DLM2000 Series
Digital Oscilloscope
Mixed Signal Oscilloscope

U S E R ' S   M A N U A L

YOKOGAWA ◆
Yokogawa Test & Measurement Corporation

Thank you for purchasing the DLM2000 Series Digital Oscilloscope/Mixed Signal Oscilloscope. This User's Manual explains how to use the DLM2000. To ensure correct use, please read this manual thoroughly before beginning operation.
Keep this manual in a safe place for quick reference in the event a question arises.

List of Manuals

The following manuals, including this one, are provided as manuals for the DLM2000. Read them along with this manual.

Manual Title	Manual No.	Description
DLM2000 Series Digital Oscilloscope Mixed Signal Oscilloscope Features Guide	IM 710105-01E	The supplied CD contains the PDF file of this manual. The manual explains all the DLM2000 features other than the communication interface features.
DLM2000 Series Digital Oscilloscope Mixed Signal Oscilloscope User's Manual	IM 710105-02E	This manual. The supplied CD contains the PDF file of this manual. The manual explains how to operate the DLM2000.
DLM2000 Series Digital Oscilloscope Mixed Signal Oscilloscope Operation Guide	IM 710105-03E	This guide explains the handling precautions and basic operations of the DLM2000.
DLM2000 Series Digital Oscilloscope Mixed Signal Oscilloscope Communication Interface User's Manual	IM 710105-17E	The supplied CD contains the PDF file of this manual. The manual explains the DLM2000 communication interface features and instructions on how to use them.
DLM2000 Series Digital Oscilloscope Mixed Signal Oscilloscope	IM 710105-92	Document for China

The "E" in the manual number is the language code.

Contact information of Yokogawa offices worldwide is provided on the following sheet.

Document No.	Description
PIM 113-01Z2	List of worldwide contacts

Notes

- The contents of this manual are subject to change without prior notice as a result of continuing improvements to the instrument's performance and functionality. The figures given in this manual may differ from those that actually appear on your screen.
- Every effort has been made in the preparation of this manual to ensure the accuracy of its contents. However, should you have any questions or find any errors, please contact your nearest YOKOGAWA dealer.
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Revisions

- 1st Edition: November 2008
- 2nd Edition: March 2009
- 3rd Edition: February 2010
- 4th Edition: April 2011
- 5th Edition: December 2013
- 6th Edition: August 2014
- 7th Edition: May 2015
- 8th Edition: January 2016
- 9th Edition: October 2016
- 10th Edition: October 2017

DLM Models and Conventions Used in This Manual

Models Explained
This manual explains the DLM2000 series 4-channel models. Channel settings vary depending on the model.

Notes and Cautions
The notes and cautions in this manual are categorized using the following symbols.

Improper handling or use can lead to injury to the user or damage to the instrument. This symbol appears on the instrument to indicate that the user must refer to the user's manual for special instructions. The same symbol appears in the corresponding place in the user's manual to identify those instructions. In the manual, the symbol is used in conjunction with the word "WARNING" or "CAUTION."

WARNING Calls attention to actions or conditions that could cause serious or fatal injury to the user, and precautions that can be taken to prevent such occurrences.

CAUTION Calls attention to actions or conditions that could cause light injury to the user, or cause damage to the instrument or user's data, and precautions that can be taken to prevent such occurrences.

French

AVERTISSEMENT Attire l'attention sur des gestes ou des conditions susceptibles de provoquer des blessures graves (voire mortelles), et sur les précautions de sécurité pouvant prévenir de tels accidents.

ATTENTION Attire l'attention sur des gestes ou des conditions susceptibles de provoquer des blessures légères ou d'endommager l'instrument ou les données de l'utilisateur, et sur les précautions de sécurité susceptibles de prévenir de tels accidents.

Note Calls attention to information that is important for proper operation of the instrument.

Unit

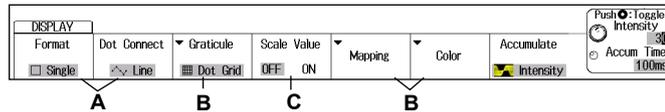|	
k	Denotes 1000. Example: 100 kS/s (sample rate)
K	Denotes 1024. Example: 720 KB (file size)

Key and Jog Shuttle Operations
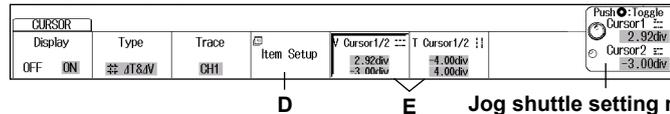
Key Operations

How to Use Setup Menus That Appear When Keys Are Pressed

The operation after you press a key varies depending on the key that you press.
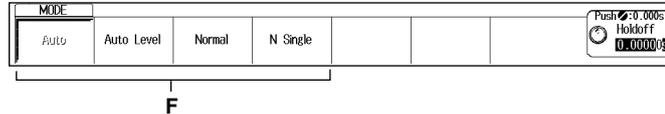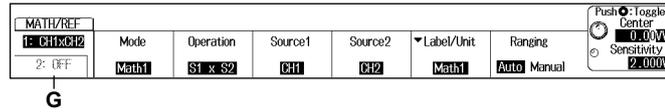
DISPLAY menu

CURSOR menu

MODE menu

MATH/REF menu

A: A selection menu appears when you press the soft key.
   Press the soft key that corresponds to the appropriate setting.

B: A related setup menu appears when you press the soft key.

C: The selected setting switches each time you press the soft key.

D: Displays a dialog box or a keyboard.
   Use the jog shuttle and the SET key (⬤) to set values.

E: Pressing the soft key selects the item that you can control using the jog shuttle.
   The jog shuttle setup menu, which appears at the right end of the setup menu, shows the selected item. Use the SET key to move between digits and set the number.

F: Pressing a key sets the item to the setting that corresponds to that key.

G: Selects which item to configure when configuring a feature that consists of two items that operate with different settings, such as the MATH1 and MATH2 computation features.

How to Display the Setup Menus That Are Written in Purple below the Keys

In the explanations in this manual, "SHIFT+key name (written in purple)" is used to indicate the following operation.

1. Press the **SHIFT** key. The SHIFT key illuminates to indicate that the keys are shifted.
   Now you can select the setup menus written in purple below the keys.

2. Press the key that you want to display the setup menu of.

ESC key operation

- If you press ESC when a setup menu or available options are displayed, the screen returns to the menu level above the current one.
- If you press ESC when the highest level menu is shown, the display changes as follows.

Operation of pressing ESC	When measured values are displayed	When measured values are not displayed
1st time	The setup menu disappears.	
2nd time	Measured values move outside the waveform area.	The jog shuttle setting menu disappears.
3rd time	The jog shuttle setting menu disappears.	
	From this point, the display position of measured values switches between outside the waveform area and inside the area each time you press ESC.	Nothing changes from this point.

Entering Values Using the RESET (⊘) and SET (⬤) Keys

When you use the jog shuttle to set a value, the jog shuttle setup menu shows a RESET key mark or a SET key mark.
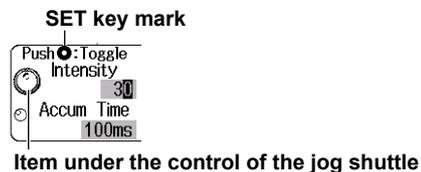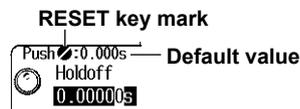
RESET Key Mark

If the RESET key mark is displayed, you can press the RESET key to reset the value to its default value. (The value may not return to its default value depending on the DLM2000 condition.) The default value is displayed next to the RESET key mark.

SET Key Mark

If there are two values that you need to set, the SET key mark appears. Press the SET key to select which value you want to set using the jog shuttle. The jog shuttle mark in front of the selected value is enlarged.

Like when the RESET key mark is displayed, you can press the RESET key to reset the value to its default value.

RESET key mark

Push⊘:0.000s —— **Default value**
Holdoff
0.00000s

SET key mark

Push⬤:Toggle
Intensity
30
Accum Time
100ms

Item under the control of the jog shuttle

How to Enter Values in Setup Dialog Boxes

1. Use the keys to display the appropriate setup dialog box.

2. Use the **jog shuttle** or the **SET** key (⬤) to move the cursor to the appropriate item.

3. Press the **SET** key (⬤). The operation varies depending on the selected item.
   - A setup menu appears.
   - A check box is selected or cleared.
   - The item at the cursor is selected.
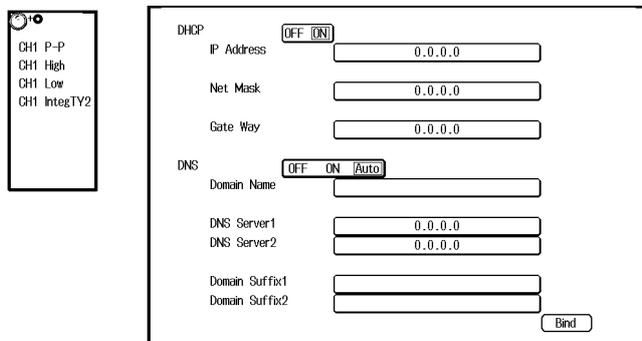
How to Clear Setup Dialog Boxes

Press the **ESC** key to clear the active setup dialog box.

Scroll Operation

If a vertical or horizontal scroll bar is shown on the screen, you can move the SET key up and down or left and write to scroll.

Entering Values and Strings

Entering Values

Using Dedicated Knobs

You can use the following dedicated knobs to enter values directly.

- ♦ POSITION knob (VERTICAL)
- ◀ POSITION ▶ knob (HORIZONTAL)
- SCALE knob (VERTICAL)
- TIME/DIV knob
- LEVEL knob (TRIGGER)
- ZOOM magnification knob
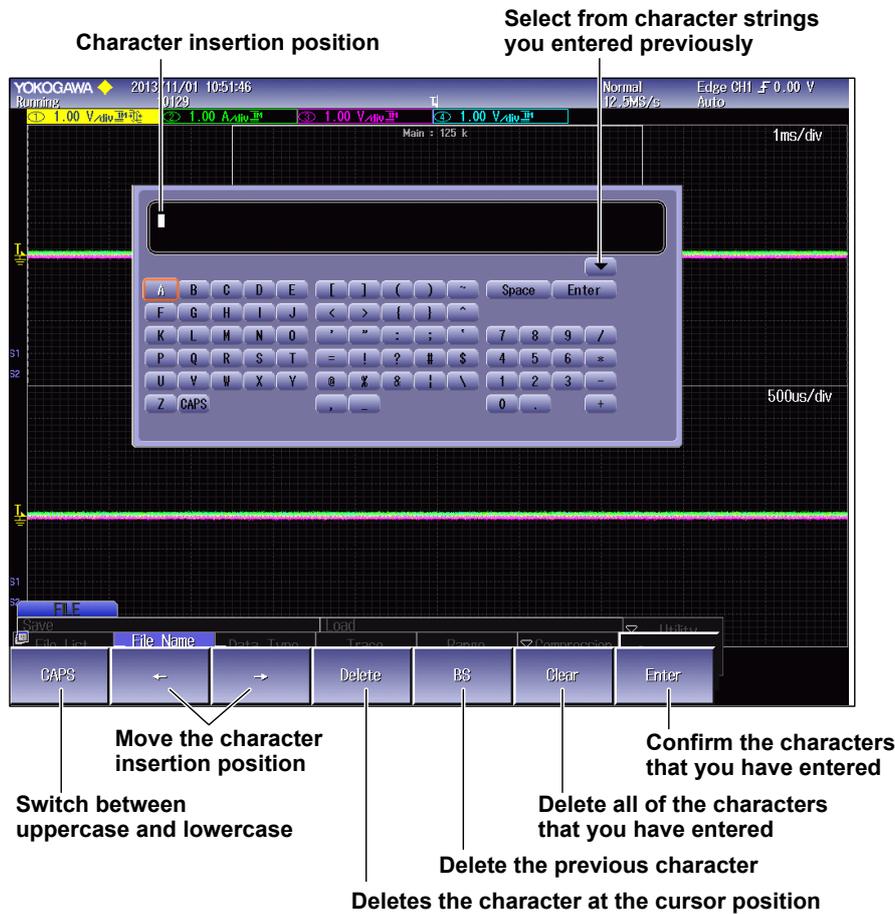
Using the Jog Shuttle

Select the appropriate item using soft keys, and change the value using the jog shuttle and the SET key. This manual sometimes describes this operation simply as "using the jog shuttle."

> *Note*
>
> Some items that you can set using the jog shuttle can be reset to their default values when you press the RESET key.

Entering Character Strings

Use the keyboard that appears on the screen to enter file names and comments. Use the jog shuttle and the SET key to control the keyboard and enter characters.

Character insertion position

Select from character strings you entered previously

Switch between uppercase and lowercase

Move the character insertion position

Deletes the character at the cursor position

Delete the previous character

Delete all of the characters that you have entered

Confirm the characters that you have entered

How to Operate the Keyboard

1. After bringing up the keyboard, use the jog shuttle to move the cursor to the character that you want to enter. You can also move the **SET** key up, down, left, and right to move the cursor.

2. Press the **SET** key to enter the selected character.
   - If a character string is already entered, use the arrow soft keys to move the cursor to the position you want to insert characters into.
   - Use the **CAPS** soft key to switch between uppercase and lowercase.
   - Use the **BS** soft key to delete the previous character.
   - Use the **CLEAR** soft key to clear all the entered characters.

3. Repeat steps 1 and 2 to enter all of the characters in the string.
   Select ⬇ on the keyboard to display a list of character strings that you have entered previously.
   Use the **jog shuttle** to select a character string and press the **SET** key to enter the selected character string.

4. Move the cursor to ENTER on the keyboard and press the **SET** key straight down or press the **ENTER** soft key to confirm the character string and clear the keyboard.

Note

- @ cannot be entered consecutively.
- File names are not case-sensitive. Comments are case-sensitive. The following file names cannot be used due to MS-DOS limitations:
  AUX, CON, PRN, NUL, CLOCK, COM1 to COM9, and LPT1 to LPT9

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Chapter 12 Analyzing and Searching Serial Bus Signals

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Chapter 14 Power Supply Analysis (Power Analysis and Power Measurement, Option)

Chapter 15 Displaying and Searching History Waveforms

Chapter 16 Printing and Saving Screen Captures

Chapter 17 Saving and Loading Data

1.1   Setting the Vertical Axis for Analog Signals

This section explains the following settings (which are related to the vertical axis for analog signals):

CH menu
- Waveform display on and off
- Input coupling
- Probe
- Inverted waveform display on and off
- Linear scaling
- Label display
- Bandwidth
- Offset

UTILITY menu
- Offset cancel on and off

SCALE knob
- Vertical scale

♦ POSITION knob
- Vertical position

► **"Vertical Axis (Analog Signal)" in the Features Guide.**

CH Menu

Press a key from **CH1** to **CH4** to display the following menu.

Switch the waveform display on or off
Set the input coupling
Set the probe attenuation
Switch the inverted waveform display on or off
Set the linear scaling
Set the label display
Set the bandwidth

CH1							Push ⊘:0.0mV
Display	Coupling	▽ Probe	Invert	▽LinearScale	▽ Label	▽Bandwidth	Offset
OFF ON	⊞ DC	1:1	OFF ON	OFF	OFF	Full	0.0mV

**Set the offset
(press RESET to set to 0 V)**
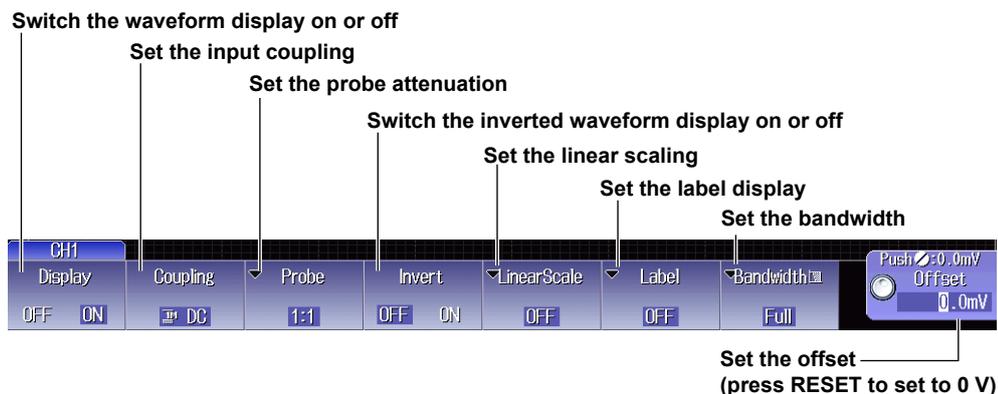
Note
- Channel keys (CH1 to CH4) whose waveforms are displayed are illuminated. You can press channel keys that are not illuminated to turn the waveform display on. You can press channel keys that are illuminated turn the waveform display off.
- When interleave mode (see section 3.1 for details) is on, you cannot display the waveforms for CH2 and CH4.

Setting the Input Coupling (Coupling)

AC: Only displays the waveform produced from the input signal's AC component of the input signal through 1 MΩ.

DC   Displays the waveform produced from both the DC and AC components of the input signal through 1 MΩ.

DC50:   Displays the waveform produced from both the DC and AC components of the input signal through 50 Ω.

GND: Displays the ground level.

Input Coupling Settings and Frequency Response

The frequency response when the DLM2000 is set to AC, DC, or DC50 is shown below.
Please note that when set to AC, the DLM2000 does not acquire low frequency signals or low frequency components, as seen in the following figure.

AC 1 MΩ   **DC 50 Ω or DC 1 MΩ**

Attenuation   Attenuation

0 dB   0 dB
−3 dB   −3 dB

Input frequency 500 MHz*   **Input frequency 500 MHz***

With a 1:1 probe and a frequency less than or equal to 10 Hz
With a 10:1 probe and a frequency less than or equal to 1 Hz
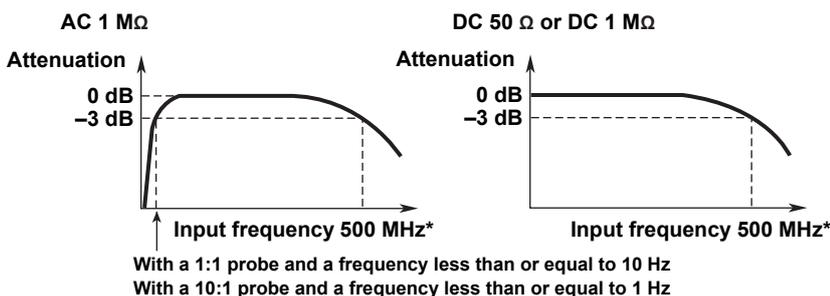
* The high-frequency −3 dB point differs based on the model and the voltage scale settings.

⚠️

CAUTION

- The maximum input voltage for 1 MΩ input is 150 Vrms when the frequency is less than or equal to 1 kHz. Applying a greater voltage may damage the input section. For frequencies above 1 kHz, damage may occur even if the voltage is less than 150 Vrms.
- The maximum input voltage for 50 Ω input is 5 Vrms or 10 Vpeak. Applying voltage greater than either of these limits may damage the input section.
- If the input coupling is AC, in accordance with the frequency response, the input signal is attenuated more in lower frequencies. As a result, even when a high voltage signal is actually applied, it may not be measured as a high voltage signal. Furthermore, the over-range indicator may not be displayed on the screen. As necessary, switch the input coupling to DC to check the input signal voltage.

French

⚠️

ATTENTION

- La tension d'entrée maximale pour une entrée de 1 MΩ est de 150 Vrms lorsque la fréquence est inférieure ou égale à 1 kHz. L'application d'une tension supérieure pourrait endommager la section d'entrée. Si la fréquence est supérieure à 1 kHz, une tension inférieure à 150 Vrms pourra tout de même endommager la section d'entrée.
- La tension d'entrée maximale pour une entrée de 50 Ω est de 5 Vrms ou 10 Vcrête. L'application d'une tension supérieure à l'une de ces limites pourrait endommager la section d'entrée.
- Si le courant du couplage d'entrée est alternatif (CA), conforme à la réponse en fréquence, le signal d'entrée est davantage atténué aux fréquences plus basses. Par conséquent, même si vous appliqué un signal de tension élevée, ce dernier risque de ne pas être mesuré comme tel. De plus, le voyant de dépassement de plage risque de ne pas s'afficher à l'écran. Le cas échéant, basculez le couplage d'entrée sur CC (courant continu) afin de vérifier la tension du signal d'entrée.

Setting the Probe (Probe)

Press the **Probe** soft key to display the following menu.

Set the probe type (voltage and current)

Set the attenuation (set using the jog shuttle)

Execute the automatic zero adjustment of current probes (can only be executed when current probes are connected)

Set the deskew value (set using the jog shuttle)

Execute the demagnetization and automatic zero adjustment of current probes (can only be executed when a YOKOGAWA PBC100 or PBC050 is connected)

Set the attenuation or deskew

Note

When a current probe with YOKOGAWA probe interface (such as a PBC100 or PBC050 probe) is connected to the DLM2000, you can execute demagnetization and automatic zero adjustment from the DLM2000. When you demagnetize and perform automatic zero adjustment on a current probe, do not clamp the conductor. If you demagnetize a current probe while the conductor is clamped, the current that flows through the conductor as a result of demagnetization may damage components of the EUT circuitry.

Setting the Linear Scaling (LinearScale)

Press the **LinearScale** soft key to display the following menu.

Turn linear scaling on or off

Set the unit

Set the scaling coefficient A and offset B
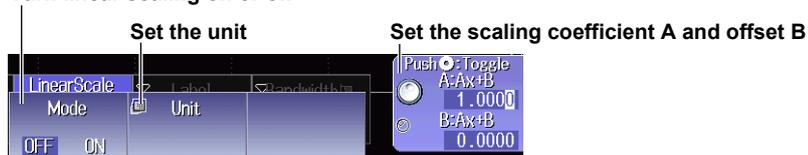
Setting the Label Display (Label)

Press the **Label** soft key to display the following menu.

Turn labels on or off

Set the label

Setting the Bandwidth

Press the **Bandwidth** soft key. The jog shuttle now controls the Bandwidth setting.
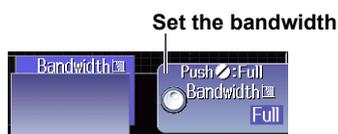
Set the bandwidth

UTILITY Preference Menu

Press **UTILITY**, and then press the **Preference** soft key to display the following menu.

Turn offset cancel on or off
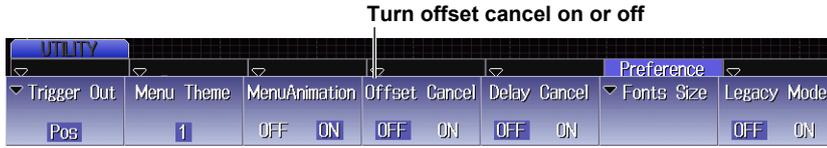
Turning Offset Cancel On or Off (Offset Cancel)

ON: The offset is subtracted from the input signal when cursor measurements, computations, and other operations are performed.

OFF: The offset is not subtracted from the input signal when cursor measurements, computations, and other operations are performed.

Setting the Vertical Scale (SCALE knob)

1. Press one of the keys from **CH1** to **CH4** to select the channel that you want to set the vertical scale for.

   The CH key that you press illuminates brightly.

   The LED between the SCALE and ♦ POSITION knobs illuminates in the color assigned to the selected channel (yellow, green, magenta, or cyan).

2. Turn the **SCALE** knob to set the vertical scale.

   If you push the SCALE knob, the FINE indicator illuminates, and you can set the vertical scale with higher resolution.

   Display the vertical scale and input impedance for each channel

Setting the Waveform Vertical Position (♦ POSITION knob)

1. Press one of the keys from **CH1** to **CH4** to select the channel that you want to set the vertical position for.

   The CH key that you press illuminates brightly.

   The LED between the SCALE and ♦ POSITION knobs illuminates in the color assigned to the selected channel (yellow, green, magenta, or cyan).

2. Turn the ♦ **POSITION** knob to set the vertical position.

   You can set the vertical position to 0 V by pressing the knob.

♦**POSITION knob**

Illuminates in the color assigned to the selected channel

SCALE knob

When the FINE indicator is illuminated, you can set the vertical position with higher resolution. (Press the push knob to turn off the FINE indicator)
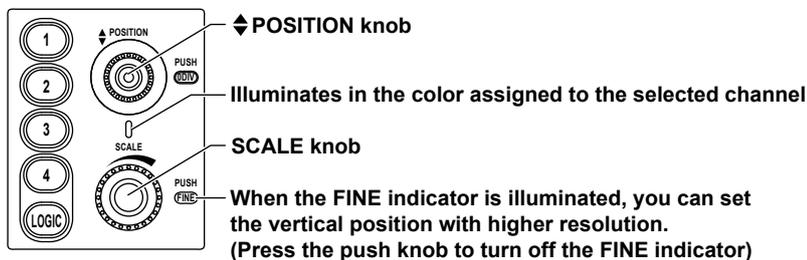
Note

Preview

• If you change the vertical scale when waveform acquisition is stopped, the waveform is displayed expanded or reduced vertically.

• If you change the vertical position when waveform acquisition is stopped, only the waveform display position changes.

1.2 Setting the Vertical Axis for Logic Signals

This section explains the following settings (which are related to the vertical axis for logic signals):

LOGIC menu
- Display on and off, label name, and threshold level for each bit
- Bus display, format, and bit order
- Noise rejection
- Threshold level
- Deskew

SCALE knob
- Display size

⬍ POSITION knob
- Vertical position

► **"Vertical Axis (Logic Signal)" in the Features Guide.**

LOGIC Menu

Press **LOGIC** to display the following menu.

Switch the waveform display on or off

Set each bit

Configure the display

Set the noise rejection (⊼ or ⊼)
(only when using a 701989 logic probe)

Set the threshold level for each bit
(only when using a 701989 logic probe)

Set the threshold level

Set the deskew value

LOGIC							Push⟳:2.50V
Display			Noise Rejection	Threshold Type		Deskew	Level
OFF ON	Bit Setup	Display Setup	⊼ ⊼	All Each	Threshold ⊼	0.00ns	2.50V

Set the threshold level or deskew value
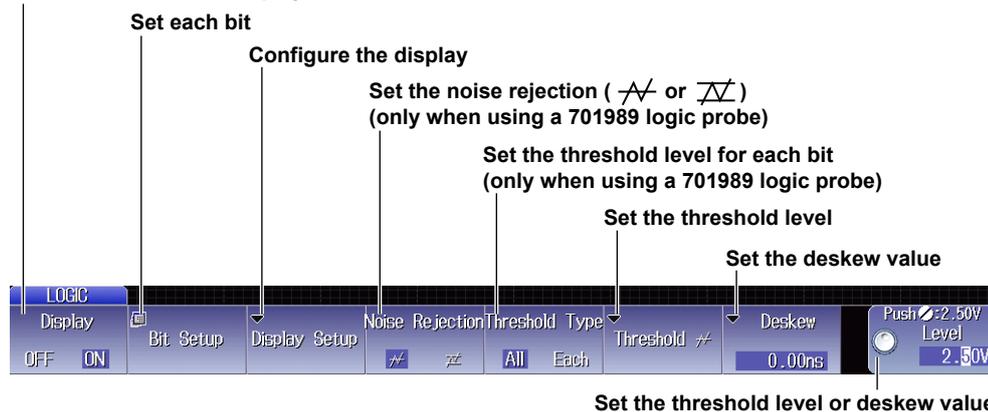
Note
- If the LOGIC key is not illuminated, you can press it to turn the waveform display on. Logic signal waveforms are displayed in the CH4 waveform display area.
- If the LOGIC key is illuminated, you can press it to turn the waveform display off.

Setting the Bits (Bit Setup)

Press the **Bit Setup** soft key to display the following screen.

Turn the display on or off and set the label for each bit

**Set the threshold level
(set each bit when using a 701989 logic probe
and Threshold Type is set to Each)**

Turn on or off the display for all bits

Configuring the Display (Display Setup)

Press the **Display Setup** soft key to display the following screen.

Turn the bus display on or off

Set the format of the bus display (Hex or Bin)

Set the bit order of the bus display

Turn the state display on or off

**Set the clock source of the state display
(CH1 to CH3 or LOGIC)**

Set the polarity of the clock source (ſ, Ł, ſŁ)

**Set the threshold or hysteresis
level of the clock source**

Set the clock source bit

When the clock source is set to LOGIC

Setting the Threshold Level for Each Bit (Threshold Type)

When using a 701989 logic probe, you can select whether or not to set the threshold level for each bit.

All: Specify that all bits have a common threshold level.

Each: Specify that the threshold level for each bit will be set individually.

Note

For models 701980, 701981, and 701988, Threshold Type is fixed to All.

Setting the Threshold Level (Threshold)

You can select the threshold level from one of the following presets. You can also use the jog shuttle to change the threshold level.

CMOS(5 V), CMOS(3.3 V), CMOS(2.5 V), CMOS(1.8 V), and ECL

Depending on the probe you are using and the Threshold Type, the setup menu differs as follows.

When Using a 701989 Logic Probe with Threshold Type Set to Each

Specify the bit that you want to set the threshold level for

Set the threshold level for each bit

When Using a 701989 Logic Probe with Threshold Type Set to All and Other Logic Probes

Set the common threshold level for all bits

Deskew (Deskew)

Set the adjustment values for the time offsets (skew) between the logic signal and other signals, which are caused by the use of different types of probes. Deskewing is performed on all eight bits collectively.

Setting the Display Size (SCALE knob)

1. Press **LOGIC**, the SCALE knob now controls the LOGIC setting.
   The LOGIC key illuminates brightly.
   The LED between the SCALE and ⬦ POSITION knobs illuminates in the color assigned to the LOGIC channel (cyan).

2. Turn the **SCALE** knob to set the display size.

Setting the Vertical Position (⬦ POSITION knob)

1. Press **LOGIC**, the ⬦ POSITION knob now controls the LOGIC setting.
   The LOGIC key illuminates brightly.
   The LED between the SCALE and ⬦ POSITION knobs illuminates in the color assigned to the LOGIC channel (cyan).

2. Turn the ⬦ **POSITION** knob to set the vertical position.

⬦ POSITION knob

Illuminates in the color assigned to the LOGIC channel (cyan)

SCALE knob
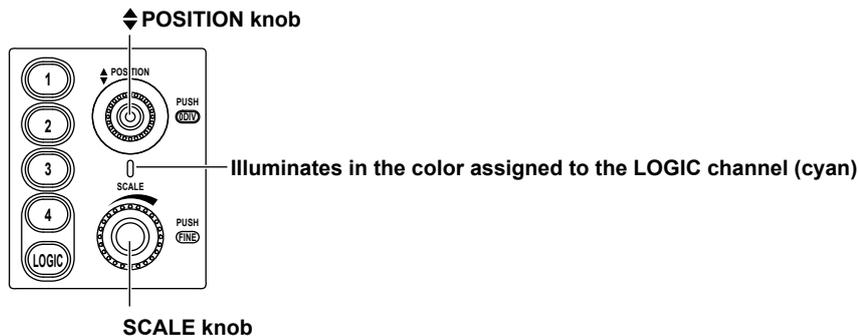
1.3   Setting the Horizontal Axis (Time Axis)

Set the time per grid (1 division) displayed on the screen.

Turn the **TIME/DIV** knob to set the value.

If you change the TIME/DIV setting while waveform acquisition is stopped, the waveform is displayed expanded or reduced along the time axis.

► **"Horizontal Axis (Time Axis)" in the Features Guide.**

See section 2.2

TIME/DIV knob
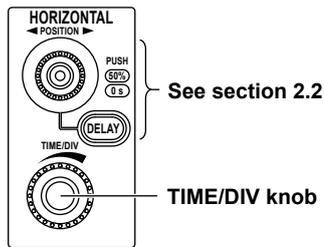
2.1   Setting the Trigger Mode and Trigger Hold-off Time

This section explains the following settings (which are used when updating the displayed waveform):

- Trigger mode
- Hold-off time

► **"Trigger Mode (Trigger Mode)" and "Trigger Hold-off (Holdoff)" in the Features Guide**

MODE Menu

Press **MODE** to display the following menu.

Set the trigger mode   **Set the hold-off time**

When you select N Single

Set the number of waveforms to acquire
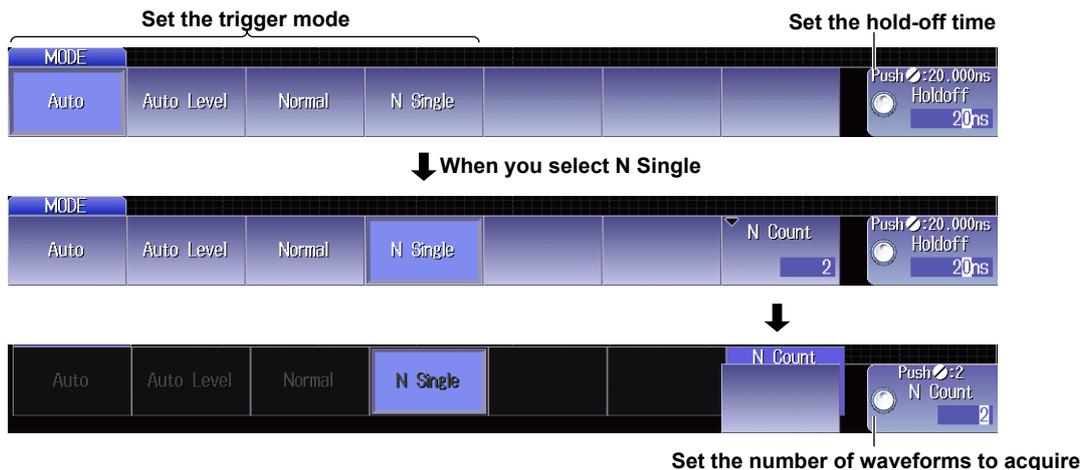
Setting the Trigger Mode (Mode)

Auto: If the trigger conditions are met within 100 ms, the DLM2000 updates the displayed waveforms on each trigger occurrence. If not, the DLM2000 automatically updates the displayed waveforms. If the time axis is set to a value that causes the display to switch to roll mode, roll mode display will be enabled.

Auto Level: If a trigger occurs before a timeout, the DLM2000 updates the waveform in the same way that it does in Auto mode. If a trigger does not occur before a timeout, the DLM2000 automatically changes the trigger level to the center value of the trigger source amplitude, triggers on that value, and updates the displayed waveform.

Normal: The DLM2000 only updates the waveform display when the trigger conditions are met.

N Single: The DLM2000 acquires signals each time the trigger conditions are met until a specified number of signals have been acquired, and then displays all of the acquired signals.

Note
Press any of the trigger mode soft keys to execute waveform acquisition in the selected trigger mode.
Single Mode
There is also a Single trigger mode in which the DLM2000 updates the displayed waveform once and stops signal acquisition when the trigger conditions are met. Press SINGLE on the front panel to execute Single Mode waveform acquisition.

Setting the Hold-off Time (Holdoff)

The trigger hold-off feature temporarily stops the detection of the next trigger once a trigger has occurred.

Note
Trigger hold-off cannot be used when the serial bus trigger's SENT trigger is set or is in use.

2.2 Setting the Trigger Position and Trigger Delay

This section explains the following settings (which are used when updating the displayed waveform):

- Trigger position
- Trigger delay
- Delay cancel

► **"Trigger Position (POSITION knob)," "Trigger Delay (DELAY),"**
and "Delay Cancel (Delay Cancel)"
in the Features Guide

Setting the Trigger Position (◄ POSITION ► knob)

1. Turn the ◄ **POSITION** ► knob to set the trigger position.

The specified trigger position is shown at the top of the display during operation.

The display disappears approximately 3 seconds after the last operation.

* You can set the trigger position even when waveforms are not being acquired.

Setting the Trigger Delay (DELAY)

1. Press **DELAY**.

The DELAY key illuminates.

2. Turn the ◄ **POSITION** ► knob to set the trigger delay.

The specified trigger delay is shown at the top of the display during operation.

The display disappears approximately 3 seconds after the last operation.

* You can set the trigger delay even when waveforms are not being acquired.

3. Press **DELAY** key again.

The DELAY key turns off, and you can set the trigger position.

Turning Delay Cancel On or Off (Delay Cancel)

Press **UTILITY**, and then press the **Preference** soft key to display the following menu.

Turn delay cancel on or off

You can select whether or not to apply the specified trigger delay to the time measurement values.

ON: The DLM2000 measures time values by setting the trigger position to 0 s (the delay is not applied to time measurement values).

OFF: The DLM2000 measures time values by setting the trigger point to 0 s (the delay is applied to time measurement values).

2.3 Triggering on an Edge Trigger

This section explains the following settings (which are used when triggering on trigger source edges):
- Trigger source
  Source bit, trigger level, trigger slope, trigger coupling, HF rejection, and noise rejection
- Window comparator
- Probe attenuation
- Input range
  ► **"EDGE Trigger [EDGE]," "Trigger Source (Source)," "Trigger Slope (Slope/Polarity),"**
  "Trigger Coupling (Coupling)," "HF Rejection (HF Rejection),"
  "Noise Rejection (Noise Rejection)," "Window Comparator (Window)," and
  "Trigger Level (Level)" in the Features Guide

EDGE Menu

Press **EDGE** to open one of the menus shown below. The menu that appears varies depending on the specified trigger source.

When the Trigger Source Is Set to a Channel from CH1 to CH4

When the Window Comparator Is Off

Set the trigger source (CH1 to CH4)
Set the trigger slope (⌐ or ⌐)
Set the trigger coupling (AC or DC)
Set the HF rejection (OFF, 20 MHz, or 15 kHz)
Set the noise rejection (⌐ or ⌐)
Set the window comparator (OFF)
Set the trigger level

EDGE							Push ◊:0mV
Source	Slope	Coupling	HF Rejection	Noise Rejection		Window	CH1 Level
CH1	⌐ ⌐	AC DC	OFF	⌐ ⌐		OFF ON	0mV

When the Window Comparator Is On

Set the trigger source (CH1 to CH4)
Set the trigger slope IN/OUT (⌐ or ⌐)
Set the trigger coupling (AC or DC)
Set the HF rejection (OFF, 20 MHz, or 15 kHz)
Set the noise rejection (⌐ or ⌐)
Set the window comparator (ON)
Set the window center point

EDGE							Push ◊:Toggle
Source	Polarity	Coupling	HF Rejection	Noise Rejection		Window	CH1 Center
CH1	⌐ ⌐	AC DC	OFF	⌐ ⌐		OFF ON	0mV
							Width
							0.50V

Set the window width

When the Trigger Source Is LOGIC (On models with the logic signal input port)

Set the trigger source (LOGIC)

Set the trigger slope (ꓝ or ꓶ)

Set the source bit (Bit0 to Bit7)

EDGE
Source   Slope
LOGIC   ꓝ   ꓶ

Push ●:Toggle
Source Bit
Bit0
Level
2.50V

Set the source bit trigger level

When the Trigger Source Is EXT (External trigger signal)

On 4-Channel Models

Set the trigger source (EXT)

Set the trigger slope (ꓝ or ꓶ)

Set the probe attenuation (1:1 or 10:1)

Set the trigger level

EDGE
Source   Slope   Probe
EXT   ꓝ   ꓶ   1:1   10:1

Push ⊘:0.000V
Ext Level
0.000V

On 2-Channel Models

Set the trigger source (EXT)

Set the trigger slope (ꓝ or ꓶ)

Set the probe attenuation (1:1 or 10:1)

Set the input range (±1 V, or ±10 V)

Set the trigger level

EDGE
Source   Slope   Probe   Range
EXT   ꓝ   ꓶ   1:1   10:1   ±1V   ±10V

Push ⊘:0.000V
Ext Level
0.000V
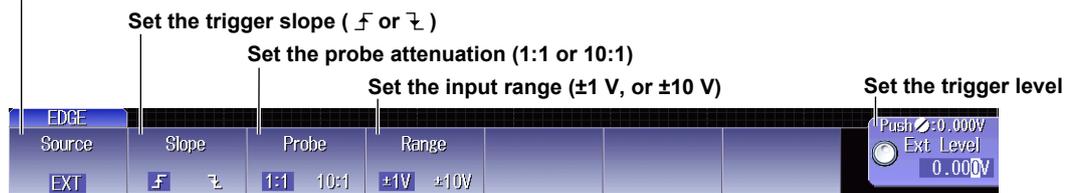
Input Range (Range)

When you set the trigger source to EXT on a 2-channel model, set the input range.

The selectable ranges vary depending on the probe attenuation setting.

