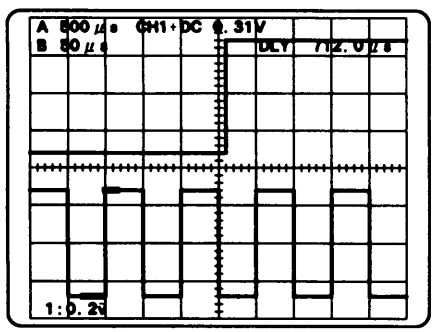
♦ **Key operation**

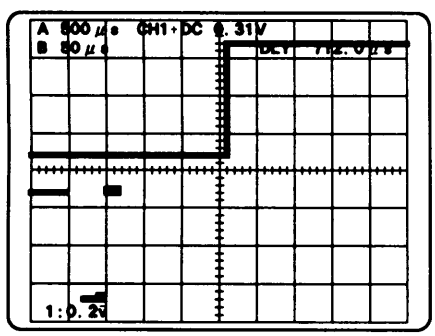
Setting B ENDS A

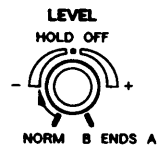


(inner knob)

♦ **Operating procedure**





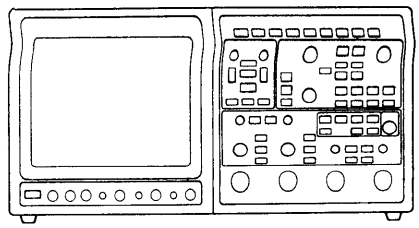
① Using the 

knob (inner knob), set the B ENDS A function.

- The A sweep ends at the last of the intensified portion, or the end of the B sweep.

APPLICATIONS (only for REAL)

CH2 DLY

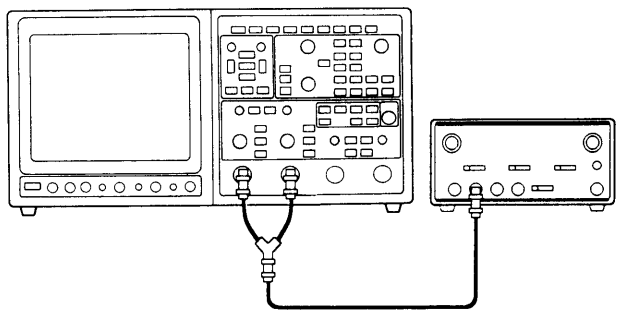


When measuring the time lag using two channels ([CH1, CH2]), it is possible to raise the measuring accuracy by controlling the time lag ([SKWE]) beforehand between the channels.

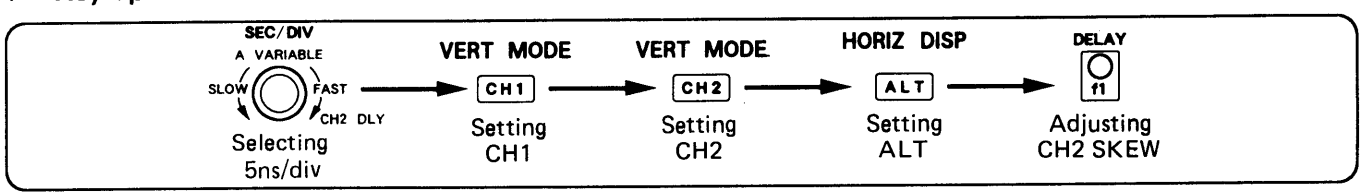
♦ **Preliminary setup**

Enter a signal from a signal generator (e.g., SC -340 made by IWATSU) to CH1 and CH2.

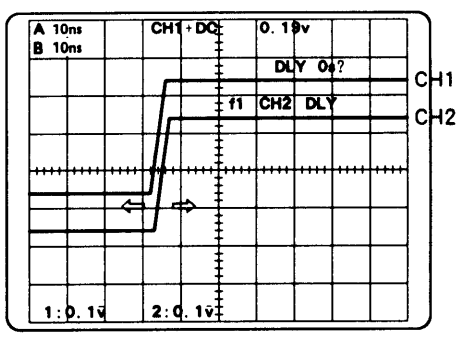
Output : FAST RISE



♦ **Key operation**



♦ **Operating procedure**



① Turn the SEC/DIV A VARIABLE knob (outer) to select 10ns/div for a sweep rate.

② Press the [CH1] key to set CH1.

③ Press the [CH2] key to set CH2.

④ Press the ALT CHOP key to select ALT for VERT MODE.

⑤ Press the [ALT] key to select ALT for HORIZ DISP, and make HORIZ DISP serve as a mode to adjust f1 CH2 DLY.

⑥ Turn the DELAY f1 knob to fit the rise of CH2 waveform to that of CH1 waveform.

One-point advice

- If you select one of those sweep rates other than 10ns/div, SKEW ADJUST does not work.
- To adjust the SKEW of B sweep, select B for HORIZ DISP.
- If you adjust the SKEW at a sweep rate of 10ns/div, other ranges of sweep rates are adjusted as well.

6

MEMO

6

1 2 3 4 5 6 **7** 8 9

Daily Check

Cleaning

This page describes how to clean a digital storage scope to keep it in good condition over a long period of time (see the table).

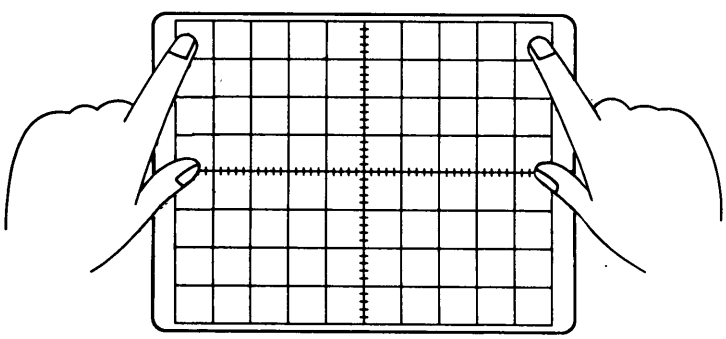
♦ **Follow the next instructions:**

◊ **Use the appropriate cleaner.**

clean the covers and panels gently with the soft cloths dipped in the water or the mild detergent. Using the prohibited cleaner in the list may change the coloring or cause the unexpected damage.

