DL7100/DL7200

Digital Oscilloscope

OPERATION GUIDE

YOKOGAWA ◆
Yokogawa Electric Corporation

IM 701410-02E
2nd Edition

Introduction

Thank you for your purchase of the DL7100/DL7200 Digital Oscilloscope. This Operation Guide explains the basic operations to familiarize you quickly and easily with this digital oscilloscope when using it for the first time.

Within this manual, the "  " icon means that you must set the appropriate value using the DL7100/DL7200's jog shuttle.

This manual is part of a three-manual set provided with the DL7100/DL7200. Please use it together with the other two manuals in the set.

- Refer to the DL7100/DL7200 User's Manual (IM 701410-01E) for full details about all of the DL7100/DL7200 functions.
- Refer to the DL7100/DL7200 Communication Interface Manual (IM 701410-11E) for detailed information about the DL7100/DL7200 communication functions.

Notices

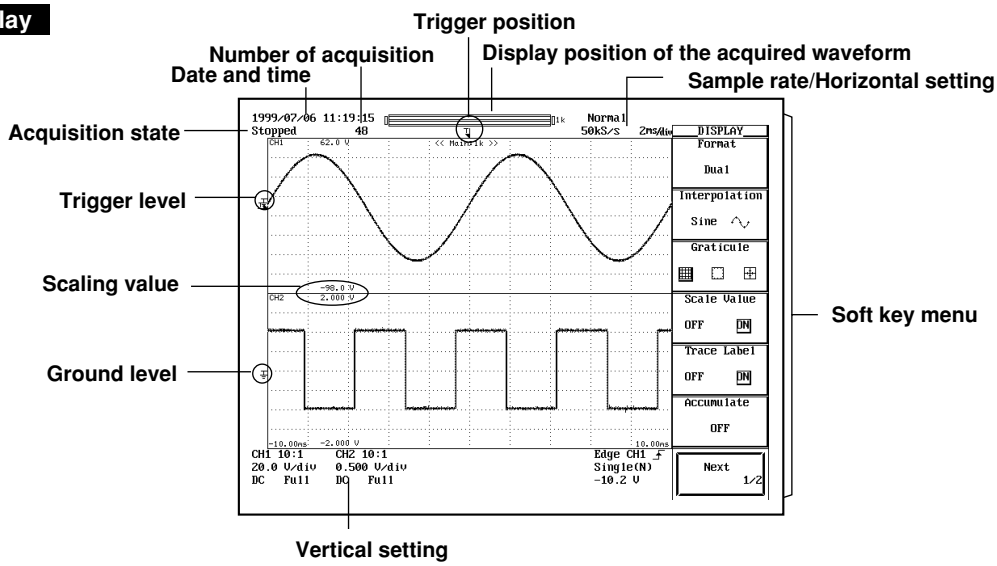
- The contents of this guide are subject to change without prior notice as a result of improvements in the instrument's performance and functions.
- Display contents illustrated in this manual may differ slightly from what actually appears on your screen.
- Every effort has been made in the preparation of this manul to ensure the accuracy of its contents. However, should you have any questions or find any errors, please contact your nearest YOKOGAWA representative as listed on the back cover of this manual.

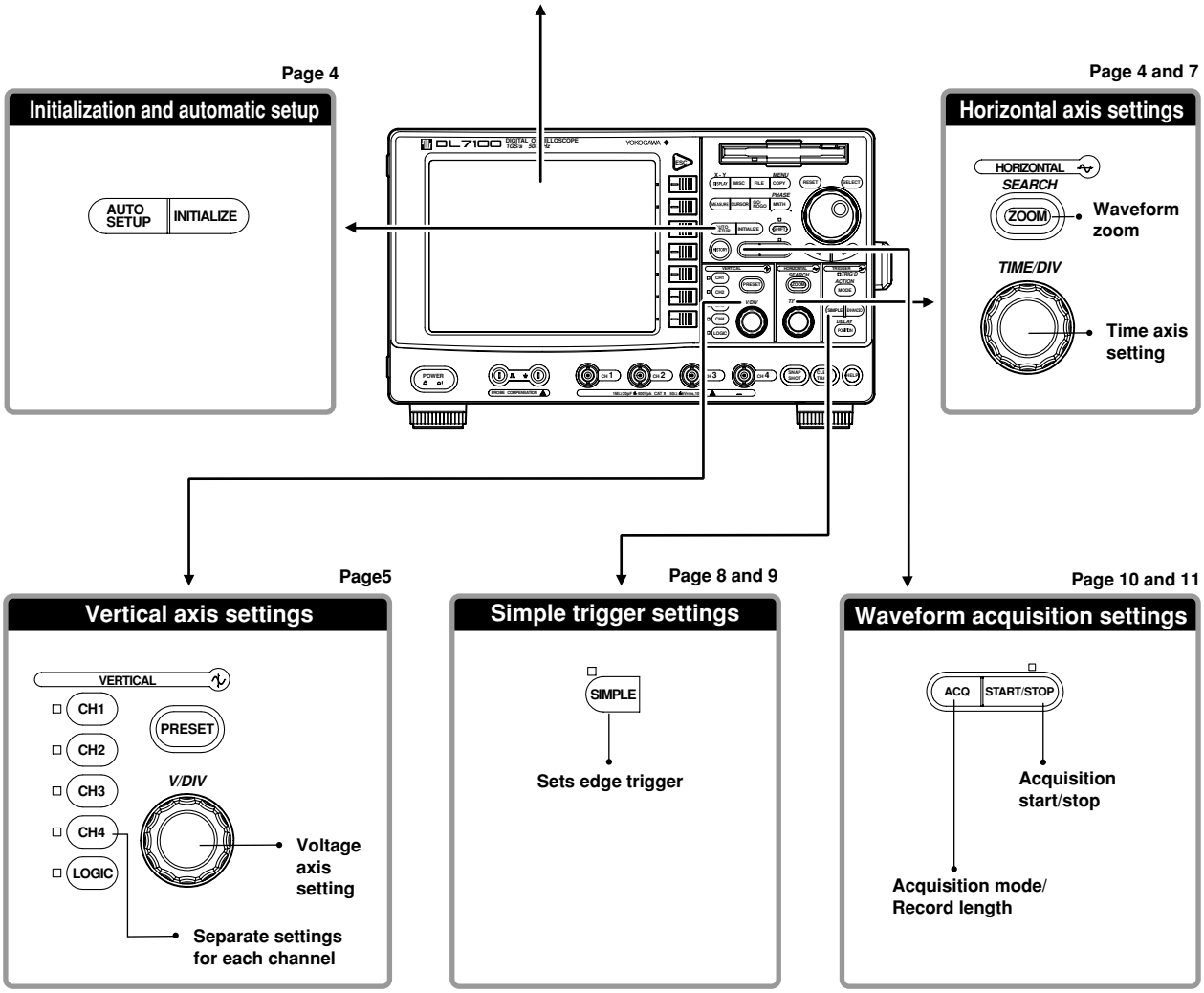
Revisions
1st edition: August 1999
2nd edition: August 2000