1:1:   ±1 V or ±10 V

10:1:   ±10 V or ±100 V

When the Trigger Source Is LINE (the DLM2000 power source)

Set the trigger source (LINE)

EDGE
Source
LINE

2.4   Triggering on the OR of Multiple Edge Triggers

This section explains the following settings (which are used when triggering on the logical OR of multiple edge triggers):
- Trigger source
  Trigger level, trigger scope, trigger coupling, HF rejection, noise rejection
- Window comparator

► **"Edge OR Trigger [ENHANCED]" in the Features Guide**

ENHANCED Edge OR Menu

Press **ENHANCED** and then the **Type** soft key. From the setup menu that appears, select **Edge OR** to display the following menu.

Set the trigger type to Edge OR

Select the trigger slope or select to not use the channel as a trigger source
- Select ⌐, ⌐, or X when the window comparator is off
- Select ⌐, ⌐, or X when the window comparator is on

Set the trigger coupling, HF rejection, noise rejection, and the window comparator

Set the trigger level

Set the window center point

This appears when the window comparator is on.

Set the window width

Setting the Level and Coupling for Trigger Coupling, HF Rejection, Noise Rejection, and the Window Comparator

Press the **Level/Coupling** soft key to display the following menu.

Set each channel separately (CH1 to CH4)

Set all channels at the same time

Set the trigger level

Set the trigger coupling (AC or DC)

This appears when the window comparator is on.

Set the HF rejection (OFF, 20 MHz, or 15 kHz)

Turn the window comparator on or off

Set the noise rejection

Set the window width
Set the window center point

Applying Settings to All Channels

Press the **All** soft key to display the following menu.

For details on setting trigger coupling, HF rejection, noise rejection, trigger level, and the window comparator. ► the previous menu

Set all the channels at the same time

When the window comparator is on, use this to set the window width and the window center point.

2.5   Triggering on Edge Conditions

This section explains the following settings (which are used when triggering on an edge condition):
- Trigger source
  Trigger level
- Qualification
  Level used to detect signal states
- Logic combination
- Trigger condition

► **"Edge Qualified Trigger [ENHANCED]" in the Features Guide**

ENHANCED Edge Qualified Menu

Press **ENHANCED** and then the **Type** soft key. From the setup menu that appears, select **Edge Qualified** to display the following menu.
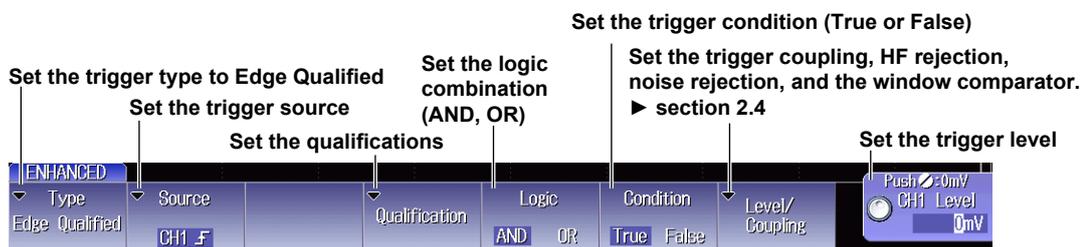
Set the trigger condition (True or False)

Set the trigger type to Edge Qualified

Set the logic combination (AND, OR)

Set the trigger coupling, HF rejection, noise rejection, and the window comparator. ► section 2.4

Set the trigger source

Set the qualifications

Set the trigger level

Setting the Trigger Source (Source)

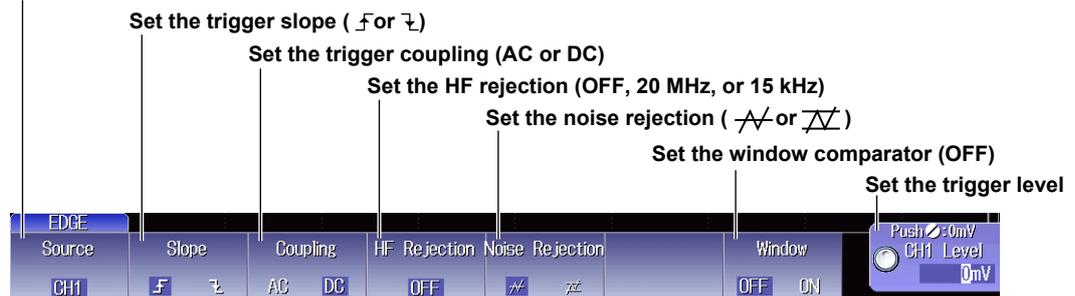Press the **Source** soft key to open one of the menus shown below. The menu that appears varies depending on the specified trigger source.

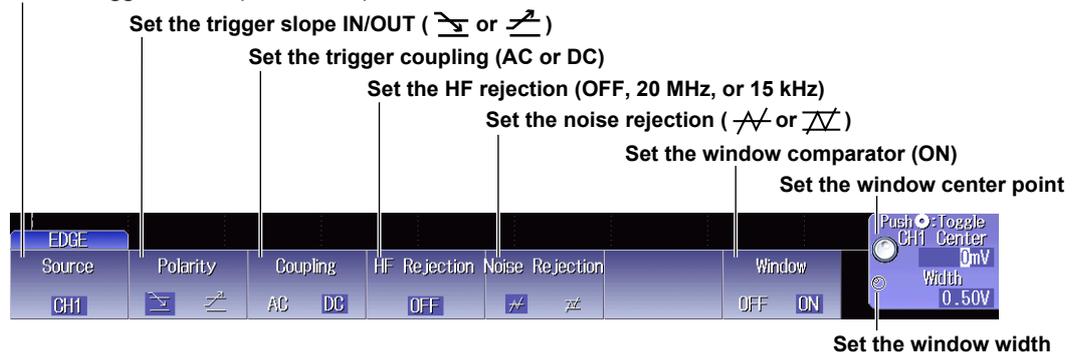### When the Trigger Source Is Set to a Channel from CH1 to CH4

Set the trigger source (CH1 to CH4)

Set trigger coupling, HF rejection, noise rejection, trigger labels, the trigger slope, and the window comparator. ► section 2.3

When the Trigger Source Is LOGIC (On models with the logic signal input port)

Set the trigger source (LOGIC)

Set the trigger slope, source bit, and trigger level. ► section 2.3

When the Trigger Source Is EXT (External trigger signal)

Set the trigger source (EXT)

Set the trigger slope, probe attenuation, input range, and trigger level. ► section 2.3
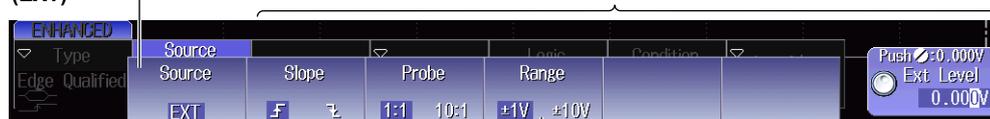
Set the input range, this option only appears on 2-channel models

Setting the Qualifications (Qualification)

Press the **Qualification** soft key to open one of the menus shown below. The menu that appears varies depending on the specified trigger source.

When the Trigger Source Is Set to a Channel from CH1 to CH4

Set the trigger slope for the trigger source signal
- Select ⌐ or ⌐ when the window comparator is off
- Select ⌐ or ⌐ when the window comparator is on

Set qualifications for signals other than the trigger source
- Select H, L, or X when the window comparator is off
- Select IN, OUT, or X when the window comparator is on

On models with the logic signal input port ⬇

Set the level used to detect each signal's slope, H, L, IN, and OUT states

When the Trigger Source Is LOGIC (On models with the logic signal input port)

Set qualifications for signals other than the trigger source
- Select H, L, or X when the window comparator is off
- Select IN, OUT, or X when the window comparator is on

On models with the logic signal input port ⬇

Set the level used to detect each signal's slope, H, L, IN, and OUT states

Set the source bit (Bit0 to Bit7)

Set the trigger slope for the trigger source signal (⌐ or ⌐)

When the Trigger Source Is EXT (External trigger signal)

The same menu appears as that shown above for when the trigger source is set to a channel from CH1 to CH4. Because the trigger source is an external signal (EXT), you can specify all of the signal states from CH1 to CH4 and LOGIC as qualifications.

2.6   Triggering on State Conditions

This section explains the following settings (which are used when triggering on state conditions):
- State condition
  Level used to detect the clock sources and signal states
- Logic combination
- Trigger condition

ENHANCED State Menu

Press **ENHANCED** and then the **Type** soft key. From the setup menu that appears, select **State** to display the following menu.

Set the trigger type to State

Set the state conditions

Set the logic combination (AND, OR)

Set the trigger condition (Enter or Exit)

Set the trigger coupling, HF rejection, noise rejection, and the window comparator.
► section 2.4

Setting the State Conditions (State)

Press the **State** soft key to open one of the menus shown below. The menu that appears varies depending on the specified clock source.

When the Clock Source Is Set to a Channel from CH1 to CH4

Set the slope for the clock source signal
- Select ⌐ or ⌐ when the window comparator is off
- Select ⌐ or ⌐ when the window comparator is on

Set the state conditions for signals other than the clock source
- Select H, L, or X when the window comparator is off
- Select IN, OUT, or X when the window comparator is on

Set the clock source (CH1 to CH4)

On models with the logic signal input port

Set the level used to detect each signal's slope, H, L, IN, and OUT states

When the Clock Source Is LOGIC (On models with the logic signal input port)

Set the clock source
(LOGIC)

Set the state conditions for signals other than the clock source
• Select H, L, or X when the window comparator is off
• Select IN, OUT, or X when the window comparator is on

On models with the logic signal input port ⬇

Set the source bit (Bit0 to Bit7)

Set the slope for the clock source
signal (⌐ or ⌐)

Set the level used
to detect each
signal's slope, H, L,
IN, and OUT states

No Clock Source

Set the clock source (X)

Set the level used to detect the state condition
and each signal's, H, L, IN, and OUT states

The same menu appears as that shown on the previous page for when the clock source is set to a channel from CH1 to CH4. Because there is no clock source, you can specify all of the signal states from CH1 to CH4 and LOGIC as state conditions.

2.7 Triggering on Pulse Width

This section explains the following settings (which are used when triggering on pulse width):
- Trigger source
  Polarity
- Time width mode
  Reference time

► **"Pulse Width Trigger [ENHANCED]" in the Features Guide**

ENHANCED Pulse Width Menu

Press **ENHANCED** and then the **Type** soft key. From the setup menu that appears, select **Pulse Width** to display the following menu.

Set the trigger type to Pulse Width
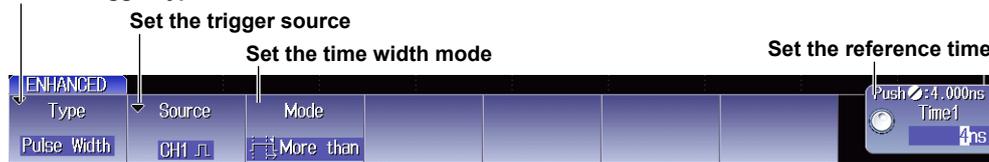
Set the trigger source

Set the time width mode

Set the reference time

Setting the Trigger Source (Source)

Press the **Source** soft key to open one of the menus shown below. The menu that appears varies depending on the specified trigger source.

When the Trigger Source Is Set to a Channel from CH1 to CH4

Set the polarity
- **Select ⊓ or ⊔ when the window comparator is off**
- **Select IN or OUT when the window comparator is on**

Set the trigger source (CH1 to CH4)

Set trigger coupling, HF rejection, noise rejection, trigger labels, and the window comparator. ► section 2.3
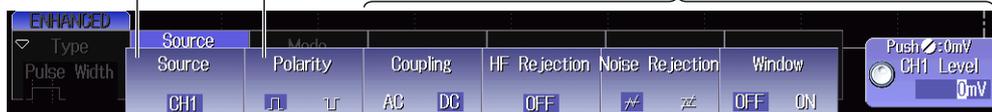
When the Trigger Source Is LOGIC (On models with the logic signal input port)

Set the trigger source (LOGIC)

Set the polarity (⊓ or ⊔)

Set the source bit (Bit0 to Bit7)

Set the source bit trigger level
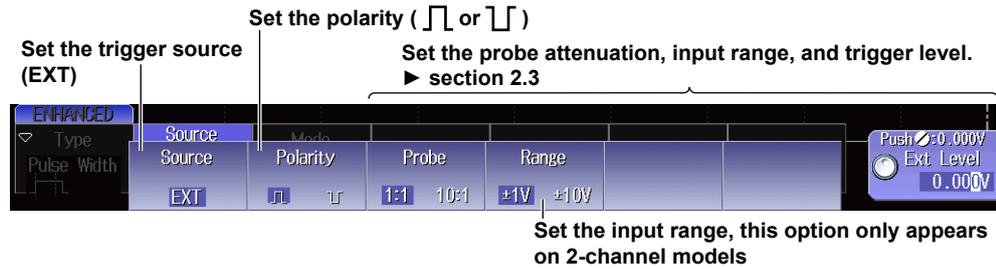
When the Trigger Source Is EXT (External trigger signal)

Set the polarity (⊓ or ⊔)

Set the trigger source (EXT)

Set the probe attenuation, input range, and trigger level.
► section 2.3

Set the input range, this option only appears on 2-channel models

Setting the Time Width Mode (Mode)

Press the **Mode** soft key to display the following menu.

Set what kind of relationship must be established between the trigger source's pulse width and the specified reference times (Time1 and Time2) for the DLM2000 to trigger.

More than: When the pulse width is longer than the reference time specified by Time1
Less than: When the pulse width is shorter than the reference time specified by Time1
Between: When the pulse width is longer than Time1 but shorter than Time2
OutOfRange: When the pulse width is shorter than Time1 or longer than Time2
Time Out: When the pulse width is longer than the reference time specified by Time1

Setting the Reference Times (Time1 and Time2)

When Time Width Mode Is More than, Less than, or Time Out

Set the reference time specified by Time1

When Time Width Mode Is Between or OutOfRange

Set the reference times specified by Time1 and Time2

2.8 Triggering on State Width

This section explains the following settings (which are used when triggering on pulse width):
- State condition
 Level used to detect the clock sources and signal states
- Logic combination
- Trigger condition
- Time width mode
  Reference time

► **"State Width Trigger [ENHANCED]" in the Features Guide**

ENHANCED State Width Menu

Press **ENHANCED** and then the **Type** soft key. From the setup menu that appears, select **State Width** to display the following menu.

Set the trigger type to State Width

Set the state conditions

Set the logic combination (AND, OR)

Set the trigger condition (True or False)

Set the trigger coupling, HF rejection, noise rejection, and the window comparator.
► section 2.4

Set the time width mode

Set the reference time

Setting the State Conditions (State)

Press the **State** soft key to open one of the menus shown below. The menu that appears varies depending on the specified clock source.

When the Clock Source Is Set to a Channel from CH1 to CH4

Set the slope for the clock source signal
- Select ⌐ or ⌐ when the window comparator is off
- Select ⌐ or ⌐ when the window comparator is on

Set the state conditions for signals other than the clock source
- Select H, L, or X when the window comparator is off
- Select IN, OUT, or X when the window comparator is on

Set the clock source (CH1 to CH4)

On models with the logic signal input port ⬇

Set the level used to detect each signal's slope, H, L, IN, and OUT states

When the Clock Source Is LOGIC (On models with the logic signal input port)

Set the state conditions for signals other than the clock source
• Select H, L, or X when the window comparator is off
• Select IN, OUT, or X when the window comparator is on

Set the clock source
(LOGIC)

On models with the logic signal input port ⬇

Set the level used to detect each signal's slope, H, L, IN, and OUT states

Set the source bit (Bit0 to Bit7)

Set the slope for the clock source signal (⌐ or ⌐)

No Clock Source

Set the clock source (X)

Set the level used to detect the state condition and each signal's , H, L, IN, and OUT states

The same menu appears as that shown on the previous page for when the clock source is set to a channel from CH1 to CH4. Because there is no clock source, you can specify all of the signal states from CH1 to CH4 and LOGIC as state conditions.

Setting the Time Width Mode (Mode)

Press the **Mode** soft key to display the following menu.

Set what kind of relationship between the length of time the state condition is met or not met and the specified reference times (Time1 and Time2) will cause the DLM2000 to trigger.

More than: When the period during which the state condition is met or not met is longer than the reference time specified by Time1 and the condition changes

Less than: When the period during which the state condition is met or not met is shorter than the reference time specified by Time1 and the condition changes

Between: When the period during which the state condition is met or not met is longer than Time1 but shorter than Time2 and the condition changes

OutOfRange: When the period during which the state condition is met or not met is shorter than Time1 or longer than Time2 and the condition changes

Time Out: When the period during which the state condition is met or not met is longer than the reference time specified by Time1

Setting the Reference Times (Time1 and Time2)

When Time Width Mode Is More than, Less than, or Time Out

Set the reference time specified by Time1

When Time Width Mode Is Between or OutOfRange

Set the reference times specified by Time1 and Time2
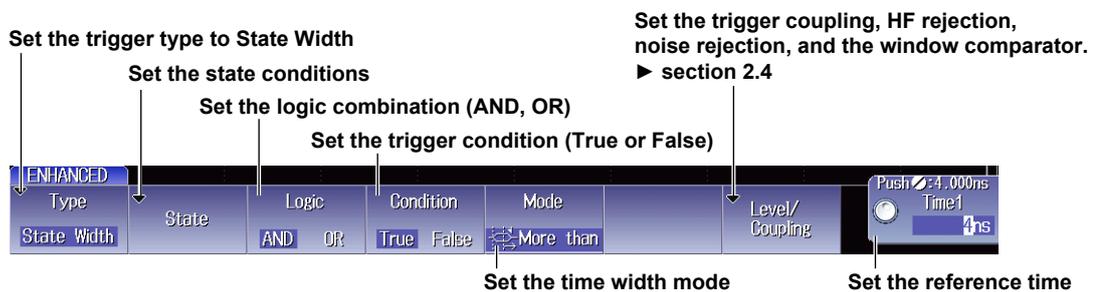
2.9 Triggering on CAN Bus Signals (Option)

This section explains the following settings (which are used when triggering on CAN bus signals):
- Trigger source
  Bit rate, recessive level, sample point, and the level used to detect the source state
- Trigger type
  Trigger condition

► **"CAN Bus Trigger [ENHANCED, option]" in the Features Guide**

Auto Setup

The DLM2000 can automatically set the trigger source level and bit rate from the received CAN bus signal and trigger on them. For more details, see section 12.1.

CAN Menu

Press **ENHANCED** and then the **Type** soft key. From the setup menu that appears, select **CAN** to display the following menu.
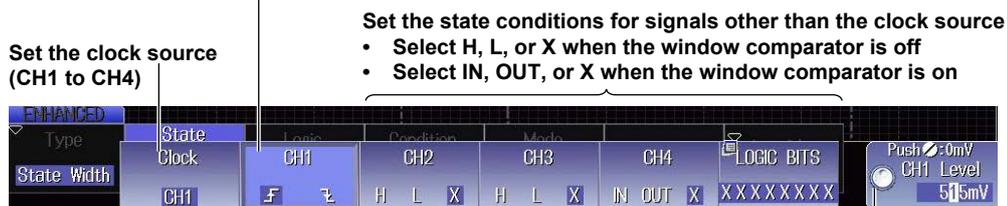
Set the trigger type to CAN
Set the trigger source
Set the trigger type
Set the level used to detect source states

Setting the Trigger Source (Source)

Press the **Source** soft key to display the following menu.

Set the bit rate (33.3 kbps, 83.3 kbps, 125 kbps, 250 kbps, 500 kbps, 1 Mbps, or User Define)
Set the recessive level (H or L)
Set trigger coupling, HF rejection, and noise rejection. ► section 2.3
Set the trigger source (CH1 to CH4)
Set the sample point

Set the bit rate

This appears when you set the bit rate to User Define.

Set the sample point

Trigger Type (Mode)

Press the **Mode** soft key to display the following menu.

SOF mode
Error mode
ID/Data mode
ID OR mode
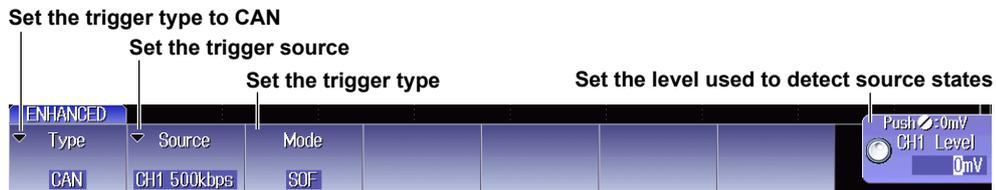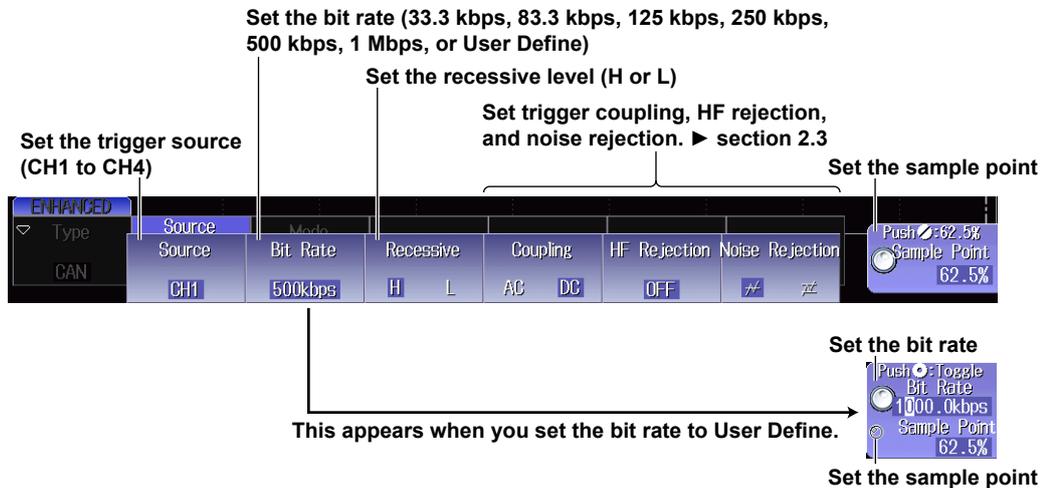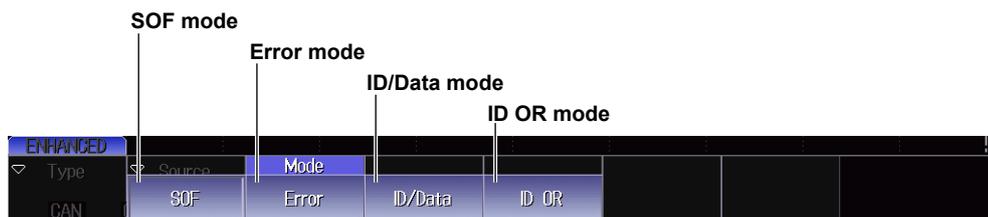
SOF (Start of Frame) Mode

Press the **SOF** soft key.

The DLM2000 triggers on the start of CAN bus signal frames.

Error Mode (Error)

Press the **Error** soft key and then the **Error Type Or** soft key to display the following menu.

Turn error detection on or off for Error Frame, Stuff, and CRC errors
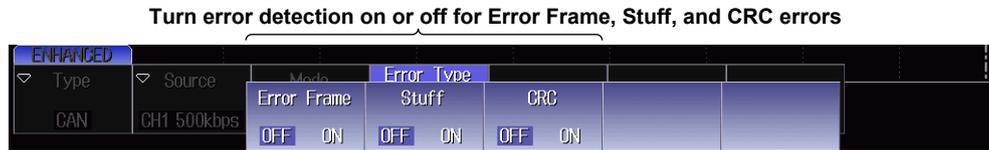
The DLM2000 triggers on error frames (when the error flag is active) or when it detects various errors.

ID/Data Mode (ID/Data)

Press the **ID/Data** soft key to display the following menu.

Set the trigger conditions

Setting Trigger Conditions (Condition Setup)

Press the **Condition Setup** soft key to display the following screen.

The DLM2000 triggers on the AND of SOF, ID, frame type (Remote Frame or Data Frame), Data, and ACK. Items whose check boxes are selected are used as trigger conditions.

- **When the Comparison Condition Is True or False**

- **When the Comparison Condition Is Data = a; Data ≠ a; a ≤ Data; Data ≤ b; a ≤ Data ≤ b; or Data < a, b < Data**

Set the frame format

SOF (always selected)

Set the ID input format
(See the next section for details
about the display after you select Message)

Set the ID bit pattern

If you select Extend for the frame format, 29 bits are displayed here

Set the trigger source frame

Set the data length for the data field

Set the comparison condition
("Data = a" is selected in this example.)

Set data reference values a and b

Set the bit positions of the most
significant bit (MSB) and the least
significant bit (LSB) in the data that
you will compare

Set whether to use a signed (Sign)
or unsigned (Unsign) data format

Set the byte order

Set the ACK slot state

- **When ID Input Format Is Message**

SOF (always selected)

Set the ID input format
("Message" is selected in this example.)

Select an ID from the message list
in the loaded physical value/symbol
definition file (.sbl)

Select a data item from the signal list
in the loaded physical value/symbol
definition file (.sbl)

Set the comparison condition
("Data = a" is selected in this example.)

Set data reference values a and b

ID OR Mode (ID OR)

Press the **ID OR** soft key to display the following menu.

Set the trigger conditions

Setting Trigger Conditions (Condition Setup)

Press the **Condition Setup** soft key to display the following screen.

The DLM2000 triggers on the AND of SOF, frame type (Remote Frame or Data Frame), ACK, and one of the four IDs. Items whose check boxes are selected are used as trigger conditions.

- **When ID Input Format Is Bin or Hex**

Set the frame format

SOF (always selected)

Set the ID input format
(See the next section for details about the display after you select Message)

Set the ID bit pattern

If you select Extend for the frame format, 29 bits are displayed for each ID

Set the trigger source frame

Set the ACK slot state

- **When ID Input Format Is Message**

SOF (always selected)

Set the ID input format
("Message" is selected in this example.)

Select IDs from the list of messages loaded from the physical value/symbol definition file (.sbl)

2.10　Triggering on CAN FD Bus Signals (Option)

This section explains the following settings for triggering on CAN FD bus signals.
- Trigger source
  Bit rate, data bit rate, recessive level, sample point, and the level used to detect the source state
- Trigger type
  Trigger condition

► **"CAN FD Bus Trigger [ENHANCED, option]" in the Features Guide**

Auto Setup

The DLM2000 can automatically set the trigger source level and bit rate from the received CAN FD bus signal and trigger on them. For details, see section 12.2.

CAN FD Menu

Press **ENHANCED** and then the **Type** soft key. From the setup menu that appears, select **CAN FD** to display the following menu.

Set the trigger type to CAN FD

Set the trigger source

Set the trigger type

Set the level used to detect source states

ENHANCED					
▽ Type	▽ Source	Mode			Push ◉:0.00V
CAN FD	CH1 500kbps /1Mbps	SOF			◉ CH1 Level 0.00V

Setting the Trigger Source (Source)

Press the **Source** soft key to display the following menu.

Set the trigger source (CH1 to CH4)

Set the bit rate

Set the data bit rate

Set the recessive level (H or L)

Set trigger coupling, HF rejection, and noise rejection. ► section 2.3

ENHANCED						
Source	▽ Bit Rate	▽ Data BitRate	Recessive	Coupling	HF Rejection	NoiseRejection
CH1	500kbps 62.5%	1Mbps 62.5%	H L	AC DC	OFF	⟋ ⟋⟋
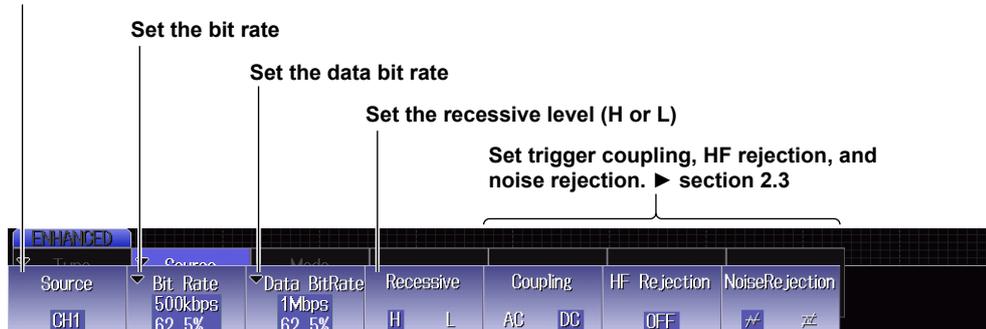
Setting the Bit Rate (Bit Rate)

Press the **Bit Rate** soft key to display the following menu.

Set the bit rate (250 kbps, 500 kbps, 1 Mbps, or User Define)

Set the sample point

ENHANCED						
▽ Type	Source	Mode				Push ◉:62.5%
Source	▽ Bit Rate	▽Data BitRate	Recessive	Coupling	HF Rejection	NoiseRejection
CH1	Bit Rate 500kbps					◉ Sample Point 62.5%

This appears when you set the bit rate to User Define.

Set the bit rate

Push ◉:Toggle
Bit Rate
◉ 1000.0kbps
◉ Sample Point 62.5%

Set the sample point
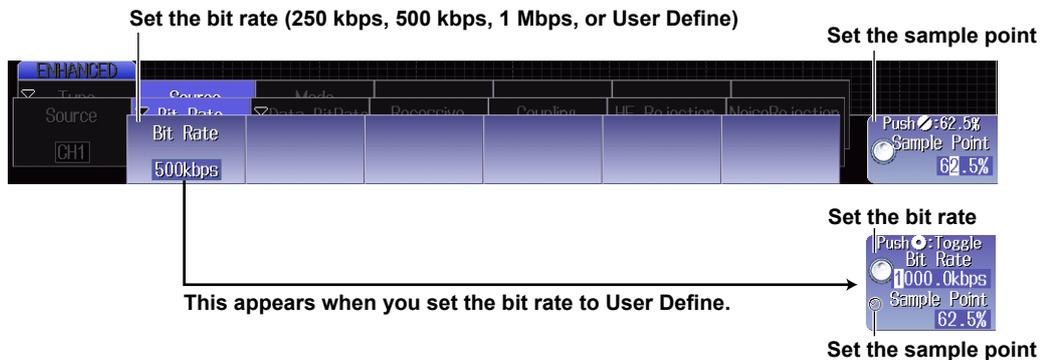
Setting the Data Bit Rate (Data BitRate)

Press the **Data BitRate** soft key to display the following menu.
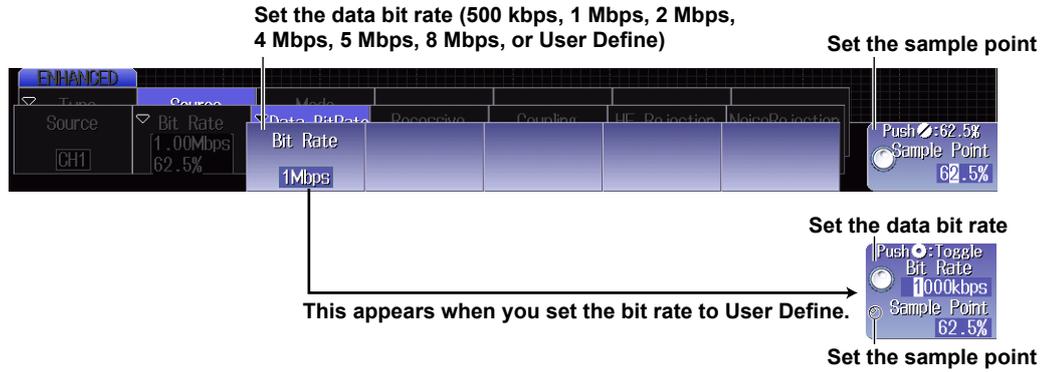
Set the data bit rate (500 kbps, 1 Mbps, 2 Mbps, 4 Mbps, 5 Mbps, 8 Mbps, or User Define)

Set the sample point

This appears when you set the bit rate to User Define.

Set the data bit rate

Set the sample point

Trigger Type (Mode)

Press the **Mode** soft key to display the following menu.

SOF mode

Error Frame mode

ID mode

ID OR mode
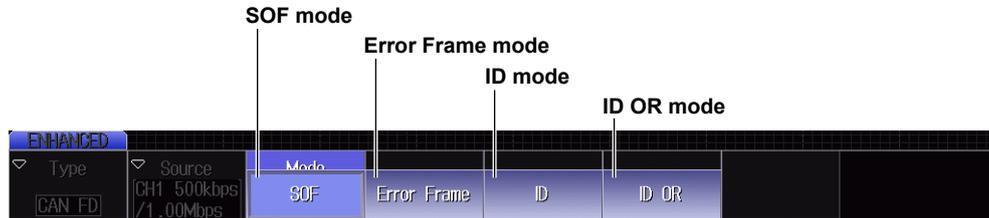
SOF (Start of Frame) Mode

Press the **SOF** soft key.

The DLM2000 triggers on the start of CAN FD bus signal frames.

Error Frame Mode (Error)

Press the **Error Frame** soft key to display the following menu. The DLM2000 triggers on error frames (when the error flag is active).

ID Mode (ID)

Press the **ID** soft key to display the following menu.
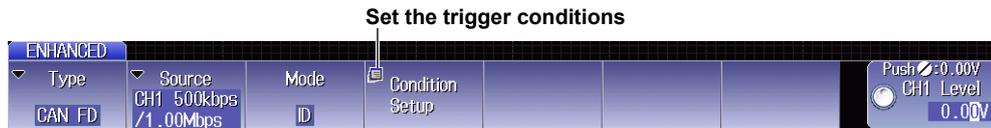
Set the trigger conditions

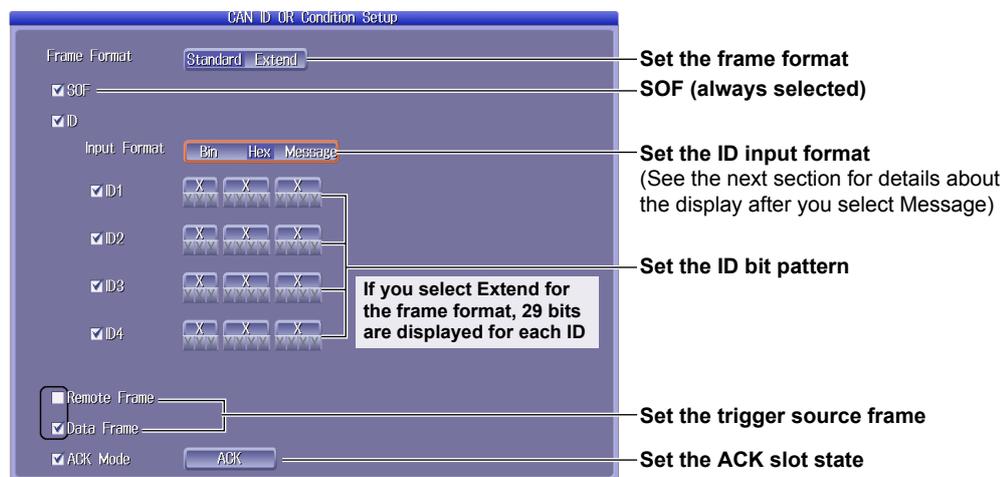| ENHANCED | | | | | | Push ⊘=0.00V |
| Type | Source | Mode | Condition | | | CH1 Level |
| CAN FD | CH1 500kbps /1.00Mbps | ID | Setup | | | 0.00V |

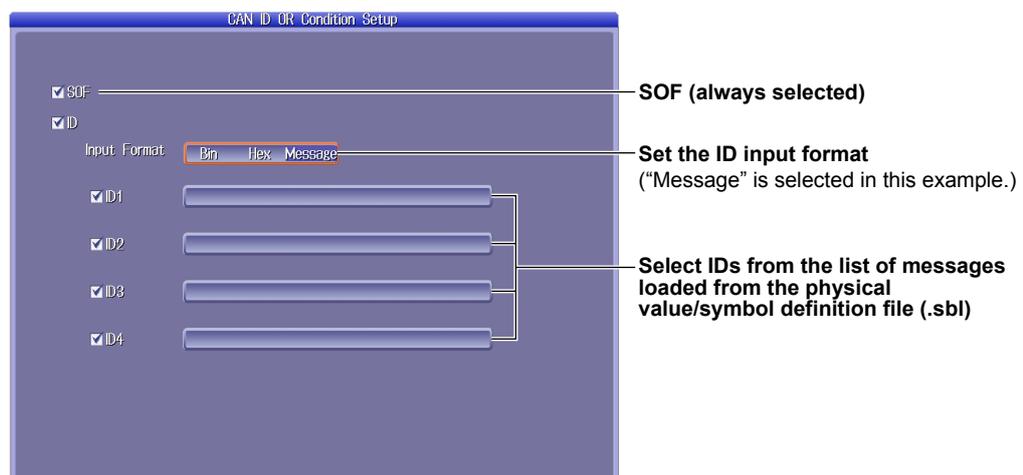### Setting Trigger Conditions (Condition Setup)

Press the **Condition Setup** soft key to display the following screen.
The DLM2000 triggers on the AND of the SOF, ID, and frame type (Remote Frame or Data Frame).
Items whose check boxes are selected are used as trigger conditions.

- **When ID Input Format Is Bin or Hex**

CAN FD ID Condition Setup

Frame Format   Standard Extend ————————— **Set the frame format**

☑ SOF ——————————————————————— **SOF (always selected)**

☑ ID

Input Format   Bin   Hex   Message ——— **Set the ID input format**
(See the next section for details about the display after you select Message)

X X X   **If you select Extend for the frame format, 29 bits are displayed here** ——— **Set the ID bit pattern**

■ Remote Frame ——————————————— **Set the trigger source frame**
☑ Data Frame

- **When ID Input Format Is Message**

CAN FD ID Condition Setup

☑ SOF ——————————————————————— **SOF (always selected)**

Input Format   Bin   Hex   Message ——— **Set the ID input format**
("Message" is selected in this example.)

☑ Message ▼ ————————————————— **Select an ID from the message list in the loaded physical value/symbol definition file (.sbl)**
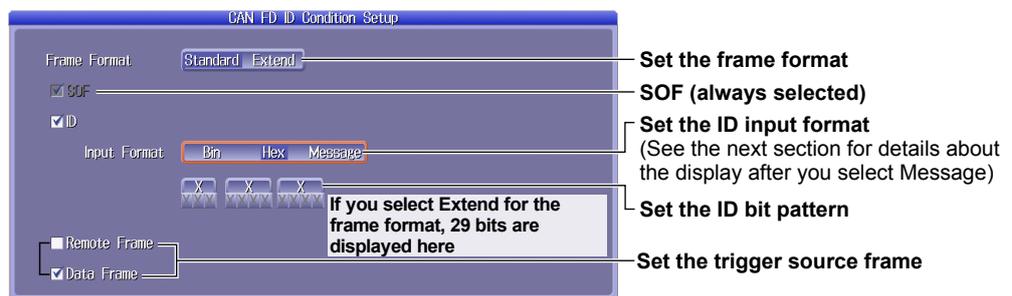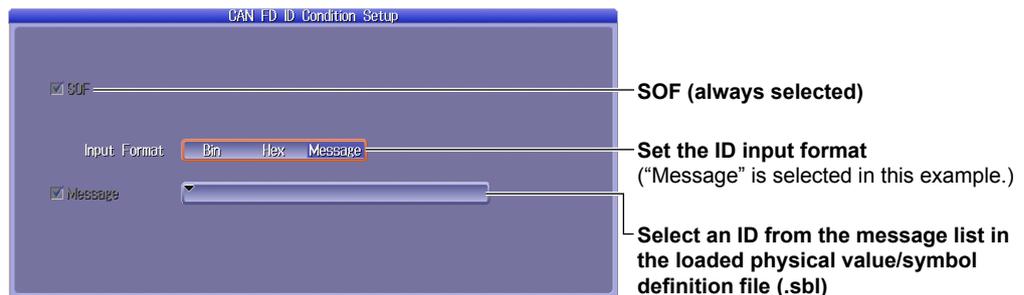
ID OR Mode (ID OR)

Press the **ID OR** soft key to display the following menu.

Set the trigger conditions

Setting Trigger Conditions (Condition Setup)

Press the **Condition Setup** soft key to display the following screen.

The DLM2000 triggers on the AND of the SOF, any of the four IDs, and frame type (Remote Frame or Data Frame). Items whose check boxes are selected are used as trigger conditions.