Recommended cleaner	Prohibited cleaner
Water mild detergent	Alcohol, gasoline, acetone, lacquer, ether, thinner, methyl-ethyl-ketone, detergent containing ketone

◊ **How to take off the filter**



① Shift upward the filter by the tip of a finger.
② Press the filter toward CRT.
③ Pull the filter toward you by the tip of your finger.

* Smear between filter and CRT

The filter and screen face of CRT may get dust for a long time use.

Clean the filter and screen face gently with a soft cloth.

Use a mild detergent if necessary.

Quick Calibration

- **Periodical calibration**

  The periodical calibration ensures an accurate measurement and may reduce a risk of instrument damage as well. One-thousand-hour and six-month intervals are recommended for frequent and normal use, respectively.

- **Quick calibration**

  The following lists the quick calibration procedures:

Items checked	Calibration
Unaligned trace and cursors	• Adjust the TRACE ROTATION control to align the horizontal trace with horizontal scale graticule
Out of focus of trace and readout display	• Adjust the FOCUS control.
Does ground level change when varying the VOLTS/DIV ?	• See "CALIB" in "SYSTEM menu".
Probe phase compensation	• See the manual for probe.

Messages on the Screen

The following messages are displayed on the screen to indicate the instrument condition.

POWER ON TEST : program runs at power-on time for the self diagnosis.

RUNNING SELF TEST	:	shows that the self test program is running.
WORK RAM ERROR	:	shows that the WORK RAM may have a defect.
SLAVE CPU RAM ERROR	:	shows that the SLAVE CPU RAM may have a defect.
ROM CHECK-SUM ERROR	:	shows that the ROM may have a defect.
SLAVE CPU ROM CHECK-SUM ERROR	:	shows that the SLAVE CPU ROM may have a defect.
SLAVE CPU HANDSHADE ERROR	:	shows that the CPU handshake may have a defect.
BACK-UP RAM ERROR	:	shows that the BACK-UP RAM may have a defect.

AUTO-CALIB : program runs for the self calibration.

AUTO CALIBRATION NO. nn	:	shows that the current calibration step number nn is under executing.

AUTO SET : program runs for the automatic setup.

AUTO SET : SEARCHING VERTICAL RANGE
: shows that the program is searching for the appropriate VOLTS/DIV setting.

AUTO SET : SEARCHING TRIG CONDITION
: shows that the program is searching for the appropriate trigger condition.

AUTO SET : SEARCHING HORIZONTAL RANGE
: shows that the program is searching for the appropriate SEC/DIV condition.

AUTO SET : COMPLETED
: shows that the program is completed.

AUTO SET : ERROR
: shows that the program failed to provide the appropriate setup condition to display the input signal.

SAVE and RECALL : operations may bring up following messages on the screen.

FILE NOT FOUND	:	shows that the file name is not found in the directory.
INVALID FILE NAME	:	shows that the invalid character is used as a file name.
MEDIA FULL	:	shows that no more file will be saved in the memory area.
SAVE COMPLETE	:	shows that the save operation is completed.
RECALL COMPLETE	:	shows that the recall operation is completed.
TOO MANY FILES	:	shows that the file directory is full.
FORMAT COMPLETE	:	shows that the file formating is completed.
DELETE COMPLETE	:	shows that the file deleting is completed.
FILE ACCESSING	:	shows that the save or recall operation is being executed.

Miscellaneous messages

CAUTION ! SEE THE MANUAL. (BATTERY DRAIN)
: shows that the battery for the back-up RAM is drained.

CPU START : is displayed once in short time only after power-up time or power interruption.

P-STEP nn RECALLED
: shows that the program or file number nn is recalled by using remote controller PGM operation.

INPUT OVERLOADED AND REVERTED TO 1MΩ
: shows that the input is overloaded at 50Ω input impedance is reverted to 1MΩ.

WARNING ! INCOMPATIBLE LENGTH (only for STORAGE)
: shows that the recall LENGTH is shorter than save LENGTH.

MEASUREMENT MODE MUST BE SET (only for STORAGE)
: shows that the measurement condition is not set when setting the GO/NOGO.

Quick Diagnosis

♦ Quick diagnosis

Follow the next procedure when the digital storage scope does not operate properly.

Sympton	Check	Action
No trace display	• Is digital storage scope power cord plugged into outlet ?	Plug power cord of digital storage scope into power outlet.
	• Is power switch turned on ?	Turn on the power switch.
	• Is the INTEN control turned counterclockwise ?	Turn INTEN A control clockwise for appropriate wave.
	• Is sweep mode set to the SINGLE ?	Set sweep mode to AUTO position.
	• Is display positioned correctly ?	Rotate POSITION FINE ◄► or POSITION control to move a wave within the screen if it is out of screen.
Obscure scale	• Is SCALE control turned counterclockwise ?	Turn the SCALE knob clockwise for appropriate brightness.
	• Are illumination lamps burnt out ?	Replace the lamps. See the service manual for the detail.
No character readout	• Is INTEN control turned counterclockwise ?	Turn READ OUT control clockwise for appropriate brightness.
Out of focus	• Is FOCUS control adjusted correctly ?	Adjust FOCUS control correctly.
No signal display	• Is probe damaged ?	Change probe.
	• Is the vertical coupling set to the [GND] ?	Set [DC AC] key.
	• Is VERT MODE set to correct channel	Set VERT MODE to channel into which signal is applied.
	• Is VOLTS/DIV switch set to lower sensitivity ?	Set the VOLTS/DIV switch to higher sensitivity.
No triggering	• Is trigger condition enabling switch set properly ?	Set A and B enable to select A and B trigger conditions, respectively.
	• Is trigger source selected correctly ?	Set trigger source to a channel into which signal is applied.
	• Is TRIG LEVEL adjusted correctly ?	Adjust TRIG LEVEL to right level.
Jittering display	• Is line voltage below the rating ?	Use digital storage scope within the rating.

- When you cannot obtain a stable display on the screen, press the [AUTO SET] key.

Storing and transporting

◆ **Storing**

Store the digital storage scope under the circumstances shown in the right table.
Avoid locations where the digital storage scope will be exposed to direct sunlight, dust, corrosive gas.