Disk No. DL27
2nd Edition : August 2000 (YK)

Basic Operations

Display





Useful functions

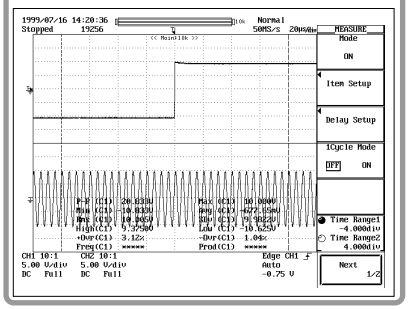
For other functions and more details on the functions mentioned hereafter, please refer to the indicated sections in the User's Manual (IM701410-01E).

Section 9.2

Automatic measurement of waveform parameters

MEASURE

Automatic measurement and statistical analysis of parameters such as rise time and pulse width.

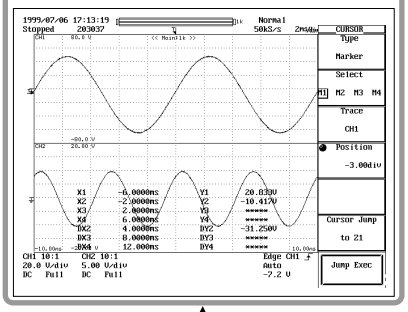


Section 9.1

Cursor measurement

CURSOR

Shows values and distances directly from waveform by positioning H cursors, V cursors, markers and degree.

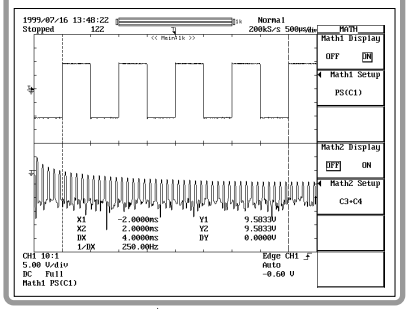


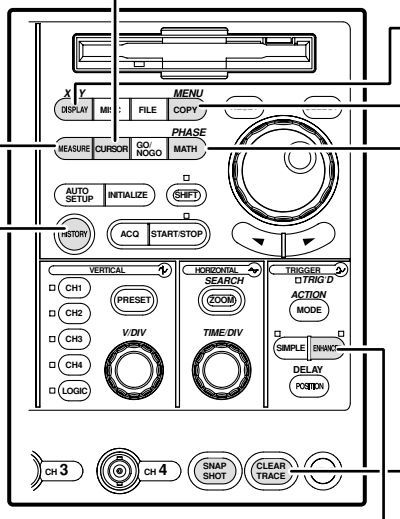
Sections 9.3 to 9.10

Waveform computations

PHASE MATH

Various math operations, including computations on values from different channels, binarization, phase shift, and display of power spectrum.





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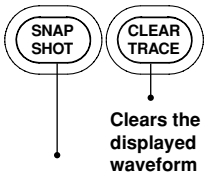
Snapshot



Clears the displayed waveform

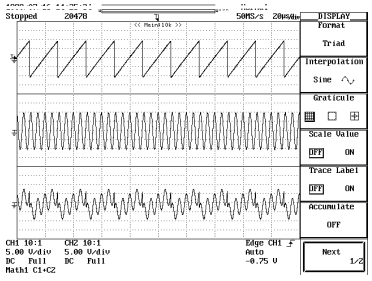
Retain the displayed waveform on the screen

Section 8.1

X-Y

X-Y DISPLAY

Selects number of waveform windows on screen (1, 2, 3, 4,or 6).

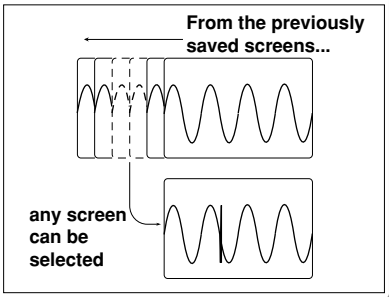


Page 12 and 13

History function

HISTORY

History memory retains data from previous screens (up to 2048 previous screens for the DL7100 or up to 4096 previous screens for the DL7200).

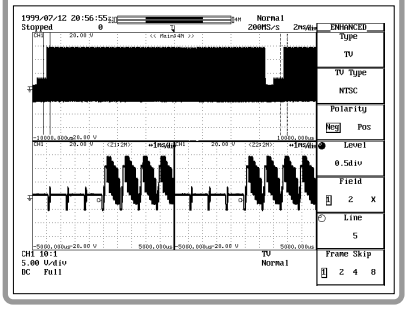


Sections 6.8 to 6.15

Enhanced trigger settings

ENHANCED

Use this function to set up an enhanced trigger.



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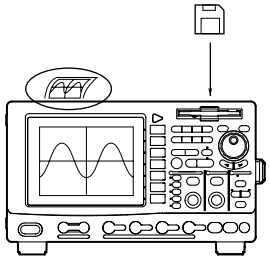
Print/Save screen image

MENU COPY

Send screen image to built-in printer, external prinnter or to floppy disk.