- **When ID Input Format Is Bin or Hex**

Set the frame format

SOF (always selected)

Set the ID input format
(See the next section for details about the display after you select Message)

Set the ID bit pattern

If you select Extend for the frame format, 29 bits are displayed for each ID

Set the trigger source frame

- **When ID Input Format Is Message**

SOF (always selected)

Set the ID input format
("Message" is selected in this example.)

Select IDs from the list of messages loaded from the physical value/symbol definition file (.sbl)
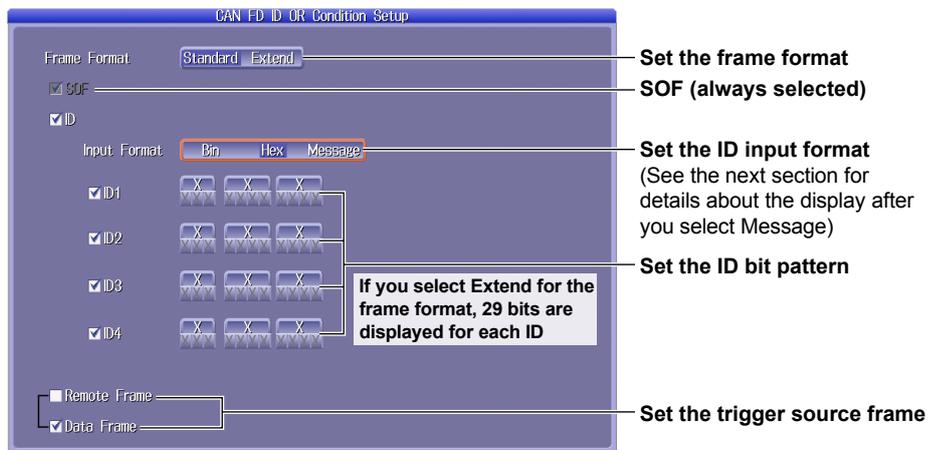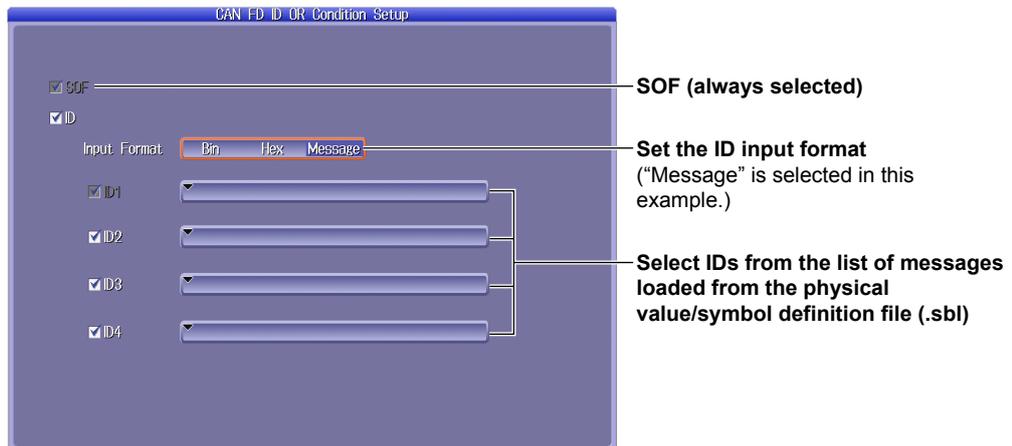
2.11 Triggering on LIN Bus Signals (Option)

This section explains the following settings (which are used when triggering on LIN bus signals):
- Trigger source
  Bit rate, sample point, and the level used to detect the source state
- Trigger type
  Trigger condition

► **"LIN Bus Trigger [ENHANCED, option]" in the Features Guide**

Auto Setup

The DLM2000 can automatically set the trigger source level and bit rate from the received LIN bus signal and trigger on them. For more details, see section 12.3.

LIN Menu

Press **ENHANCED** and then the **Type** soft key. From the setup menu that appears, select **LIN** to display the following menu.

Set the trigger type to LIN
Set the trigger source
Set the trigger type
Set the level used to detect source states

ENHANCED						Push ✐:0mV
▽ Type	▽ Source	Mode	Break Length			◯ CH1 Level
LIN	CH1 19200bps	Break Synch	10 11 12 13			445mV

Setting the Trigger Source (Source)

Press the **Source** soft key to display the following menu.

Set the trigger source (CH1 to CH4)
Set the bit rate (1200 bps, 2400 bps, 4800 bps, 9600 bps, 19200 bps, or User Define)
Set trigger coupling, HF rejection, and noise rejection. ► section 2.3
Set the sample point

ENHANCED						Push ✐:62.5%
▽ Type	Source	Mode	Break Length			◯ Sample Point
Source	Bit Rate		Coupling	HF Rejection	Noise Rejection	62.5%
CH1	19200bps		AC DC	OFF	≁ ≠	

Set the bit rate

Push ◉:Toggle
◯ Bit Rate
19200bps
◯ Sample Point
62.5%

This appears when you set the bit rate to User Define.

Set the sample point

Trigger Type (Mode)

Press the **Mode** soft key to display the following menu.

Break Synch mode
Error mode
ID/Data mode
ID OR mode

ENHANCED					
▽ Type	▽ Source	Mode	Break Length		
LIN	CH1 19200bps	Break Synch	Error	ID/Data	ID OR

Break Synch Mode

Press the **Break Synch** soft key to display the following menu.

Set the low-pulse bit length that is used to detect breaks (10, 11, 12, or 13)

The DLM2000 triggers when it detects a break field and then a synch field (Break Field + Synch Field).

Error Mode

Press the **Error** soft key and then the **Error Type Or** soft key to display the following menu.

Turn error detection on or off for Parity and Sync errors

The DLM2000 triggers when it detects an error.

ID/Data Mode

Press the **ID/Data** soft key to display the following menu.

Set the trigger conditions

Setting Trigger Conditions (Condition Setup)

Press the **Condition Setup** soft key to display the following screen.
The DLM2000 triggers on the AND of Break Synch, ID, and Data. Items whose check boxes are selected are used as trigger conditions.

• **When the Comparison Condition Is True or False**

Break Synch (always selected)

Set the ID input format

Set the ID bit pattern

Set the data length

Set the comparison condition
("True" is selected in this example.)

Set the data pattern input format

Set the data pattern

- **When the Comparison Condition Is Data = a; Data ≠ a; a ≤ Data; Data ≤ b; a ≤ Data ≤ b; or Data < a, b < Data**

Break Synch (always selected)

Set the ID input format

Set the ID bit pattern

Set the data length

Set the comparison condition ("Data = a" is selected in this example.)

Set data reference values a and b

Set the bit positions of the most significant bit (MSB) and the least significant bit (LSB) in the data that you will compare

Set whether to use a signed (Sign) or unsigned (Unsign) data format

Set the byte order

ID OR Mode

Press the **ID OR** soft key to display the following menu.

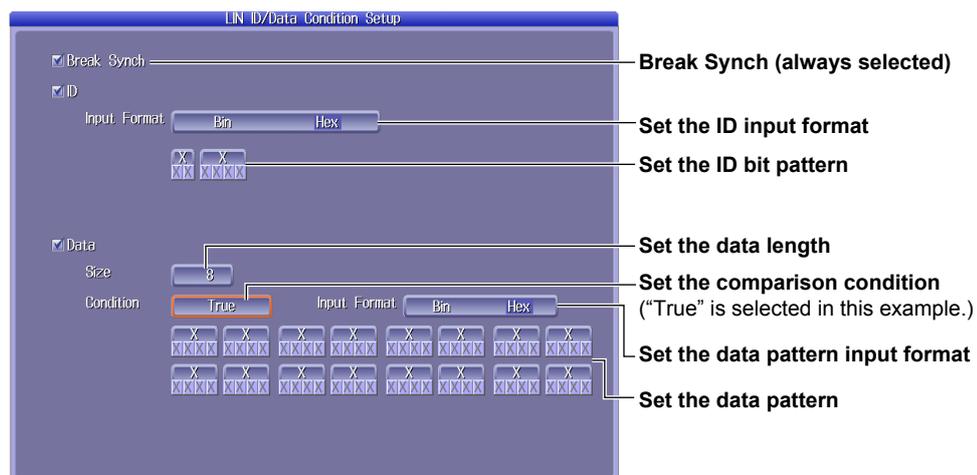Set the trigger conditions

Setting Trigger Conditions (Condition Setup)

Press the **Condition Setup** soft key to display the following screen.
The DLM2000 triggers on the AND of Break Synch and one of the four IDs. Items whose check boxes are selected are used as trigger conditions.

Break Synch (always selected)

Set the ID input format

Set the ID bit pattern

2.12 Triggering on SENT Signals (Option)

This section explains the following settings for triggering on SENT signals.
- Trigger source
  Bit rate and level used to detect source states
- Version

► **"SENT Trigger [ENHANCED, option]" in the Features Guide**

Auto Setup

The DLM2000 can automatically set the trigger source level and bit rate from the received SENT signal and trigger on them. For details, see section 12.5.

SENT Menu

Press **ENHANCED** and then the **Type** soft key. From the setup menu that appears, select **SENT** to display the following menu.

Set the trigger type to SENT

Set the trigger source

Set the version (JAN2010 or FEB2008 and older)

ENHANCED							Push ⊘:3.00us
Type	Source	Version	Clock Tick	Pause Pulse	Frame Length		Clock Tick
SENT	CH1	JAN2010	3.00us	ON(PPC)	294tick		3.00us

Setting the Trigger Source (Source)

Press the **Source** soft key. The menu that appears varies depending on the specified source.

When the Source Is Set to a Channel from CH1 to CH4

Set the source (CH1 to CH4)   **Set trigger coupling, HF rejection, and noise rejection. ► section 2.3**

ENHANCED							Push ⊘:0.00V
▽ Type	Source	Version	Clock Tick	Pause Pulse	Frame Length		CH1 Level
Source			Coupling	HF Rejection	NoiseRejection		
SENT	CH1		AC DC	OFF	⫫ ⫬		0.00V

Set the level used to detect source states

When the Source Is LOGIC (On models with the logic signal input port)

Set the source (LOGIC)   **Set the source bit (Bit0 to Bit7)**

ENHANCED							Push ●:Toggle
▽ Type	Source	Version	Clock Tick	Pause Pulse	Frame Length		Source Bit
Source							Bit 0
SENT	LOGIC						Level
							2.50V

Set the level used to detect source states

Setting the Version (Version)

Press the **Version** soft key. The menu that appears varies depending on the specified version.

Version JAN2010
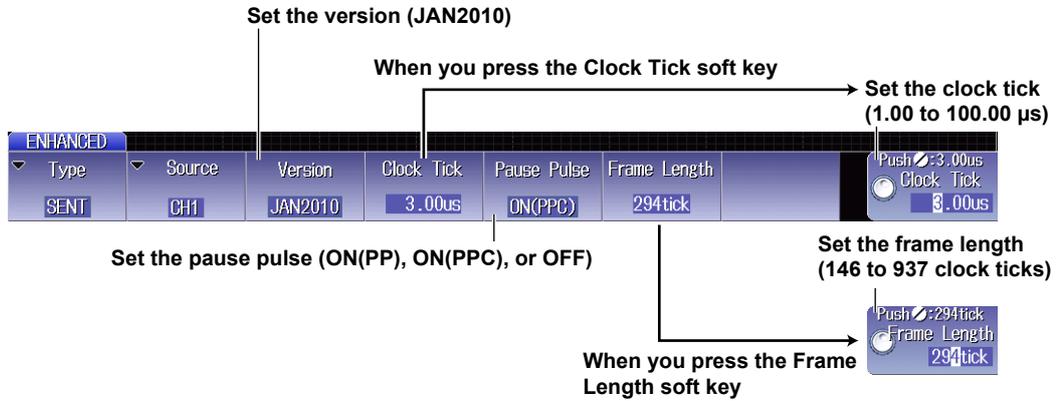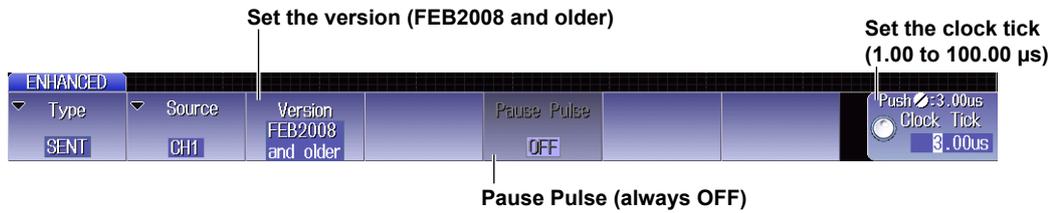
Set the version (JAN2010)

When you press the Clock Tick soft key

Set the clock tick
(1.00 to 100.00 µs)

Set the pause pulse (ON(PP), ON(PPC), or OFF)

Set the frame length
(146 to 937 clock ticks)

When you press the Frame Length soft key

Version FEB2008 and older

Set the version (FEB2008 and older)

Set the clock tick
(1.00 to 100.00 µs)

Pause Pulse (always OFF)

Note

Trigger hold-off cannot be used when the serial bus trigger's SENT trigger is set or is in use.

2.13 Triggering on PSI5 Airbag Signals (Option)

This section explains the following settings for triggering on PSI5 Airbag signals.
- Trigger source (sync signal, data frame source)
  Bit rate, level, data length, and error detection method used to detect source states
- Trigger type
  Trigger condition

► **"PSI5 Airbag Trigger [ENHANCED, option]" in the Features Guide**

Auto Setup

The DLM2000 can automatically set the bit rate, data length, error detection method, level, and hysteresis of the trigger source from the received PSI5 Airbag signal and trigger on them. For details, see section 12.6.

PSI5 Airbag Menu

Press **ENHANCED** and then the **Type** soft key. From the setup menu that appears, select PSI5 Airbag to display the following menu.
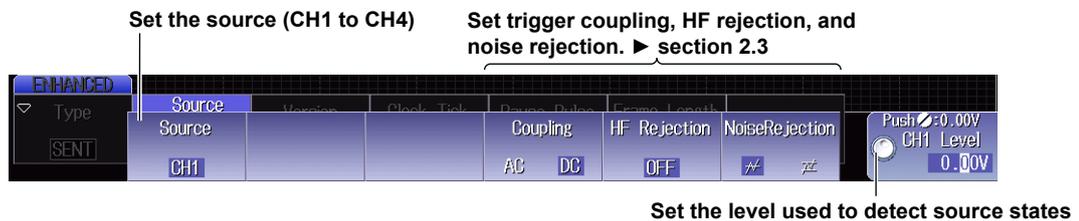
Set the trigger type to PSI5 Airbag

Set the sync signal

Set the data frame source

Set the trigger type
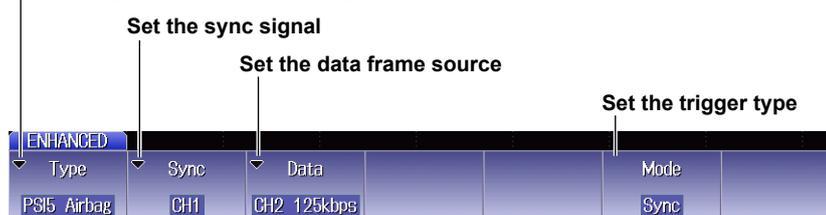
Setting the Sync Signal (Sync)

Press the **Sync** soft key to display the following menu.

Set the sync signal (CH1 to CH4, X)
  *   If you select X, sync signal will not be detected.
      Therefore, Trigger mode Sync will not be available.

Set trigger coupling, HF rejection, and noise rejection. ► section 2.3
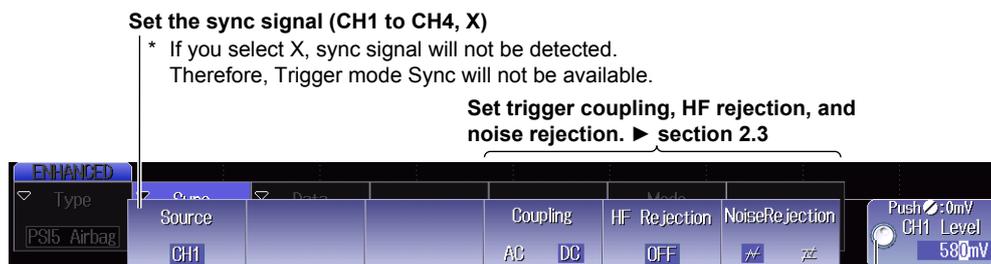
Set the level used to detect the state of the sync signal

Setting the Data Frame Source (Data)

Press the **Data** soft key to display the following menu.

Set the data frame source (CH1 to CH4)

Set the bit rate (125kbps, 189kbps, User Define)

Set trigger coupling, HF rejection, and noise rejection. ► section 2.3

Set the level used to detect data frame source states

ENHANCED								
Source	Bit Rate	Data Bits	ErrorDetection	Coupling	HF Rejection	NoiseRejection	Push ⊘:0.0mV CH2 Level	
CH2	125kbps	10bit 16bit	Parity CRC	AC DC	OFF	⊬ ⇌	42.0mV	

Set the error detection method (Parity, CRC)

Set the data length (10bit, 16bit)

This appears when you set the bit rate to User Define.

Set the bit rate

Push ●:Toggle
Bit Rate
125.0kbps
CH2 Level
42.0mV

Set the level used to detect data frame source states

Trigger Type (Mode)

Press the **Mode** soft key to display the following menu.

Sync mode

Start bit mode

Data mode

ENHANCED							
▽ Type	▽ Sync	▽ Data			Mode		
PSI5 Airbag	CH1	CH2 125kbps		Sync	Start Bit	Data	

Sync Mode

Press the **Sync** soft key.
The DLM2000 triggers on the rising edge of sync pulses.

Start Bit Mode

Press the **Start Bit** soft key.
The DLM2000 triggers on start bits.

Data Mode

Press the **Data** soft key to display the following menu.
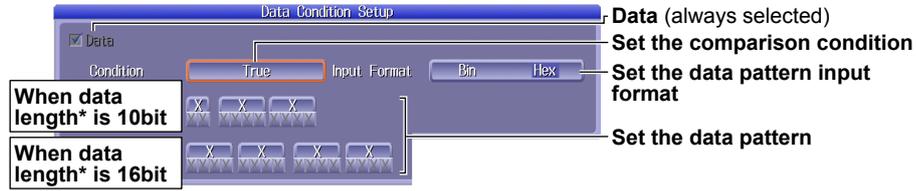
Set the trigger conditions

ENHANCED							
▽ Type	▽ Sync	▽ Data			Mode	▣ Condition Setup	
PSI5 Airbag	CH1	CH2 125kbps			Data		

Setting Trigger Conditions (Condition Setup)

Press the **Condition Setup** soft key to display the following screen.

- **When the Comparison Condition Is True**

Data (always selected)
Set the comparison condition
Set the data pattern input format
Set the data pattern

- **When the Comparison Condition Is Data = a**

Data (always selected)
Set the comparison condition
Set the input format of reference value a
Set reference value a

Setting Reference Value a

Data length*	10bit		16bit	
Input format	Hex	Dec	Hex	Dec
Selectable range	200 to 1FF	–512 to 511	8000 to 7FFF	–32768 to 32767

* Set the data length on the data frame source menu on the previous page.

2.14 Triggering on UART Signals (Option)

This section explains the following settings (which are used when triggering on UART signals):
- Trigger source
  Bit rate, sample point, bit order, polarity, and the level used to detect the source state
- Format
- Trigger type
  Trigger condition

► **"UART Trigger [ENHANCED, option]" in the Features Guide**

Auto Setup

The DLM2000 can automatically set the trigger source level and bit rate from the received UART signal and trigger on them. For more details, see section 12.7.

UART Menu

Press **ENHANCED** and then the **Type** soft key. From the setup menu that appears, select **UART** to display the following menu.

Set the trigger type to UART

Set the trigger source

Set the format (8bit NoParity, 7bit Parity, or 8bit Parity)

Set the trigger type

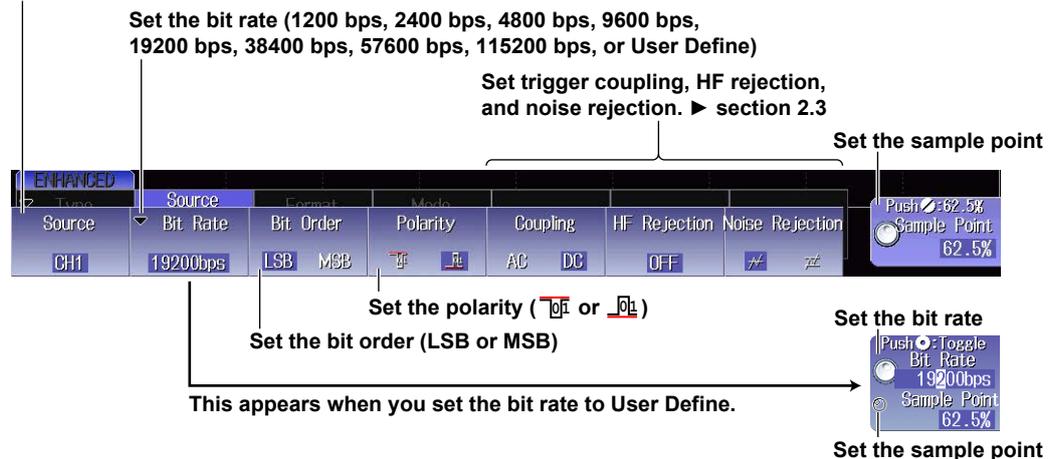Set the level used to detect source states

Setting the Trigger Source (Source)

Press the **Source** soft key to open one of the menus shown below. The menu that appears varies depending on the specified trigger source.

When the Source Is Set to a Channel from CH1 to CH4

Set the trigger source (CH1 to CH4)

Set the bit rate (1200 bps, 2400 bps, 4800 bps, 9600 bps, 19200 bps, 38400 bps, 57600 bps, 115200 bps, or User Define)

Set trigger coupling, HF rejection, and noise rejection. ► section 2.3

Set the sample point

Set the polarity (10 or 01)

Set the bit order (LSB or MSB)

This appears when you set the bit rate to User Define.

Set the bit rate

Set the sample point

When the Source Is LOGIC (On models with the logic signal input port)

Set the trigger source (LOGIC)

Set the bit rate (1200 bps, 2400 bps, 4800 bps, 9600 bps, 19200 bps, 38400 bps, 57600 bps, 115200 bps, or User Define)

Set the bit order (LSB or MSB)

Set the polarity (⌐ or _)

Press to set the source bit

Set the sample point

Set the source bit (Bit0 to Bit7)

This appears when you set the bit rate to User Define.

Set the bit rate

Set the sample point

Trigger Type (Mode)

Press the **Mode** soft key to display the following menu.

Every Data mode

Error mode

Data mode

Every Data Mode

Press the **Every Data** soft key.
The DLM2000 triggers on all data.

Error Mode

Press the **Error** soft key and then the **Error Type** soft key to display the following menu.

Turn error detection on or off for Parity and Framing errors

Specify whether to perform even or odd parity checks when parity error detection is on

If you set the format to 8bit NoParity on the UART menu shown on the previous page, Parity OFF/ON and Even/Odd do not appear on this menu.

The DLM2000 triggers when it detects an error.

Data Mode

Press the **Data** soft key to display the following menu.
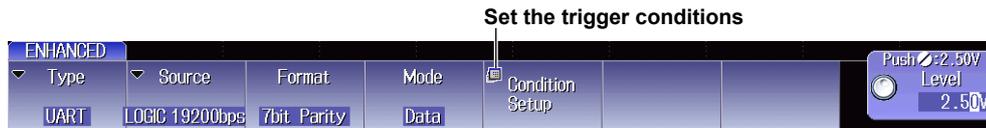
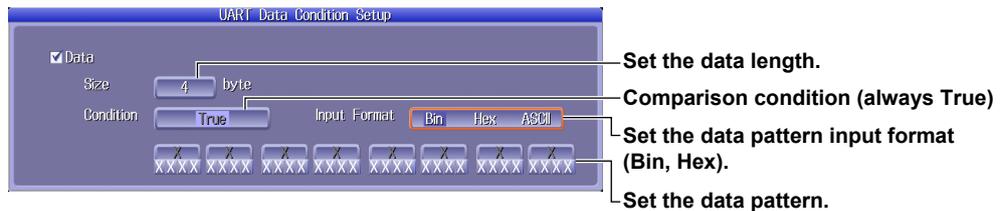**Set the trigger conditions**

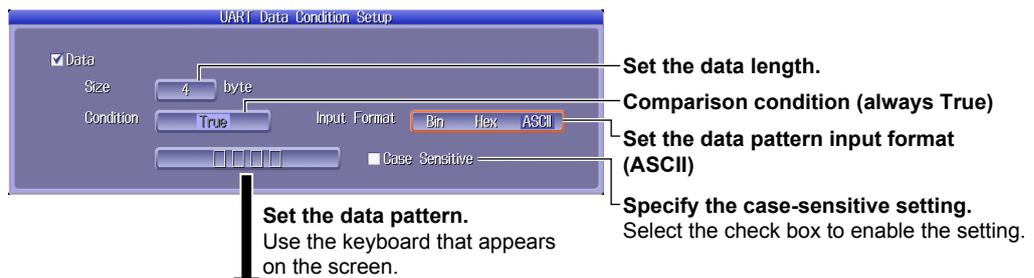## Setting Trigger Conditions (Condition Setup)

Press the **Condition Setup** soft key to display the following screen.
The DLM2000 triggers when the data pattern is matched.

• **When the Data Pattern Input Format Is Bin or Hex**

Set the data length.
Comparison condition (always True)
Set the data pattern input format (Bin, Hex).
Set the data pattern.

• **When the Data Pattern Input Format Is ASCII**

Set the data length.
Comparison condition (always True)
Set the data pattern input format (ASCII)
Specify the case-sensitive setting.
Select the check box to enable the setting.

Set the data pattern.
Use the keyboard that appears on the screen.

Setting the Data Pattern

You can enter up to 4 characters.

• You can switch between uppercase and lowercase to enter alphabet characters. However, case is distinguished only when the **Case Sensitive** check box is selected.
• The special characters CR, LF, SP, and NUL are shown in single quotation marks. These special characters are counted as one character including the single quotation marks.
  Examples: **AB'CR'D** (four characters), **XY'SP'** (three characters), **P'NUL'WU** (four characters)
• The case of the entered alphabet letters is retained even if the input format is changed to Bin or Hex. It is also retained when the format is changed from Bin or Hex to ASCII.
• If a character code that does not exist on the keyboard is entered when the input format is Bin or Hex and then the input format is changed to ASCII, a white square is displayed in the corresponding position.

2.15 Triggering on I²C Bus Signals (Option)

This section explains the following settings (which are used when triggering on I²C bus signals):

- SDA source and SCL source
  Level used to detect source states
- Trigger type
  Trigger condition

▶ **"I²C Bus Trigger [ENHANCED, option]" in the Features Guide**

Auto Setup

The DLM2000 can automatically set the source level from the received I²C bus signal and trigger on them. For more details, see section 12.8.
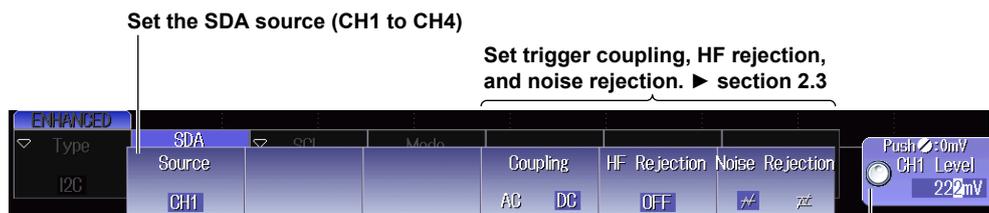
I2C Menu

Press **ENHANCED** and then the **Type** soft key. From the setup menu that appears, select **I2C** to display the following menu.

Set the trigger type to I2C
Set the SDA source
Set the SCL source
Set the trigger type
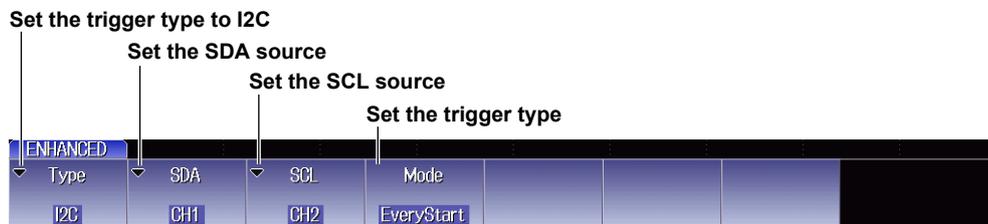
## Setting the SDA Source or the SCL Source (SDA, SCL)

Press the **SDA** or **SCL** soft key to open one of the menus shown below. The menu that appears varies depending on the specified source. This section shows how to set the SDA source, you can set the SCL source in the same manner.

When the Source Is Set to a Channel from CH1 to CH4

Set the SDA source (CH1 to CH4)

Set trigger coupling, HF rejection, and noise rejection. ▶ section 2.3

Set the level used to detect SDA source states

When the Source Is LOGIC (On models with the logic signal input port)

Set the SDA source (LOGIC)

Set the source bit (Bit0 to Bit7)
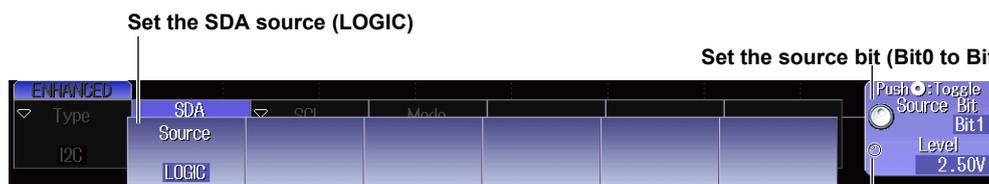
Set the level used to detect SDA source states

Trigger Type (Mode)

Press the **Mode** soft key to display the following menu.

Every Start mode
Adr Data mode
NON ACK mode
General Call mode
Start Byte mode
HS mode
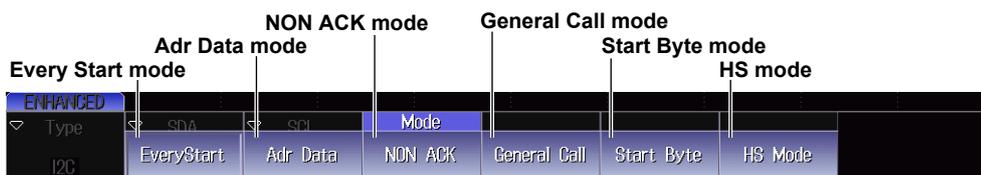
Every Start Mode

Press the **Every Start** soft key.

The DLM2000 triggers when it detects a start condition.

Adr Data Mode

Press the **Adr Data** soft key to display the following menu.

Set the trigger conditions
Turn the inclusion R/W bit on or off

R/W Bit Inclusion (Include R/W)

When setting the address in hexadecimal, specify whether to include the R/W bit (ON) or omit it (OFF) in the address pattern.

Note

You can set R/W bit inclusion (Include R/W) under the conditions listed below. The setting is universal.
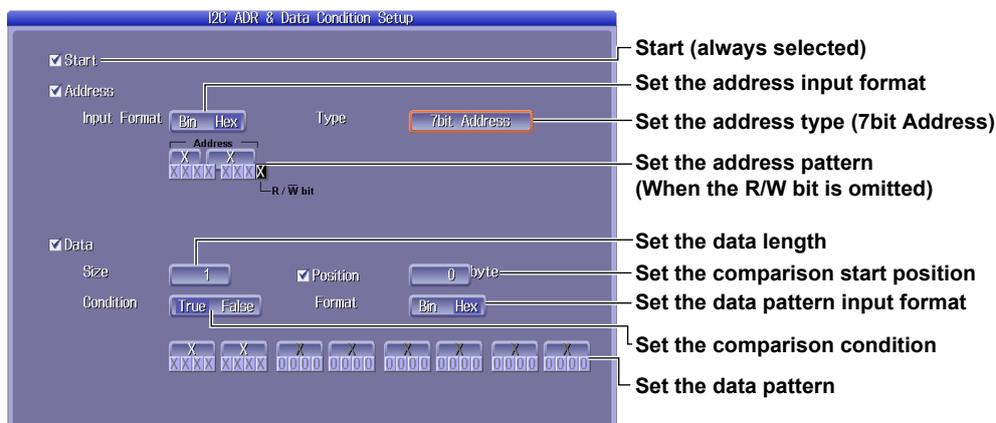*   When the I²C bus trigger type is Adr Data.
*   When the I²C bus trigger type is set to General Call and Second Byte is set to Master Adr.
*   When the I²C bus signal is being analyzed or searched.

Setting Trigger Conditions (Condition Setup)

Press the **Condition Setup** soft key to display the following screen.

The DLM2000 triggers on the AND of the start, address pattern, data pattern, and comparison start position conditions. Items whose check boxes are selected are used as trigger conditions.

•   When Address Type Is 7bit Address

Start (always selected)
Set the address input format
Set the address type (7bit Address)
Set the address pattern (When the R/W bit is omitted)
Set the data length
Set the comparison start position
Set the data pattern input format
Set the comparison condition
Set the data pattern

The address pattern setting screen for when the R/W bit is included

• When Address Type Is 7bit + Sub Adr

I2C ADR & Data Condition Setup	
☑ Start	**Start (always selected)**
☑ Address	**Set the address input format**
Input Format [Bin Hex] Type [7bit + Sub Adr]	**Set the address type (7bit + Sub Adr)**
Address / Sub Address	**Set the address pattern**
☑ Data	**Set the data length**
Size [1] ☑ Position [0] byte	**Set the comparison start position**
Condition [True False] Format [Bin Hex]	**Set the data pattern input format**
	Set the comparison condition
	Set the data pattern

• When Address Type Is 10bit Address

I2C ADR & Data Condition Setup	
☑ Start	**Start (always selected)**
☑ Address	**Set the address input format**
Input Format [Bin Hex] Type [10bit Address]	**Set the address type (10bit Address)**
F 1111 0 Address	**Set the address pattern**
☑ Data	**Set the data length**
Size [1] ☑ Position [0] byte	**Set the comparison start position**
Condition [True False] Format [Bin Hex]	**Set the data pattern input format**
	Set the comparison condition
	Set the data pattern

NON ACK Mode

Press the **NON ACK** soft key to display the following menu.

Set whether to use or ignore the acknowledge bits that belong to the start byte, HS mode master code, and read access byte

ENHANCED				Ignore		
▽ Type	▽ SDA	▽ SCL	Mode	Start Byte	HS Mode	ReadAccess
I2C	CH1	CH2	NON ACK	OFF ON	OFF ON	OFF ON

The DLM2000 triggers when the acknowledgement bit is Nack.

General Call Mode

Press the **General Call** soft key to display the following menu.

**Set the Second Byte address pattern
(X, 0000 0100, 0000 0110, or Master Adr)**

When the Second Byte address pattern is set to Master Adr

**Turn the inclusion R/W bit on or off
► the earlier section "Adr Data Mode"**

**Set the trigger conditions
► the earlier section "Adr Data Mode"**

When you set the second byte address to Master Adr, the DLM2000 triggers on the AND of the general call address (0000 0000), second byte address pattern, data pattern, and comparison start position conditions. Items whose check boxes are selected are used as trigger conditions.

Start Byte Mode

Press the **Start Byte** soft key.
The DLM2000 triggers when it detects the start byte master code.

HS Mode

Press the **HS Mode** soft key.
The DLM2000 triggers when it detects the high speed mode master code.

2.16 Triggering on SPI Bus Signals (Option)

This section explains the following settings (which are used when triggering on SPI bus signals):
- Wiring System (Mode)
- Clock source, data source, chip select source
  Polarity, active state, and the level used to detect source states
- Trigger condition

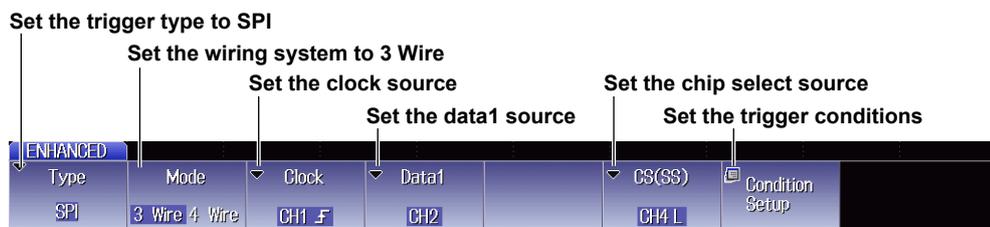► **"SPI Bus Trigger [ENHANCED, option]" in the Features Guide**

Auto Setup

The DLM2000 can automatically set the source level from the received SPI bus signal and trigger on it. For more details, see section 12.9.
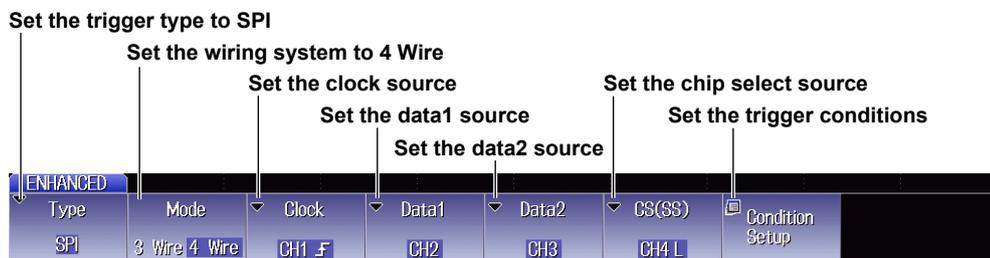
SPI Menu

Press **ENHANCED** and then the **Type** soft key. From the setup menu that appears, select **SPI** to display the following menu.
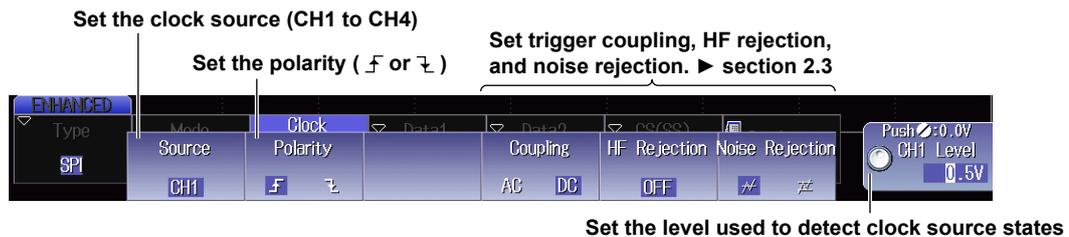
When Wiring System Is 3 Wire

Set the trigger type to SPI
Set the wiring system to 3 Wire
Set the clock source
Set the data1 source
Set the chip select source
Set the trigger conditions

ENHANCED						
Type	Mode	▽ Clock	▽ Data1		▽ CS(SS)	Condition Setup
SPI	3 Wire 4 Wire	CH1 ⌐	CH2		CH4 L	

When Wiring System Is 4 Wire

Set the trigger type to SPI
Set the wiring system to 4 Wire
Set the clock source
Set the data1 source
Set the data2 source
Set the chip select source
Set the trigger conditions

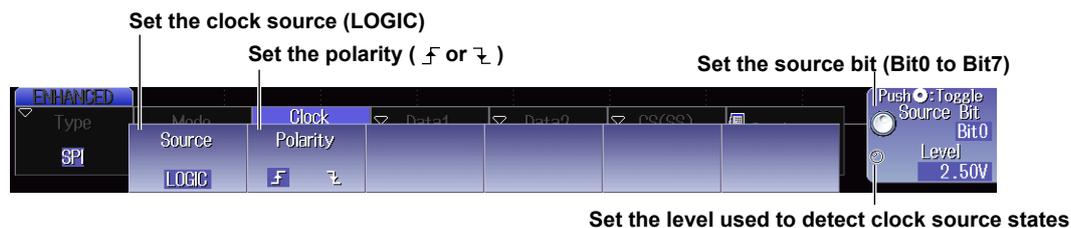| ENHANCED						
Type	Mode	▽ Clock	▽ Data1	▽ Data2	▽ CS(SS)	Condition Setup
SPI	3 Wire 4 Wire	CH1 ⌐	CH2	CH3	CH4 L	

Setting the Clock Source (Clock)

Press the **Clock** soft key to open one of the menus shown below. The menu that appears varies depending on the specified clock source.