Storage temperature	DS-8623	−20 to +70°C
	SE-500	−20 to +60°C
Storage humidity	DS-8623	80%+70°C (Relative humidity)
	SE-500	95%+60°C (Relative humidity)

◆ **Transporting**

Pack the digital storage scope with the original packings or equivalent one when transporting it.

1 2 3 4 5 6 7 **8** 9

Specifications

SPECIFICATIONS

Unless specified especially, REAL and STORAGE have common specifications.

ELECTRICAL SPECIFICATIONS

Vertical deflection system (Yaxis)

Mode: CH1, CH2, CH3, CH4, ALT
ADD, CHOP (only for REAL)
CALC (CH1+CH2, CH1×CH2), REF1, REF2, REF3, REF4 (only for STORAGE)
(CHOP switching frequency : 500kHz ±2%)

CH1 and CH2

Deflection factor: 2mV/div to 5V/div in a 1-2-5 sequence of 11 steps
2mV/div to 12.5V/div (continuously variable with VARIABLE)

For REAL

Accuracy:

5mV/div to 5V/div:	±2%	(+10°C to +35°C)
	±5%	(0°C to +50°C)
2mV/div:	±3%	(+10°C to +35°C)
	±6%	(0°C to +50°C)

< Note >

- The above accuracies are valid after auto calibration (CALIB) at +23°C ±5°C.

5mV/div to 5V/div : ±1% (+10°C to +35°C)

< Note >

- The above accuracies are valid within ±5°C from the temperature at which auto calibration is done and between +15°C and +30°C.

For STORAGE

Accuracy:

5mV/div to 5V/div:	±2% ±1/32div	(+10°C to +35°C)
	±5% ±1/32div	(0°C to +50°C)
2mV/div:	±3% ±1/32div	(+10°C to +35°C)
	±6% ±1/32div	(0°C to +50°C)

In the case of envelope mode, the values above are increased by 2%.

Frequency response: For REAL (+10°C to +35°C)

Sensitivty	Bandwidth	With SS-082R probe or internal 50Ω termination	With external 50Ω termination
2mV/div	DC to 100MHz	−3dB	−4.9dB
5mV/div to 5V/div	DC to 200MHz	−3dB	−4.9dB

For STORAGE (+10°C to +35°C)

Sampling type	Sensitivity	Bandwidth
Equivalent sampling	2mV/div	DC to 100MHz-3dB
	5mV/div to 5V/div	DC to 200MHz-3dB
One-shot sampling Sweep rate: 500ns/div to 10ns/div Only on VERT MODE CH1	2mV/div to 5V/div	DC to 50MHz-3dB
One-shot sampling Sweep rate: 1μs/div to 10ns/div	2mV/div to 5V/div	DC to 25MHz-3dB
One-shot sampling Sweep rate: 500ms/div to 1μ/div	2mV/div to 5V/div	DC to $\frac{100\text{MHz}}{\text{Sweep rate} \times 4}$ -3dB

< Note >

- The lower cutoff frequency at AC coupling is 10Hz.
- When the bandwidth limit is on, the bandwidth is limited to 20MHz (only for REAL).
- The input coupling is set to DC at 50Ω input impedance position.

Rise time: At 10mV/div in the 50Ω input impedance (+10°C to +35°C)
1.75ns
(Rise time is calculated from: Bandwidth × Rise time = 0.35)

Pulse response: At 10mV/div with internal 50Ω termination (+10°C to +35°C)
Overshoot: 5.0%
Sag (at 1kHz): 1.0%
Other distortions: 7.5%

Signal delay: 20ns or greater (delay time on the screen) by internal delay cable

Input coupling: AC, DC, GND

Input RC: For 50Ω input impedance: 50Ω ±1% (on DC coupling)
For 1MΩ input impedance:
Without probe: 1MΩ ±1%//16pF ±1pF
With SS-082R probe: 10MΩ ±2%//13pF ±2pF

Maximum input voltage: For 50Ω input impedance: 5Vrms, or 0.5W-second during any one second within ±50V peak voltage
For 1MΩ input impedance
Without probe: Max. ±400V
With SS-082R probe: Max. ±600V

VSWR: 1.6 or less
DC to 200MHz in the 50Ω input impedance

Drift: 0.2 div/hour or 1mV/hour, whichever is greater after 15-minute warm up (typical value)

Polarity: CH2 only

Common mode rejection ratio: At 10mV/div
50 : 1 (1kHz sine wave)
15 : 1 (20MHz sine wave)

CH3 and CH4

Deflection factor: 0.1V/div, 0.5V/div in 2 steps
For REAL
Accuracy: ±4% (+10°C to +35°C)
±6% (0°C to +50°C)
For STORAGE
Accuracy: ±4% ± 1/32div (+10°C to +35°C)
±6% ± 1/32div (0°C to +50°C)
In the case of envelope mode, the values above are increased by 2%.

Frequency response: For REAL (10°C to +35°C)

Sensitivity	Bandwidth	With SS-082R probe or Internal 50Ω termination
0.1V, 0.5	DC to 200MHz	–3dB

For STORAGE (+10°C to +35°C)

Sampling type	Sensitivity	Bandwidth
Equivalent sampling	0.1V, 0.5V	DC to 200MHz -3dB
One-shot sampling Sweep rate: 1μs/div to 10ns/div	0.1V, 0.5V	DC to 25MHz -3dB
One-shot sampling Sweep rate: 500ms/div to 1μs/div	0.1V, 0.5V	DC to $\frac{100\text{MHz}}{\text{Sweep rate} \times 4}$ -3dB

< Note >

- The lower cutoff frequency at AC coupling is 10Hz.
- When the bandwidth limit is on, the bandwidth is limited to 20MHz (only for REAL)

Pulse response: With internal 50Ω termination (+10°C to +35°C)
Overshool: 13%
Sag (at 1kHz): 2%
Other distortions: 12.5%

Input coupling: AC, DC

Input RC: Without probe: 1MΩ ±1%//16pF ±1pF
With SS-082R probe: 10MΩ±2%//13pF ±2pF

Maximum input voltage: Without probe: Max. ±400V
With SS-082R probe: Max. ±600V

Triggering

A triggering

Trigger sensitivity: (+10°C to +35°C)