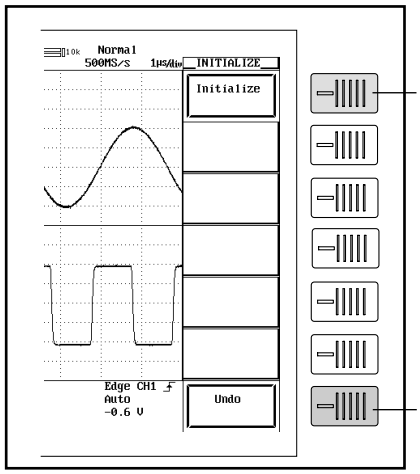
Initializing Settings / Auto Setup

Initializing

Use the front panel's [INITIALIZE] key to reset values to their defaults.
This function is useful when you need to change settings when preparing for a new signal input.

Operation

INITIALIZE

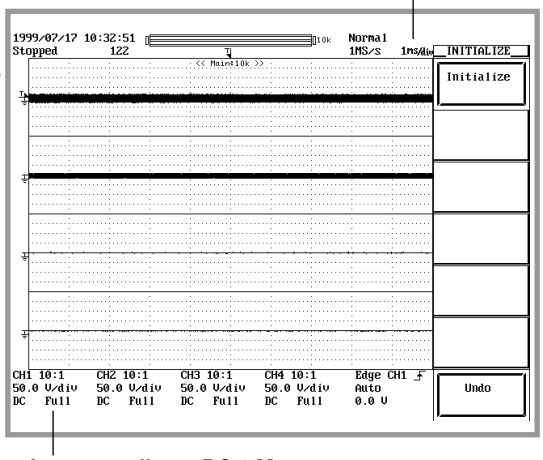


Execute initialization.

Undo initialization (restore previous settings).

Initialized Display

Time-axis setting = 1 ms/div



Input coupling = DC 1 MΩ
Voltage axis setting = 50 V/div (10:1)

MEMO

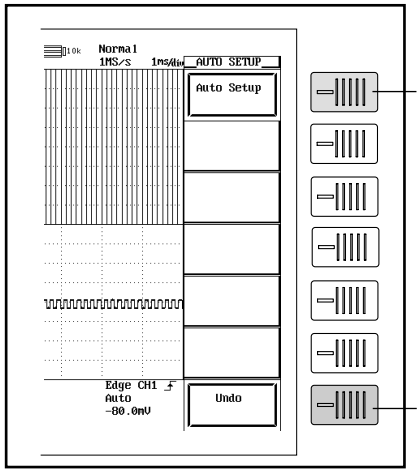
- The GP-IB address and certain other settings are not initialized.
- If waveform acquisition is in STOP state at time of initialization, it restarts automatically.

Auto Setup

The DL7100/DL7200 can automatically set vertical and horizontal axes, trigger conditions, and other parameters to match the incoming waveform. This function is useful when you want to view the waveform quickly, or when you are unclear about what settings to use.

Operation

AUTO SETUP



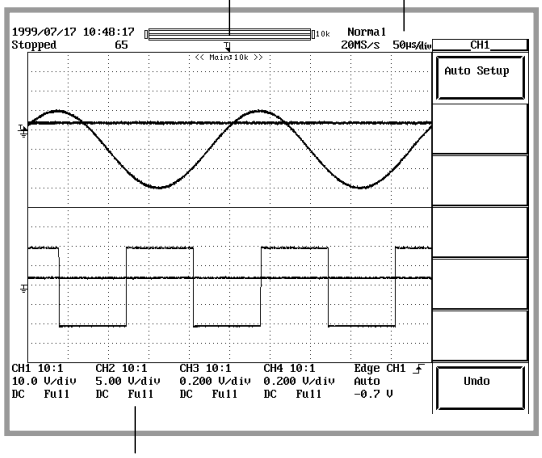
Execute auto setup.

Undo auto-setup (restore previous settings).

Auto setup

Time axis is set so that the waveform with the longest cycle shows 2 to 4 cycles on the screen.

Trigger at rising edge of the weveform with the longest cycle.



Input coupling
Over DC 50 Ω: DC 1 MΩ,
DC 50 Ω: DC 50 Ω (usually set to DC 1 MΩ for the DL7100 with software (ROM) version prior to 1.11).

MEMO

- Required input conditions for auto-setup are approximately as follows.
  Frequency : 50 Hz or more
  Maximum absolute value of input :
  Above 20 mV (assuming 1:1 probe attenuation)
  Type :Repetitive waveform
- You can apply auto-setup to any selected channel.
- If waveform acquisition is in STOP state at time of auto-setup, it restarts automatically.

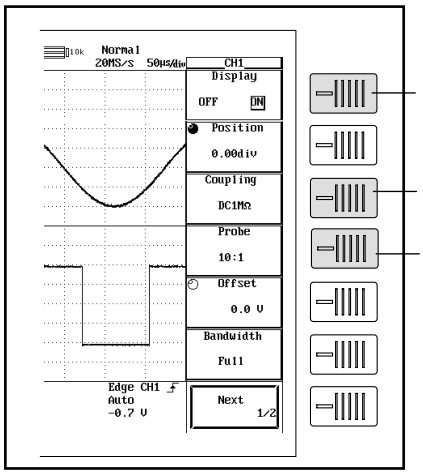
Vertical Axis Settings

Waveform ON/OFF, coupling select, and probe attenuation

You can set input coupling and the probe attenuation for each channel to the following values.
Coupling: AC 1 MΩ/DC 1 MΩ/DC 50 Ω/GND
Probe: 1:1/10:1/100:1/1000:1

Operation

CH1 to CH4



Waveform ON/OFF

Select input coupling

Select probe attenuation

MEMO

Attenuation must be set to match the probe you are using. Improper setting will result in incorrect cursor readings.

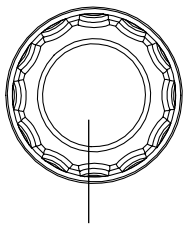
Voltage axis sensitivity

Use this function to adjust the displayed waveform amplitude.

Operation

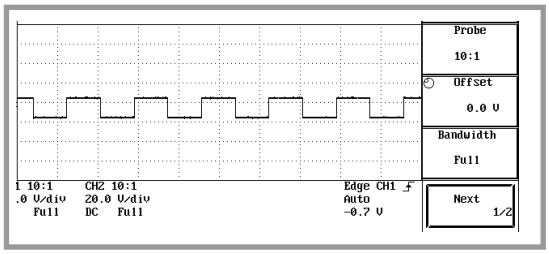
CH1 to CH4

V/DIV

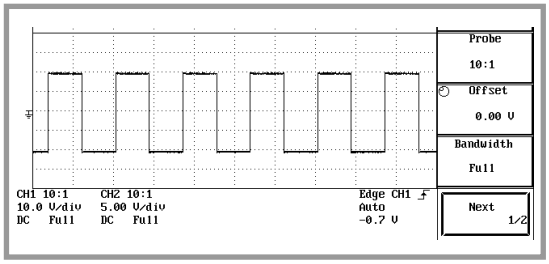


Turn right to increase the amplitude.