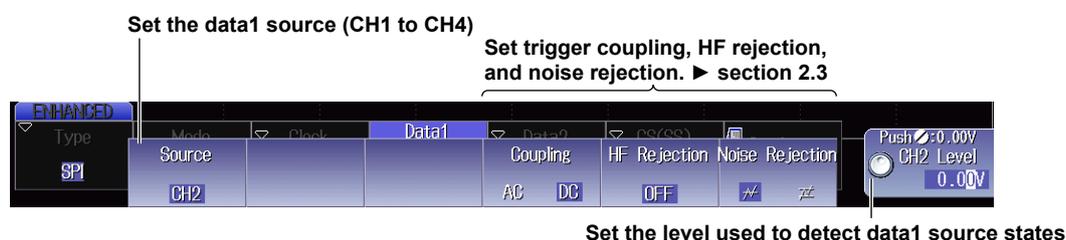### When the Source Is Set to a Channel from CH1 to CH4

Set the clock source (CH1 to CH4)
Set the polarity (⌐ or ⌐)
Set trigger coupling, HF rejection, and noise rejection. ► section 2.3

ENHANCED		Clock					Push⌀:0.0V
Type	Mode	Source	Polarity	▽ Data1	Coupling	HF Rejection Noise Rejection	CH1 Level
SPI		CH1	⌐ ⌐		AC DC	OFF ⌐ ⌐	0.5V

Set the level used to detect clock source states

When the Source Is LOGIC (On models with the logic signal input port)

Set the clock source (LOGIC)

Set the polarity (⌐ or ⌐)

Set the source bit (Bit0 to Bit7)

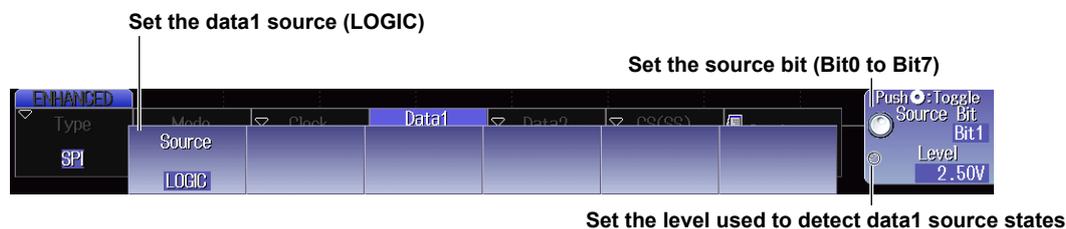Set the level used to detect clock source states

Setting the Data1 or Data2 Sources (Data1 and Data2)

Press the **Data1** or **Data2** soft key to open one of the menus shown below. The menu that appears varies depending on the specified data source. This section shows how to set the Data1 source. You can set the Data2 source in the same manner. When the wiring system is 4 Wire, set the Data2 source.

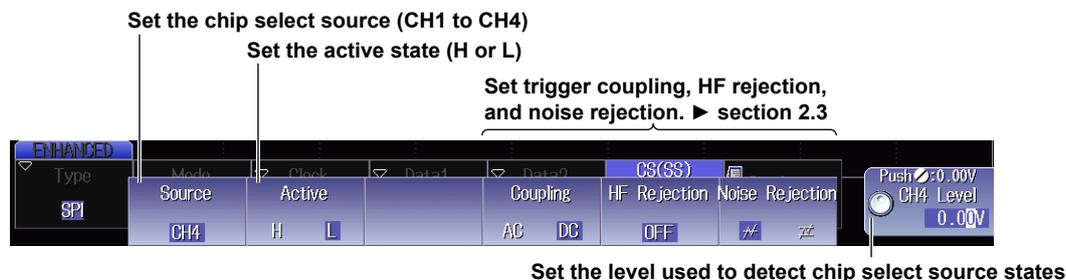**When the Source Is Set to a Channel from CH1 to CH4**

Set the data1 source (CH1 to CH4)

Set trigger coupling, HF rejection, and noise rejection. ► section 2.3

Set the level used to detect data1 source states

When the Source Is LOGIC (On models with the logic signal input port)

Set the data1 source (LOGIC)

Set the source bit (Bit0 to Bit7)

Set the level used to detect data1 source states
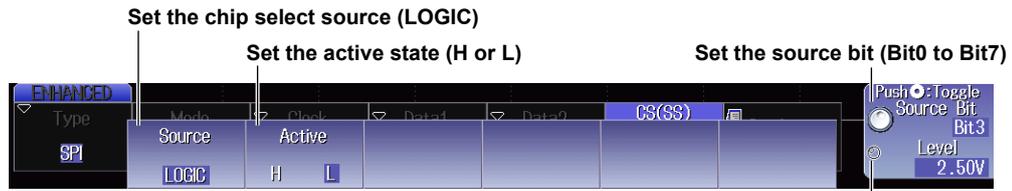
Setting the Chip Select Source (CS (SS))

Press the **CS(SS)** soft key to open one of the menus shown below. The menu that appears varies depending on the specified data source.

When the Source Is Set to a Channel from CH1 to CH4

Set the chip select source (CH1 to CH4)

Set the active state (H or L)

Set trigger coupling, HF rejection, and noise rejection. ► section 2.3

Set the level used to detect chip select source states

When the Source Is LOGIC (On models with the logic signal input port)

Set the chip select source (LOGIC)

Set the active state (H or L)

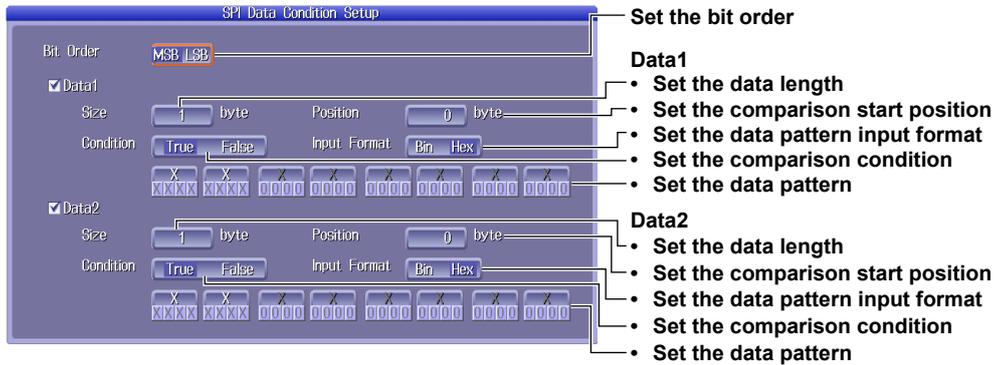**Set the source bit (Bit0 to Bit7)**

Set the level used to detect chip select source states

Setting Trigger Conditions (Condition Setup)

Press the **Condition Setup** soft key on the SPI Menu to display the following screen.

This section gives an explanation of the settings when the wiring system is 4 Wire. When the wiring system is 3 Wire, only set the trigger condition for Data1.

Set the bit order

Data1
- **Set the data length**
- **Set the comparison start position**
- **Set the data pattern input format**
- **Set the comparison condition**
- **Set the data pattern**

Data2
- **Set the data length**
- **Set the comparison start position**
- **Set the data pattern input format**
- **Set the comparison condition**
- **Set the data pattern**

2.17 Triggering on FlexRay Bus Signals (Option)

This section explains the following settings (which are used when triggering on FlexRay bus signals):

- Trigger source
  Bit rate, source channel (A or B), and level used to detect the source state.
- Trigger types and conditions

► **"FlexRay Bus Trigger [ENHANCED, option]" in the Features Guide**

Auto Setup

The DLM2000 can automatically set the trigger source level and bit rate from the received FlexRay bus signal and trigger on them. For more details, see section 12.10.
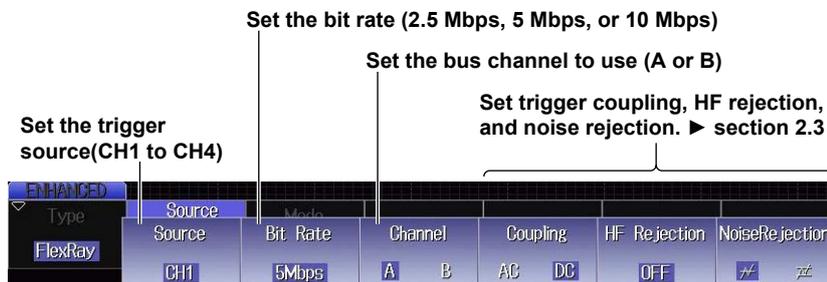
FlexRay Menu

Press **ENHANCED** and then the **Type** soft key. From the setup menu that appears, select **FlexRay** to display the following menu..
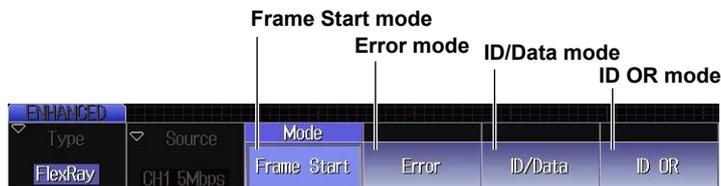
Set the trigger type to FlexRay

    Set the trigger source

       Set the trigger type   Set the level used to detect source states

ENHANCED					Push ⊘:0.00V
Type	Source	Mode			CH1 Level
FlexRay	CH1 5Mbps	Frame Start			0.00V

Setting the Trigger Source (Source)

Press the **Source** soft key to display the following menu.

        Set the bit rate (2.5 Mbps, 5 Mbps, or 10 Mbps)

        Set the bus channel to use (A or B)

        Set trigger coupling, HF rejection, and noise rejection. ► section 2.3

Set the trigger source(CH1 to CH4)

ENHANCED	Source	Mode			
Type	Source	Bit Rate	Channel	Coupling	HF Rejection	NoiseRejection
FlexRay	CH1	5Mbps	A B	AC DC	OFF	

Trigger Type (Mode)

Press the **Mode** soft key to display the following menu.

       Frame Start mode

        Error mode ID/Data mode

           ID OR mode

ENHANCED		Mode			
Type	Source	Frame Start	Error	ID/Data	ID OR
FlexRay	CH1 5Mbps				

Frame Start Mode (Frame Start)

Press the **Frame Start** soft key.

The DLM2000 triggers on the start of FlexRay bus signal frames.

Error Mode (Error)

Press the **Error** soft key and then the **Error Type Or** soft key to display the following menu.

Turn error detection on or off for CRC, BSS, and FES errors

ID/Data Mode (ID/Data)

Press the **ID/Data** soft key to display the following menu.

Set the trigger conditions

Setting Trigger Conditions (Condition Setup)

Press the **Condition Setup** soft key to display the following screen.

The DLM2000 triggers on the AND of Frame Start, Indicator, ID, Cycle Count, Data1, and Data2.

Items whose check boxes are selected are used as trigger conditions.

• **When the Comparison Condition of Data1 Is True or False**

Frame Start (always selected)
Set the indicator
Set the ID comparison condition
Set data reference values a and b

Set the Cycle Count comparison condition
Set data reference values a and b
Set the data length
Set the comparison start position
Set the data pattern input format
Set the comparison condition

Set the data pattern
Set Data2
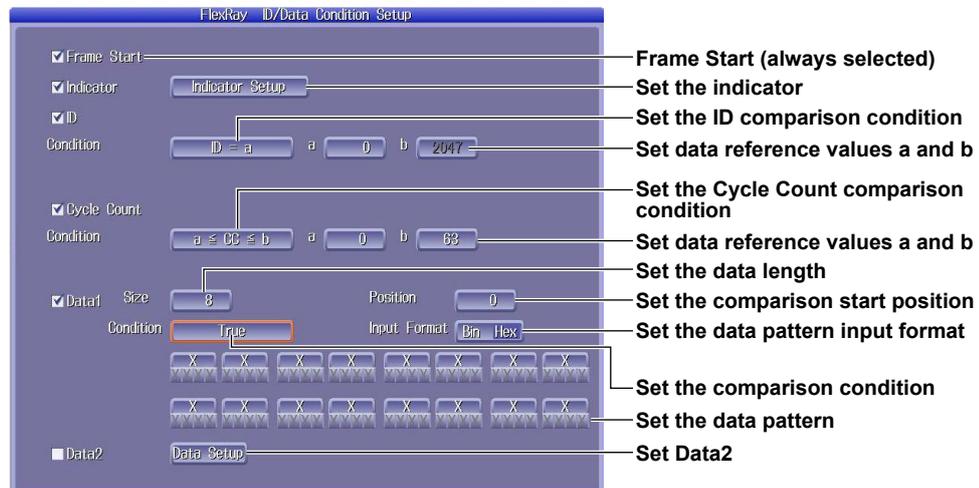
• **When the Comparison Condition of Data1 Is Data = a; Data ≠ a; a ≤ Data; Data ≤ b; a ≤ Data ≤ b; or Data < a, b < Data**
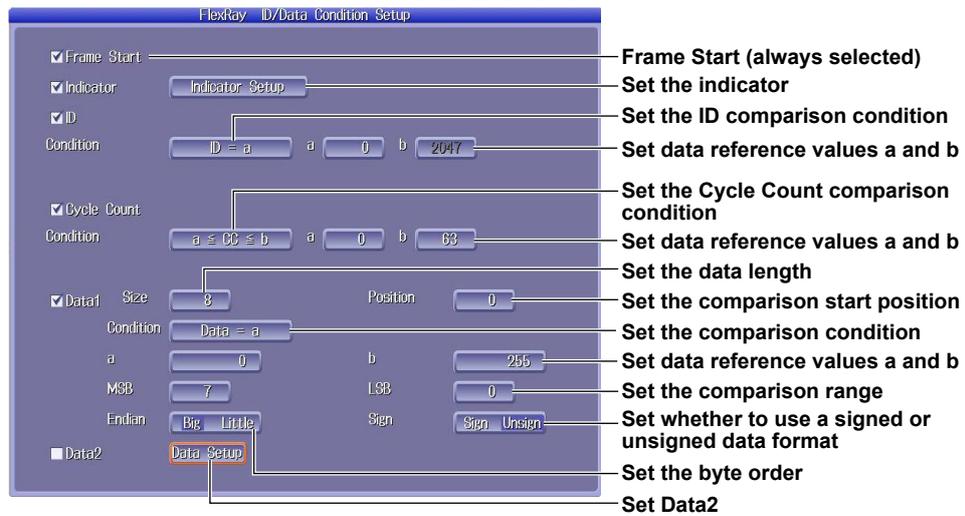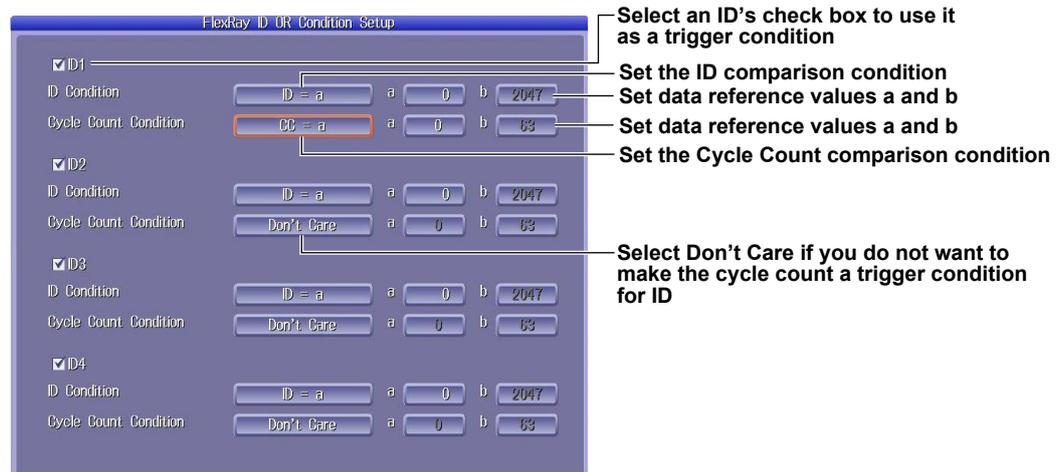

Frame Start (always selected)
Set the indicator
Set the ID comparison condition
Set data reference values a and b

Set the Cycle Count comparison condition
Set data reference values a and b
Set the data length
Set the comparison start position
Set the comparison condition
Set data reference values a and b
Set the comparison range
Set whether to use a signed or unsigned data format
Set the byte order
Set Data2

ID OR Mode (ID OR)

Press the ID OR soft key to display the following menu.

Set the trigger conditions

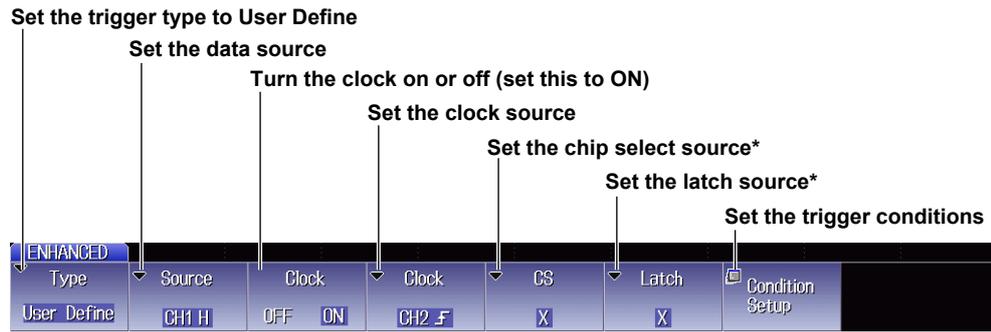### Setting Trigger Conditions (Condition Setup)

Press the Condition Setup soft key to display the following screen.

The DLM2000 triggers when the condition of one of the four IDs is met. Items whose check boxes are selected are used as trigger conditions.

Select an ID's check box to use it as a trigger condition
Set the ID comparison condition
Set data reference values a and b
Set data reference values a and b
Set the Cycle Count comparison condition

Select Don't Care if you do not want to make the cycle count a trigger condition for ID

2.18 Triggering on User-Defined Serial Bus Signals

This section explains the following settings (which are used when triggering on user-defined serial bus signals):

- Bit rate
- Data source, clock source, chip select source, and latch source
  Level used to detect source states
- Trigger condition
  ▶ **"User-Defined Serial Bus Trigger [User Define, ENHANCED]" in the Features Guide**

User Define Menu

Press **ENHANCED** and then the **Type** soft key. From the setup menu that appears, select **User Define**. The menu that appears varies depending on whether the clock is on or off.

When the Clock Is Off
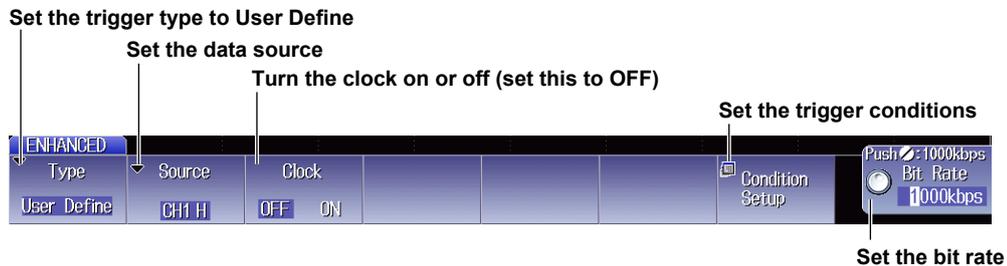
Set the trigger type to User Define

Set the data source

Turn the clock on or off (set this to OFF)

Set the trigger conditions

Set the bit rate

- **Setting the Data Source (Source)**

  Press the **Source** soft key to display the following menu.

  Set the data source (CH1 to CH4)

  Set the data source state to be recognized as 1 (H or L)

  Set trigger coupling, HF rejection, and noise rejection. ▶ section 2.3

  Set the level used to detect data source states
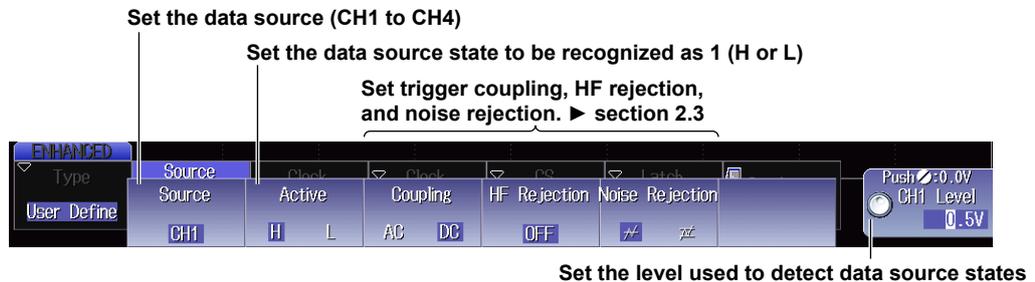
  Set the data source to compare with the pattern specified as a trigger condition.

- **Setting Trigger Conditions (Condition Setup)**

  Press the **Condition Setup** soft key to display the following screen.
  You can use data patterns as trigger conditions. The data pattern trigger condition is met when the sampled data source pattern matches the specified pattern.

  Set the data length

  Set the data pattern input format

  Set the data pattern
  The length of the data pattern you can enter is determined by the Data Size setting. The maximum data pattern length you can specify is 128 bits.

When the Clock Is On

Set the trigger type to User Define

Set the data source

Turn the clock on or off (set this to ON)

Set the clock source

Set the chip select source*

Set the latch source*

Set the trigger conditions

ENHANCED Type	Source	Clock	Clock	CS	Latch	Condition Setup
User Define	CH1 H	OFF ON	CH2 ⅃	X	X	

* The chip select source and latch source can only be set on 4-channel models.

If you press the **Source** soft key and specify one of the channels from CH1 to CH4, you can then set the respective source conditions.

• **Setting the Data Source (Source)**

The menu is the same as the one shown on the previous page for when the clock is off.

• **Setting the Clock Source (Clock)**

Press the **Clock** soft key to display the following menu.

Set the clock source (CH1 to CH4)

Set the timing for data source sampling (⅃ or ⌐)

Set trigger coupling, HF rejection, and noise rejection. ► section 2.3

ENHANCED Type	Source	Polarity	Clock Coupling	HF Rejection	Noise Rejection	Push ⬛:0.00V CH2 Level
User Define	CH2	⅃ ⌐	AC DC	OFF	⇌ ⇌	0.00V
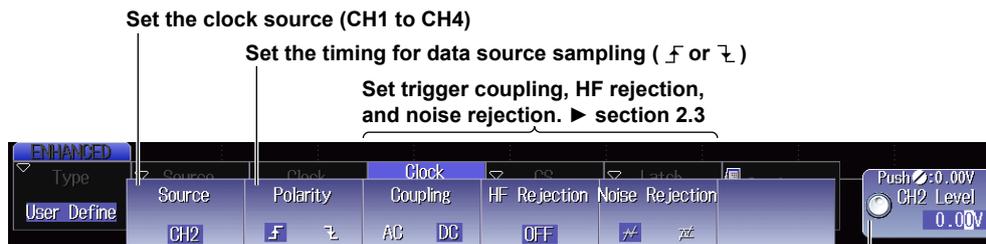
Set the level used to detect clock source states

Specify which clock source edge causes the data source to be sampled.

• **Setting the Chip Select Source (CS)**

Press the **CS** soft key to display the following menu.

Set the chip select source (CH1 to CH4 or X)

Set the chip select source state to be recognized as the data source (L or H)

Set trigger coupling, HF rejection, and noise rejection. ► section 2.3

ENHANCED Type	Source	Active	Coupling	HF Rejection	Noise Rejection	Push ⬛:0.0V CH1 Level
User Define	CH1	L H	AC DC	OFF	⇌ ⇌	0.5V

Set the level used to detect chip select source states

When the data source is sampled in sync with the clock source, the period for which the DLM2000 tests the data source can be controlled using the chip select source.

• **Setting the Latch Source (Latch)**

Press the **Latch** soft key to display the following menu.

Set the latch source (CH1 to CH4 or X)

Set the timing to compare the data source pattern (⌐ or ⌐)

Set trigger coupling, HF rejection, and noise rejection. ► section 2.3
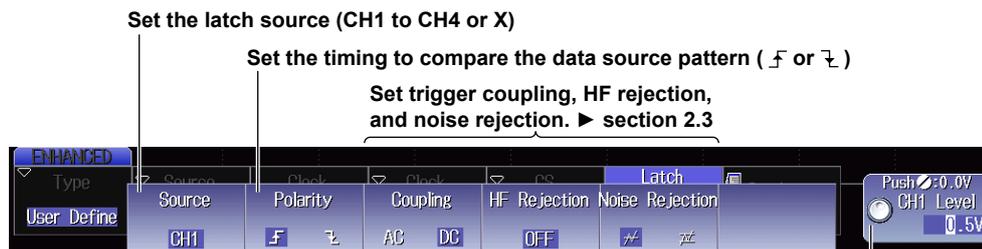
Set the level used to detect latch source states

You can specify the timing at which the data source pattern sampled in sync with the clock source is compared with the specified pattern.

• **Setting Trigger Conditions (Condition Setup)**

The menu is the same as the one shown two pages earlier for when the clock is off.

2.19 Triggering on a TV Trigger

This section explains the following settings (which are used when triggering on a TV trigger):
- Broadcasting system
- Source
  Polarity, line number, field number, frame skip, and the level used to detect source states
- Resolution
- Horizontal sync frequency
- Sync guard frequency

TV Menu

Press **ENHANCED** and then the **Type** soft key. From the setup menu that appears, select **TV** to display the following menu.

Set the line number (One or All)

Set the trigger type to TV

Set the field number (1, 2, or X)
You can set this only when the broadcasting system is set to NTSC, PAL, or HDTV (1080/60i, 1080/50i, 1080/24sF).

Set the broadcasting system

Set the source
(CH1 to CH4)

Set the frame skip (1, 2, 4, or 8)

Set the polarity
(Pos or Neg)

Set the level used to
detect source states

When Line is set to One, set the field number,
frame skip, and line number.

Broadcasting System (Mode)

Press the **Mode** soft key to display the following menu.

SDTV(480/60p)

NTSC   PAL   HDTV   UserdefTV

NTSC
Press the **NTSC** soft key. The DLM2000 triggers using the specified field and line of the NTSC signal as trigger conditions.

PAL
Press the **PAL** soft key. The DLM2000 triggers using the specified field and line of the PAL signal as trigger conditions.

SDTV (480/60p)
Press the **SDTV(480/60p)** soft key. The DLM2000 triggers using the specified line of the SDTV signal as trigger conditions.

HDTV

Press the **HDTV** soft key to display the following menu. The DLM2000 triggers using the specified field and line of the HDTV signal as trigger conditions.

Set the video format (effective number of scanlines/frame rate:
1080/60i, 1080/50i, 720/60p, 1080/25p, 1080/24p, 1080/24sF, or 1080/60p)

UserdefTV

Press the **UserdefTV** soft key to display the following menu. The DLM2000 triggers using the user-defined field and line as trigger conditions.

Set the broadcasting system
to UserdefTV

Set the line number (One or All)

Set the field number (1, 2, or X)

Set the source

Set the frame skip (1, 2, 4, or 8)

Set the resolution
(SD or HD)

Set the level used to
detect source states
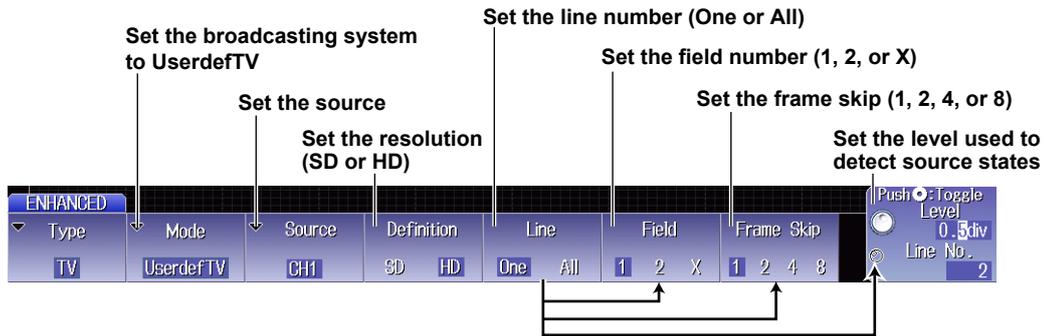
When Line is set to One, set the field number,
frame skip, and line number.

Setting the Source (Source)

Press the **Source** soft key to display the following menu.

Set the source (CH1 to CH4)

Set the polarity (Pos or Neg)

Set the HF rejection (OFF or 300 kHz)

Set the horizontal sync frequency
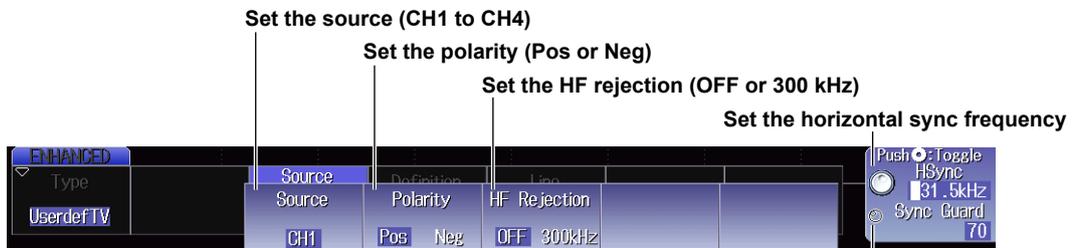
Set the sync guard frequency as
a percentage of the horizontal
sync frequency.

2.20 Triggering on Combination Triggers (B TRIG)

This section explains the following settings (which are used when triggering on a combination trigger):
- Combination
- A trigger: condition A
- B trigger: condition B
- Delay time for condition B
- Number of times condition B must be met

► **"Trigger B [B TRIG]" in the Features Guide**

B TRIG Menu

Press **B TRIG** to display the following menu.

Configure the combination

Configure trigger A

Configure trigger B

B TRIG						
Combination	A Trigger	B Trigger				
OFF	Edge	Edge				
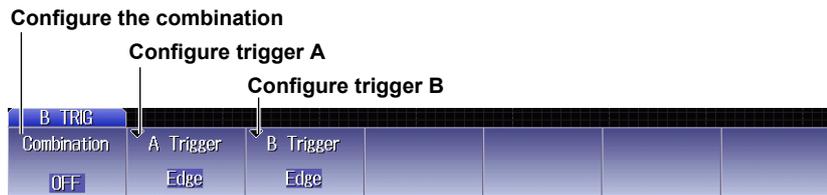
Setting the Combination (Combination)

Press the **Combination** soft key to display the following menu.

OFF   A Delay B   A -> B(N)   Dual Bus

Combination	A Trigger	B Trigger	
OFF	A Delay B	A -> B(N)	Dual Bus
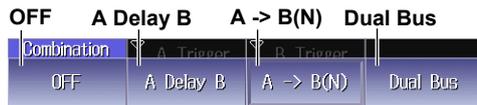
Note

- On 2-channel models, the only serial bus trigger you can set is User Define for both condition A and condition B.
- On 4-channel models, if condition A is set to CAN FD, SENT, or PSI5 Airbag serial bus trigger, the combination setting is fixed to OFF.
- If you specify a serial bus trigger other than CAN FD, SENT, or PSI5 Airbag for condition A, you can set Combination to Dual Bus.
- If you specify a serial bus trigger other than CAN FD, SENT, or PSI5 Airbag for condition A and anything other than a serial bus trigger for condition B and then set Combination to Dual Bus, condition B becomes one of the following:
  - 4-channel models: The top most serial bus trigger of the serial bus triggers that can be used and are displayed on the menu
  - 2-channel models: User Define

OFF

Press the **OFF** soft key.
The DLM2000 triggers when the trigger A conditions are met.

A Delay B

Press the **A Delay B** soft key to display the following menu.

Set the delay time

B TRIG						Push⏺:0.0s
Combination	A Trigger	B Trigger				○ Delay
A Delay B	Edge	Edge				0.000s

After the trigger A conditions are met and the specified amount of time (the delay time) elapses, the DLM2000 triggers when the trigger B conditions are met.

A -> B(N)

Press the **A -> B(N)** soft key to display the following menu.

Set the number of times condition B must be met

After the trigger A conditions are met, the DLM2000 triggers when the trigger B conditions are met N times.

Dual Bus

Press the **Dual Bus** soft key to display the following menu.

The DLM2000 triggers when the serial bus trigger A or B conditions are met.

Setting Trigger Condition A (A Trigger)

Press the **A Trigger** soft key to display the following menu.

Trigger condition A is set to the trigger condition that has been set with the EDGE key or the ENHANCED key, whichever one is illuminated. You can also set trigger condition A from the following menu.

Setting the Trigger Type
The specified trigger type menu appears. For information on setting each trigger type, see its corresponding reference in the following table.

Trigger Type	Reference	Trigger Type	Reference	Trigger Type	Reference
Edge	Section 2.3	CAN	Section 2.9	I2C	Section 2.15
Edge OR	Section 2.4	CAN FD	Section 2.10	SPI	Section 2.16
Edge qualified	Section 2.5	LIN	Section 2.11	FlexRay	Section 2.17
State	Section 2.6	SENT	Section 2.12	User-defined	Section 2.18
Pulse width	Section 2.7	PSI5 Airbag	Section 2.13	serial bus	
State width	Section 2.8	UART	Section 2.14	TV	Section 2.19

Setting Trigger Condition B (B Trigger)

Press the **B Trigger** soft key to display the following menu.

Set trigger B to one of the trigger types shown in the following table.

Setting the Trigger Type
The specified trigger type menu appears. For information on setting each trigger type, see its corresponding reference in the following table.

Trigger Type	Reference	Trigger Type	Reference	Trigger Type	Reference
Edge	Section 2.3	CAN	Section 2.9	SPI	Section 2.16
Edge qualified	Section 2.5	LIN	Section 2.11	FlexRay	Section 2.17
State	Section 2.6	UART	Section 2.14	User-defined	Section 2.18
		I2C	Section 2.15	serial bus	

2.21 Setting the Action-On-Trigger Function

This section explains the following settings (which are used when executing the action-on-trigger function):

• Action mode
• Action to execute
• The number of actions
• Action execution

► **"Executing Actions" in the Features Guide**

Action on Trig Menu

Press **SHIFT+MODE** (ACTION GO/NO-GO), the **Mode** soft key, and the **Action on Trig** soft key to display the following menu.

Execute the action

Set Mode to Action on Trig   Set the action to execute

Set the number of actions
(the number of waveform
acquisitions)
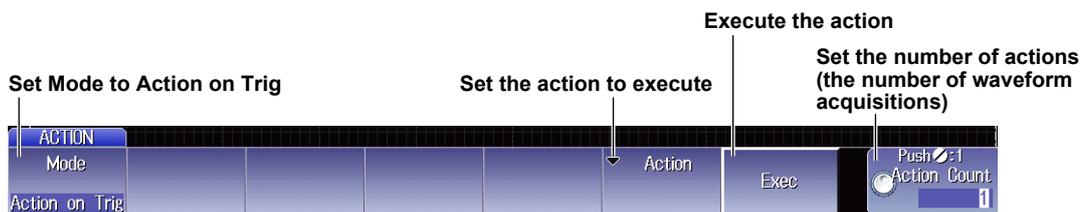
Setting the Action to Execute (Action)

Press the **Action** soft key to display the following menu.

Sound a buzzer

Print the screen

Save the waveform data

Transmit e-mail

Set the number of e-mail
messages to transfer
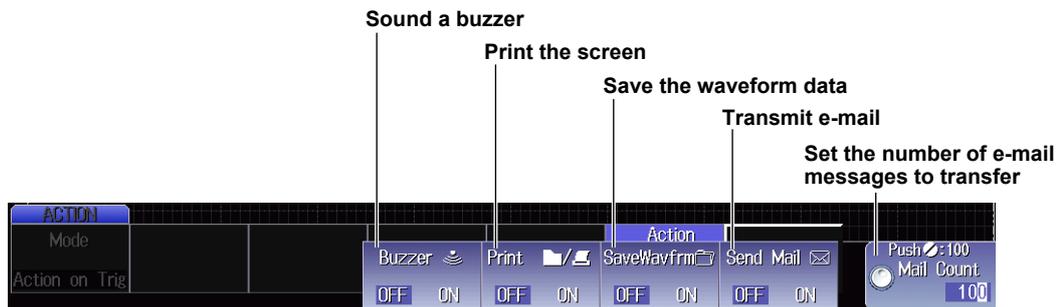
Executing Actions (Exec)

After specifying the action mode, the action to execute, and the number of actions, press the **Exec** soft key. The DLM2000 executes the action each time it triggers until the specified number of actions has been reached.

While actions are being executed, Exec changes to Abort. If you want to stop execution, press the **Abort** soft key.

Note

• If Print To is set to Multi on the PRINT menu, you cannot print or save screen captures even if you set Print to ON on the Action menu.
  ► section 16.6
• When the action to execute is e-mail transmission, the DLM2000 sends the number of messages specified by either Action Count or Mail Count, whichever is lower.

2.22 Performing GO/NO-GO Determination

This section explains the following settings (which are used when performing GO/NO-GO determination):
- Action mode
- The number of actions
- The number of NO-GO determinations
- Reference condition
  Reference standard
  Source waveform
  Reference range type
      Rectangular zone, waveform zone, polygonal zone, or waveform parameter
- GO/NO-GO determination source window
- Action execution

► **"Executing Actions" in the Features Guide**

Action Go/Nogo Menu

Press **SHIFT+MODE** (ACTION GO/NO-GO), the **Mode** soft key, and the **Go/Nogo AND** or **Go/Nogo OR** soft key to display the following menu.

Executing Actions (Exec)

After specifying the action mode, the action to execute, the number of actions, the number of NO-GO determinations, the reference conditions, and the GO/NO-GO determination source window, press the **Exec** soft key. The DLM2000 executes actions until either the specified number of actions or the number of NO-GO determinations is reached.

While actions are being executed, Exec changes to Abort. If you want to stop execution, press the **Abort** soft key.

Note
- If Print To is set to Multi on the PRINT menu, you cannot print or save screen captures even if you set Print to ON on the Action menu.
  ► section 16.6
- When the action to execute is e-mail transmission, the DLM2000 sends the number of messages specified by either Action Count or Mail Count, whichever is lower.

Setting the Reference Range Type (Mode)

Press the **Mode** soft key to display the following menu.
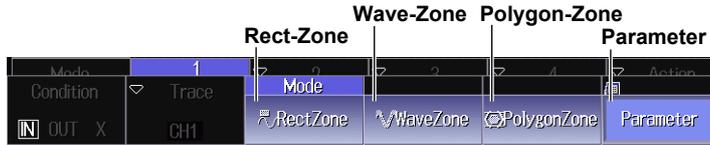
Under the following circumstances, there are reference range types that you cannot specify.

• When the source waveform is LOGIC, XY1, XY2, FFT1, or FFT2
• When the reference condition is 2 or 4 and the source waveform is Math1 or Math2

Source Waveform	Reference Range Type			
	Rect-Zone	Wave-Zone	Polygon-Zone	Parameter
CH1 to CH4	Yes	Yes	Yes	Yes
LOGIC	No	No	No	Yes
Math1 and Math2				
Reference condition 1 and 3	Yes	Yes	Yes	Yes
Reference condition 2 and 4	No	No	No	Yes
XY1 and XY2	Yes	No	Yes	Yes
FFT1 and FFT2	No	No	No	Yes

Note

Using the CH4 Terminal and Logic Signal Input Port

When you perform GO/NO-GO determination, you cannot use the CH4 terminal and logic signal input ports as the source at the same time. Specify the source that you want to use in advance by pressing either the CH4 key or the LOGIC key.

Rect-Zone

Press the **RectZone** soft key to display the following menu.

Reference standard, the rectangular zone appears when this is set to IN or OUT

Set the source waveform (CH1 to CH4, Math1,* Math2,* XY1, or XY2)
* Math1 and Math2 can be specified when the reference condition is 1 or 3.

Set the reference range type (RectZone)

Set the GO/NO-GO determination source window (Main, Zoom1, or Zoom2)
Set this when the source waveform is from CH1 to CH4, Math1, or Math2.

This appears after you press the **Upper/Lower** soft key.

Configure the range of the rectangular zone
Up

Down

Left

This appears after you press the **Left/Right** soft key.