Coupling	Frequency range	Maximum sensitivity			
		Other than AUTO LEVEL		AUTO LEVEL	
		Other than NOISE REJ	NOISE REJ	Other than NOISE REJ	NOISE REJ
AC	10H to 10MHz	0.4div	——	0.8div	——
	10MHz to 100MHz	1.0div		1.5div	
	100MHz to 200MHz	1.5div		2.5div	
DC	DC to 10MHz	0.4div	1.5div	0.8div	2.4div
	10MHz to 100MHz	1.0div	3.5div	1.5div	4.0div
	100MHz to 200MHz	1.5div	4.5div	2.5div	
TV-V TV-H	——	Composite video signal amplitude:1.5div		——	

< Note >

- The lower limit frequency at AUTO mode is ;
  50Hz at a sweep rate of 10ns to 5ms
  10Hz at a sweep rate of 10ms to 0.5s
- The lower limit frequency at AUTO LEVEL mode is 200Hz.
- The composite video signal is assumed to consist of 70% video signal amplitude and 30% sync signal amplitude.
- At REJ coupling, the trigger signal is attenuated at the frequency of:
  HF REJ : 50kHz or higher
  LF REJ : 50kHz or lower

Trigger source: CH1, CH2, CH3, CH4, LINE, COMB, VERT (only for REAL)
Coupling: DC, DC HF REJ, DC NOISE REJ, AC HF REJ, AC LF REJ, AC, TV-V, TV-H
Polarity: Positive (+), negative (−)
Synchronous position jitter (value P-P) (only for STORAGE)
Equivalent sampling mode: 0.05 × A sweep rate +500ps
Others: 0.02 × A sweep rate +20ns
Data position: (only for STORAGE)
Set a trigger point to the points 0/8, 1/8, 2/8, 3/8, 4/8, 5/8, 6/8, and 7/8 of waveform acquisition memory length.

B Triggering
Trigger sensitivty; (+10°C to +35°C)

Coupling	Frequency range	Maximum sensitivity	
		Other than NOISE REJ	NOISE REJ
AC	10Hz to 10MHz	0.4div	
	10MHz to 100MHz	1.0div	
	100MHz to 200MHz	1.5div	
DC	DC to 10MHz	0.4div	1.5div
	10MHz to 100MHz	1.0div	3.5div
	100MHz to 200MHz	1.5div	4.5div

Note: Maximum of 20MHz in event trigger.

Trigger source: CH1, CH2, CH3, CH4, COMB
Coupling: DC, DC HF REJ, DC NOISE REJ, AC HF REJ, AC
Polarity: Positive (+), negative (−)

Event delay
Mode: COUNT, MISSING, BURST, EXTRA
Setting range:

COUNT	1 to 65535 times, Maximum counting frequency :20MHz, Error in counting : 0 or −1
MISSING BURST EXTRA	SEC/DIV value/50 × (2n + 1) [s] n=4 to 32767 NORM 1 μs/div for higher speed to 1μs. ENV5 μs/div for higher speed to 5μs. SETTING TIME ERROR = $\frac{\text{SEC/DIV}}{50}$ × (3 to −1) ±1%

Others by "B triggering".

TV Triggering
Triggerable TV system: NTSC, PAL and SECAM
FIELD SEL (NTSC only)
BOTH, ODD, EVEN
LINE SEL: 1 to 9999H

Horizontal deflection system (X axis)

Horiz Display: A, ALT, B, X-Y

A time base:

Sweep mode: AUTO LEVEL, AUTO, NORM, SINGLE

Sweep rate: 10ns/div to 0.5s/div in a 1-2-5 sequence of 24 steps.
10ns/div to 1.5s/div (continuously variable with VARIABLE)

Accuracy I : (over center 8 divisions)
±2% at 10ns/div to 0.5s/div in a 1-2-5 sequence (+10°C to +35°C)
±3% at 10ns/div to 1.5s/div with VARIABLE on (only for REAL)
(+10°C to +35°C)

< Note >
- The above accuracies are valid after auto calibration (CALIB) at +23°C ±5°C.

±1.2% at 10μs/div to 0.5s/div in a 1-2-5 sequence (+10°C to +35°C)
(only for REAL)

< Note >
- The above accuracies are valid within ±5°C from the temperature at which auto calibration is done and between +10°C and +35°C.

Accuracy II: (over any 2 divisions within center 8 divisions)
±5% at 10ns/div to 0.5s/div in a 1-2-5 sequence (+10°C to +35°C)
±5% at 10ns/div to 1.5s/div with VARIABLE on (+10°C to +35°C)
(only for REAL)

Sweep rate and sampling rate (only for STORAGE)

Mode	Sweep rate	Sampling rate (sample/sec)
CH1/sweep rate	10ns/div to 0.5μs/div	200M
	1μs/div to 0.5s/div	100 ÷ Sweep rate
Envelope	10ns/div to 2μs/div	20M
	5μs/div to 0.5s/div	100 ÷ Sweep rate
Equivalent sampling mode	10ns/div to 0.5μs/div	100 ÷ Sweep rate
Others	10ns/div to 0.5μs/div	100M
	1μs/div to 0.5s/div	100 ÷ Sweep rate

Sampling rate accuracy: 0.1% (only for STORAGE)

Holdoff time: Variable with HOLDOFF

B time base

Delay
Triggered delay: TRIG AFT DLY (only for REAL)
Continuous delay: RUNS AFT DLY

Sweep rate: 10ns/div to 20ms/div in a 1-2-5 sequence of 20 steps

Accuracy I : (over center 8 divisions)
±2% at 10ns/div to 20ms/div (+10°C to +35°C)

< Note >
- The above accuracies are valid after auto calibration (CALIB) at +23°C ±5°C.

±1.2% at 10μs/div to 20ms/div in a 1-2-5 sequence
(only for REAL)

< Note >

- The above accuracies are valid within ±5°C from the temperature at which auto calibration is done and between +15°C and +30°C.