Adjustment example,V/div



Change from 20 V/div to 5 V/div.

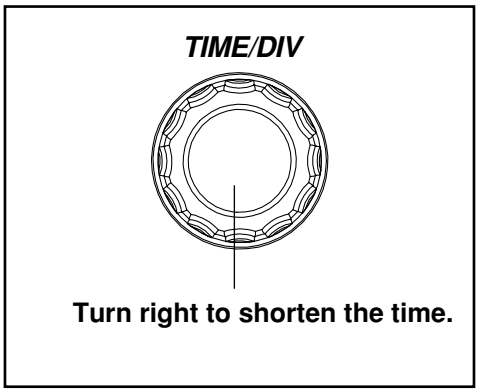


Horizontal Axis Settings

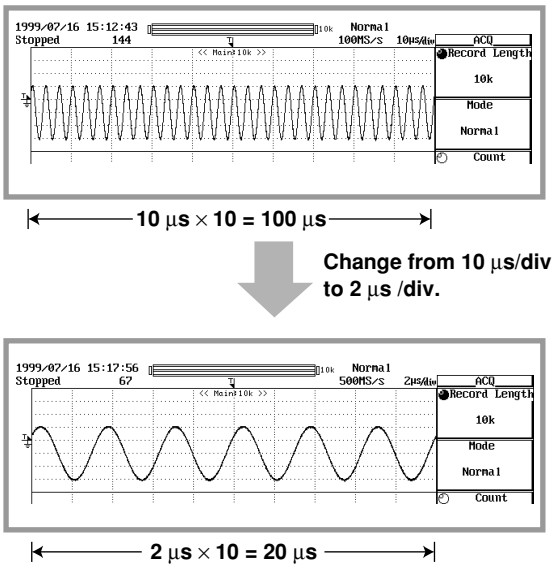
Time axis

You can adjust the screen's time axis to any value from 2 ns/div to 50 s/div. Since the display spans 10 divisions, the time length of the displayed waveform corresponds to 10 times the setting.

Operation



Adjustment example, Time/div



Sampling mode

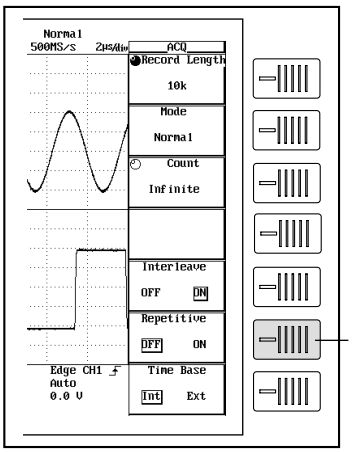
The following two methods are available to sample an input signal. However, if the record length on the DL7200 is set to 16 M word, you cannot turn ON repetitive sampling mode.

Real-time sampling mode : The input signal is sampled sequentially.

Repetitive sampling mode : Data is sampled from several waveforms and data is put in the correct order using the trigger point as reference. (An apparent sample rate of up to 100 GS/s can be used).

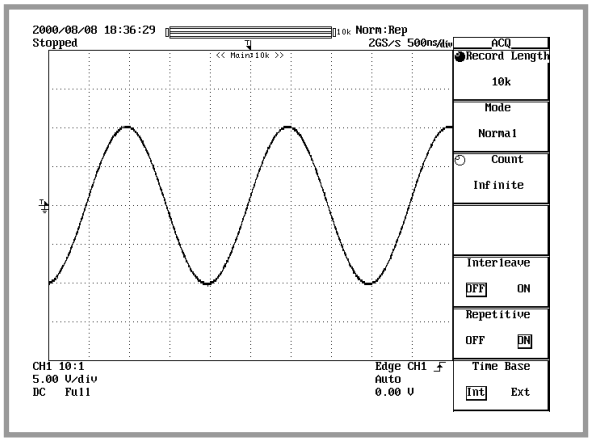
Operation

ACQ



Set repetitive sampling mode ON/OFF.

Screen Appearance during repetitive sampling



MEMO

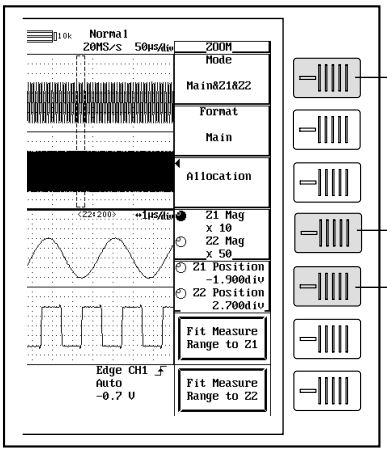
Sampling rate required to enable repetitive sampling varies according to record length and machine model. Refer to the User's Manual (Doc. IM701410-01E).

Expanding the waveform

The displayed waveform can be expanded in the time axis direction.
Two zoom positions can be specified on this instrument.

Operation

ZOOM

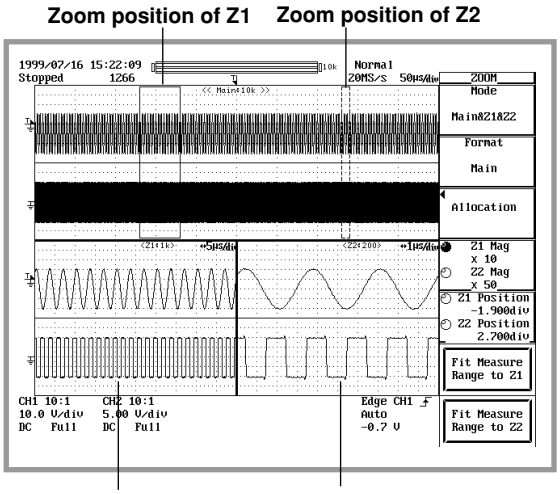


Select the display mode.