Right
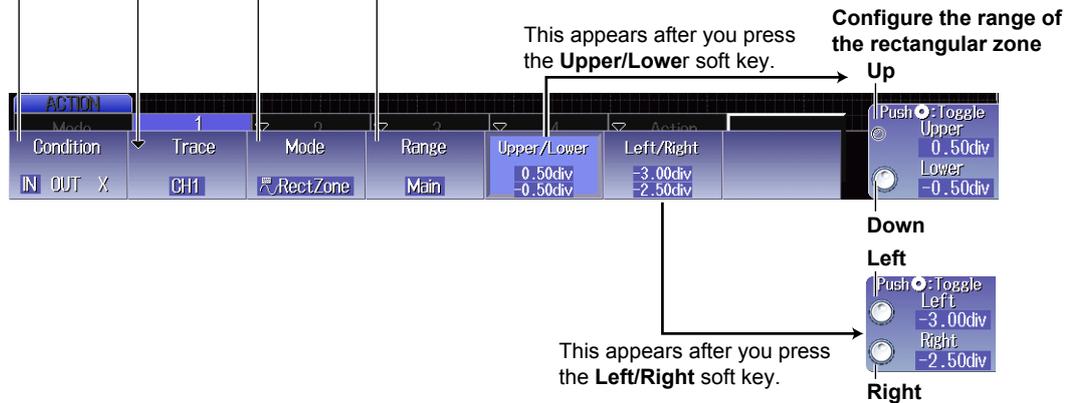
Wave-Zone

Press the **WaveZone** soft key to display the following menu.

Reference standard, the waveform zone appears when this is set to IN or OUT

Set the source waveform (CH1 to CH4, Math1,* or Math2*)
* Math1 and Math2 can be specified when the reference condition is 1 or 3.

Set the reference range type (WaveZone)

Set the GO/NO-GO determination source window (Main, Zoom1, or Zoom2)

Set the waveform zone to edit (1 to 4)
GO/NO-GO determination is performed using the waveform zone that you specify here.

Configure the GO/NO-GO determination area
Left

ACTION					
Mode	1	2	3	4	Action
Condition	Trace	Mode	Time Range	Zone No.	Edit 1
IN OUT X	CH1	WaveZone	Main	1 2 3 4	

Push ●:Toggle
T Range1
−5.00div
T Range2
5.00div

Right

Edit the waveform zone
It takes a few seconds to switch to the editing screen.

Editing a Waveform Zone (Edit1 to 4)

Press one of the soft keys from **Edit 1** to **Edit 4**, whichever is shown on the menu, to display the following menu.

Editing the Whole Waveform

Change the base waveform (CH1 to CH4, Math1, or Math2)
If you change the base waveform, all the zones that you have edited up to that point are lost.

Set the editing range to Whole

This appears after you press the **Upper/Lower** soft key.

Confirm the changes to the waveform zone

Configure the range of the waveform zone
Up

Mode	1	2	3	4	Action
Condition	Trace	Mode	Time Range	Zone No.	Edit 1
Edit	Upper/Lower	Left/Right	New	Store	Quit
Whole Part	0.00div / 0.00div	0.00div / 0.00div			

Push ●:Toggle
Upper
0.00div
Lower
0.00div

Down
Left

Push ●:Toggle
Left
0.00div
Right
0.00div

Stop editing
It takes a few seconds to return to the previous menu from the editing screen.

This appears after you press the **Left/Right** soft key.

Right

Editing a Part of the Waveform

Change the base waveform (CH1 to CH4, Math1, or Math2)
If you change the base waveform, all the zones that you have edited up to that point are lost.

Set the editing range to Part

This appears after you press the **Upper/Lower** soft key.

Confirm the changes to the waveform zone

**Configure the range of the waveform zone
Up**

| Edit | Upper/Lower | T Range1/2 | ▽ | New | Store | | Quit |
| Whole Part | | −5.00div 5.00div | | | | | |

Push ◉ :Toggle
Upper
◎ Lower

Down
Configure the partial editing range
Left

Push ◉ :Toggle
◎ T Range1
−5.00div
◎ T Range2
5.00div

Stop editing
It takes a few seconds to return to the previous menu from the editing screen.

This appears after you press the **T Range1/2** soft key.

Right

- **Changing the Base Waveform**

  Change the base waveform when you want to use a waveform other than the GO/NO-GO determination source waveform or when you want to recreate the zone.

- **Confirming the Waveform Zone**

  Confirm the edited waveform zone and store it in internal memory.

- **Finishing Editing**

  Return to the previous menu from the editing screen. If you do not confirm the edited waveform zone by pressing the **Store** soft key, the changes that you made are lost.

Note
- If you change the base waveform, all the zones that you have edited up to that point are lost.
- If you want to move from the editing menu to a different menu, you have to press the Quit soft key to finish editing.

Polygon-Zone

Press the **PolygonZone** soft key to display the following menu.

Reference standard, the polygonal zone appears when this is set to IN or OUT

Set the source waveform (CH1 to CH4, Math1,* Math2,* XY1, or XY2)
* Math1 and Math2 can be specified when the reference condition is 1 or 3.

Set the reference range type (PolygonZone)

Set the GO/NO-GO determination source window (Main, Zoom1, or Zoom2)
Set this when the source waveform is from CH1 to CH4, Math1, or Math2.

Configure the position of the polygonal zone
Vertical position

| Condition | ▽ | Trace | Mode | Time Range | Zone No. | ▽ | Action | |
| IN OUT X | | CH1 | ◎PolygonZone | Main | 1 2 3 4 | | | |

Push ◉ :Toggle
◎ V-Position
−0.04div
◎ H-Position
0.26div

Set the polygonal zone (1 to 4)
GO/NO-GO determination is performed using the polygonal zone that you specify here.

Horizontal position

Use the Mask Editor software on a PC in advance to create the polygonal images that you will use as polygonal zones. After loading the file (see section 17.8) and loading the polygonal image into the specified zone number (Zone No. 1 to 4), configure the polygonal zone GO/NO-GO determination.

Parameter

Press the **Parameter** soft key to open one of the menus shown below. The menu that appears varies depending on the specified source waveform.

When Math1, Math2, or a Channel from CH1 to CH4 Is the Source Waveform

You can select the measurement items to use in the GO/NO-GO determination from all of the items used for automated measurement of waveform parameters For information on setting automated measurement of waveform parameters, see section 9.1.

Set the source waveform (CH1 to CH4, Math1, or Math2)
Set the reference range type (Parameter)
Configure the GO/NO-GO determination range
Upper limit
Set the measurement items to use in the GO/NO-GO determination
Lower limit
Enters the selected measurement items

When LOGIC Is the Source Waveform

You can select the measurement item to use in the GO/NO-GO determination from the items used for time axis measurement of waveform parameters shown below. For information on setting automated measurement of waveform parameters, see section 9.1.

Freq, Period, Avg Freq, Duty, Pulse Count, and Delay

Set the source waveform (LOGIC)
Set the reference range type (Parameter)
This appears when you press the **Source Bit** soft key.
Set the source bit (Bit0 to Bit7)
This appears after you press the **Upper/Lower** soft key.
Configure the GO/NO-GO determination range
Upper limit
Set the measurement items to use in the GO/NO-GO determination
Lower limit
Enters the selected measurement items

When XY1 or XY2 Is the Source Waveform

The measurement item to use in the GO/NO-GO determination is the area of XY1 or XY2. For information on setting how the XY waveform is displayed and how its area is determined, see chapter 5 and appendix 1.

Set the source waveform (XY1 or XY2)

Set the reference range type (Parameter)

Configure the GO/NO-GO determination range
Upper limit

Lower limit
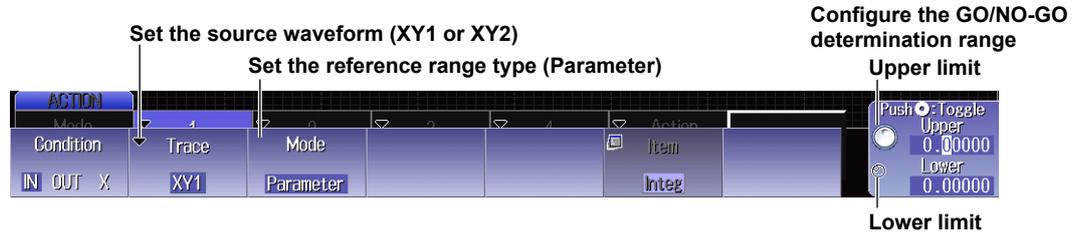
When FFT1 or FFT2 Is the Source Waveform

You can select the measurement item to use in the GO/NO-GO determination from the cursor measurement items for FFT. For information on setting the cursor measurement items for FFT, see section 7.2.

Set the source waveform (FFT1 or FFT2)

Set the reference range type (Parameter)

Configure the GO/NO-GO determination range
Upper limit

Set the measurement items to use in the GO/NO-GO determination

Lower limit

Enters the selected measurement items
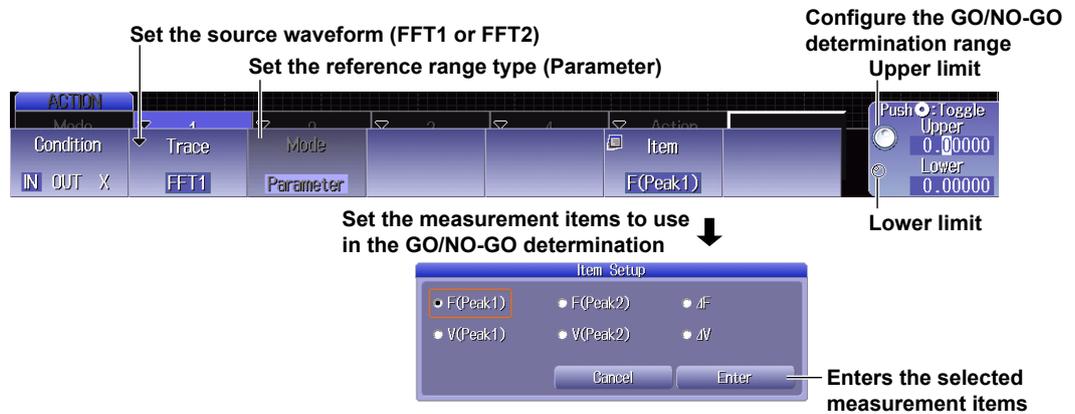
3.1   Setting Conditions for Waveform Acquisition

This section explains the following settings (which are used when acquiring waveforms):
- Record length
- Acquisition mode
- Trigger mode
- High resolution mode
- Interleave mode
- Sampling mode
- The number of waveforms to acquire, the attenuation constant, and the number of times to average

► **"Waveform Acquisition" in the Features Guide**

ACQUIRE Menu
Press **ACQUIRE** to display the following menu.
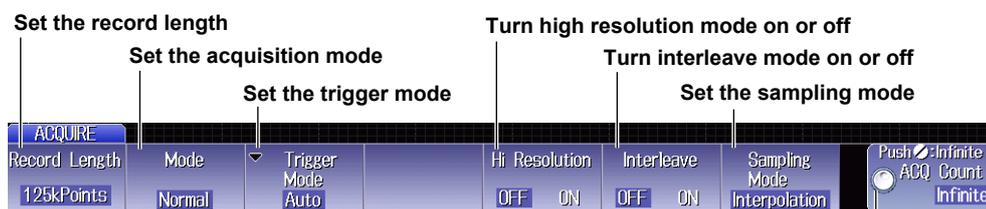
Set the record length

Set the acquisition mode

Set the trigger mode

Turn high resolution mode on or off

Turn interleave mode on or off

Set the sampling mode

ACQUIRE						
Record Length	Mode	▽ Trigger Mode		Hi Resolution	Interleave	Sampling Mode	Push ∅:Infinite ACQ Count
125kPoints	Normal	Auto		OFF ON	OFF ON	Interpolation	Infinite

Set the number of waveforms to acquire, the attenuation constant, and the number of times to average

Setting the Acquisition Mode (Mode)
Normal: Displays waveforms without processing the sampled data. You can set the number of waveforms to acquire with the jog shuttle.

Envelope: Displays waveforms in envelope mode. You can set the number of waveforms to acquire with the jog shuttle.

Average: Displays averaged waveforms. You can set the attenuation constant and the number of times to average with the jog shuttle.

Setting the Trigger Mode (Trigger Mode)
The trigger mode determines the conditions for updating the displayed waveforms. You can also set the trigger mode by pressing the MODE key. ► section 2.1

You can set the trigger mode to one of the settings below.

   Auto, Auto Level, Normal, and N Single

Setting the Sampling Mode (Sampling Mode)
Realtime: Samples data in real-time sampling mode.

Interpolation: Samples data in interpolation mode.

Repetitive: Samples data in repetitive sampling mode.

Sampling mode

Acquisition mode

Sample rate

T	Normal	Edge CH1
	IntP 6.25GS/s	
M 5.00 V		
Main : 125 k		2us/div

Record length
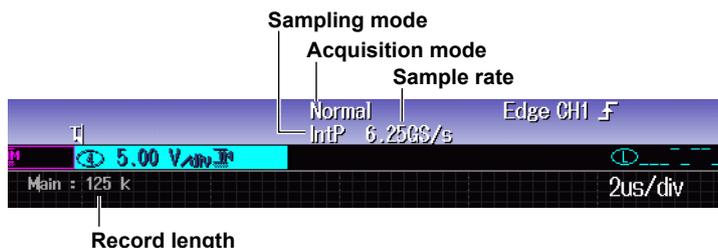
3.2　Acquiring Waveforms

Starting and Stopping Waveform Acquisition (RUN/STOP)

Press **RUN/STOP** to start or stop waveform acquisition.

The key is illuminated while the DLM2000 is acquiring waveforms.

Acquiring a Waveform Once (SINGLE)

Press **SINGLE**. The key illuminates and the DLM2000 updates the waveform display only once when the trigger condition is met. After that, it stops acquiring waveforms and the key turns off.

4.1   Setting Display Conditions

This section explains the following settings (which are used when viewing the display):

- Display format
- Display interpolation
- Graticule
- Scale value display
- Waveform mapping
- Color
- Intensity

DISPLAY Menu

Press **DISPLAY** to display the following menu.

Set the display format (Auto, Single, Dual, Triad, Quad,* or Hexa*)
* Only on 4-channel models

Set the display interpolation (Sine, Line, Pulse, or OFF)

Set the graticule

Turn the scale value display on or off

Set waveform mapping

Set the display colors

Set the intensity
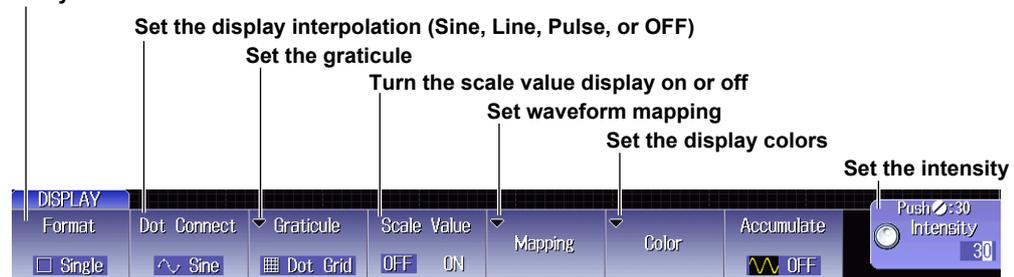
Setting the Graticule (Graticule)

Press the **Graticule** soft key to display the following menu.

Display the grid with dotted lines

Display the grid with solid lines

Display the grid frame

Display the grid with a cross hair

Select ON to display the fine grid.
Select OFF to not display the fine grid.
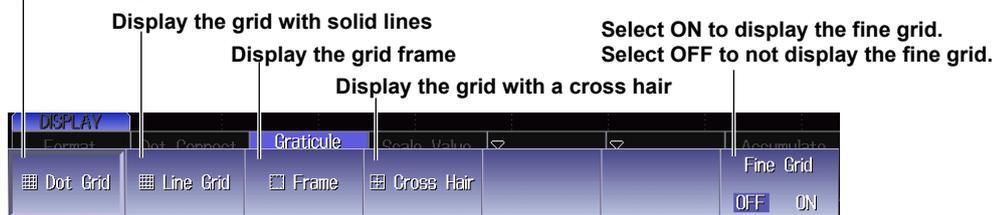
Setting Waveform Mapping (Mapping)

Press the **Mapping** soft key to display the following menu.

Set the waveform mapping mode (Auto or Manual)
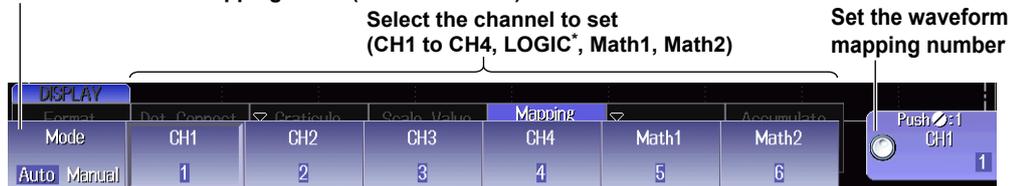
Select the channel to set
(CH1 to CH4, LOGIC*, Math1, Math2)

Set the waveform mapping number

*   CH4 or LOGIC, whichever the corresponding key is illuminated, can be selected.
      Specify the channel that you want to set in advance by pressing either the CH4 key or the LOGIC key.

Setting the Display Color (Color)

Press the **Color** soft key to display the following menu.

Models without the SENT or PSI5 Option

Set the intensity of the grid, zoom box, cursor, or marker*

Set the waveform color*

* **See "Setting the Intensity" and "Setting the Waveform Color" for models with the SENT or PSI5 option, which are explained next.**

Models with the SENT or PSI5 Option

Set the waveform color

Set the intensity

Set the serial bus trend color
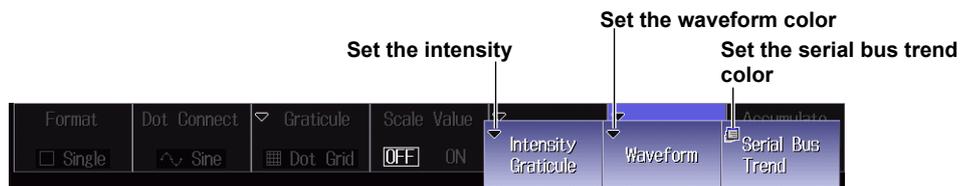
- **Setting the Intensity (Intensity Graticule)**

  Press the **Intensity Graticule** soft key to display the following menu.

  Select the item you want to set, and set the intensity.

  Grid   **Zoom box**   **Cursor**   **Marker**   **Set the intensity of the selected item**

- **Setting the Waveform Color (Waveform)**

  Press the **Waveform** soft key to display the following menu.

  Select the waveform you want to set, and set the color.

  Set the display color of each waveform (CH1 to CH4, LOGIC*, Math1, Math2)

  * **CH4 or LOGIC, whichever the corresponding key is illuminated, can be selected. Specify the channel that you want to set in advance by pressing either the CH4 key or the LOGIC key.**

- **Setting the Serial Bus Trend Color (Serial Bus Trend)**

  Press the **Serial Bus Trend** soft key to display the following screen.

  Select the trend you want to set, and set the color.
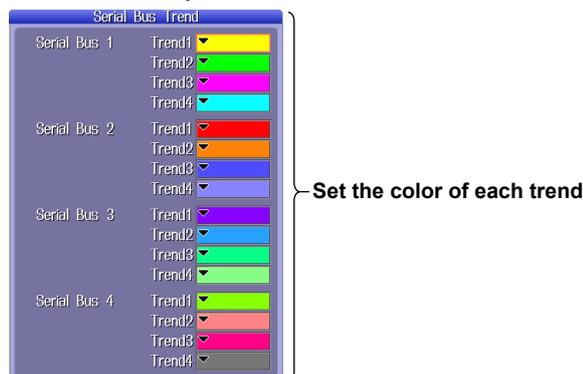
  Set the color of each trend

4.2 Using the Accumulate Feature

This section explains the following settings (which are used when using the accumulate feature):
- Gradation mode (accumulate display)
- Intensity level
- Accumulation time

► **"Accumulate (Accumulate)" in the Features Guide**

DISPLAY Menu

Press **DISPLAY** to display the following menu.

**Set the intensity
(When Mode is set to Intensity)**

Set the gradation mode

**Set the accumulation time(When
Gradation Mode is not set to OFF)**
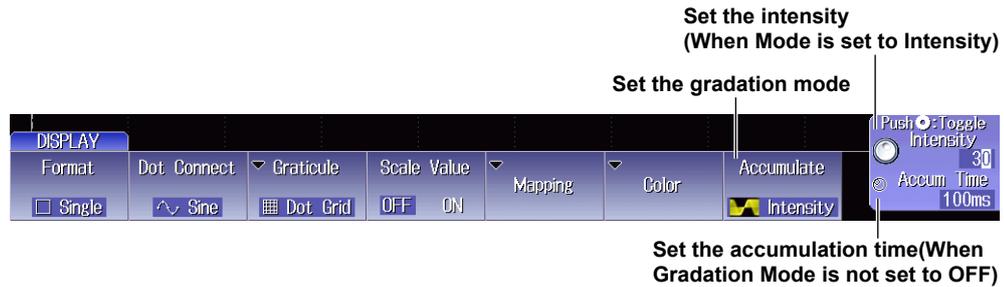
Gradation Mode (Accumulate)

Intensity: Indicates waveform frequency using different intensity levels. You can set the different
            intensity levels with the jog shuttle.
Color: Indicates waveform frequency using different colors.
OFF: Does not accumulate waveforms.

4.3 Using the Snapshot and Clear Trace Features

Press **SNAP SHOT** to retain the currently displayed waveform on the screen as a snapshot displayed in white. Snapshot waveforms remain on the screen until you execute a clear trace operation.

Press **CLEAR TRACE** to clear all of the waveforms that are displayed on the screen.

► **"Snapshot (SNAP SHOT)" and "Clear Trace (CLEAR TRACE)"**
in the Features Guide

4.4 Adjusting the Backlight

This section explains the following settings (which are used when adjusting the backlight):
- Turning off the backlight
- Automatically turning off the backlight
- Adjusting the brightness

► **"System Configuration (System Configuration)" in the Features Guide**

UTILITY System Configuration Menu

Press **UTILITY**, and then press the **System Configuration** soft key to display the following menu.

Adjust the backlight
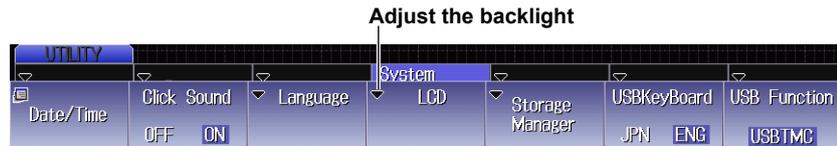
Adjusting the Backlight (LCD)

Press the **LCD** soft key to display the following menu.

Turn off the backlight
(You can turn on the backlight by pressing any key)

Enable or disable the automatic turning off of the backlight

Set the backlight brightness

Set the timeout value for automatically turning the backlight off (Set with the jog shuttle)

Set the backlight brightness (Set with the jog shuttle)
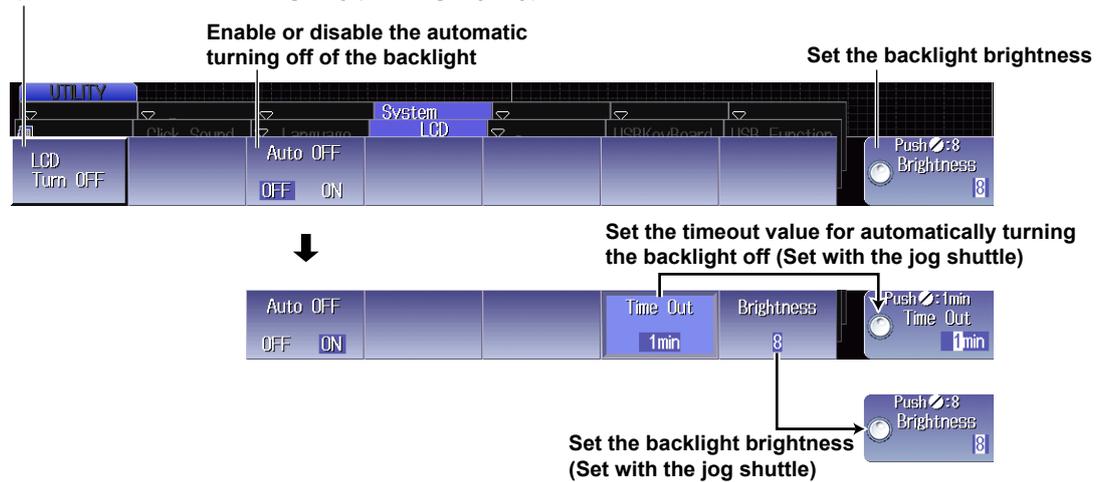
5.1   Displaying XY Waveforms

5-1

This section explains the following settings (which are used when displaying XY waveforms):
- XY waveform display
- X-axis and Y-axis source waveforms
- VT waveform display and split display
- Display range

► **"Displaying XY Waveforms" in the Features Guide**

XY Menu

Press **SHIFT+DISPLAY** (X-Y) to display the following menu.

Select whether to set XY1 or XY2*

Turn XY waveform display on or off

Set the source waveform for the X axis

Set the source waveform for the Y axis

Turn the VT waveform (VT Display) and split (Split) displays on or off

Configure the display range
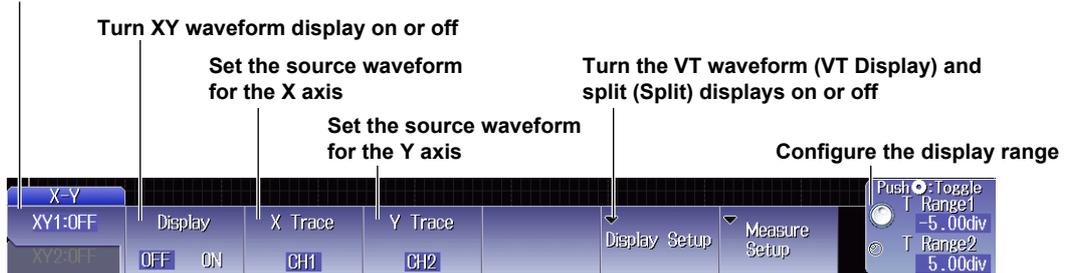
* XY2 is only available on 4-channel models

5.2 Performing Cursor Measurements and Area Calculations

This section explains the following settings (which are used when performing cursor measurements on and determining the area of the displayed XY waveform):
- Measurement mode
- Cursor measurement
- Area determination method

► **"Measurement (Measure Setup)" in the Features Guide**

XY Measure Setup Menu

Press **SHIFT+DISPLAY** (X-Y), the **Measure Setup** soft key, and then the **Mode** soft key to display the following menu.

Disables measurement

Measure with cursors

Determine the area
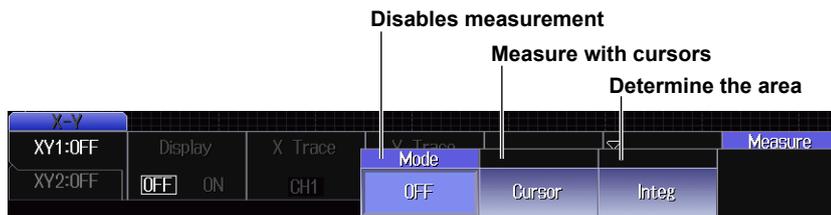
Performing Cursor Measurements (Cursor)

Press the **Cursor** soft key to display the following menu.

Set the cursor that is controlled by the jog shuttle

Set the cursor positions

Set measurement items

Select the measurement items that you want to use
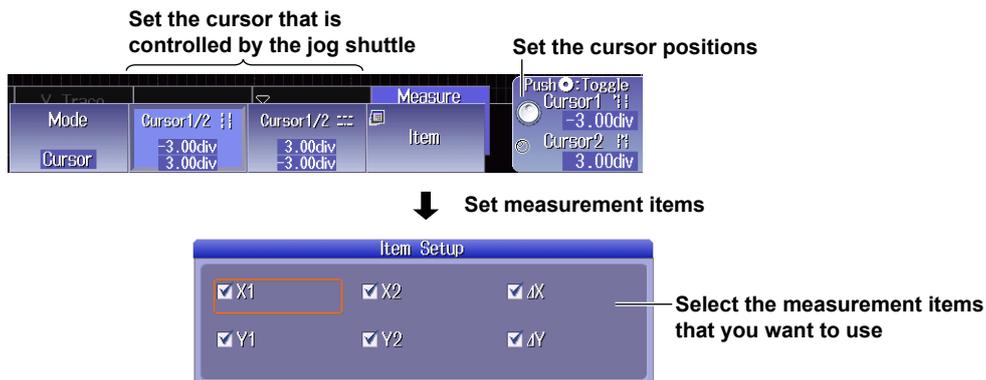
Performing Area Calculations (Integ)

Press the **Integ** soft key to display the following menu.

Set the method of determining the area (Open or Close)

Set which direction to make positive (CW, clockwise or CCW, counterclockwise)
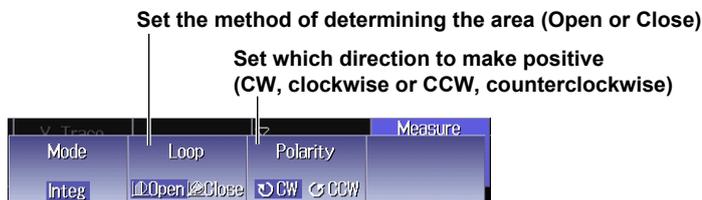
6.1   Setting the Computation Mode

This section explains how to set the computation mode.

► **"Computation Mode (Mode)" in the Features Guide**

MATH/REF menu

Press **MATH/REF** to display the following menu.

Select whether to set MATH1/REF1 or MATH2/REF2*

Set the computation mode
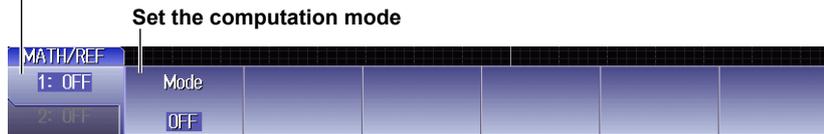
**   MATH2/REF2 is only available on 4-channel models**

Setting the Computation Mode (Mode)

Press the **Mode** soft key to display the following menu.

Do not display computed waveforms and reference waveforms

Display computed waveforms

Display reference waveforms
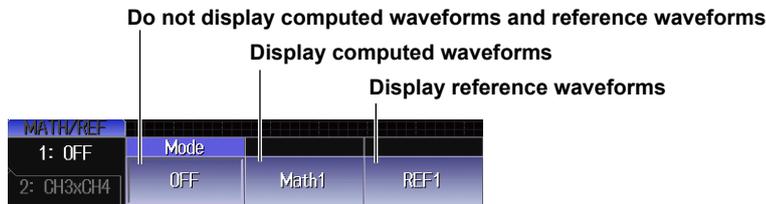
Note
You cannot use MATH2/REF2 when the logic signal state display is on.

6.2 Performing Addition, Subtraction, and Multiplication

This section explains the following settings (which are used when performing addition, subtraction, and multiplication):
- Operators
- Computation source waveforms

► **"Operators (Operation)" in the Features Guide**

MATH/REF menu

Press **MATH/REF** to display the following menu.

The specified operator

Specify Math1 or Math2

Set the operator (S1 + S2, S1 - S2, or S1 × S2)

Set the computation source waveform (CH1 to CH4 or Math1*)
*   You can only specify Math1 when Mode is set to Math2.

MATH/REF	Mode	Operation	Source1	Source2	▾Label/Unit	Ranging	Push ⊙:Toggle Center 0.00W
1: CH1xCH2							
2: CH3xCH4	Math1	S1 x S2	CH1	CH2	Math1	Auto Manual	Sensitivity 1.000V

6.3 Performing Filter Functions

This section explains the following settings (which are used when performing the phase shift and average filter functions and when applying an IIR filter to the waveform):

• Operators
• Computation source waveforms
• Filter type

► **"Operators (Operation)" in the Features Guide**

MATH/REF menu

Press **MATH/REF** to display the following menu.

The specified operator

Specify Math1 or Math2

Set the operator to Filter(S1)

Set the computation source waveform (CH1 to CH4 or Math1*)
* You can only specify Math1 when Mode is set to Math2.
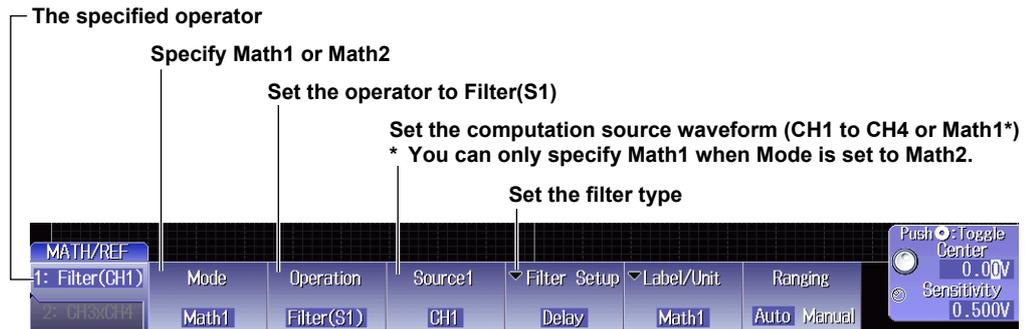
Set the filter type

Setting the Filter Type (Filter Type)

Press the **Filter Setup** soft key, then the **Type** soft key to display the following menu.

Configure phase shifting

Configure smoothing

Configure the IIR lowpass filter

Configure the IIR highpass filter
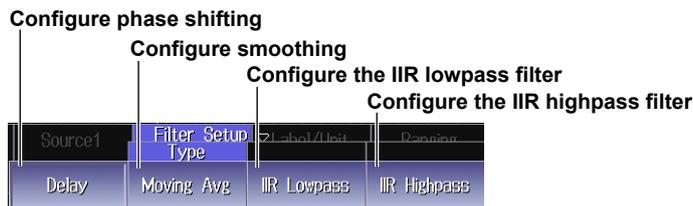
Configuring Phase Shifting (Delay)

Press the **Delay** soft key to display the following menu.

Set the delay value

Configuring Smoothing (Moving Avg)

Press the **Moving Avg** soft key to display the following menu.

Set the weighted points

Configuring the IIR Filter (IIR Lowpass or IIR Highpass)

Press the **IIR Lowpass** or **IIR Highpass** soft key to display the following menu.

Set the filter order   **Set the cutoff frequency**
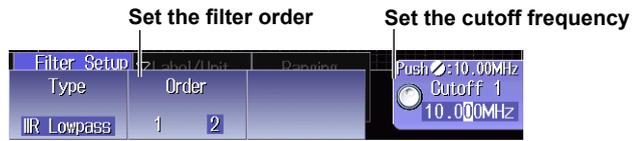
6.4　Performing Integration
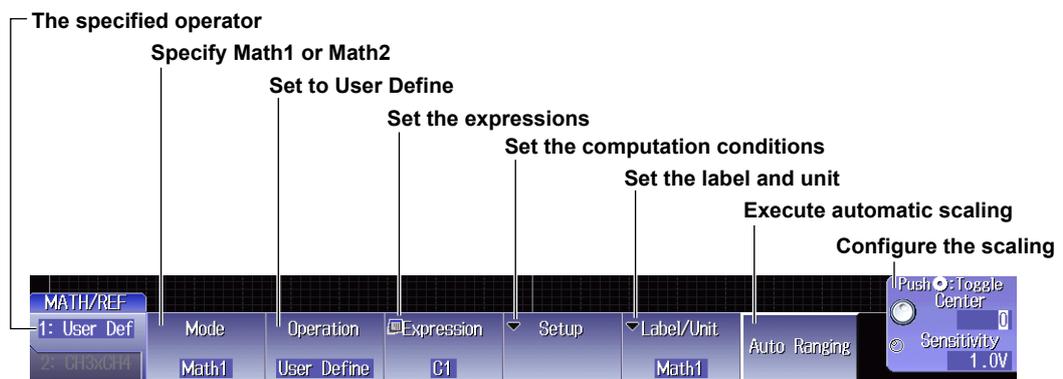
This section explains the following settings (which are used when performing integration):
- Operators
- Computation source waveforms
- Initial point

► "Operators (Operation)" in the Features Guide

MATH/REF menu

Press **MATH/REF** to display the following menu.

The specified operator

Specify Math1 or Math2

Set the operator to Integ(S1)

Set the computation source waveform (CH1 to CH4 or Math1*)
* You can only specify Math1 when Mode is set to Math2.

Set the initial point
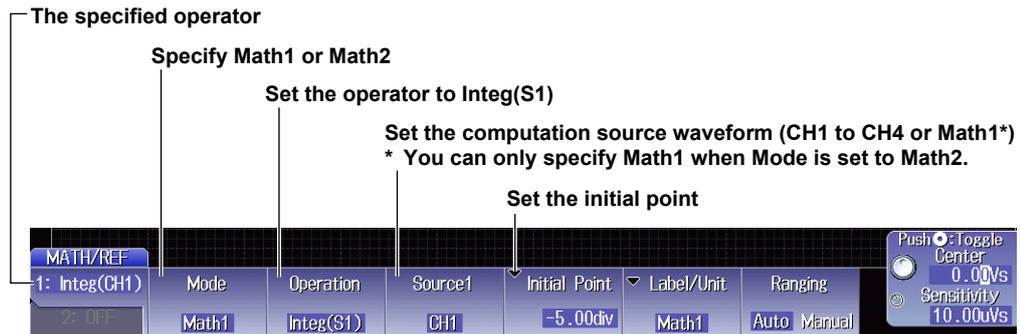
Setting the Initial Point (Initial Point)

Press the **Initial Point** soft key to display the following menu.

Set the initial point　　　　**Set the initial point to the specified value**

6.5   Performing Count Computations

This section explains the following settings (which are used when performing edge count or rotary count):

- Operators
- Count type
- Computation source waveforms
- Initial point
- Edge count detection level, slope, and hysteresis
- Rotary count threshold level

► **"Edge Count or Rotary Count (Count(S1))" in the Features Guide**

MATH/REF menu

Press **MATH/REF** to display the following menu.

The specified operator

Specify Math1 or Math2

Set the operator to Count(S1)

Set the count type

Set the initial point ► section 6.4
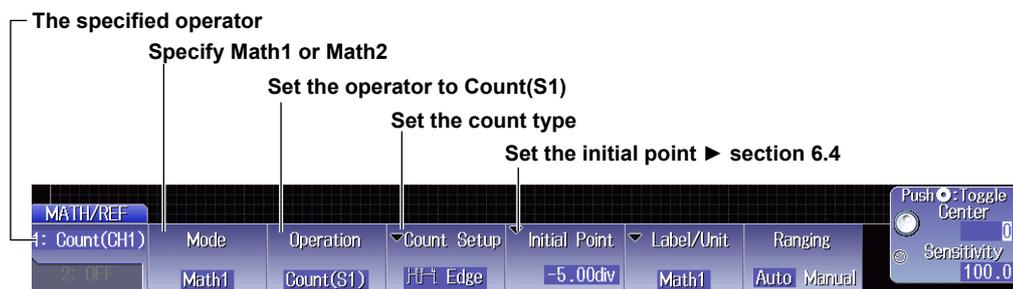
Setting the Count Type (Type)

Press the **Count Setup** soft key, then the **Type** soft key to display the following menu.

Set the edge count

Set the rotary count
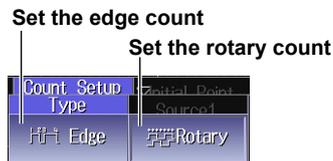
Setting the Edge Count (Edge)

Press the **Edge** soft key to display the following menu.

Set the computation source waveform

Set the slope

Set the detection level and the hysteresis
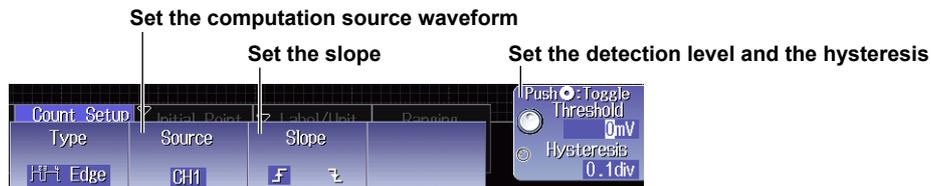
Setting the Rotary Count (Rotary)

Press the **Rotary** soft key to display the following menu.

**Set the computation source waveform
(CH1 to CH4 or Math1*)
* You can only specify Math1
when Mode is set to Math2**

**Configure the level used to determine
waveform state changes**
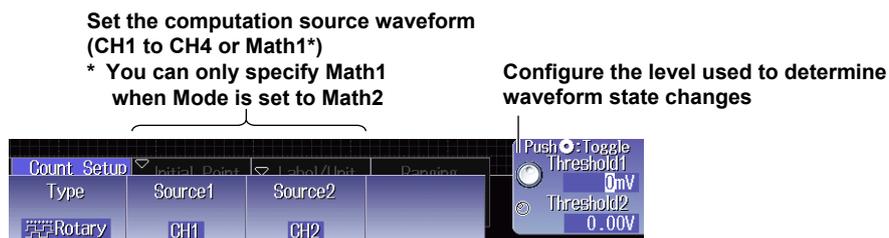
6.6 Setting Labels, Units, and Scaling

This section explains the following settings (which are used with labels, units, and scaling):

- Label
- Unit
- Scaling

MATH/REF menu

Press **MATH/REF** to display the following menu.