Accuracy II: (over any 2 divisions within center 8 divisions)
:±5% at 10ns/div to 20ms/div (+10°C to +35°C)

Delay time range: 0 to 5.0ms or more at 0.5ms/div (only for REAL)
Accuracy at 1 μs/div to 0.5s/div (+10°C to +35°C) (only for REAL)
±1% of reading ±1.5% of full scale − 45ns

Delay jitter: 1/20,000 or less (only for REAL)

Sweep magnification: 10 times (max. sweep rate: 1ns/div)
Accuracy I : (over center 8 divisions)
±5% at 10ns/div to 50ns/div (+10°C to +35°C)
±3% at 100ns/div to 0.5s/div (+10°C to +35°C)
Accuracy II: (over any 2 divisions within center 8 divisions)
±10% at 10ns/div to 50ns/div (+10°C to +35°C)
±5% at 100ns/div to 0.5s/div (+10°C to +35°C)

< Note >

- At 10ns/div to 20ns/div, the first 20ns and last 20ns of the sweep are not valid for this specification.
- At 50ns/div to 50ms/div, the first 1 division and the last 20ns of the sweep are not valid for this specification.

Sweep rate and sampling rate (only for STORAGE)

Mode	Sweep rate	Sampling rate (sample/sec)
Envelope	10ns/div to 2μs/div	20M
	5μs/div to 20ms/div	100 ÷ Sweep rate
Others	10ns/div to 0.5μs/div	100M
	1μs/div to 20ms/div	100 ÷ Sweep rate

Sampling rate accuracy: 0.1% (only for STORAGE)

EXT clock: Input a clock signal to CH4 and use the B sweep.
Maximum input frequency : 50MHz

Storage function (for STORAGE)

A/D converter

Resolution: 8 bits, 32 levels/div

Maximum sampling rate: 200MHz sample/sec (CH1 one channel only)
100MHz sample/sec (two channels, simultaneously)
20MHz sample/sec (envelope mode)
Minimum pulse width which can be detected in the envelope mode: 8ns (it is displayed with 50% of original amplitude.)

Memory length

Waveform acquisition memory:
1024 words × 4 channels
2048 words × 4 channels
16384 words × 2 channels (CH1, CH2 only)
Switchable

Waveform save memory:
16384 words
Dividable in steps of 1024 words or 2048 words

Waveform display memory:
1024 words × 8 waveforms

Storage

Averaging:	2 to 256 times
Maximum hold:	2 to 255 times, limitless times
Waveform operation fimctopm:	CH1+CH2, CH1×CH2
Interpolation function:	Pulse interpolation, linear interpolation, sine interpolation
Smoothing:	Moving average of points located at the top and end of data (2n + 1) of each sampling point n=1 to 20
GO/NOGO judgment:	Judgment by setting area with four or two cursors and reference waveform or waveform parameter or judgment by using measurement readout value Stop of waveform storage, save of waveform data, and waveform output to plotter can be made depending on the judgment results.

Waveform magnification and reduction (STORAGE mode)

Vertical axis (Y axis):	magnified by 10 times max. reduced by 1/2, 1/2.5 min.
Horizontal axis (X axis):	magnified by 200 times max. with the left edge of screen waveform at the center.

X-Y operation

X axis

Input:	CH1
Deflection factor:	Same as that of CH1 Accuracy :2mV/div to 5V/div ±3% (−10°C to +35°C)
Frequency response:	DC to 2MHz at −3dB (+10°C to +35°C) (for REAL) Same as that of CH1 (for STORAGE)
Input RC:	Same as that of CH1
Max. input voltage:	Same as that of CH1

Y axis

Input:	CH1, CH2, CH3, CH4, ADD (CALC and REF 1 to 4 are only for STORAGE.)
Deflection factor:	Same as that of CH1, CH2, CH3, and CH4
Frequency response:	Same as that of CH1, CH2, CH3, and CH4
Input RC:	Same as that of CH1, CH2, CH3, and CH4
Max. input voltage:	Same as that of CH1, CH2, CH3, and CH4

Phase difference: Within 3° (at DC to 1MHz for REAL) (at DC to 50MHz for STORAGE)

External intensity modulation (Z axis) (only for REAL)

Min. modulation voltage:	0.5Vp-p
Polarity:	Positive going signal decreases intensity, and negative going signal increases intensity.

Frequency range: DC to 5MHz
Input impedance: 5kΩ ±20%
Max. input voltage: ±50V MAX

Signal output
Calibrator
Waveform: Square wave
Repetition rate: 1kHz
Accuracy: ±0.01% (0°C to +50°C)
Duty ratio: 49% to 51%
Output voltage: 0.6V
Accuracy: ±1% (+10°C to +35°C)
±1.5% (0°C to +50°C)
Output current: 10mA
Accuracy: ±1% (+10°C to +35°C)

CH2 signal output
Output voltage: 20mV ±30% for 1 division screen amplitude (at 50Ω load)
Bandwidth: DC to 100MHz (−3dB)
Output impedance: 50Ω ±20%

A GATE output (only for REAL)
Output voltage: 5Vp-p approx.
Output impedance: 2.7kΩ approx.

B GATE output (only for REAL)
Output voltage: 5Vp-p approx.
Output impedance: 2.7kΩ approx.

TRIG OUT: Outputs a trigger signal.
Output voltage: For TRIG'D: 0V ±0.5V
For other than TRIG'D: +4.0V to 5.5V
Output impedance: Approx. 2.7kΩ

RECX, NOGO (only for STORAGE)
RECX: Outputs an analog signal for X axis of pen recorder.
Output voltage: 0V to 1.6V ±20%
Output impedance: 50Ω ±20%
Output current: 2mA or less (load resistor is 1 kΩ.)

NOGO: Outputs a trigger signal when GO and NOGO are operated.
Output voltage and output impedance

NO/NOGO	Output voltage	Output impedance
GO	0V ± 0.5V	50Ω ± 20%
NOGO	5V ±1V	50Ω ± 20%

Output current: 2mA or less (load resistor is 3kΩ.)

RECY, SYNC (only for STORAGE)

RECY: Outputs an analog signal for Y axis of pen recorder.

Output voltage: 0V to 2V ±20%

Output impedance: 50Ω ±20%

Output current: 2mA or less (load resistor is 1.2kΩ.)

SYNC: Outputs a trigger signal when GO and NOGO are operated.

Output voltage and output impedance

	Output voltage	Output impedance
When GO/NOGO output is valid:	5V ± 1V	50Ω ± 20%
When GO/NOGO output is invalid:	0V ± 0.5V	50Ω ± 20%

Output current: 2mA or less (load resistor is 3kΩ.)

PEN UP: Outputs a signal for pen recorder.