Select the zoom factor of Z1 or Z2 area (◎)

Select position of Z1 or Z2 area (◎)

Zoom display



MEMO

- Zoom is not available if the displayed waveform contains less than 50 or 40 data points.
- If there are less than 50 points per division, the DL7100 adds interpolation to the zoomed display. Note that interpolated points do not reflect actual sample values.

Setting a Simple Trigger

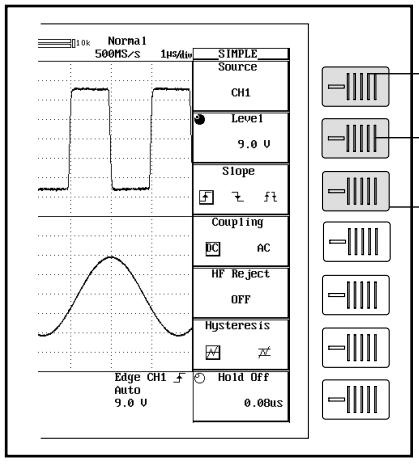
The trigger settings determine the input conditions required to update the waveform display. You can select from a wide variety of trigger conditions and types. This section introduces the trigger source, trigger level, trigger mode, and trigger position settings. For more information about these settings, and for details about gate triggers and enhanced triggers, refer to the User's Manual (IM701410-01E).

Changing the trigger source, level, and slope

The trigger source is the channel that provides the trigger signal. You can select any channel (CH1 to CH8) as the source, or you can select an external trigger (EXT TRIG IN).
A trigger occurs when the trigger source signal crosses the specified trigger level in the specified direction, as determined by the slope setting.

- ⨍ : Trigger occurs when signal level rises through trigger level.
- ⨏ : Trigger occurs when signal level drops through trigger level.
- ⨍⨏ : Trigger occurs when signal level crosses trigger level from either direction.

Operation SIMPLE

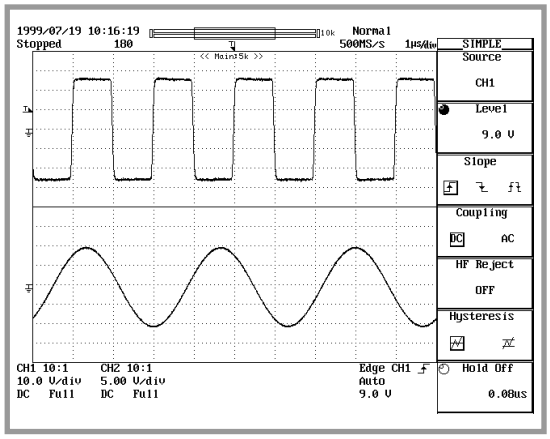


Set the trigger source

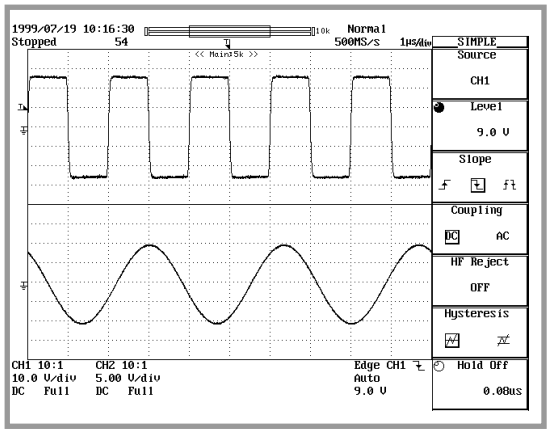
Set the trigger level. ( )

Set the trigger slope.

Source and slope setup example



Changing slope from ⨍ to ⨏ .



Changing the trigger mode

Sets the condition to update the displayed waveform. A selection can be made from the following modes.

Auto : Updates the displayed waveform automatically when no trigger has been activated during a specified time.

Auto evel : If the trigger is not activated for a certain amount of time, the trigger level is automatically changed to the center value of the waveform. The trigger is activated using the new level and the waveform is automatically updated.

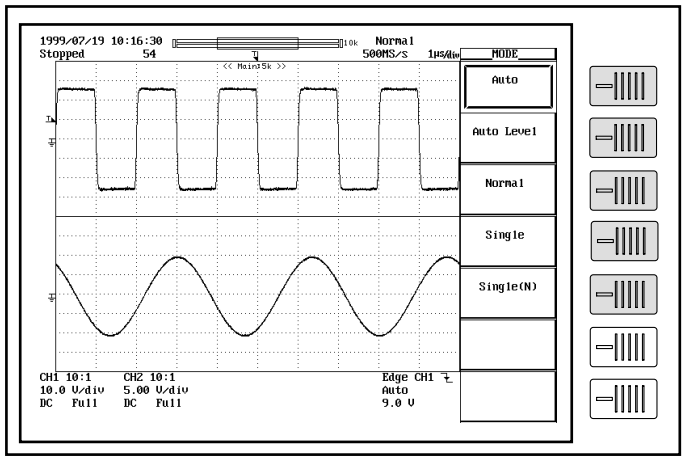
Normal : Updates the displayed waveform only when a trigger is activated.

Single : When a trigger is activated, the waveform is updated only once and then waveform acquisitioning stops.

Single(N) : Updates the displayed waveform only a pre-set number of times when a trigger is occurs and then waveform acquisitioning stops.

Operation

MODE



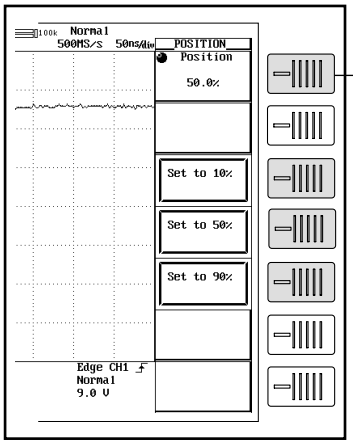
Select the trigger mode

Changing the trigger position

Determines where on the time axis position to display the data that is sampled when the trigger is activated (trigger point). It is specified in terms of %, taking the entire record length to be 100%.