Set the label and unit

Set the scaling

Set the center point and
the sensitivity
(When Ranging is set to Manual)

Setting Labels and Units (Label/Unit)

Press the **Label/Unit** soft key to display the following menu.

Set the unit (Auto or Manual)

Set the user unit

Set the label

Turn labels on or off
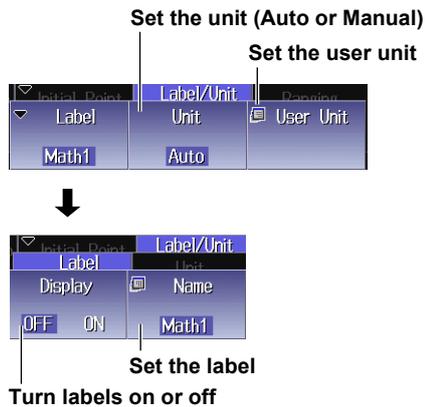
Setting Scaling (Ranging)

Auto: Automatically set the vertical display range of the computed waveform.
Manual: Manually set the sensitivity (Sensitivity) and the signal level at the vertical center (Center).

6.7   Loading Reference Waveforms

This section explains the following settings (which are used when loading reference waveforms):
- Loading reference waveforms
- Label
- Vertical position

MATH/REF menu
Press **MATH/REF** to display the following menu.
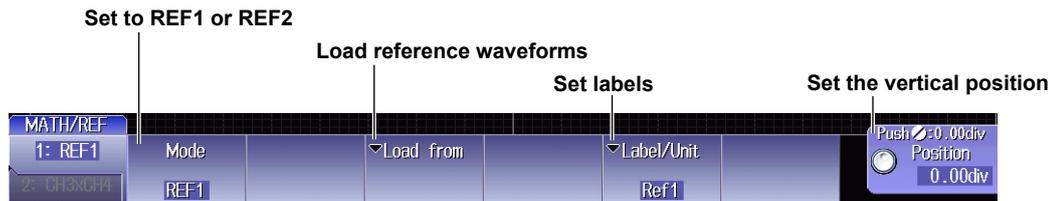
Loading the Reference Waveform (Load from)
Specify the waveform to use as the reference waveform from one of the following:

Load from CH1, Load from CH2, Load from CH3*, and Load from CH4*

*   Only on 4-channel models

Setting Labels (Label/Unit)
Press the **Label/Unit** soft key to display the following menu.

6.8 Performing User-Defined Computations (Option)

This section explains the following settings (which are used when performing user-defined computations):
- Operators
- Expressions
- Computation conditions
- Labels and units
- Auto scaling
- Scaling

► **"User-Defined Computation (User Define, option)" in the Features Guide**

MATH/REF menu

Press **MATH/REF** to display the following menu.

The specified operator
Specify Math1 or Math2
Set to User Define
Set the expressions
Set the computation conditions
Set the label and unit
Execute automatic scaling
Configure the scaling

Setting Expressions (Expression)

Press the **Expression** soft key to display the following screen.

You can append the automated measurement values of waveform parameters to expressions.

Define an expression by combining computation source waveforms and operators.

Inserts a right parenthesis
Moves the cursor to the left
Moves the cursor to the right
Deletes the character at the cursor position
Deletes the previous character
Deletes all the characters you have entered
Enters the expression
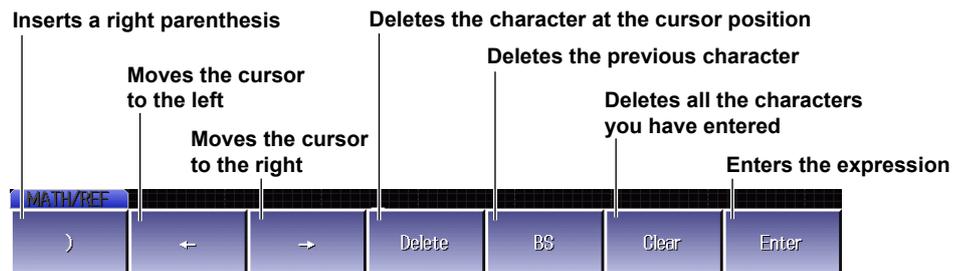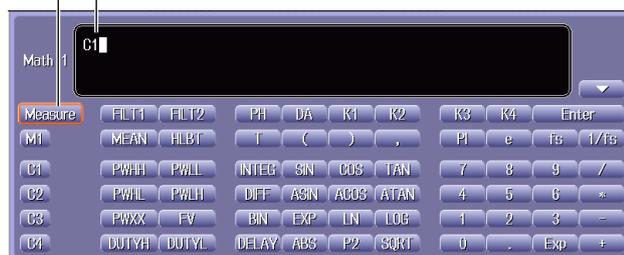
Setting Computation Conditions (Setup)

Press the **Setup** soft key to display the following menu.

Perform computations on past waveforms

Set constants K1 to K4 (with the jog shuttle)

Set the digital filters

**Turn averaging on or off
(This setting is the same
for Math1 and Math2.)**

1: User Def	Mode	Operation	Expression	Setup	Label/Unit	
Math on History		Const Setup	Filter1	Filter2		Average
			Lowpass IIR	Lowpass IIR		OFF ON
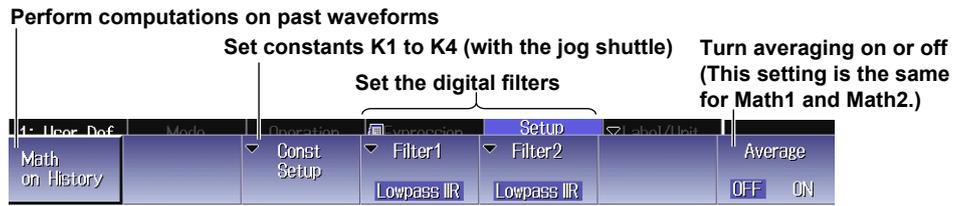
Setting Digital Filters (Filter1 and Filter2)

Frequency band (Band):	Set to LowPass, BandPass, or HighPass.
Filter type (Type):	Set to IIR or FIR.
Cutoff frequency (Cutoff1 or Cutoff2)*:	Set for Filter1 and Filter2 separately.

*   Cutoff2 is only applicable when frequency band is set to BandPass.

7.1   Displaying FFT Waveforms

This section explains the following settings (which are used when performing FFT analysis):
- FFT waveform display
- Analysis source waveform
- FFT conditions
- Analysis range
- Vertical and horizontal scale values
- The number of FFT points

► **"FFT" in the Features Guide**

FFT Menu

Press **SHIFT+MATH/REF** (FFT) to display the following menu.

Select whether to set FFT1 or FFT2*

Turn the FFT waveform display on or off

Set the analysis source waveform (CH1 to CH4, Math1, or Math2)

Configure the FFT conditions

Set the analysis range (Main, Zoom1, or Zoom2)

Set the vertical and horizontal scale values

Configure FFT waveform measurement
► section 7.2

Set the number of FFT points

FFT	Display	Trace	FFT Setup	Time Range	Display Setup	Measure Setup	Push⬤:12.5k FFT Points
FFT1:OFF FFT2:OFF	OFF ON	CH1		Main			12.5k

* FFT2 is only available on 4-channel models.

Setting FFT Conditions (FFT Setup)

Press the **FFT Setup** soft key to display the following menu.

Set the spectrum type (LS-, RS-, PS-, PSD-, CS-, TF-, or CH-)[1]

Set the spectrum sub type (MAG, LOGMAG, PHASE, REAL, or IMAG)[1,2]

Set the time window (Rectangle, Hanning, or Flattop)

Set the waveform display method (Normal, Max Hold, or Average)

Set the analysis source waveform (CH1 to CH4, Math1, or Math2)[3]

Configure the unit

Type	Sub Type	Window	Mode	Trace2	Unit
CS-	LOGMAG	Rectangle	Normal	CH2	

1   Only available on DLM2000s with the user-defined computation option
2   PHASE, REAL, and IMAG can be specified when Type is set to LS-, CS-, or TF-.
3   Can only be set when Type is CS, TF, or CH

Setting the Unit (Unit)

Press the **Unit** soft key to display the following menu.

Set the unit type (Auto or User Define)

Set the user-defined unit using 4 characters or less

Mode	Unit User Unit
Auto	dBW

Setting the Vertical and Horizontal Scale Values (Display Setup)

Press the **Display Setup** soft key to display the following menu.

Set the vertical scale (Auto or Manual)

Manually set the vertical scale value (set using the jog shuttle)

Set the horizontal scale (Auto, Center/Span, or Left/Right)

Manually set the horizontal scale value (set using the jog shuttle)

Turn the VT waveform display on or off

Configure the vertical or horizontal scale values

Vert. Scale	Center/Sens	Horiz. Scale	Center/Span	VT Display	Display Setup ▽	Measure Setup	Push ●:Toggle Center
Auto Manual	−40.000dBV 20.0dBV	Auto	312.5kHz 625.0kHz	OFF ON			−40.000dBV Sensitivity 20.0dBV

7.2　Measuring FFT Waveforms

This section explains the following settings (which are used when measuring FFT waveforms):
- Cursor type
- Marker cursor measurements
- Peak cursor measurements

► **"Cursor Measurement (Measure Setup)" in the Features Guide**

Setting the Cursor Type (Mode)

Press **SHIFT+MATH/REF** (FFT), the **Measure Setup** soft key, and then the **Mode** soft key to display the following menu.

Disables measurement

Measure with marker cursors

Measure with peak cursors
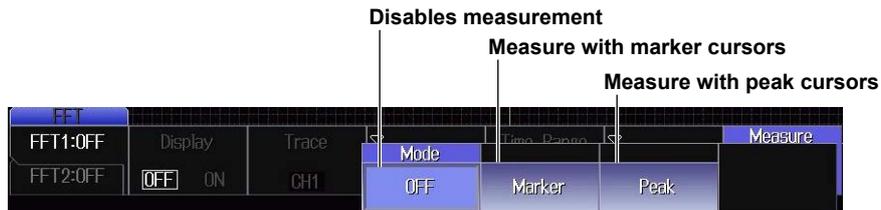
Measuring with Marker Cursors (Marker)

Press the **Marker** soft key to display the following menu.

Set the marker cursor positions

Set measurement items

Select the measurement items that you want to use
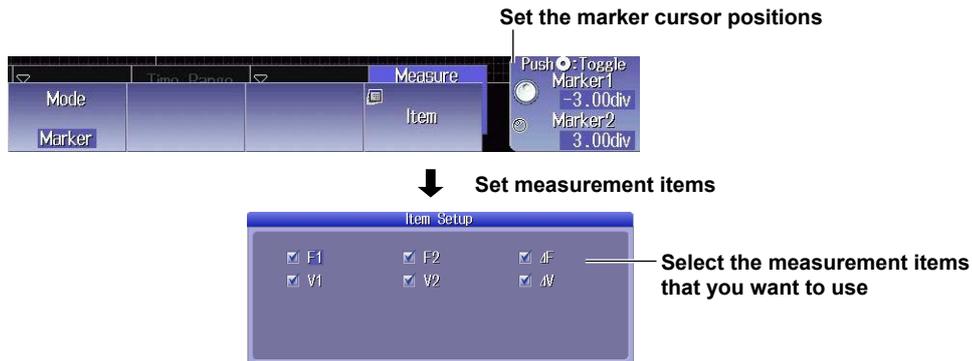
Measuring with Peak Cursors (Peak)

Press the **Peak** soft key to display the following menu.
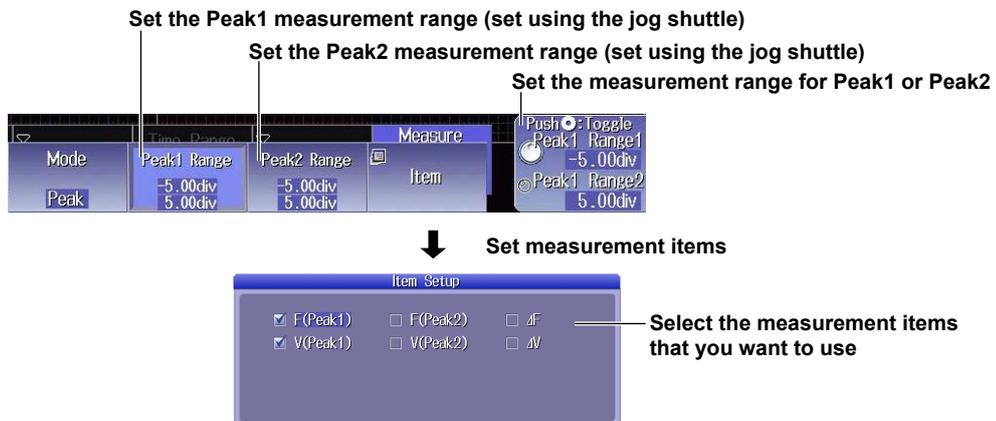
Set the Peak1 measurement range (set using the jog shuttle)

Set the Peak2 measurement range (set using the jog shuttle)

Set the measurement range for Peak1 or Peak2

Set measurement items

Select the measurement items that you want to use

8.1   ΔT Cursor Measurements

This section explains the following settings (which are used when performing ΔT cursor measurements):

• Cursor measurement
• Cursor type
• Source waveform
• Measurement items
• Cursor jumping
• Cursor position

► **"ΔT Cursors (ΔT)" in the Features Guide**

CURSOR Menu

Press **CURSOR** to display the following menu.

Turn cursor measurement on or off
Set the cursor type to ΔT
Set the source waveform (All, CH1 to CH4, LOGIC,* Math1, or Math2)
Cursor jumping
Set the cursor positions

Set measurement items

Select the measurement items that you want to use

*   **You can select CH4 or LOGIC, depending on which channel's corresponding key (CH4 or LOGIC) is illuminated.**
     Specify the channel that you want to measure in advance by pressing either the CH4 key or the LOGIC key.

Cursor Jumping (Cursor Jump)

Press the Cursor Jump soft key to display the following menu.

Specify a zoom window to make Cursor1 or Cursor2 jump to

Note

Setting the Cursor Position
You can move Cursor1 and Cursor2 together by pressing SET repeatedly until the jog shuttle adjusts both of them.

8.2　ΔV Cursor Measurements

This section explains the following settings (which are used when performing ΔV cursor measurements):

- Cursor measurement
- Cursor type
- Source waveform
- Measurement items
- Cursor position

CURSOR Menu

Press **CURSOR** to display the following menu.

Turn cursor measurement on or off
Set the cursor type to ΔV
Set the source waveform (CH1 to CH4, Math1, or Math2)
Set the cursor positions
► section 8.1

Set measurement items

Select the measurement items that you want to use

8.3 ΔT&ΔV Cursor Measurements

This section explains the following settings (which are used when performing ΔT&ΔV cursor measurements):
- Cursor measurement
- Cursor type
- Source waveform
- Measurement items
- ΔT cursor jumping
- Cursor position

► **"ΔT&ΔV Cursors (ΔT&ΔV)" in the Features Guide**

CURSOR Menu

Press **CURSOR** to display the following menu.

Turn cursor measurement on or off

Set the cursor type to ΔT&ΔV

Set the source waveform (CH1 to CH4, Math1, or Math2)

Specify the setting that the jog shuttle controls

Make cursor ΔT jump ► section 8.1

Set the cursor positions ► section 8.1

Set measurement items

The cursor positions

Select the measurement items that you want to use
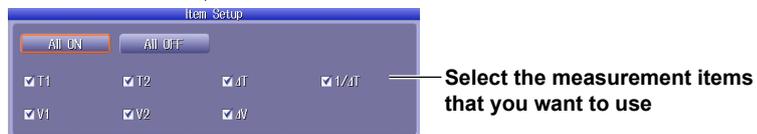
8.4   Marker Cursor Measurements (Marker)

This section explains the following settings (which are used when measuring with marker cursors):
- Cursor measurement
- Cursor type
- Marker display format
- The waveform to measure using the cursors
- Measurement items
- Cursor jumping
- Cursor position

CURSOR Menu
Press **CURSOR** to display the following menu.

Turn cursor measurement on or off
Set the cursor type to Marker
Set the marker display format (Mark or Line)
Set the source waveform and the measurement items for the cursor
Set the cursor position
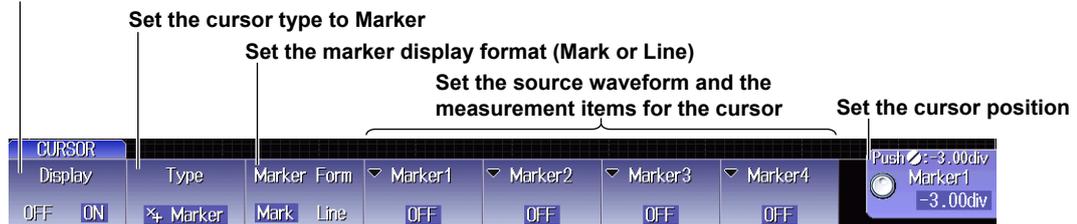
Selecting the Waveform to Measure and Setting the Measurement Items (Marker1, Marker2, Marker3, and Marker4)
Press a soft key from **Marker1** to **Marker4** to display the following menu.

Set the source waveform (OFF, CH1 to CH4, LOGIC,* Math1, or Math2)
Cursor jumping
Set the cursor position

Set measurement items

Select the measurement items that you want to use
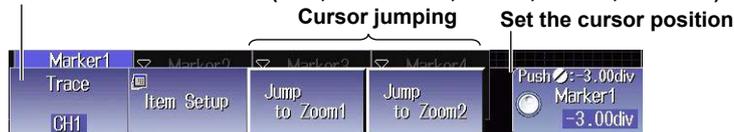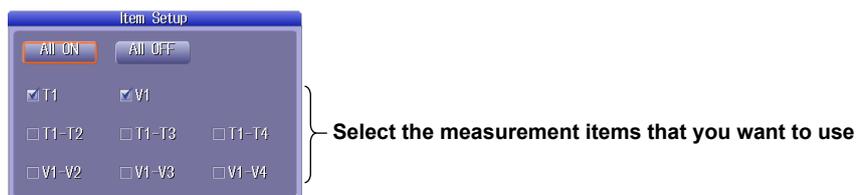
* **You cannot select CH4 while the LOGIC key is illuminated.**
  To make CH4 the source channel, first enable CH4 by pressing the CH4 key.

8.5   Angle Cursor Measurements (Degree)

This section explains the following settings (which are used when measuring with angle cursors):
- Cursor measurement
- Cursor type
- Source waveform
- Measurement items
- References
- Cursor jumping
- Cursor position

▶ **"Angle Cursors (Degree)" in the Features Guide**

CURSOR Menu
Press **CURSOR** to display the following menu.

Turn cursor measurement on or off
 Set the cursor type to Degree
  Set the source waveform (All, CH1 to CH4, LOGIC,* Math1, or Math2)
   Configure the references
    Cursor jumping ▶ section 8.1
    **Set the cursor positions
    ▶ section 8.1**

⬇ **Set measurement items**

**Select the measurement items
that you want to use**
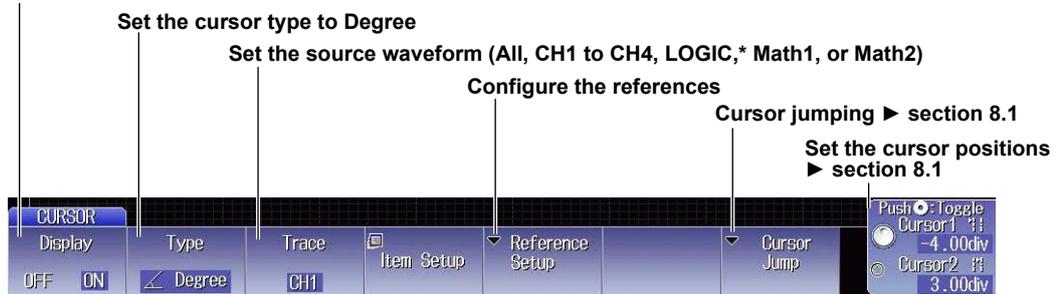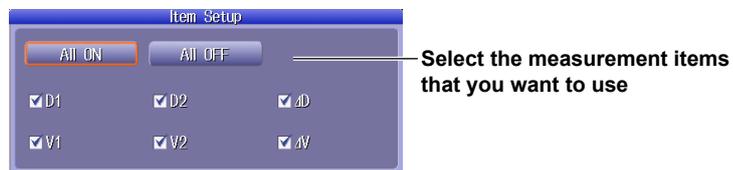
*   **You can select CH4 or LOGIC, depending on which channel's corresponding key (CH4 or LOGIC)
     is illuminated.
     Specify the channel that you want to measure in advance by pressing either the CH4 key or the
     LOGIC key.**

Configuring the Reference (Reference Setup)
Press the **Reference Setup** soft key to display the following menu.

Set the attenuation (set using the jog shuttle)
 Set the unit
  Set the reference cursor (set using the jog shuttle)
   **Set the reference angles
   or reference cursors**
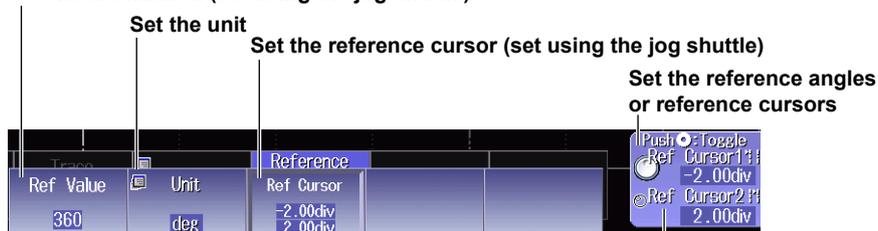
**Ref Cursor1: zero point,
Ref Cursor2: end point**

9.1 Automatically Measuring Waveform Parameters

This section explains the following settings (which are used when automatically measuring waveform parameters):

- Automated measurement
- The source waveform and measurement items
- The measurement location indicator

- The reference level for time measurements
- The measurement source window and the measurement range

▶ **"Automated Measurement of Waveform Parameters" in the Features Guide**

MEASURE Menu

Press **MEASURE** to display the following menu.

Turn automated measurement on or off
Set the source waveform and measurement items
Set the automatic measurement location indicator
Set the reference levels for time measurement
Set the measurement source window
Configure the time range
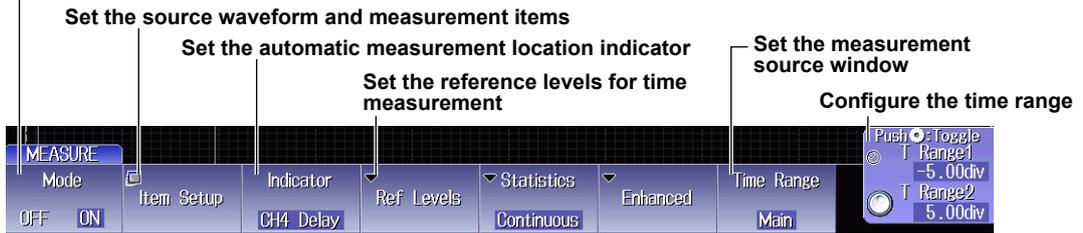
Setting the Source Waveform and the Measurement Items (Item Setup)

Press the **Item Setup** soft key and then a soft key from **CH1** to **CH4**, **Math1**, **Math2**, or **LOGIC*** to display the following menu.

* You can select CH4 or LOGIC, depending on which channel's corresponding key (CH4 or LOGIC) is illuminated. Specify the channel that you want to measure in advance by pressing either the CH4 key or the LOGIC key.

When You Press a soft key from CH1 to CH4, Math1, or Math2
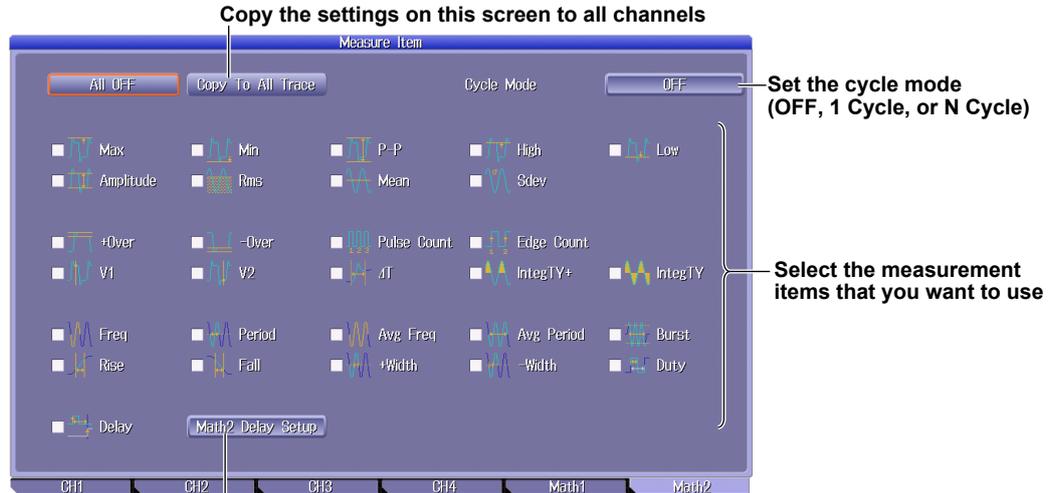
Copy the settings on this screen to all channels
Set the cycle mode (OFF, 1 Cycle, or N Cycle)
Select the measurement items that you want to use

Configure the measurement of delay between waveforms

Set the reference (CH1 to CH4, Math1, Math2, or TrigPos)
Set the slope of the edge to be detected
Set which counted edge to use as a detected point
Set the unit (when Reference is not set to TrigPos)
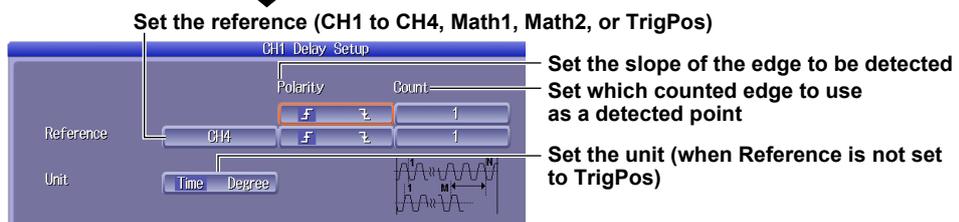
When You Press the LOGIC Soft Key

Configure the measurement of delay between waveforms

Set the reference (CH1 to CH3, LOGIC, Math1, Math2, or TrigPos)

Set the source bit when Reference is set to LOGIC

Set the slope of the edge to be detected

Set which counted edge to use as a detected point

Select the measurement items that you want to use

Set the unit (when Reference is not set to TrigPos)

Setting the Reference Levels for Time Measurements (Ref Levels)

Press the **Ref Levels** soft key and then a soft key from **CH1** to **CH4**, **Math1**, or **Math2** to display the following menu.

Set the unit for the reference level (% or Unit)

Set the distal value (set using the jog shuttle)

Set the mesial value (set using the jog shuttle)

Set the proximal value (set using the jog shuttle)

Set the high/low level (Auto, Max-Min, or Histogram)

Set each reference level

Setting the Measurement Source Window (Time Range)

Main: Set the measurement source window to the Main window.
Zoom1: Set the measurement source window to the Zoom1 window.
Zoom2: Set the measurement source window to the Zoom2 window.

Setting the Measurement Time Period (T Range1/T Range2)

Set the measurement time period within the window specified by Time Range.

Note

About the roll-mode display
- If the record length is 1.25 Mpoints or longer, measured time values such as Freq appear after you stop waveform acquisition using the RUN/STOP key.
- If the record length is set such that waveform acquisition operates in Single mode (6.25 Mpoints or longer for models without a memory option), automatically measured values of waveform parameters appear when the roll mode display stops.
- When the trigger mode is set to Single, the DLM2000 will not display computed waveforms while it is acquiring waveforms. The DLM2000 will display computed waveforms after it triggers and the roll mode display stops.
- The DLM2000 will not display computed waveforms that have been generated through user-defined computation while it is acquiring waveforms. The DLM2000 will display the computed waveforms after it stops acquiring waveforms.

9.2 Processing Statistics on Automatically Measured Values

This section explains the following settings (which are used when processing statistics on automatically measured waveform parameters):

- Statistical processing mode
- Normal statistical processing
- Cyclic statistical processing
- Statistical processing of history data

MEASURE Statistics Menu

Press **MEASURE**, the **Statistics** soft key, and then the **Mode** soft key to display the following menu.

Disable statistical processing

Configure normal statistical processing

Configure cyclic statistical processing

Configure statistical processing of history data
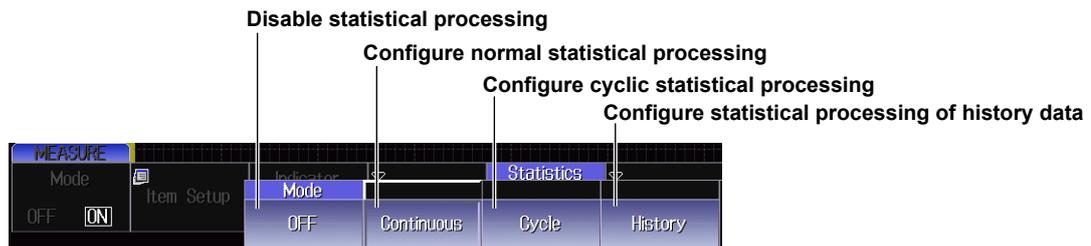
Configuring Normal Statistical Processing (Continuous)

Press the **Continuous** soft key to display the following menu.

Restart statistical processing

Set whether statistical processing is restarted when the trigger level is changed

Configure the trend display or the histogram display
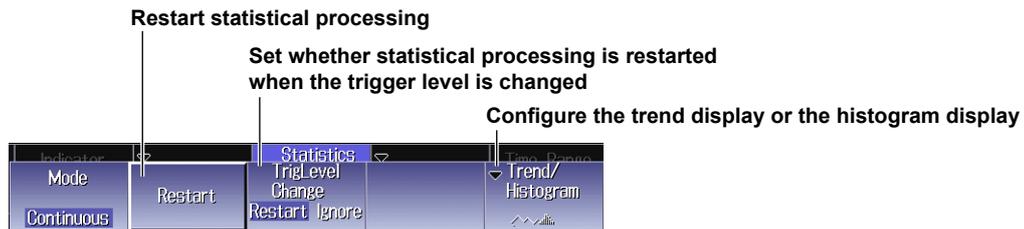
Setting for Restarting Statistical Processing When the Trigger Level Is Changed

Restart: If the trigger level is changed during waveform acquisition, the statistical processing performed up to that point is discarded, the waveform Count is set to 1, and statistical processing restarts.

Ignore: If the trigger level is changed during waveform acquisition, waveform acquisition and statistical processing continue without statistical processing being reset.

Configuring the Trend Display and the Histogram Display (Trend/Histogram)

Press the **Trend/Histogram** soft key to display the following menu.

Trend Display

Select whether to set Trend1 or Trend2*

Switch the graph display on or off

Set the displayed graph to Trend

Set the measurement items to display the trends for

Turn cursor measurement on or off

Set the cursor positions
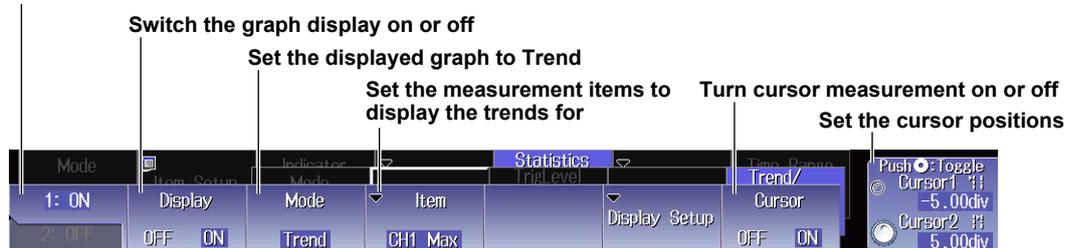
***** **Trend2 is only available on 4-channel models.** **Display settings**

Set the horizontal or vertical scale values

Switch the VT waveform display window on or off

Set the horizontal scale values

Set the vertical scale values

Execute automatic scaling
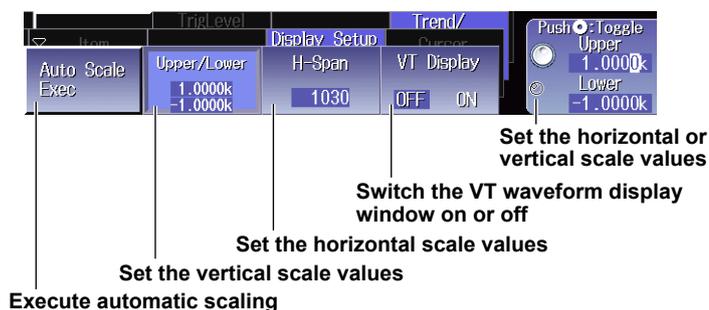
Histogram Display

Select whether to set Hist1 or Hist2*

Switch the graph display on or off

Set the displayed graph to Histogram

Set the measurement items to display histograms for

Switch the VT waveform display window on or off
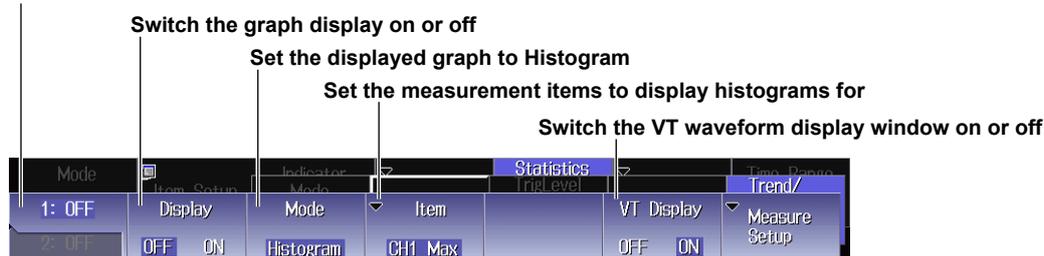
***** **Hist2 is only available on 4-channel models.**

Configure parameter or cursor measurements

Set the cursor position

Set the items for measuring waveform parameters

Set the measurement mode
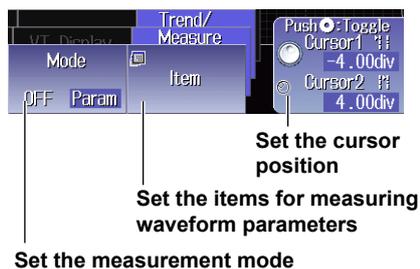
Configuring Cyclic Statistical Processing (Cycle)

Press the **Cycle** soft key to display the following menu.

Execute statistical processing

Set the source waveform used to determine the period (Own, CH1 to CH4, LOGIC,* Math1, or Math2)

Configure the list display

Configure the trend display or the histogram display
► the Trend and Histogram menus for Continuous mode

*   You can select CH4 or LOGIC, depending on which channel's corresponding key (CH4 or LOGIC) is illuminated.
   Specify the channel that you want to measure in advance by pressing either the CH4 key or the LOGIC key.

Configuring the List Display (List)

Press the **List** soft key to display the following menu.

↓: Displayed by the minimum value of each measurement item.

↑: Displayed by the maximum value of each measurement item.

When a scroll bar appears, you can use the left, right, up, and down select keys to scroll through the list.

Select the sort method (Forward or Reverse)

Jumps to and highlights the specified destination

Set the value of a and b (only when Search Mode is set to Data ≤ b, a ≤ Data, or a ≤ Data ≤ b)

Set the search mode (OFF, Statistics Max, Statistics Min, Data ≤ b, a ≤ Data, or a ≤ Data ≤ b)

Note

You can highlight a measured value and then press SET to zoom in on the corresponding waveform position.

Configuring Statistical Processing of History Data (History)

Press the **History** soft key to display the following menu.

Configure the list display
► the List menu for Cycle mode

Configure the trend display or the histogram display
► the Trend and Histogram menus for Continuous mode

Execute statistical processing

9.3   Measuring Enhanced Parameters

This section explains the settings used when performing automated measurement of the waveform parameters of two areas.

► **"Enhanced Parameter Measurement (Enhanced)" in the Features Guide**

MEASURE Enhanced Menu

Press **Measure**, and then the **Enhanced** soft key to display the following menu.

Set up the calculation that uses automated measurement values

Set the source waveform and measurement items

Configure the time range

Setting the Source Waveform and the Measurement Items (Item Setup for Area2)

Press the **Item Setup (Area2)** soft key to display the following screen. The screen is the same as the Item Setup screen shown in section 9.1.

► section 9.1

Setting Calculations That Use Automated Measurement Values (Calc Setup)

Press the **Calc Setup** soft key to display the following screen.

Select the expressions to use

Enter the name using 8 characters or less

Enter the unit using 4 characters or less
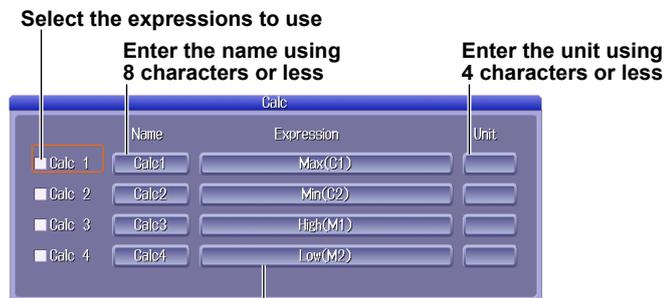
Set the expressions

You can append the automated measurement values of waveform parameters to expressions.

Define an expression by combining computation source waveforms and operators

Note

You cannot use the enhanced parameter measurement feature when the statistical processing mode is set to Cycle.

10.1 Zooming in on or out from Waveforms

This section explains the following settings (which are used when zooming in on or out from waveforms):

- Zoom
- Display format
- Main window display
- Auto scrolling
- Zoom source waveform
- Zoom position
- Zoom factor

► **"Zooming in on Waveforms" in the Features Guide**

ZOOM Menu

Press **ZOOM1** or **ZOOM2** to display the following menu.

Turn zooming on or off

Set the display format (Main, Single, Dual, Triad, Quad, or Hexa)*
* Quad and Hexa are only available on 4-channel models.

Set the main window display to OFF, ON(20%), or ON(50%)

Configure automatic scrolling

Turn zoom source waveforms on or off (CH1 to CH4, Math1, or Math2)

Set the zoom position

Configuring Auto Scrolling (Auto Scroll)

Press the **Auto Scroll** soft key to display the following menu.

Decrease the speed by one level

Increase the speed by one level

Zoom in on the left edge of the Main window

Scroll left

Stop auto scrolling

Scroll right

Zoom in on the right edge of the Main window

Set the scroll speed

Setting the Zoom Factor (ZOOM knob)

Use the **ZOOM** knob to set the zoom factor.

The ZOOM knob controls the waveforms in the window whose corresponding key is illuminated more brightly.

If you push the ZOOM knob, the FINE indicator illuminates, and you can set the zoom factor with higher resolution.

When the FINE indicator is illuminated, you can set the vertical position with higher resolution.
(Press the push knob to turn off the FINE indicator)

10.2 Zooming in on or out from Waveforms in the Vertical Direction

This section explains the following settings (which are used when zooming in on or out from waveforms in the vertical direction):

► **"Vertical Zoom (Vertical Zoom)" in the Features Guide**

ZOOM Vertical Zoom Menu

Press **ZOOM1** or **ZOOM2**, and then the **Vertical Zoom** soft key to display the following menu.
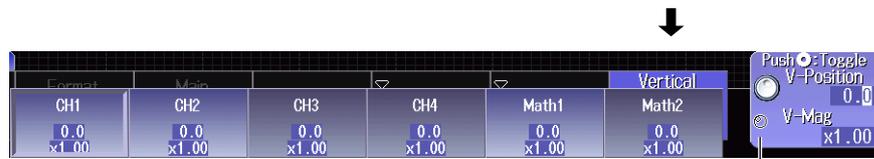
Specify the setting that the jog shuttle controls

Set the zoom position and factor

Note

You can reset the zoom position and factor by pressing the RESET key.