Output voltage: High 4.5V ±1V, LOW 0V ±0.5V (at a load resistance of 20kΩ)

Output impedance: Less than 2.5kΩ

Output current: Less than 2mA

Plotter output: 7400 series produced by HP co. corresponding to the HP-GL format by GP-IB or RS-232C

Interface or its equivalent GP-IB interface:
conforms to IEEE488-1978

Subset function: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT0, C0, E2

RS-232C interface

Synchronous system: asynchronous

Character length: 7 bits, 8 bits

Parity: None, odd, even

Stop bit: 1,2

Communication rate: 300BPS, 600bps, 1200BPS, 2400BPS, 4800BPS, 9600BPS

Readout and cursor measurement

Readout

Vertical deflection system: CH1 through CH4 deflection factors (VOLTS/DIV) with automatic factor correction by using SS-082R probe of accessories.
UNCAL, AC, DC, GND, INV, VERT MODE, BW (only for REAL)

Horizontal defelction system: A and B sweep rate, x 10MAG (automatic factor correction), DLY, HOLDOFF, ENHANCE (only for REAL), DP (only for STORAGE)

Cursor: Two voltage cursors (horizontal cursors) and two time cursors (vertical cursors)

Menu mode: MEASUREMENT, SAVE RECALL, COMMENT, SYSTEM (STORAGE, GO /NOGO and COPY are for STORAGE.)

Frequency counter (only for REAL)

Measurement channel: Same as A trigger block

Maximum sensitivity:

Frequency	Amplitude on screen
40Hz to 10MHz	More than 1div
10MHz to 100MHz	More than 2div
100MHz to 200MHz	More than 3div

Display digit: Four digits

Maximum count times: 5sec or less

Frequency range: 40Hz to 200MHz

Measurement error: ±3 counts (for digits of resolution)

DVM (Direst Voltage Measurement) (only for REAL)

Measurement channel:

CH1 only

Measurement range:

VOLTS/DIV setting	Range	Resolution
2mV/div to 50mV/div	0 to ±1.2V	0.5mV
0.1V/div to 0.5V/div	0 to ±12V	5mV
1V/div to 5V/div	0 to ±120V	50mV

Accuracy without probe

±1.5% of reading ±3 × resolution

Cursor measurement (+10°C to +35°C)

Delta voltage(ΔV): Calculated by measuring a voltage between two cursors.
Accuracy: ±[(2% of reading) + (0.3% of full scale)]

Voltage ratio (V-RATIO): Calculated by measuring a voltage ratio with any div to be 100% and 0 dB.
Accuracy: ±[(2% ofreading) + (0.3% of full-scale)]

Delta time: Calculated by measuring a delta time between two cursors.
Accuracy: ±[(1% of reading) + (1% of full-scale)]

Time ratio (T-RATIO): Measures any time interval with any div being 360 degrees or 100%.
Accuracy: ±[(1% of reading) + (1% of full-scale)]

Frequency (1/Δt): ±1% of reading +1% of full scale

Rise time (ΔV·Δt) (10 to 90%) (only for REAL): ±2% of reading +1% of full scale

Voltage (V at T) (only for STORAGE): Displays voltage between the position set by vertical cursor and GND and the time from the triggering point.

Cursor position range

Resolution: 0.01div

Moving range: Vertical direction : ±4div ±0.2div from the center of screen
Horizontal direction: ±5div ±0.2div from the center of screen.

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Performance warranty range: Vertical direction: ±3div from the center of screen
Horizontal direction: ±4div from the center of screen

Waveform parameter measurement (only for STORAGE)

Items measured

Amplitude (AMPL): Calculated by measuring an amplitude between set periods using two vertical-direction cursors.

Peak to peak (P-P): Calculated by measuring a P-P value of waveform between vertical-direction cursors.

Frequency (f): Calculated by measuring a frequency of waveform between vertical-direction cursors.

Pulse width (PW): Calculated by measuring a pulse width between vertical-direction cursors.

Rise time (tr): Calculated by measuring a rise time of waveform between vertical-direction cursors.

Fall time (tf): Calculated by measuring a fall time of waveform between vertical-direction cursors.

Skew measurement (CH1, CH2, SKEW): Calculated by measuring a delta time of waveform between CH1 and CH2 waveforms.

Data and time

Display format: DD-MMM-YY HH:MM:SS

DD: day (2-digit number, 01 to 31)

MMM: month (3-digit alphabet, JAN, FEB, MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV, DEC)

YY: year (2-digit number, 0 ~ 19, 88 ~ 99)

␣: space

HH: hour (2-digit number, 00 to 23)

MM: minute (2-digit number, 00 to 59)

SS: second (2-digit number, 00 to 59)

Leap year: Auto correction of leap year

Comment display

Display area: 6th row through 11th row from the top of screen

Number of characters: Up to 240 characters

Character set:

	!	"	#	$	%	&	'	(	)	*	+	,	-	.	/
0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
P	Q	R	S	T	U	V	W	X	Y	Z					

Deta memory: Backup by built-in batteries

Storage data: SETUPs can be registered as many as will satisfy the following items 1 and 2 (excluding those given when POWER is set to OFF).

1. Number of SET UP (32 max.) + number of comment (32 max.) + [number of registered waveforms (14.2kw max. when setting 1 kW to LENGTH, 7 max. when setting 2 kW to LENGTH and 1 max. when setting 16 kW to LENGTH)] $\leqq 32$
2. (Number of SET UP × 2)+ (number of comment × 2) + [number of registered waveforms (number of waveforms × 9.2 kW when setting 1 kW to LENGTH, number of waveforms × 17 when setting 2 kW to LENGTH, number of waveforms × 129 when setting 16 kW to LENGTH)] $\leqq 129$
(Waveforms are registered only in STORAGE mode.)