Operation

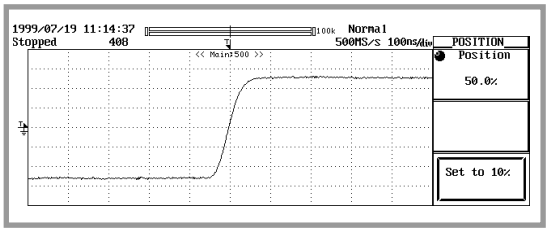
POSITION



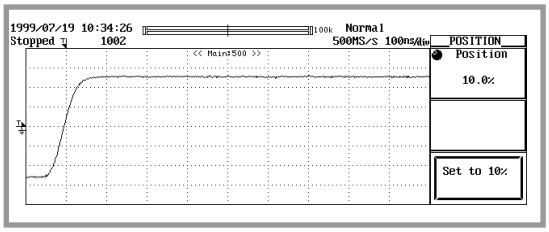
Change the trigger position. ( )

Set the trigger position to 10%, 50%, or 90% with 1 single operation

Changing trigger position

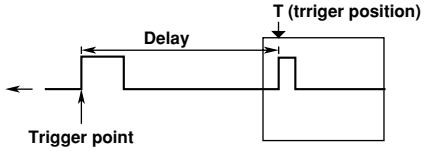


Change the trigger position from 50% to 10%.



MEMO

Although the display usually shows the waveform before and after the trigger point, using the delay function, it is possible to display the acquired waveform after a fixed time period elapses, as shown in the figure on the right.



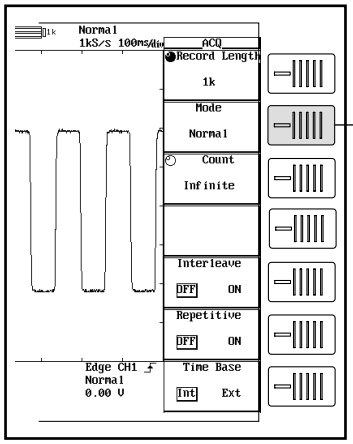
Changing the acquisition mode

The acquisition mode determines how the DL7100/DL7200 stores, processes, and displays the incoming sampling data. You can select from five modes.

- Normal : Values are stored and displayed as received, with no special processing.
- Envelope : Determines the maximum and minimum values in the waveform acquisition interval for the normal mode from the data sampled at the maximum sample rate of each module, and displays the waveform using those values.
- Average : Displays averages of values obtained at each time point of waveform (based on time difference from trigger point).
  Two methods are available.
  Exponential : Count = Infinite
  Linear : Count = 2^n (2 to 65536)
- Box Average : Calculates moving averages of 400 MS/s (Interleave ON: 800 MS/s or 1 GS/s) for the DL7100, and 800 MS/s or 1 GS/s with the DL7100 sampling data.

Operation

ACQ

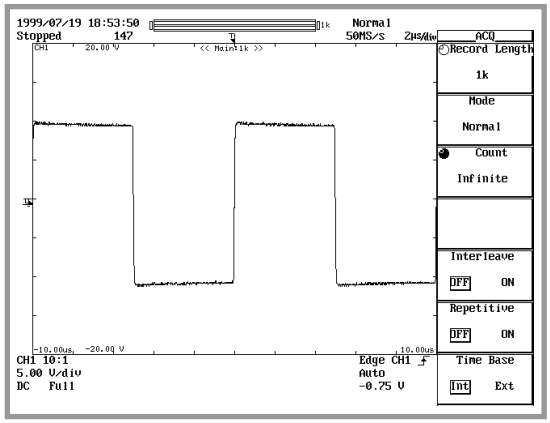


Select the acquisition mode

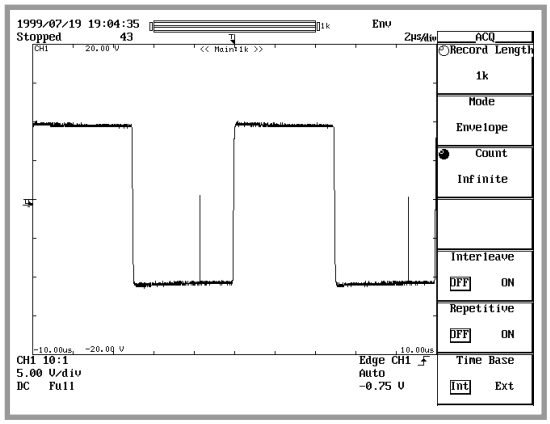
Screen examples

When observing the same input signal using the normal mode and the envelope mode, the glitch that could not be acquired inthe normal mode was acquired in the envelope mode.

Normal mode



Envelope mode

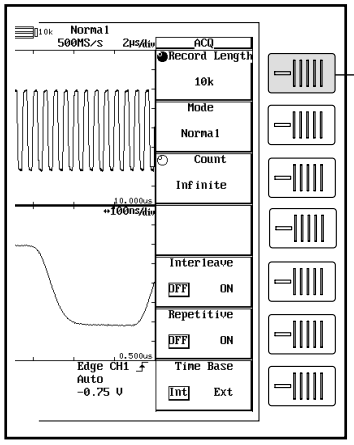


Selecting the record length

The term, record length, refers to the amount of waveform data that can be acquired in the acquisition memory.
Of the waveform data in the acquisition memory, the amount of waveform that is displayed on the screen is called the display record length.
Word is used as a unit to describe the record length. One word is equivalent to one sampling data.
By setting a long record length, the waveform can be observed at a high sample rate without changing the time axis setting.
Depending on the time axis setting, the record length and the display record length may differ.