11.1   Searching for Edges

This section explains the following settings (which are used when searching for edges):
- Search type
- Search range
  Search start and end points
- Search conditions
  Source, slope, the level used to detect source states, and hysteresis
- Detected waveform display
  Detected point marks, zoom window, and zoom position
- Search skipping
- Executing searches

► **"Search Type (Type),"**
"Search Range (Start/End Point),"
"Search Conditions (Condition Setup),"
"Displaying Detected Waveforms (Display Setup),"
and "Search Skip (Skip Mode)"
in the Features Guide

SEARCH Edge Menu

Press **SEARCH**, the **Type** soft key, and then the **Edge** soft key to display the following menu.
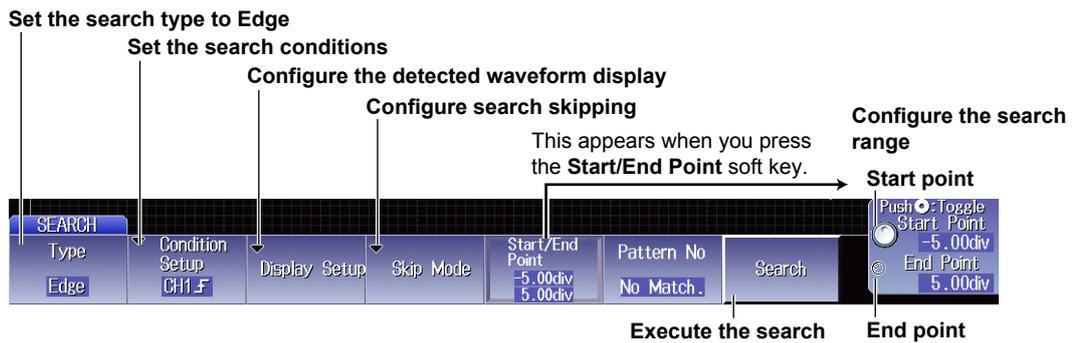
Set the search type to Edge
Set the search conditions
Configure the detected waveform display
Configure search skipping
This appears when you press the **Start/End Point** soft key.
Configure the search range
Start point

SEARCH Type	Condition Setup	Display Setup	Skip Mode	Start/End Point	Pattern No	Search
Edge	CH1 ⌐			−5.00div 5.00div	No Match.	

Push ●:Toggle
Start Point
−5.00div
End Point
5.00div

Execute the search   **End point**

Setting Search Conditions (Condition Setup)

Note

Using the CH4 Terminal and Logic Signal Input Port

When you execute a search, you cannot use the CH4 terminal and logic signal input ports as the source at the same time. Specify the source that you want to use in advance by pressing either the CH4 key or the LOGIC key.

Press the **Condition Setup** soft key to open one of the menus shown below. The menu that appears varies depending on the specified source.

When the Source is Math1, Math2, or from CH1 to CH4

Set the source (CH1 to CH4, Math1, or Math2)
Set the slope (⌐, ⌐, or ⌐⌐)
Set the level used to detect source states

Set the hysteresis

When the Source Is LOGIC (On models with the logic signal input port)
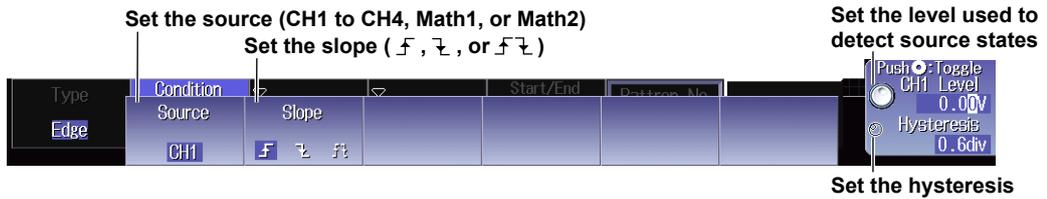
Set the source (LOGIC)
Set the slope (⌐, ⌐, or ⌐⌐)
Set the source bit (Bit0 to Bit7)
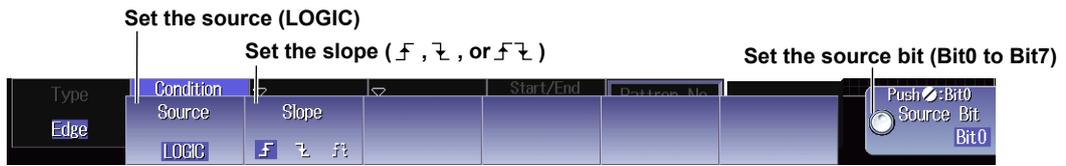
Configuring the Detected Waveform Display (Display Setup)

Press the **Display Setup** soft key to display the following menu.

Turn the display of detected point markers on or off
Set the zoom window (Zoom1 or Zoom2)
Set the zoom position
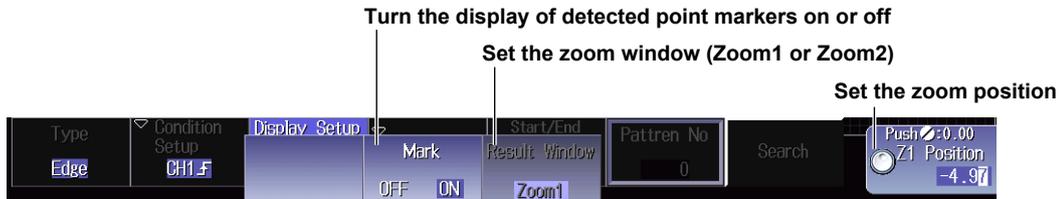
Turning the display of detected point markers on or off

You can display marks at the top of the main and zoom windows to clearly show the detected position on the waveform (the detected point mark). Marks that match detected point numbers are highlighted.

Configuring the Zoom Windows

You can configure zoom windows Zoom1 and Zoom2 when they are displayed.

Setting the zoom position

You can change the zoom position, which is the point on the waveform that is zoomed in on.

Configuring Search Skipping (Skip Mode)

Press the **Skip Mode** soft key to display the following menu.

After a search condition is met, you can skip the detection of search conditions for the specified amount of time or the specified number of counts.

Configure search skipping

Set the length of time for which to skip the search conditions

This appears when you press the **Holdoff** soft key.

This appears when you press the **Decimation** soft key.

Set the number of times to skip the search conditions
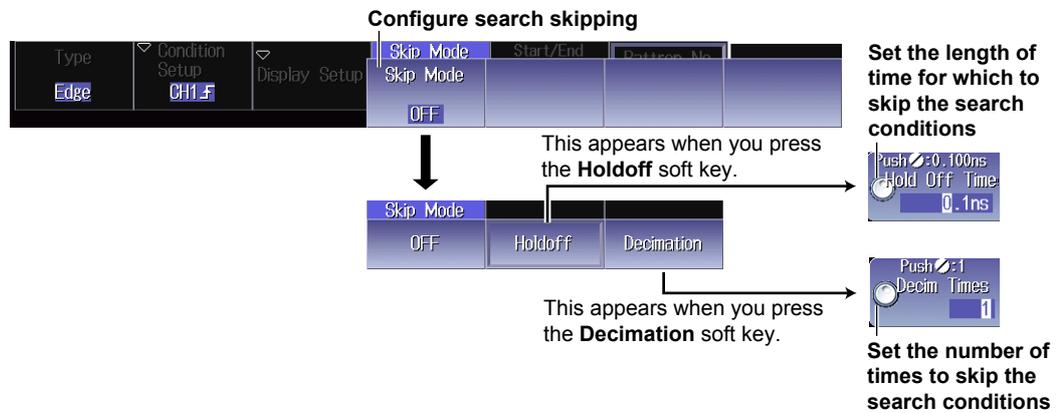
Executing a Search (Search)

Press the **Search** soft key to execute the search.
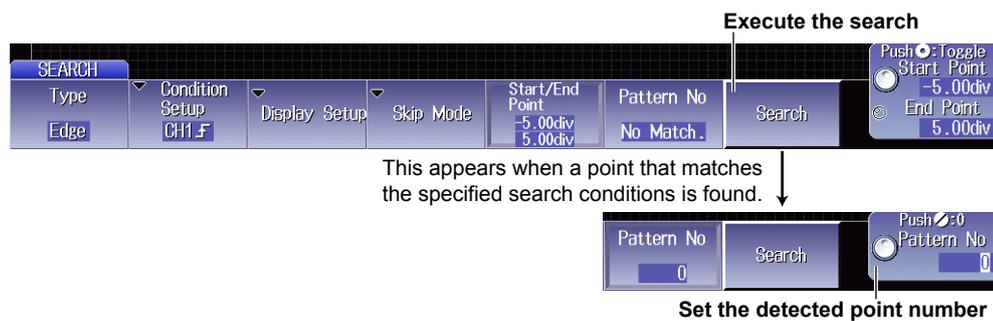
Execute the search

This appears when a point that matches the specified search conditions is found.

Set the detected point number

Executing searches

After setting the search conditions, press the **Search** soft key to execute the search. If the DLM2000 finds points that match the search conditions (detected points), it shows numbers
(0, 1, 2, etc.) from the left of the waveform display in the order that the points were detected.

Setting the detected point numbers

After setting the detected point number, you can display the waveform for the corresponding detected point on the zoom window.

11.2 Searching for Edges Using Conditions

This section explains the following settings (which are used when using conditions to limit edge searches):

- Search type
- Search range
  Search start and end points
- Search conditions
  Source, slope, qualifications, logic combination, search requirements, the level used to detect signal states, and hysteresis

SEARCH Edge Qualified Menu

Press **SEARCH**, the **Type** soft key, and then the **Edge Qualified** soft key to display the following menu.

Set the search type to Edge Qualified

Set the search conditions

Configure the detected waveform display.
► **section 11.1**

Configure search skipping.
► **section 11.1**

This appears when you press the **Start/End Point** soft key.

Configure the search range

Start point

SEARCH	Condition Setup			Start/End Point	Pattern No	Search	Push ⊙:Toggle Start Point
Type		Display Setup	Skip Mode				−5.00div
Edge Qualified	CH1 ⌐			−5.00div 5.00div	No Match.		End Point 5.00div

Execute the search
► **section 11.1**

End point

Setting Search Conditions (Condition Setup)

Note

Using the CH4 Terminal and Logic Signal Input Port

When you execute a search, you cannot use the CH4 terminal and logic signal input ports as the source at the same time. Specify the source that you want to use in advance by pressing either the CH4 key or the LOGIC key.
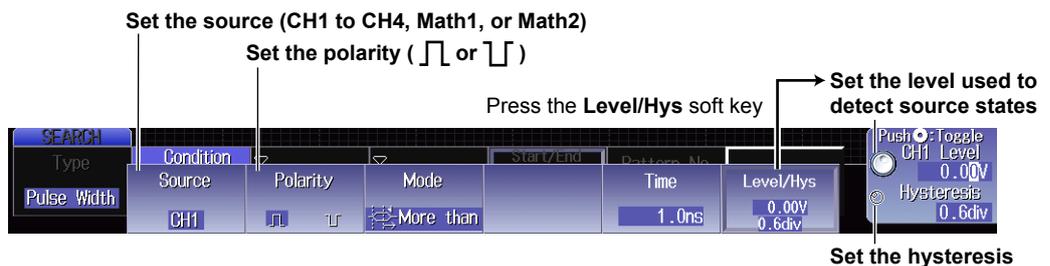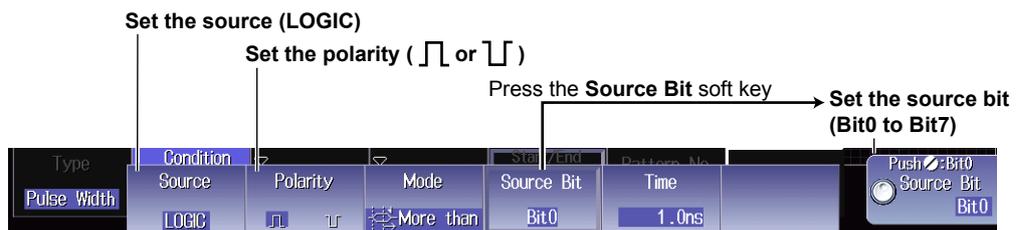
Press the **Condition Setup** soft key to open one of the menus shown below. The menu that appears varies depending on the specified source.

When the Source is Math1, Math2, or from CH1 to CH4

Set the source (CH1 to CH4, Math1, or Math2)

Set the slope (⌐ or ⌐)

Set the qualifications

Set the logic combination (AND, OR)

Set the search requirement (True or False)

Set the hysteresis and the level used to detect the state for each signal

• **Setting the Qualifications (Qualification)**

Press the **Qualification** soft key to display the following menu.

Set the qualifications (H, L, or X)

Set the level used to detect the state of each signal

Set the hysteresis

On models with the logic signal input port, the menu item CH4 becomes LOGIC BITS when LOGIC input is enabled.

• **Setting the Hysteresis and the Level Used to Detect the Signal State for Each Signal (Level/Hys)**

Press the **Level/Hys** soft key to display the following menu.

Select which signal to set the level of (CH1 to CH4, Math1, or Math2)

Set the level used to detect the state of each signal

Set the hysteresis

When the Source Is LOGIC (On models with the logic signal input port)

Set the source (LOGIC)

Set the slope (⌐ or ⌐)

Set the qualifications

Set the logic combination (AND, OR)

Set the search requirement (True or False)

Set the hysteresis and the level used to detect the state for each signal

Type	Condition			Start/End			Push ⟋:Bit0
	Source	Slope	Qualification	Logic	Condition	Level/Hys	Source Bit
Edge Qualified	LOGIC	⌐ ⌐		AND OR	True False		Bit0

Set the source bit (Bit0 to Bit7)

- **Setting the Qualifications (Qualification)**

  Press the **Qualification** soft key to display the following menu.

Set the level used to detect the state of each signal

Set the qualifications (H, L, or X)

Type	Condition			Start/End			Push ⦿:Toggle
	Source	Slope	Qualification		Condition		CH1 Level
Edge Qualified	CH1	CH2	CH3	LOGIC BITS	Math1	Math2	1.72V
	H L X	H L X	H L X	XXXXXXX⌐	H L X	H L X	Hysteresis 0.6div

On models with the logic signal input port, LOGIC BITS appears on the menu when LOGIC input is enabled. Pressing this soft key displays the following screen.

Set the hysteresis

Set the source bit (Bit0 to Bit7)

Bit State Setup

Source Bit	Bit0
Bit7	H L X
Bit6	H L X
Bit5	H L X
Bit4	H L X
Bit3	H L X
Bit2	H L X
Bit1	H L X
Bit0	⌐ ⌐

Set the slope for the source signal (⌐ or ⌐)
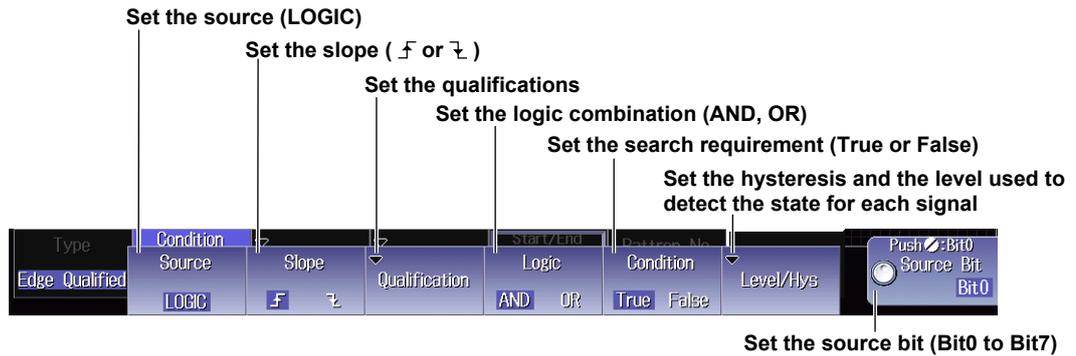
- **Setting the Hysteresis and the Level Used to Detect the Signal State for Each Signal (Level/Hys)**

  The same menu appears as that shown on the previous page for when the source is Math1, Math2, or from CH1 to CH4.

11.3 Searching for State Conditions

This section explains the following settings (which are used when searching for state conditions):
- Search type
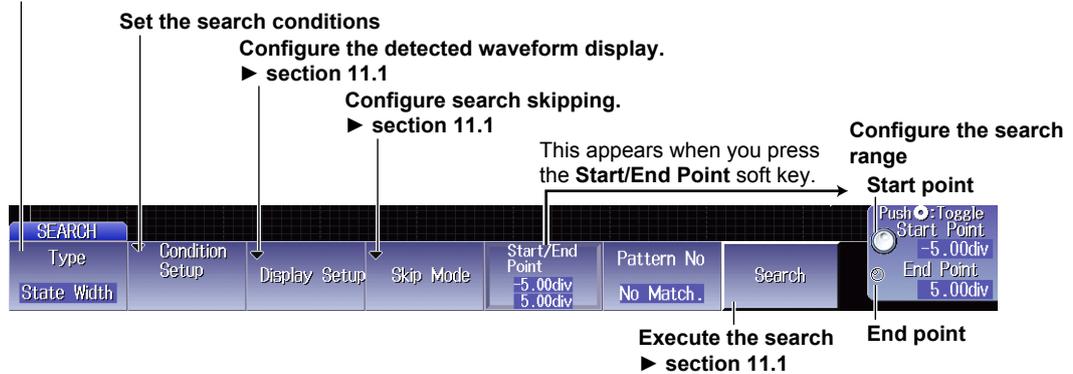- Search range
  Search start and end points
- Search conditions
  State conditions, clock source, logic combination, search requirements, the level used to detect signal states, and hysteresis

<div align="right">

► **"Search Type (Type),"**
"Search Range (Start/End Point)," and
"Search Conditions (Condition Setup)"
in the Features Guide

</div>

SEARCH State Menu

Press **SEARCH**, the **Type** soft key, and then the **State** soft key to display the following menu.

Set the search type to State

Set the search conditions

Configure the detected waveform display.
► **section 11.1**

Configure search skipping.
► **section 11.1**

This appears when you press the **Start/End Point** soft key.

Configure the search range

Start point

Execute the search
► **section 11.1**

End point

Setting Search Conditions (Condition Setup)

Press the **Condition Setup** soft key to display the following menu.

Configure the state conditions

Set the logic combination (AND, OR)

Set the search requirement (Enter or Exit)

Set the hysteresis and the level used to detect the state for each signal. ► **section 11.2**

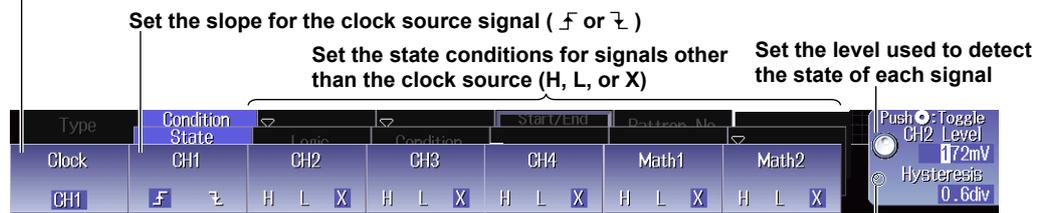### Setting the State Conditions (State)

Note

Using the CH4 Terminal and Logic Signal Input Port

When you execute a search, you cannot use the CH4 terminal and logic signal input ports as the source at the same time. Specify the source that you want to use in advance by pressing either the CH4 key or the LOGIC key.
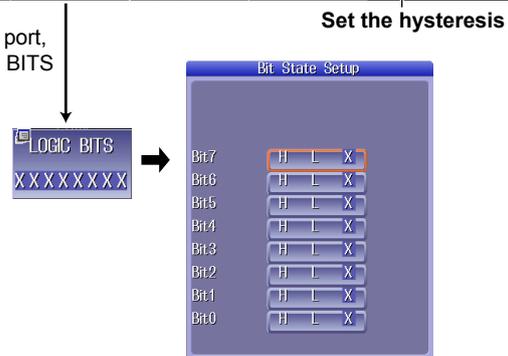
Press the **State** soft key to open one of the menus shown below. The menu that appears varies depending on the specified clock source.

- **When the Clock Source is Math1, Math2, or from CH1 to CH4**
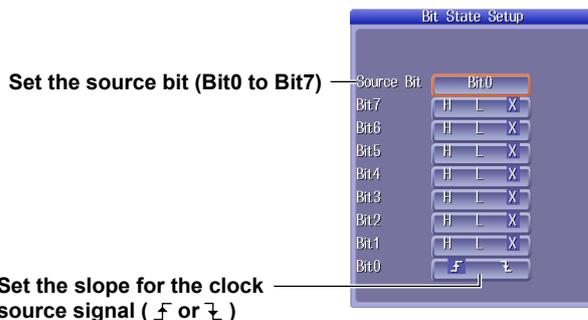

On models with the logic signal input port, the menu item CH4 becomes LOGIC BITS when LOGIC input is enabled.

- **When the Source Is LOGIC (On models with the logic signal input port)**

• When There Is No Clock Source

Set the clock source (X)

Set the state conditions for signals other than the clock source (H, L, or X)

Set the level used to detect the state of each signal

On models with the logic signal input port, the menu item CH4 becomes LOGIC BITS when LOGIC input is enabled.

Set the hysteresis

The same menu appears as that shown on the previous page for when the clock source is Math1, Math2, or from CH1 to CH4. Because there is no clock source, you can specify all of the signal states for Math1, Math2, from CH1 to CH4, and LOGIC as state conditions.

11.4   Searching for Pulse Width

This section explains the following settings (which are used when searching for pulse width):
- Search type
- Search range
  Search start and end points
- Search conditions
  Source, polarity, time width mode, reference times, the level used to detect signal states, and hysteresis

► **"Search Type (Type)," "Search Range (Start/End Point)," and**
"Search Conditions (Condition Setup)"
in the Features Guide

SEARCH Pulse Width Menu

Press **SEARCH**, the **Type** soft key, and then the **Pulse Width** soft key to display the following menu.

Set the search type to Pulse Width

Set the search conditions

Configure the detected waveform display.
► **section 11.1**

Configure search skipping.
► **section 11.1**

This appears when you press
the **Start/End Point** soft key.

Configure the search range

Start point

SEARCH	Condition Setup CH1	Display Setup	Skip Mode	Start/End Point -5.00div 5.00div	Pattern No No Match.	Search	Push ●:Toggle Start Point -5.00div End Point 5.00div
Type Pulse Width							

Execute the search
► **section 11.1**

End point

Setting Search Conditions (Condition Setup)

Press the **Condition Setup** soft key to display the following menu.

Set the source

Set the polarity (⊓ or ⊔)

Set the time width mode

This appears when you press
the **Time** soft key.

Set the reference time

Type Pulse Width	Condition Source CH1	Polarity ⊓ ⊔	Mode More than	Start/End	Pattern No	Time 1.0ns	Level/Hys 0.00V 0.6div	Push ◭:1.000ns Time1 1.0ns

This appears when you press
the **Level/Hys** soft key.

Set the level used to detect source states

Push ●:Toggle
CH1 Level 1.72V
Hysteresis 0.6div

Set the hysteresis

Setting the Source (Source)

Note

Using the CH4 Terminal and Logic Signal Input Port
When you execute a search, you cannot use the CH4 terminal and logic signal input ports as the source at the same time. Specify the source that you want to use in advance by pressing either the CH4 key or the LOGIC key.

Press the **Source** soft key to open one of the menus shown below. The menu that appears varies depending on the specified source.

• **When the Source Is Math1, Math2, or from CH1 to CH4**

Set the source (CH1 to CH4, Math1, or Math2)
Set the polarity (⊓ or ⊔)
Press the **Level/Hys** soft key
Set the level used to detect source states

Set the hysteresis

• **When the Source Is LOGIC (On models with the logic signal input port)**

Set the source (LOGIC)
Set the polarity (⊓ or ⊔)
Press the **Source Bit** soft key
Set the source bit (Bit0 to Bit7)

Setting the Time Width Mode (Mode)

Press the **Mode** soft key to display the following menu.

Set what kind of relationship must be established between the source's pulse width and the specified reference times (Time1 and Time2) for a point to be detected.

More than: The pulse width must be longer than the reference time specified by Time1
Less than: The pulse width must be shorter than the reference time specified by Time1
Between: The pulse width must be longer than Time1 but shorter than Time2
OutOfRange: The pulse width must be shorter than Time1 or longer than Time2
Time Out: The pulse width must be longer than the reference time specified by Time1

Setting the Reference Times (Time1 and Time2)

Press the **Time** soft key to open one of the menus shown below. The menu that appears varies depending on the set time width mode.

• **When the Time Width Mode is More than, Less than, or Time Out**

Set the reference time

• **When the Time Width Mode is Between or OutOfRange**

Set the reference times specified by Time1 and Time2
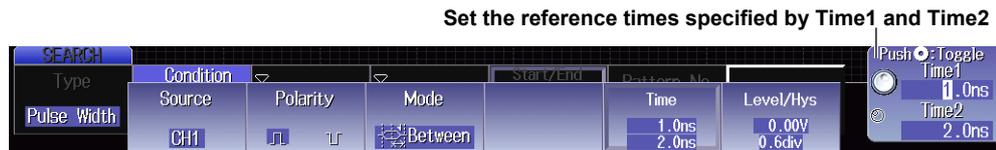
11.5 Searching for State Width

This section explains the following settings (which are used when searching for state width):
- Search type
- Search range
  Search start and end points
- Search conditions
  State conditions, clock source, logic combination, search requirements, time width mode, reference times, the level used to detect signal states, and hysteresis

**► "Search Type (Type),"
"Search Range (Start/End Point)," and
"Search Conditions (Condition Setup)"
in the Features Guide**

SEARCH State Width Menu

Press **SEARCH**, the **Type** soft key, and then the **State Width** soft key to display the following menu.

Set the search type to State Width

Set the search conditions

**Configure the detected waveform display.
► section 11.1**

**Configure search skipping.
► section 11.1**

This appears when you press the **Start/End Point** soft key.

Configure the search range

Start point

| SEARCH Type State Width | Condition Setup | Display Setup | Skip Mode | Start/End Point −5.00div 5.00div | Pattern No No Match. | Search | Push⊙:Toggle Start Point −5.00div End Point 5.00div |

**Execute the search
► section 11.1**

End point

Setting Search Conditions (Condition Setup)

Press the **Condition Setup** soft key to display the following menu.

Configure the state conditions

Set the logic combination (AND, OR)

Set the search requirement (True or False)

Set the time width mode

Set the hysteresis and the level used to detect the state for each signal. ► section 11.2

| Type State Width | Condition State | LOGIC AND OR | Condition True False | Mode More than | Start/End Pattern No | Level/Hys | Push⊘:1.000ns Time1 1.0ns |

Set the reference time

Setting the State Conditions (State)

Note

Using the CH4 Terminal and Logic Signal Input Port
When you execute a search, you cannot use the CH4 terminal and logic signal input ports as the source at the same time. Specify the source that you want to use in advance by pressing either the CH4 key or the LOGIC key.

Press the **State** soft key to open one of the menus shown below. The menu that appears varies depending on the specified clock source.

• **When the Clock Source is Math1, Math2, or from CH1 to CH4**

Set the clock source (CH1 to CH4, Math1, or Math2)

Set the slope for the clock source signal (⌐ or ⌐)

Set the state conditions for signals other than the clock source (H, L, or X)

Set the level used to detect the state of each signal

On models with the logic signal input port, the menu item CH4 becomes LOGIC BITS when LOGIC input is enabled.

Set the hysteresis

• **When the Source Is LOGIC (On models with the logic signal input port)**

Set the state conditions for signals other than the clock source (H, L, or X)

Set the level used to detect the state of each signal

On models with the logic signal input port, LOGIC BITS appears on the menu when LOGIC input is enabled. Pressing this soft key displays the following screen.

Set the hysteresis

Set the source bit (Bit0 to Bit7)

Set the slope for the clock source signal (⌐ or ⌐)

• When There Is No Clock Source

Set the clock source (X)

Set the state conditions (H, L, or X)

Set the level used to detect the state of each signal

Set the hysteresis

On models with the logic signal input port, the menu item CH4 becomes LOGIC BITS when LOGIC input is enabled.

The same menu appears as that shown on the previous page for when the clock source is Math1, Math2, or from CH1 to CH4. Because there is no clock source, you can specify all of the signal states for Math1, Math2, from CH1 to CH4, and LOGIC as state conditions.

Setting the Time Width Mode (Mode)

Press the **Mode** soft key to display the following menu.

Set what kind of relationship between the length of time the state condition is met or not met and the specified reference times (Time1 and Time2) will result in a detected point.

More than: The period during which the state condition is met or not met must be longer than the reference time specified by Time1 and the condition changes

Less than: The period during which the state condition is met or not met must be shorter than the reference time specified by Time1 and the condition changes

Between: The period during which the state condition is met or not met must be longer than Time1 but shorter than Time2 and the condition changes

OutOfRange: The period during which the state condition is met or not met must be shorter than Time1 or longer than Time2 and the condition changes

Time Out: The period during which the state condition is met or not met must be longer than the reference time specified by Time1

Setting the Reference Times (Time1 and Time2)

The menu that appears varies depending on the set time width mode.

• **When the Time Width Mode is More than, Less than, or Time Out**

Set the reference time

• **When the Time Width Mode is Between or OutOfRange**

Set the reference times specified
by Time1 and Time2

12.1 Analyzing and Searching CAN Bus Signals (Option)

This section explains the following settings (which are used when analyzing or searching CAN bus signals):

- Serial bus signal analysis and search displays
- Serial bus signal types
- Analysis
  Auto setup, source, bit rate, recessive level, sample point, the level used to detect the source state, and hysteresis
- Decoded display
- List display
  List size, display position, and zoom linking
- Zoom position
- Analysis number
- Search
  Jumping to the specified field, zoom window, search type, and search execution

Select the Number of SERIAL BUS (Serial Bus)

Press **SHIFT**+**SEARCH** (SERIAL BUS), the **Serial Bus** soft key to display the following menu.

Select which serial bus to set (Serial Bus1 to Serial Bus4).

SEARCH CAN Menu

Press the **Type** soft key. From the setup menu that appears, select **CAN** to display the following menu.

Turn on or off the serial bus signal analysis and search displays
Set the serial bus signal type to CAN
Set the serial bus
Configure the search
Set the decode display (Hex, Bin, or Symbol *)
Configure the list display
Set the analysis number

Set the zoom position
This sets the zoom position for the window selected during zoom window configuration (described later).

*   You can select Symbol for the decode display if you load the physical value/symbol definition file (.sbl).

Setting the Serial Bus (Setup)

Press the **Setup** soft key to display the following menu.

Auto Setup (Auto Setup)

After setting the source, press the **Auto Setup** soft key to automatically configure the serial bus settings. While the serial bus is being configured, Auto Setup changes to Abort. If you want to stop serial bus configuration, press the **Abort** soft key.

Execute automatic setup

Set the source (CH1 to CH4)
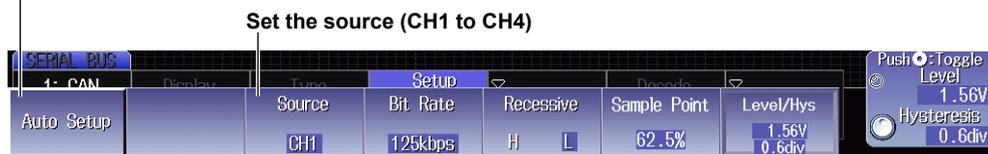
The auto setup feature automatically configures the bit rate, recessive level, sample point, level, and hysteresis and triggers on the start of frame (SOF) of the CAN bus signal.

After running auto setup, you can display decoded results and change settings by using the manual setup feature explained in the following section.

The auto setup feature will not work properly on some input signals.

Manual Setup

Note

Using the CH4 Terminal and Logic Signal Input Port

If you perform an analysis or execute a search when using the logic signal input ports for input, you cannot specify CH4 as the source. Press the CH4 key in advance to enable input from the CH4 terminal.
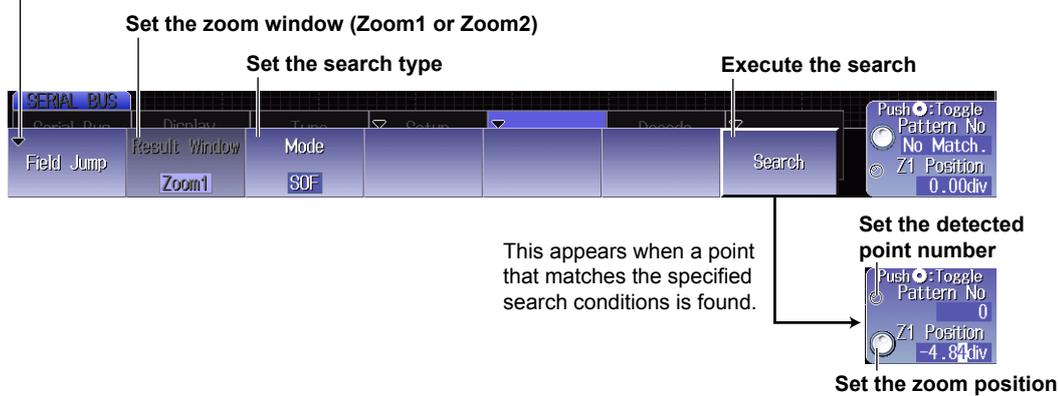
Set the bit rate (33.3 kbps, 83.3 kbps, 125 kbps, 250 kbps, 500 kbps, 1 Mbps, or User Define)

Set the recessive level (H or L)

This appears when you press the **Sample Point** soft key.

Set the source (CH1 to CH4, Math1, or Math2)

Set the sample point

This appears when you set the bit rate to User Define.

This appears when you press the **Level/Hys** soft key.

Set the level used to detect source states

Set the hysteresis

Set the bit rate

Set the sample point

This appears when you press the **BitRate/Sample Point** soft key.

Configuring the List Display (List)

Press the **List** soft key to display the decoded results as a list.

If one display setting of Serial Bus 1 to 4 is on

List of analysis results

Analysis number

Turn zoom linking on or off

Set the analysis number

**Set the list size and the display position
to Full Screen, Half(Upper), or Half(Lower)**

Data before the trigger position (on the left side of the waveform display) is assigned analysis numbers in descending order (–1, –2, and so on). Data after the trigger position (on the right side of the waveform display) is assigned analysis numbers in ascending order (0, 1, 2, and so on).

If several display settings of Serial Bus 1 to 4 are on

Cursor
The cursor of the list that is being used is highlighted.
Only the frame appears for cursors of lists that are not being used.
• **When zoom linking is on**
  **The zoom position in the zoom window (Result Window) moves in sync with the
  cursor on the list. If the signals of other lists are displayed in the same zoom
  window, the cursors of those lists also move in sync.**

Select the list **The selected list is displayed expanded**

The setting menu changes to the serial bus menu for the selected list.

Search Setup (Search)

Press the **Search** soft key to display the following menu.

Jump to the specified field (SOF, ID, Control Field, Data Field, CRC, or ACK)

    Set the zoom window (Zoom1 or Zoom2)

        Set the search type (SOF, Error, or ID/Data)
        ► section 2.9   **Execute the search**

This appears when a point that matches
the specified search conditions is found.

**Set the detected
point number**

Set the zoom position

Jumping to the specified field

Jumps to the field in the data frame that corresponds to the specified detected point number (Pattern No).

Configuring the zoom windows

You can configure zoom windows Zoom1 and Zoom2 when they are displayed. Zoom1 is automatically displayed during the automatic setup of the analysis settings.

Setting the search type

You can set this setting in the same way that you set the trigger type to SOF, Error, or ID/Data. For details, see section 2.9.

Executing searches

After setting the search type, press the **Search** soft key to execute the search. If the DLM2000 finds points that match the search conditions (detected points), it shows numbers (0, 1, 2, etc.) from the left of the waveform display in the order that the points were detected.

Setting the detected point numbers

After setting the detected point number, you can display the waveform for the corresponding detected point on the zoom window.

Setting the zoom position

You can change the zoom position, which is the point on the waveform that is zoomed in on.

12.2 Analyzing and Searching CAN FD Bus Signals (Option)

This section explains the following settings (which are used when analyzing or searching CAN FD bus signals):

- Serial bus signal analysis and search displays
- Serial bus signal types
- Analysis
  Auto setup, source, bit rate, data bit rate, recessive level, sample point, the level used to detect source states, and hysteresis
- Decoded display
- List display
  List size, display position, and zoom linking
- Zoom position
- Analysis number
- Search
  Jumping to the specified field, zoom window, search type, and search execution
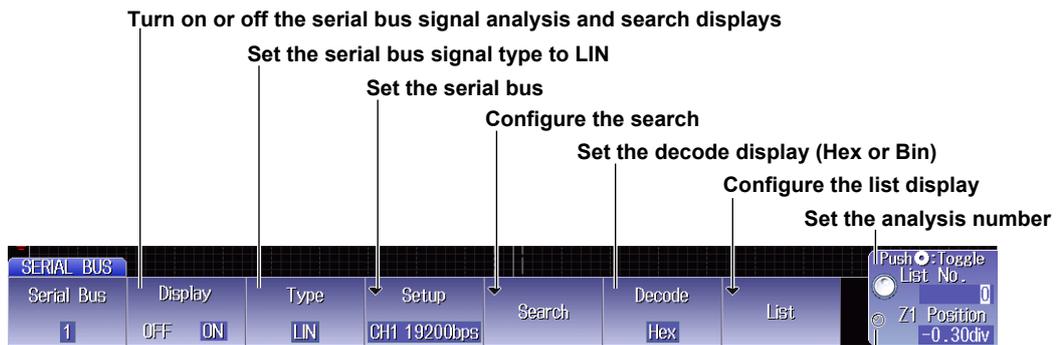
Select the Number of SERIAL BUS (Serial Bus)

Press **SHIFT+SEARCH** (SERIAL BUS), the **Serial Bus** soft key to display the following menu.

Select which serial bus to set (Serial Bus1 to Serial Bus4).

SEARCH CAN FD Menu

Press the **Type** soft key. From the setup menu that appears, select **CAN FD** to display the following menu.

Turn on or off the serial bus signal analysis and search displays
Set the serial bus signal type to CAN FD
Set the serial bus
Configure the search
Set the decode display (Hex, Bin, or Symbol[2])
Configure the list display
Set the analysis number

If the CAN FD standard is set to non-ISO, "(non-ISO)" is displayed.[1]

Set the zoom position
This sets the zoom position for the window selected during zoom window configuration (described later).

1 For setting the CAN FD standard, see page 12-6.
2 You can select display CANdB symbols if you load the physical value/symbol definition file (.sbl).

Setting the Serial Bus (Setup)

Press the **Setup** soft key to display the following menu.

Auto Setup (Auto Setup)

After setting the source and CAN FD standard, press the **Auto Setup** soft key to automatically configure the serial bus settings. While the serial bus is being configured, Auto Setup changes to Abort. If you want to stop serial bus configuration, press the **Abort** soft key.

Execute automatic setup

Set the source (CH1 to CH4)

Set the CAN FD standard (ISO, non-ISO).
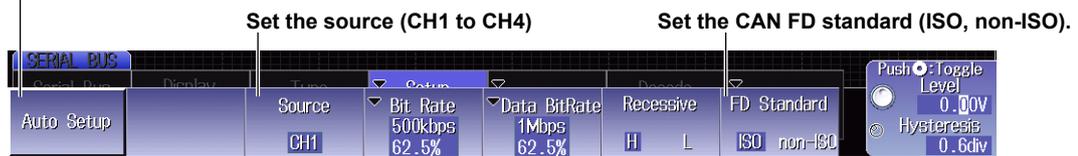
The auto setup feature automatically configures the bit rate, data bit rate, recessive level, sample point, level, and hysteresis, and triggers on the start of frame (SOF) of the CAN FD bus signal. After running auto setup, you can display decoded results and change settings by using the manual setup feature explained in the following section.
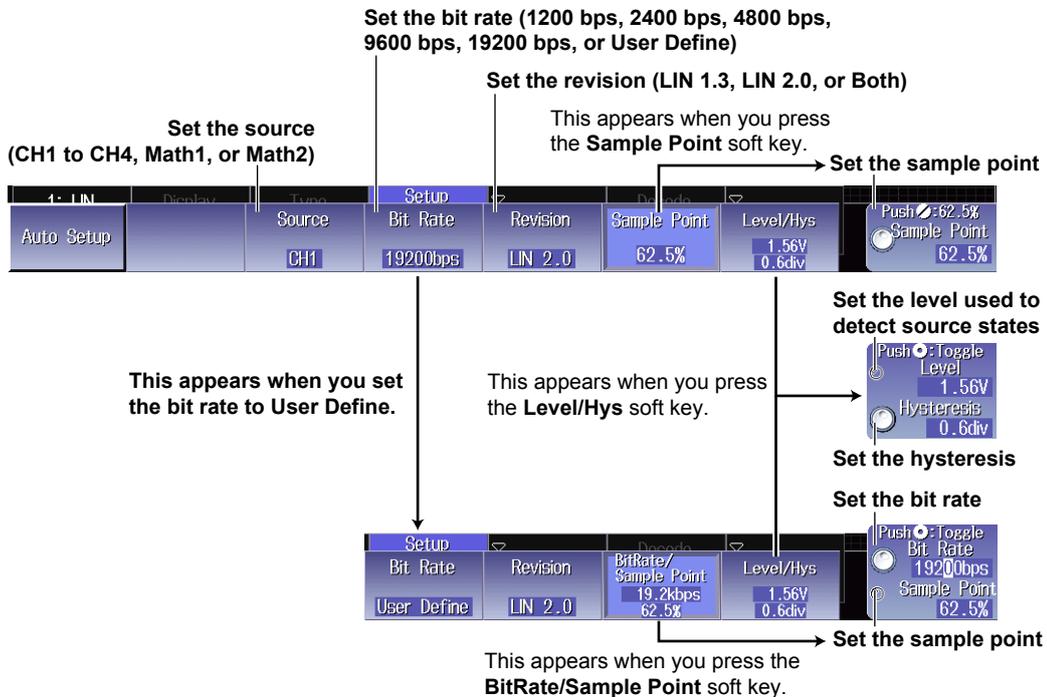
The auto setup feature will not work properly on some input signals.