Battery life: Approx. 40,000 hours (at room temperature)

CRT

Shape: Rectangular, 7 inches

Display area: 8div × 10div (1div = 12mm) Non-parallax internal graticule with scale illumination

Accelerating voltage: Approx. 18kV

Power supply

Voltage range: 90V to 250V AC

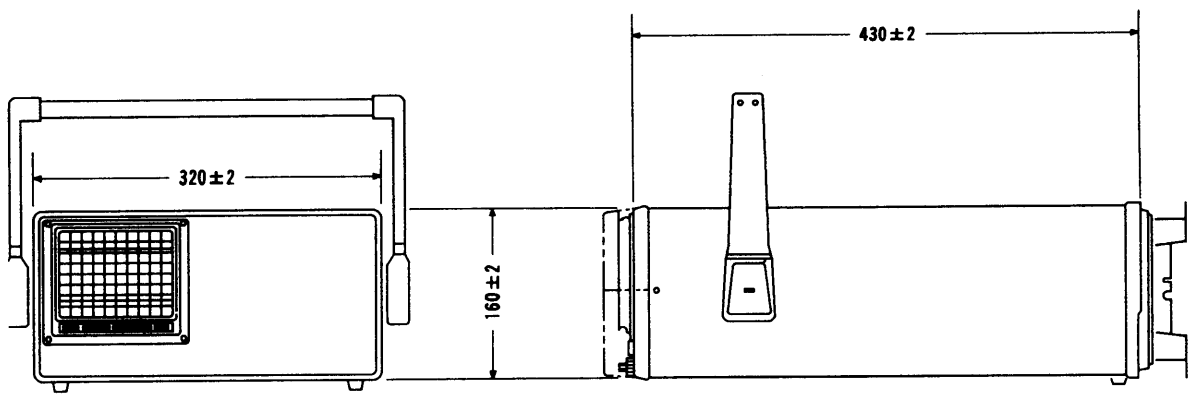
Frequency range: 48Hz to 440Hz

Power consumption: Approx. 165W (at 100V AC)

WEIGHT AND DIMENSIONS

Weight: Approx. 12.8kg (excluding the panel cover, accessory bag, and accessories)

Size: (320 ±2)W × (160 ±2)H × (430 ±2)[Lmm]



ENVIRONMENTAL CHARACTERISTICS

Operating temperature:	0°C ~ +50°C
Operating humidity:	90% at 40°C (relative humidity)
Storage temperature:	−20°C to 70°C
Altitude: Operating:	5,000m, barometric pressure of 405 mmHg
Non-operating:	15,000m; barometric pressure of 90 mmHg
Vibration test:	Start from 10Hz to 55Hz and back in one minute. Peak-to-peak amplitude 0.67mm; for 15 minutes each in vertical, horizontal and longitudinal directions for a total of 45 minutes.
Shock test:	Raise one side by 10cm and let it fall onto a piece of a hard wood; 4 times for each side.
Drop test:	Pack the instrument in the transportation carton and drop it from the height of 90cm.
Preheating time:	The specifications standard of DS-8623 should be a guarantee value after pre-heating at a lapse of 30 minutes from power on.

Remote controller-SE-500

Operating temperature:	−10°C ~ +50°C
Operating humidity:	90% at 40°C (relative humidity)
Storage temperature:	−20°C ~ +60°C
Control distance:	Approximately 4m
Control angle:	Approximately ±45 degrees
Battery life:	Approximately 2 months under 8-hour use per day with manganese battery.

ACCESSORIES

Power cord (3-core)	1
Fuse (6.3A/250V, slow blow)	2
Probe (SS-082R)	2
Dust cover	1
Panel cover	1
Accessory bag	1
Operations manual	1
Introduction manual	1

1 2 3 4 5 6 7 8 **9**

Panel Layout

MEMO

9. PANEL LAYOUT

Front Panel Layout

Positioning signal horizontally (POSITION)
: moving waveform (outer) (Page 62)
: finely adjusting the movements of waveform (inner)
x 10 MAG : horizontal magnification of sweep rate (x10) (Page6 62)

Selecting the A and B sweep rates (Page 61)

Adjusting the delay time (Page 51)
Separating the A and B sweep waveforms (TRACE SEP) (page 51)
Selecting the cursor
Time cursor (Page 84)
Volt cursor (Page 85)

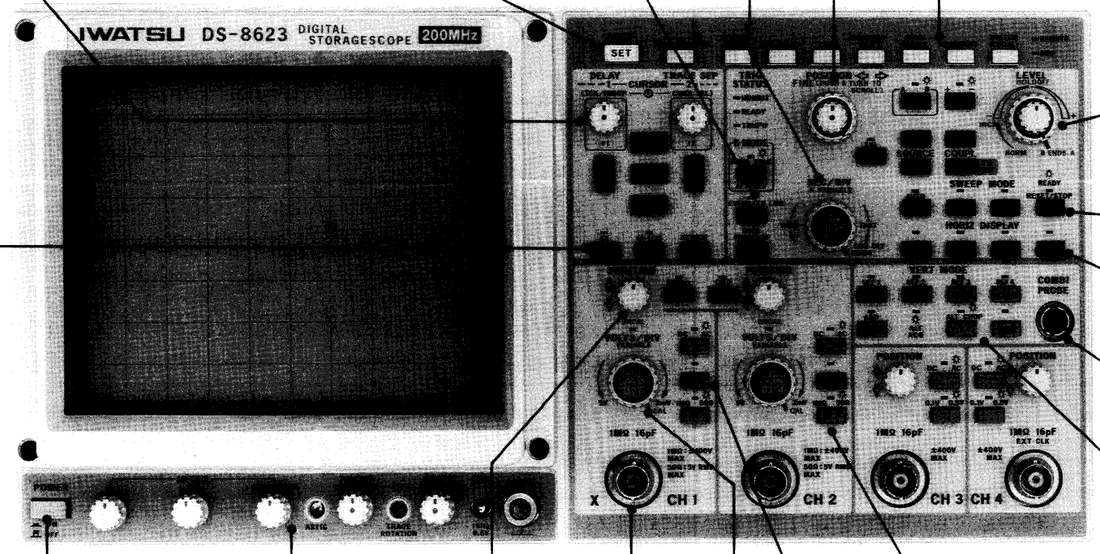
Selecting delay mode
RUNS AFT DLY : Selecitng continuous delay (Page 50)
TRIG AFT DLY . Selecting triggered delay (Page 51)
EVENT/TV LINE : (Page 52)
DATA POSITION : (page 57)

Selecting the menu (Page 64)
REAL STORAGE (Page 63)
STORAGE MODE : (Page 67)
GO NOGO : (Page 78)
COPY : (Page 89)
MEASUREMENT : (Page 93)
SAVE RECALL : (Page 122)
COMMENT: (Page 141)
SYSTEM : (Page 145)