Operation

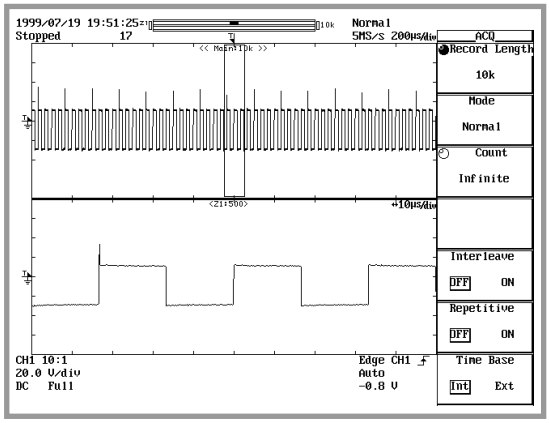
ACQ



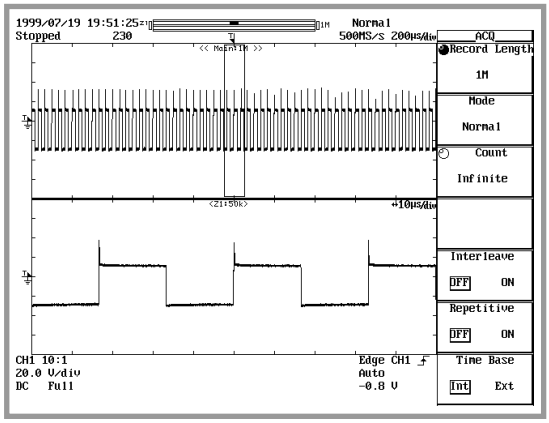
Set the record length ( )

Record length setup example

(Top window shows normal waveform; bottom window shows zoomed segment).



Change the record length from 10 kW to 1 MW



Snapshots and History Memory

Snapshots

By pressing the SNAP SHOT key, the waveform that is currently displayed (referred to as the snap shot waveform) remains on the screen. Pressing the CLEAR TRACE key clears the snap shot waveform.

Operation

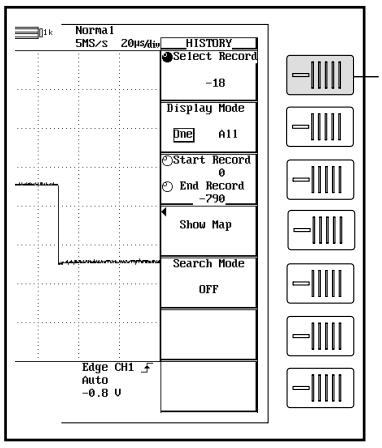
SNAP SHOT

Recalling images from history memory

The history memory stores up to 2048 for the DL7100 or 4096 for the DL7200 previously displayed waveforms (the exact number depends on the machine model and the acquisition settings). When 1000 previously displayed waveforms is stored by history memory, you can recall any of these waveform images by selecting the corresponding number with the jog or shuttle dial: –999 for the oldest waveform, –1 for the immediately preceding waveform, or 0 for the current waveform.

Operation

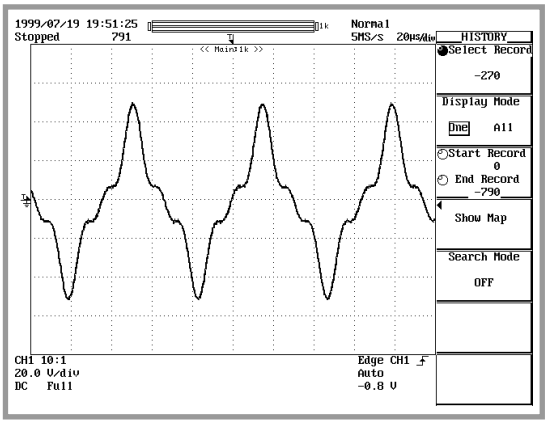
HISTORY



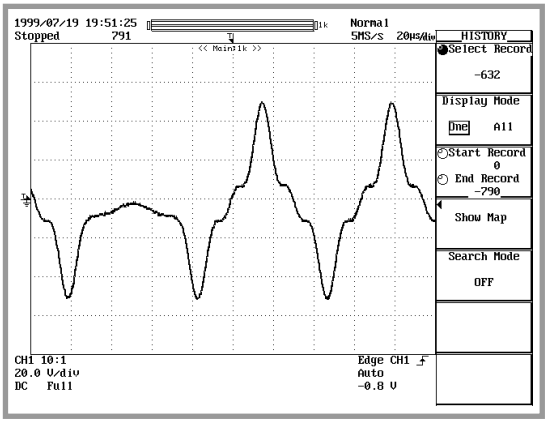
Select the screen number ( )

History display

Displaying "–270"



Displaying "–632"



MEMO

- If you set Display to "One," the screen displays a single waveform from the history. If you set Display to "All," the screen shows all waveforms within a selected range of the history.
- You can display a list of the stored waveforms and their trigger times.

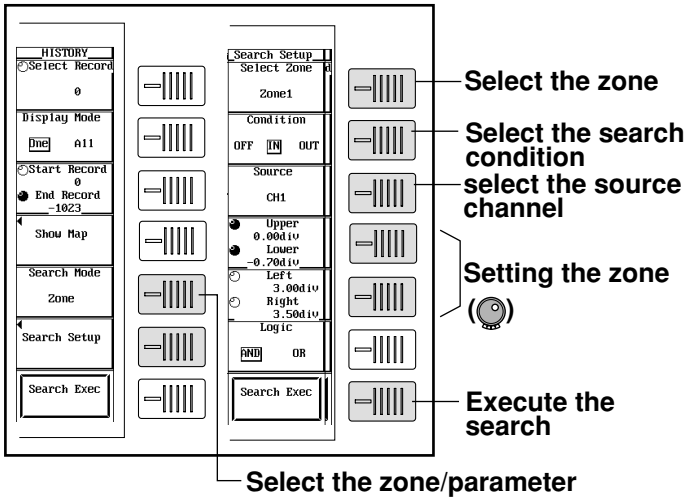
Search the waveform

History search function

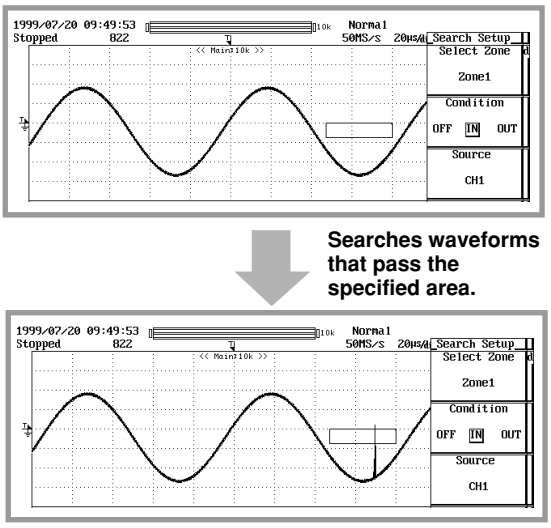
Searches waveforms that did or did not pass the specified area from the history memory (search using zone), and that did or did not satisfy the specified condition from the history memory (search using parameter; applicable to DL7100 with software (ROM) version 1.21 or later).