Adjusting A and B trigger levels
TRIG LEVEL : trigger level adjustment (Page 48)
Selecting hold off time (HOLD OFF) (Page 49)
Switching trigger slope (SLOPE) (Page 47)
Switching trigger conditions (MODE) (Page 41)
Selecting trigger source (SOURCE)
VERT (Page 40)

CH1 to CH4 (Page 41)
LINE (Page 42)
COMB (Page 43)
Selecting trigger coupling (COUPLING)
DC (Page 44)
DC HFREJ (Page 45)
DC NOISE-REJ (Page 45)
AC HFREJ (Page 45)
AC LFREJ (Page 45)
AC (Page 44)
TV-V (FIELD) (Page 46)
TV-H (Page 46)

Setting up automatically (AUTO SET) (Page 19)



Selecting sweep mode (SWEEP MODE)
AUTO LEVEL (Page 35)
AUTO (Page 36)
NORM (Page 37)
SINGLE (Page 38)

Selecting the cursor
ΔV : (Page 95)
Δt ·1/Δt : (Page 98)
ATTACH : (Page 95)

Selecting horizontal display (HORIZ DISPLAY)
A : A (main) sweep (Page 58)
ALT : ALT (alternate)sweep (Page 59)
B : B (delayed)sweep (Page 59)
X-Y : X-Y display (Page 60)

Combination trigger probe terminal (Page 48)

Turning on and off power (Page 11)

INPUT (page.20)

50Ω, 1MΩ : selecting input impedance (Page 22)

Adjusting the display
A INTEN, B INTEN : save intensity (Page 12)
ENHANCE : increasing intensity further (Page 12)
READOUT : readout intensity (page 12)
ASTIG : wave and readout astigmation control (Page 12)
FOCUS : display focus (Page 13)
TRACE ROTATION: trace alignment (Page 13)
SCALE : scale illumination adjustment (Page 13)
BEAM FIND : locating trace position (Page 13)

Selecting vertical deflection
VOLT/DIV (Page 33)

Selecting input coupling
AC : accoupling (Page 21)
GND : ground level (Page 21)
DC : dc coupling (Page 21)

Positioning vertically
(POSITION) (Page 23)
Limiting bandwith(BW)
20MHz-BANDWIDTH (Page 25)
Inverting CH2 signal
(CH INV) (Page 24)

Selecting display signal (VERT MODE)
CH1 : (Page 25)
CH2 : (Page 25)
CH3 : (Page 25)
CH4 : (Page 25)
ADD : addition of CH1 and CH2 (Page 27)
CALC : addition and multiplication of CH1 and CH2 (Page 28, 29)
ALT : multi-trace display (Page 31)
CHOP : multi-trace display (Page 32)
REF : setting the REF channel (Page 30)

Rear Panel Layout

Outputting CH2 signal
CH2 OUT (Page16)

A gate voltage output
A GATE OUT (page16)

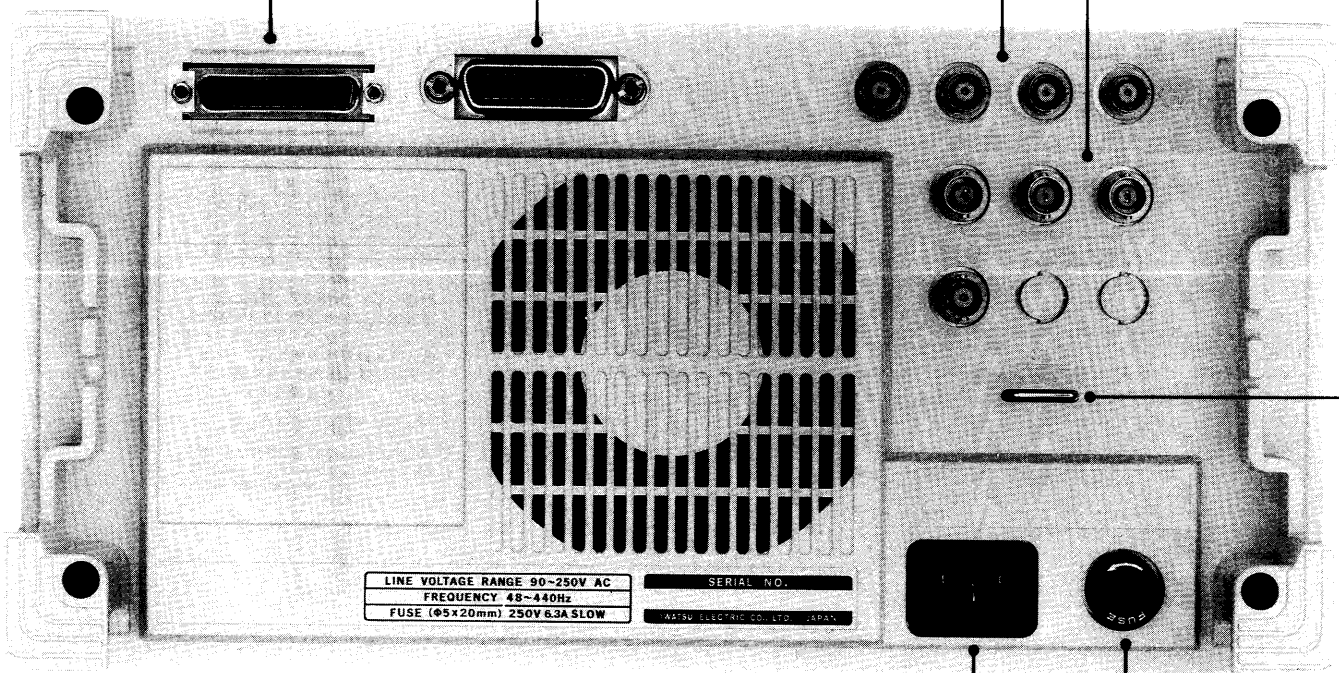
B gate voltage output
B GATE OUT (Page16)

External intensity modulation signal input terminal Z AXIS INPUT (Page16)

RS-232C connector (Page 187)

GP-IB connector (Page 184)

REC X
REC Y
PEN UP (Page 17)
NOGO (Page 16)
SYNC (Page 16)
TRIG OUT (Page 17)



Outputting current for callbration (Page 16)

Power supply connector AC LINE INPUT (Page 16)

Fuse Holder (Page 16) FUSE HOLDER