Operation

HISTORY



History memory search



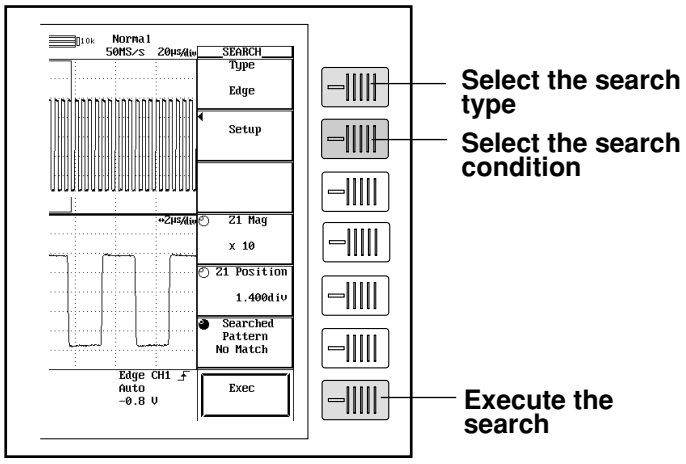
Searches waveforms that pass the specified area.

Search and zoom function

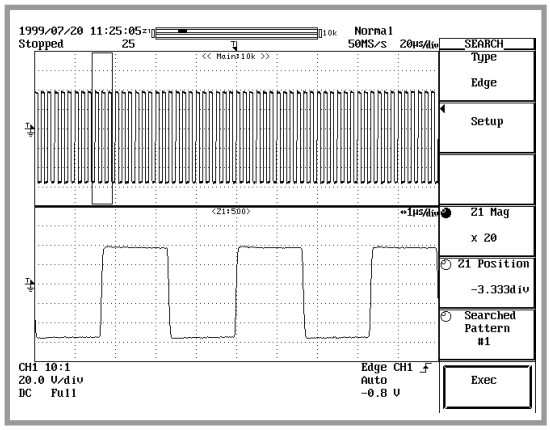
Searches waveforms by the specified area or level from the start point of the search.
Choose from the following five search methods: Edge, Serial pattern, Parallel pattern (applicable to DL7100 with software (ROM) version 1.21 or later), Pulse width (applicable to DL7100 with software (ROM) version 1.11 or later), or Auto scroll (applicable to DL7100 with software (ROM) version 1.21 or later).

Operation

SHIFT key + ZOOM



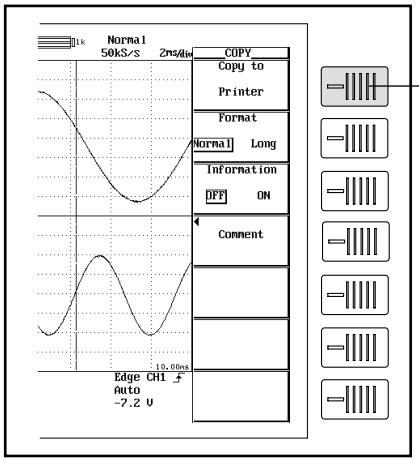
Edge search



Printing the screen image

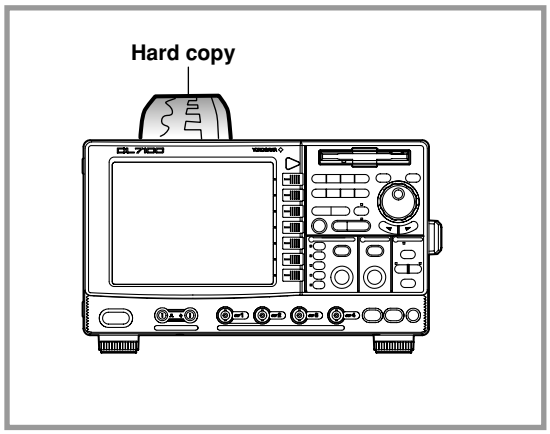
At the initial setting, the screen image data can be hard copied to the built-in printer by simply pressing the MENU / COPY key.

Operation *SHIFT key +* MENU / COPY



Select printer

Printout from built-in printer



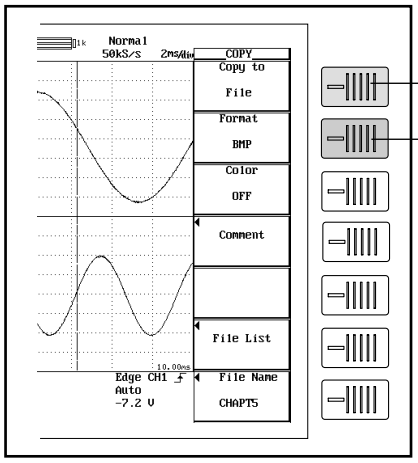
MEMO

You can use the long copy function to generate an enlarged printout (2x to 500000x enlargement) of the displayed waveform.

Saving the screen image to disk

After setting up as described below, you can execute repeated saves by pressing the MENU / COPY key as required.

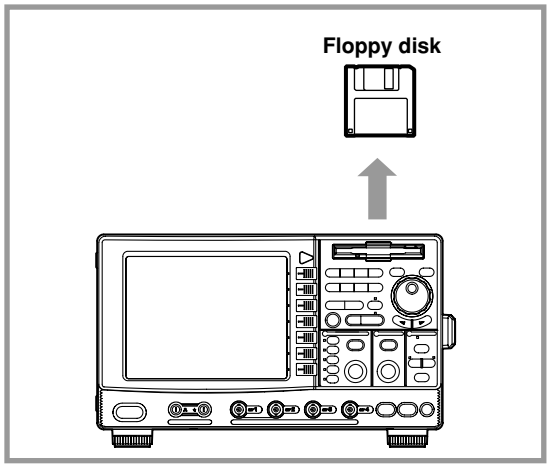
Operation *SHIFT key +* MENU / COPY



Select "File"

Select format for save file

Save to selected disk type



MEMO

If you select the autoname function, the DL7100/DL7200 automatically assigns filenames to your saved files.