Manual Setup

Note

Using the CH4 Terminal and Logic Signal Input Port

If you perform an analysis or execute a search when using the logic signal input ports for input, you cannot specify CH4 as the source. Press the CH4 key in advance to enable input from the CH4 terminal.

Set the source (CH1 to CH4, Math1, or Math2)
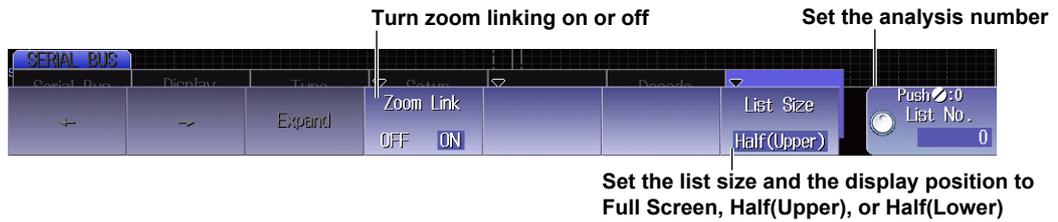
Set the bit rate

Set the data bit rate

Set the recessive level (H or L)

Set the CAN FD standard (ISO, non-ISO).

Set the level used to detect source states

Set the hysteresis

Setting the Bit Rate (Bit Rate)

Set the bit rate (250 kbps, 500 kbps, 1 Mbps, or User Define)

Set the sample point

Set the bit rate

This appears when you set the bit rate to User Define.

Set the sample point

Setting the Data Bit Rate (Data BitRate)

Set the data bit rate (500 kbps, 1 Mbps, 2 Mbps,
4 Mbps, 5 Mbps, 8 Mbps, or User Define)

Set the sample point

This appears when you set
the bit rate to User Define.

Set the bit rate

Set the sample point

Configuring the List Display (List)

Press the **List** soft key. The decoded results are listed for serial buses whose analysis and search displays (Display) are on.

If one display setting of Serial Bus 1 to 4 is on

List of analysis results
Analysis number

When the CAN FD standard is set to ISO

When the CAN FD standard is set to non-ISO

Set the analysis number

Turn zoom linking on or off

Set the list size and the display
position to Full Screen, Half(Upper),
or Half(Lower)

Data before the trigger position (on the left side of the waveform display) is assigned analysis numbers in descending order (–1, –2, and so on). Data after the trigger position (on the right side of the waveform display) is assigned analysis numbers in ascending order (0, 1, 2, and so on).
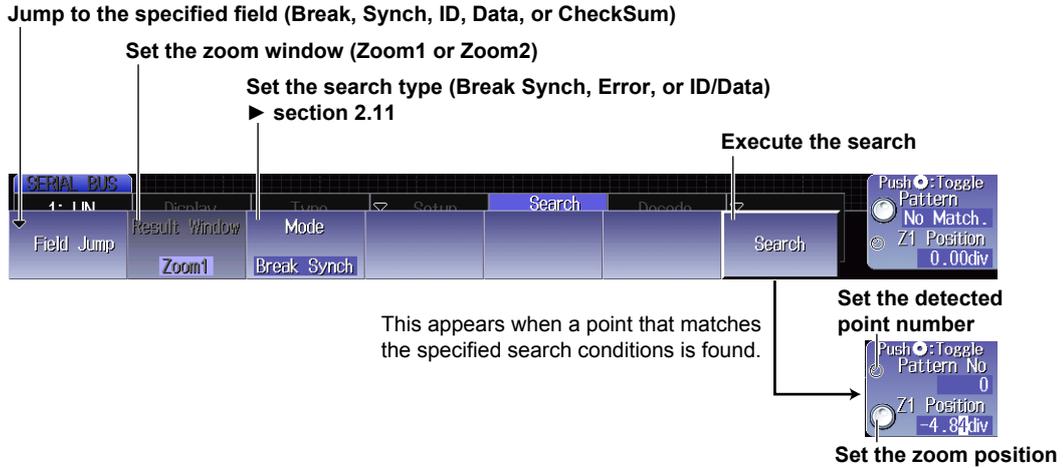
If several display settings of Serial Bus 1 to 4 are on

Select the list

The selected list is displayed expanded

The setting menu changes to the serial bus menu for the selected list.

Search Setup (Search)

Press the **Search** soft key to display the following menu.

**Jump to the specified field
(SOF, ID, Control Field, Data Field, CRC, or ACK)**

Set the zoom window (Zoom1 or Zoom2)

Set the search type

Execute the search

This appears when a point that matches the specified search conditions is found.

Set the detected point number

Set the zoom position

Jumping to the Specified Field

You can jump to the field in the data frame that corresponds to the specified detected point number (Pattern No).

Configuring the Zoom Windows

You can configure zoom windows Zoom1 and Zoom2 when they are displayed. Zoom1 is automatically displayed during the automatic setup of the analysis settings.

Setting the Search Type

Press the **Mode** soft key to display the following menu.

SOF mode

Error mode

ID/Data mode

FDF mode

ESI (Error Passive) mode
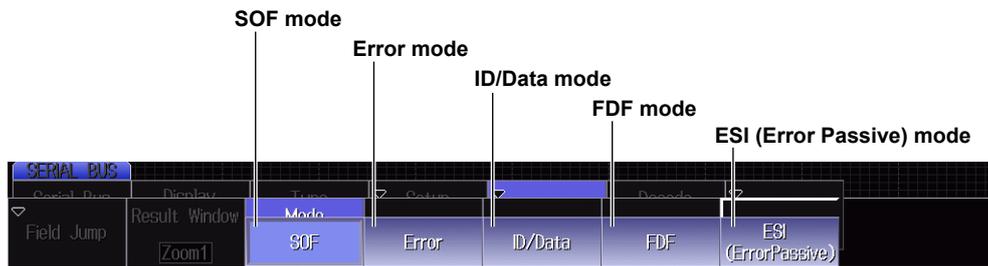
SOF Mode

Press the **SOF** soft key.
The DLM2000 searches for the start position of CAN FD bus signal frames.

Error Mode

Press the **Error** soft key and then the **Error Type Or** soft key to display the following menu.

**Turn error detection on or off for Error Frame,
Stuff, Fixed Stuff, and CRC errors**
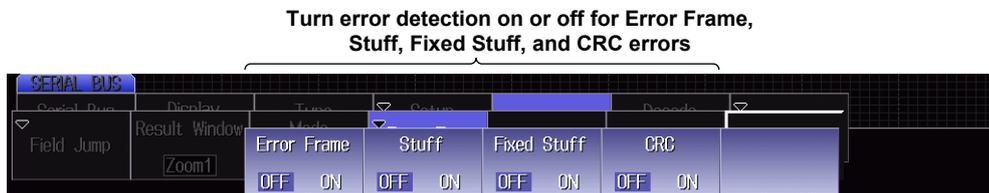
When the CAN FD standard is set to ISO[1]
Setting CRC to ON displays a CRC Error Factor menu.

1 For setting the CAN FD standard, see page 12-6.
2 CRC errors are not detected if both error factor check boxes are cleared.

**Select the check boxes for the
CRC error factors to detect.[2]**

The DLM2000 searches for error frames (when the error flag is active) or various errors.

ID/Data Mode

Press the **ID/Data** soft key to display the following menu.

Set the search conditions

Setting Search Conditions (Condition Setup)

Press the **Condition Setup** soft key to display the following screen.

The DLM2000 searches on the AND of the SOF, ID, frame type (Remote Frame or Data Frame), Data, and ACK conditions. Items whose check boxes are selected are used as search conditions.

• **When the Comparison Condition Is True or False**

Set the frame format
SOF (always selected)
Set the ID input format (Bin, Hex)
Set the ID bit pattern
If you select Extend for the frame format, 29 bits are displayed here
Set the trigger source frame
Set the comparison size
Set the comparison start position
Set the comparison condition
Set the data pattern input format
Set the data pattern
Set the ACK slot state

• **When the Comparison Condition Is Data = a; Data ≠ a; a ≤ Data; Data ≤ b; a ≤ Data ≤ b; or Data < a, b < Data**

Set the frame format
SOF (always selected)
Set the ID input format (Bin, Hex)
Set the ID bit pattern
If you select Extend for the frame format, 29 bits are displayed here
Set the trigger source frame
Set the comparison size
Set the comparison start position
Set the comparison condition
Set reference values a and b
Set the bit positions of the most significant bit (MSB) and the least significant bit (LSB) in the data that you will compare
Set whether to use a signed (Sign) or unsigned (Unsign) data format
Set the byte order
Set the ACK slot state

• **When ID Input Format Is Message**

SOF (always selected)

Set the ID input format (Message)

Select an ID from the message list in the loaded physical value/symbol definition file (.sbl)

Select a data item from the signal list in the loaded physical value/symbol definition file (.sbl)

Set the comparison condition

Set reference values a and b

FDF Mode

Press the **FDF** soft key to display the following menu.

Set the search type to FDF

Set the search conditions
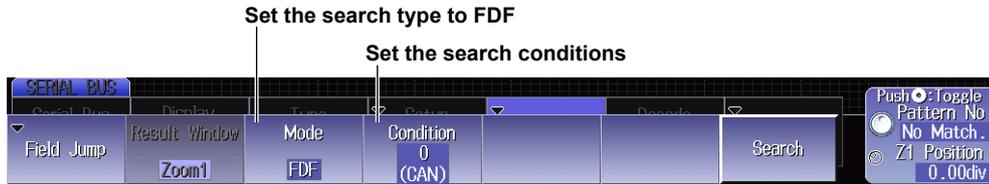
Setting Search Conditions (Condition)

Set the FDF bit state as a search condition.

0 (CAN): When the FDF bit is dominant, the DLM2000 assumes that the frame is a CAN bus signal frame and detects it.

1 (CAN FD): When the FDF bit is recessive, the DLM2000 assumes that the frame is a CAN FD bus signal frame and detects it.

ESI Mode (ESI (ErrorPassive))

Press the **ESI (ErrorPassive)** soft key.

When the ESI bit is recessive (error passive), the DLM2000 detects it as a detected point.

Executing Searches

After setting the search type, press the **Search** soft key to execute the search. If the DLM2000 finds points that match the search conditions (detected points), it shows numbers (0, 1, 2, etc.) from the left of the waveform display in the order that the points are detected.

Setting the Detected Point Numbers

After setting the detected point number, you can display the waveform for the corresponding detected point on the zoom window.

Setting the Zoom Position

You can change the zoom position, which is the point on the waveform that is zoomed in on.

12.3 Analyzing and Searching LIN Bus Signals (Option)

This section explains the following settings (which are used when analyzing or searching LIN bus signals):

- Serial bus signal analysis and search displays
- Serial bus signal types
- Analysis
  Auto setup, source, bit rate, revision, sample point, the level used to detect the source state, and hysteresis
- Decoded display
- List display
  List size, display position, and zoom linking
- Zoom position
- Analysis number
- Search
  Jumping to the specified field, zoom window, search type, and search execution

Select the Number of SERIAL BUS (Serial Bus)

Press **SHIFT**+**SEARCH** (SERIAL BUS), the **Serial Bus** soft key to display the following menu.

Select which serial bus to set (Serial Bus1 to Serial Bus4).

SEARCH LIN Menu

Press the **Type** soft key. From the setup menu that appears, select **LIN** to display the following menu.

Turn on or off the serial bus signal analysis and search displays

Set the serial bus signal type to LIN

Set the serial bus

Configure the search

Set the decode display (Hex or Bin)

Configure the list display

Set the analysis number

Set the zoom position
This sets the zoom position for the window selected during zoom window configuration (described later).

Setting the Serial Bus (Setup)

Press the **Setup** soft key to display the following menu.

Auto Setup (Auto Setup)

After setting the source, press the **Auto Setup** soft key to automatically configure the serial bus settings. While the serial bus is being configured, Auto Setup changes to Abort. If you want to stop serial bus configuration, press the **Abort** soft key.

Execute automatic setup

Set the source (CH1 to CH4)
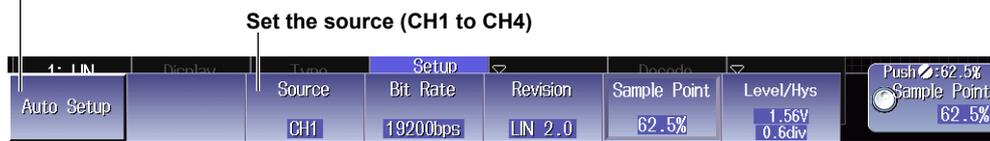
The auto setup feature automatically configures the bit rate, revision, sample point, level, and hysteresis and triggers on the LIN bus signal's Break Synch.

After running auto setup, you can display decoded results and change settings by using the manual setup feature explained in the following section.

The auto setup feature will not work properly on some input signals.

Manual Setup

Note

Using the CH4 Terminal and Logic Signal Input Port

If you perform an analysis or execute a search when using the logic signal input ports for input, you cannot specify CH4 as the source. Press the CH4 key in advance to enable input from the CH4 terminal.

Set the bit rate (1200 bps, 2400 bps, 4800 bps, 9600 bps, 19200 bps, or User Define)

Set the revision (LIN 1.3, LIN 2.0, or Both)

This appears when you press the **Sample Point** soft key.

Set the source (CH1 to CH4, Math1, or Math2)

Set the sample point

Set the level used to detect source states

This appears when you set the bit rate to User Define.

This appears when you press the **Level/Hys** soft key.

Set the hysteresis

Set the bit rate

Set the sample point

This appears when you press the **BitRate/Sample Point** soft key.

Configuring the List Display (List)

Press the **List** soft key to display the decoded results as a list.

If one display setting of Serial Bus 1 to 4 is on

List of analysis

Analysis

Turn zoom linking on or off

Set the analysis number

Set the list size and the display position to Full Screen, Half(Upper), or Half(Lower)

Data before the trigger position (on the left side of the waveform display) is assigned analysis numbers in descending order (–1, –2, and so on). Data after the trigger position (on the right side of the waveform display) is assigned analysis numbers in ascending order (0, 1, 2, and so on).

If several display settings of Serial Bus 1 to 4 are on

Select the list   **The selected list is displayed expanded**

The setting menu changes to the serial bus menu for the selected list.

Search Setup (Search)

Press the **Search** soft key to display the following menu.

Jump to the specified field (Break, Synch, ID, Data, or CheckSum)

Set the zoom window (Zoom1 or Zoom2)

Set the search type (Break Synch, Error, or ID/Data)
► section 2.11

Execute the search

This appears when a point that matches
the specified search conditions is found.

**Set the detected
point number**

Set the zoom position

Jumping to the specified field

Jumps to the field in the frame that corresponds to the specified detected point number (Pattern No).

Configuring the zoom windows

You can configure zoom windows Zoom1 and Zoom2 when they are displayed. Zoom1 is automatically displayed during the automatic setup of the analysis settings.

Setting the search type

You can set this setting in the same way that you set the trigger type to Break Synch, Error, or ID/Data. For details, see section 2.11.

Executing searches

After setting the search type, press the **Search** soft key to execute the search. If the DLM2000 finds points that match the search conditions (detected points), it shows numbers (0, 1, 2, etc.) from the left of the waveform display in the order that the points were detected.

Setting the detected point numbers

After setting the detected point number, you can display the waveform for the corresponding detected point on the zoom window.

Setting the zoom position

You can change the zoom position, which is the point on the waveform that is zoomed in on.

12.4 Analyzing and Searching CXPI Bus Signals (Option)

This section explains the following settings (which are used when analyzing or searching CXPI bus signals):
- Serial bus signal analysis and search displays
- Serial bus signal types
- Analysis
  Auto setup, source, bit rate, T Sample, clock tolerance, counter error detection, the level used to detect the source state, and hysteresis
- Decoded display
- List display
  List size, display position, and zoom linking
- Zoom position
- Analysis number
- Search
  Zoom window, search type, and search execution

► **"Analyzing and Searching Serial Bus Signals" and**
"Analyzing and Searching CXPI Bus Signals (Option)"
in the Features Guide

Select the Number of SERIAL BUS (Serial Bus)
Press **SHIFT+SEARCH** (SERIAL BUS), the **Serial Bus** soft key to display the following menu.

Select which serial bus to set (Serial Bus1 to Serial Bus4).

SEARCH CXPI Menu
Press the **Type** soft key. From the setup menu that appears, select **CXPI** to display the following menu.

Turn on or off the serial bus signal analysis and search displays

Set the serial bus signal type to CXPI

Set the serial bus

Configure the search

Set the decode display (Hex or Bin)

Configure the list display

Set the analysis number

Set the zoom position
This sets the zoom position for the window selected during zoom window configuration (described later).

Setting the Serial Bus (Setup)

Press the **Setup** soft key to display the following menu.

Auto Setup (Auto Setup)

After setting the source, press the **Auto Setup** soft key to automatically configure the serial bus settings. While the serial bus is being configured, Auto Setup changes to Abort. If you want to stop serial bus configuration, press the **Abort** soft key.

Executes automatic setup

Set the source (CH1 to CH4)
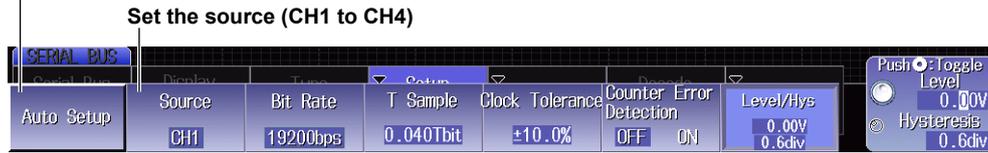
The auto setup feature automatically configures the bit rate, level, and hysteresis and triggers on the start of frame (SOF) of the CXPI bus signal.
After running auto setup, you can display decoded results and change settings by using the manual setup feature explained in the following section.
The auto setup feature will not work properly on some input signals.

Manual Setup

Note

Using the CH4 Terminal and Logic Signal Input Port
If you perform an analysis or execute a search when using the logic signal input ports for input, you cannot specify CH4 as the source. Press the CH4 key in advance to enable input from the CH4 terminal.

Set the source (CH1 to CH4, Math1, or Math2)

Set the bit rate (4800 bps, 9600 bps, 19200 bps, or User Define)

Set counter error detection on or off

This appears when you press the Clock Tolerance soft key.

This appears when you press the Level/Hys soft key.

This appears when you set the bit rate to User Define.

This appears when you press the T Sample soft key.

Set the clock tolerance

Set the level used to detect source states

Set the hysteresis

Set T Sample

Set the bit rate

Set the clock tolerance

This appears when you press the Bit Rate/Clock Tolerance soft key.

Configuring the List Display (List)

Press the **List** soft key. The decoded results are listed for serial buses whose analysis and search displays (Display) are on.

If one display setting of Serial Bus 1 to 4 is on

List of analysis results

Analysis number

Set the analysis number

Turn zoom linking on or off

Set the list size and the display position to Full Screen, Half(Upper), Half(Lower)

Data before the trigger position (on the left side of the waveform display) is assigned analysis numbers in descending order (–1, –2, and so on). Data after the trigger position (on the right side of the waveform display) is assigned analysis numbers in ascending order (0, 1, 2, and so on).

If several display settings of Serial Bus 1 to 4 are on

Select the list   **The selected list is displayed expanded.**

The setting menu changes to the serial bus menu for the selected list.

Search Setup (Search)

Press the **Search** soft key to display the following menu.

Set the zoom window (Zoom1 or Zoom2)
Set the search type

Execute the search

This appears when a point that matches the specified search conditions is found.

Set the detected point number

Set the zoom position

Configuring the Zoom Windows

You can configure zoom windows Zoom1 and Zoom2 when they are displayed. Zoom1 is automatically displayed during the automatic setup of the analysis settings.
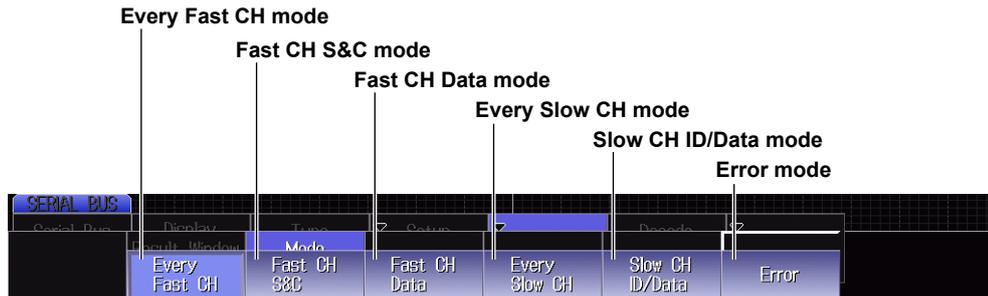
Setting the Search Type

Press the **Mode** soft key to display the following menu.

SOF mode
Error mode
PTYPE mode
ID/Data mode
Wakeup/Sleep mode

SOF (Start of Frame) Mode

Press the **SOF** soft key.
The DLM2000 searches for the start position of CXPI bus signal frames.

Error mode

Press the **Error** soft key and then the **Error Type Or** soft key to display the following menu.

Turn on or off the detection of parity, CRC, data length, framing, IBS, counter,* and clock errors
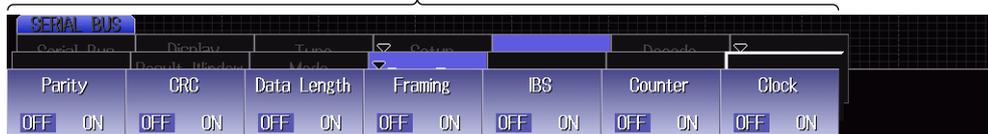
* Not displayed when the counter error detection is set to off.

The DLM2000 searches for various errors.

PTYPE mode

Press the **PTYPE** soft key.

The DLM4000 searches for the PTYPE of the CXPI bus signal.

ID/Data mode

Press the ID/Data soft key to display the following menu.
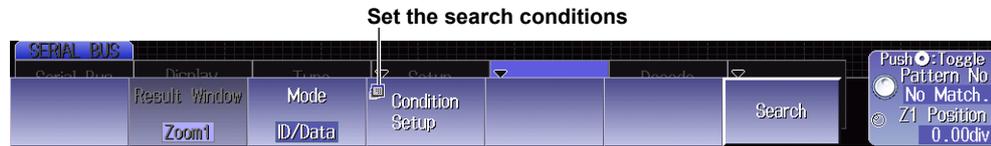
Set the search conditions

Setting Search Conditions (Condition Setup)

Press the **Condition Setup** soft key to display the following screen.

The DLM2000 searches on the AND of SOF, ID, frame information, and data conditions. Items whose check boxes are selected are used as search conditions.

When PTYPE is set to No, the ID bit pattern cannot be set to 0.

• **When the Comparison Condition Is True or False**

SOF (always selected)
Set the PTYPE
Set the ID input format
Set the ID bit pattern

Set frame information
• Wakeup (0, 1, X)
• Sleep (0, 1, X)
• CT (0 to 3, X)

Set the comparison size
Set the comparison start position
Set the comparison condition
Set the data pattern input format

Set the data pattern

• **When the Comparison Condition Is Data = a; Data ≠ a; a ≤ Data; Data ≤ b; a ≤ Data ≤ b; or Data < a, b < Data**

SOF (always selected)
Set the PTYPE
Set the ID input format
Set the ID bit pattern

Set frame information
• Wakeup (0, 1, X)
• Sleep (0, 1, X)
• CT (0 to 3, X)

Set the comparison size
Set the comparison start position
Set the comparison condition

Set reference values a and b
Set the bit positions of the most significant bit (MSB) and the least significant bit (LSB) in the data that you will compare

Set whether to use a signed (Sign) or unsigned (Unsign) data format

Set the byte order

Wakeup/Sleep mode

Press the **Wakeup/Sleep** soft key and then the **Wakeup/Sleep Type OR** soft key to display the following menu.

The DLM2000 searches for wakeup pulses, wakeup states, sleep frames, or sleep states.

Turn on or off the detection of wakeup pulses, wakeup states, sleep frames, or sleep states

Executing Searches

After setting the search type, press the **Search** soft key to execute the search. If the DLM2000 finds points that match the search conditions (detected points), it shows numbers (0, 1, 2, etc.) from the left of the waveform display in the order that the points are detected.

Setting the Detected Point Numbers

After setting the detected point number, you can display the waveform for the corresponding detected point on the zoom window.

Setting the Zoom Position

You can change the zoom position, which is the point on the waveform that is zoomed in on.

12.5 Analyzing and Searching SENT Signals (Option)

This section explains the following settings (which are used when analyzing or searching SENT signals):

- Serial bus signal analysis and search displays
- Serial bus signal types
- Analysis

  Auto setup, source, format, display channel, fast channel data type, slow channel message type, the level used to detect the source state, and hysteresis

- Decoded display
- List display

  List size, display position, and zoom linking

- Trend display

  Source, display, cursor measurement on/off, auto scale

- Zoom position
- Analysis number
- Search

  Zoom window, search type, and search execution

► **"Analyzing and Searching Serial Bus Signals" and "Analyzing and Searching SENT Signals (Option)" in the Features Guide**

Select the Number of SERIAL BUS (Serial Bus)

Press **SHIFT+SEARCH** (SERIAL BUS), the **Serial Bus** soft key to display the following menu.

Select which serial bus to set (Serial Bus1 to Serial Bus4).

SEARCH SENT Menu

Press the **Type** soft key. From the setup menu that appears, select **SENT** to display the following menu.

Turn on or off the serial bus signal analysis and search displays

Set the serial bus signal type to SENT

Set the serial bus

Configure the search

Set the decode display (Hex or Bin)

Configure the list display and trend display

Set the analysis number

Set the zoom position
This sets the zoom position for the window selected during zoom window configuration (described later).

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Setting the Serial Bus (Setup)

Press the **Setup** soft key to display the following menu.

Auto Setup (Auto Setup)

After setting the source, press the **Auto Setup** soft key to automatically configure the serial bus settings. While the serial bus is being configured, Auto Setup changes to Abort. If you want to stop serial bus configuration, press the **Abort** soft key.

Execute automatic setup

Set the source (CH1 to CH4 or LOGIC (L))
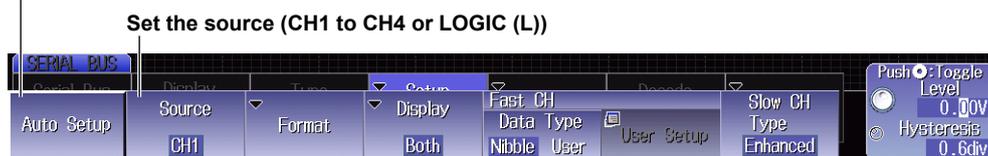
The auto setup feature automatically configures the format, level, and hysteresis and then triggers at the end of SYNC/CAL of the fast channel.
After running auto setup, you can display decoded results and change settings by using the manual setup feature explained in the following section.
The auto setup feature will not work properly on some input signals.

Manual Setup

Set the source

Set the format

Set the display channel (Both, Fast CH, or Slow CH)

Set the slow channel message type (Short or Enhanced)
(Only when the version is JAN2010)
► **"Setting the Format" on the next page**
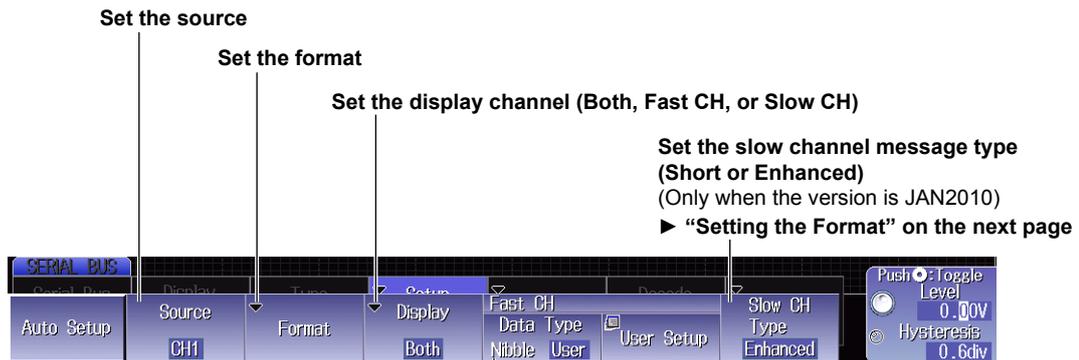
Set the fast channel data type (Nibble or User)

When the fast channel data type is User

Set the user data type

Set the nibble byte order (Big or Little)

Set the data size (0 to 24)*

Select the check boxes for the items that you want to use as comparison conditions

* The total number of bits for Data1 to Data4 is up to 24. If you try to exceed the total number of bits, the data size of other pieces of Data is reduced.

Setting the Source (Source)

Press the **Source** soft key. The menu that appears varies depending on the specified source.

Note

Using the CH4 Terminal and Logic Signal Input Port

When you perform an analysis or execute a search, you cannot use the CH4 terminal and the logic signal input port as the source at the same time. Specify the source that you want to use in advance by pressing either the CH4 key or the LOGIC key.

• **When the Source is Math1, Math2, or from CH1 to CH4**

Set the source (CH1 to CH4, Math1, or Math2)

Set the level used to detect source states

Set the hysteresis

• **When the Source Is LOGIC (On models with the logic signal input port)**

Set the source (LOGIC)

Set the source bit (Bit0 to Bit7)
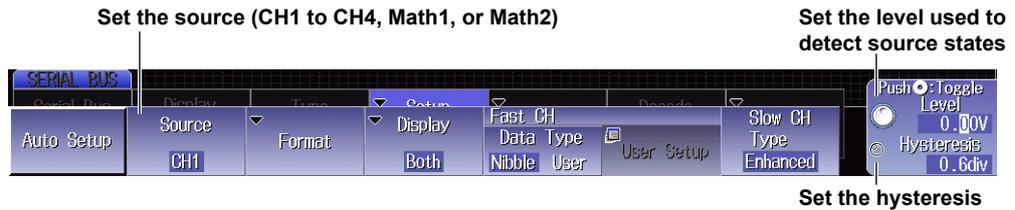
Setting the Format (Format)

Press the **Format** soft key to display the following menu.

Set the method of detecting error types Successive CAL Pulses and Status and Communication

Set the version (JAN2010, FEB2008 and older)

Select the CRC type (Recommended or Legacy)
(Only when the version is JAN2010)

Select whether to include pause pulses in fast channel messages (ON or OFF)
(Only when the version is JAN2010)

Set the number of data nibbles of fast channel messages

When you press the **Data Nibbles** soft key

When you press the **Clock Tolerance** soft key

Set the clock tick tolerance

When you press the **Clock Tick** soft key

Set the clock tick

Configuring the List Display (List/Trend - List)

Press the **List/Trend** soft key and then the **List** soft key. The decoded results are listed for serial buses whose analysis and search displays (Display) are on.

If one display setting of Serial Bus 1 to 4 is on

List of analysis results

Analysis number

Set the analysis number

Turn zoom linking on or off

Set the list size and the display position to Full Screen, Half(Upper), or Half(Lower)

Data before the trigger position (on the left side of the waveform display) is assigned analysis numbers in descending order (–1, –2, and so on). Data after the trigger position (on the right side of the waveform display) is assigned analysis numbers in ascending order (0, 1, 2, and so on).

If several display settings of Serial Bus 1 to 4 are on

Select the list   **The selected list is displayed expanded**

The setting menu changes to the serial bus menu for the selected list.

Configuring the Trend Display (List/Trend - Trend)

Selecting the Trend Number (Trend)

Press the **List/Trend** soft key, the **Trend** soft key, and then the **Trend** soft key again to display the following menu.

Select the number from Trend1 to Trend4 that you want to set

Trend Menu

When the Source Is Set to Fast Channel

Turn the trend display on or off
Set the source (Fast CH)
Set user data (1, 2, 3, or 4)
Configure the display
Turn cursor measurement on or off
Set the cursor positions

When set to on, set the cursor positions
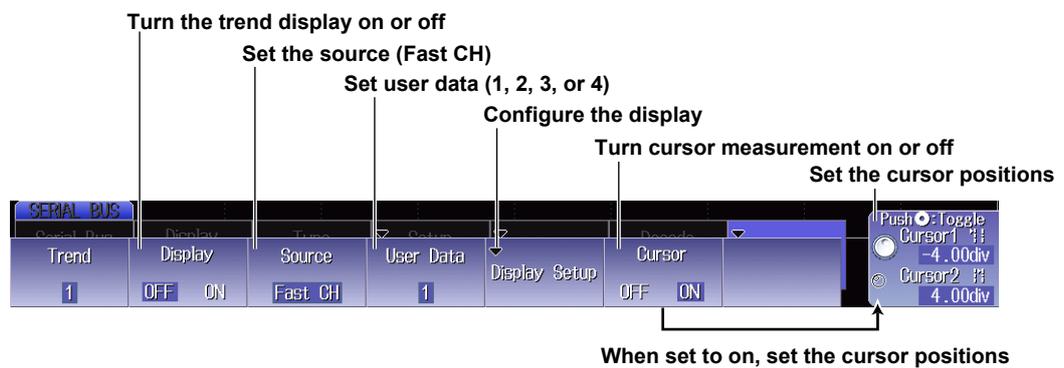
When the Source Is Set to Slow Channel

Turn the trend display on or off
Set the source (Slow CH)
Configure the display
Turn cursor measurement on or off
Set the message ID

When cursor measurement is on ⬇

Set the message ID

Set the cursor positions
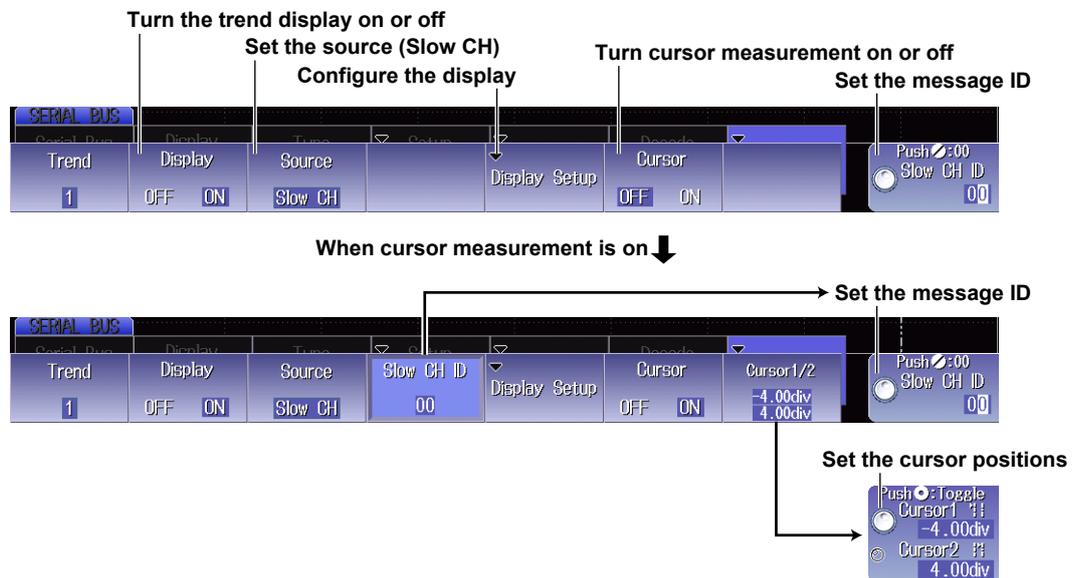
Setting the Message ID (Slow CH ID)

Set the message ID of the data you want to display the trend of. The selectable range of ID varies depending on the decode display setting in the "SEARCH SENT Menu" (page 12-21) and the version in "Setting the Serial Bus (Setup)" (page 12-22), and the slow channel message type.

Version	FEB2008 and older			
	JAN2010			
Slow channel message type	Short		Enhanced	
Decode display setting	Hex	Dec	Hex	Dec
Selectable range	0 to F	0 to 15	00 to FF	0 to 255

Configuring the Display (Display Setup)

Press the **Display Setup** soft key to display the following menu.

Execute automatic scaling

Set the range to display the trend of (Main, Zoom1, or Zoom2)

Turn the VT waveform display on or off

Set the vertical scale of the trend display

Executing Automatic Scaling

Press the **Auto Scale Exec** soft key.

The upper and lower limits are set so that the difference between the maximum data value and minimum data value in the window selected with H-Range covers 80% of the vertical scale of the Trend window.

Search Setup (Search)

Press the **Search** soft key to display the following menu.

Set the zoom window (Zoom1 or Zoom2)

Set the search type   Execute the search

Set the detected point number

This appears when a point that matches the specified search conditions is found.

Set the zoom position

Configuring the Zoom Windows

You can configure zoom windows Zoom1 and Zoom2 when they are displayed. Zoom1 is automatically displayed during the automatic setup of the analysis settings.

Setting the Search Type

Press the **Mode** soft key to display the following menu.

Every Fast CH mode

Fast CH S&C mode

Fast CH Data mode

Every Slow CH mode

Slow CH ID/Data mode

Error mode

Every Fast CH Mode

Press the **Every Fast CH** soft key.

The DLM2000 searches for fast channel messages.

Fast CH S&C Mode

Press the **Fast CH S&C** soft key to display the following menu.

The DLM2000 searches for a status and communication bit pattern.

Set the search conditions

Set the status and communication ID input format
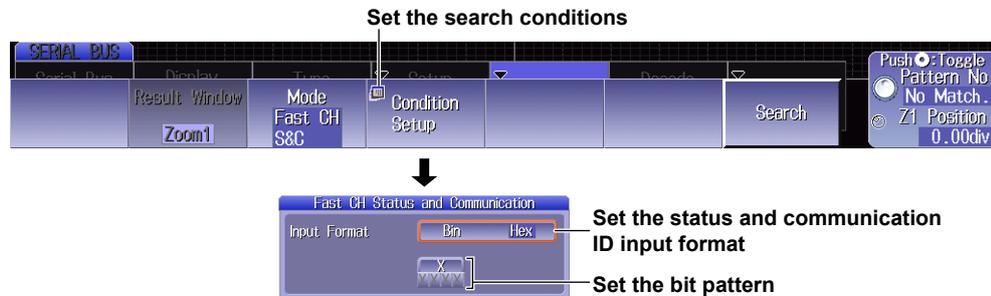
Set the bit pattern

Fast CH Data Mode

Press the **Fast CH Data** soft key to display the following menu.

Set the search conditions
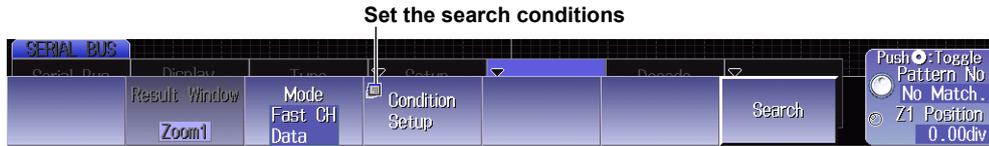
* When using Fast CH Data to search, if necessary, select the data type using the fast channel data type menu in "Setting the Serial Bus (Setup)" (page 12-22).

Setting Search Conditions (Condition Setup)

Press the **Condition Setup** soft key. The screen that appears varies depending on the fast channel data type setting.

The DLM2000 searches on the AND of fast channel data conditions. Items whose check boxes are selected are used as search conditions.

• **When the Data Type Is Nibble**

Set the comparison condition (True or False)

Set the data pattern input format (Bin or Hex)

Set the data pattern
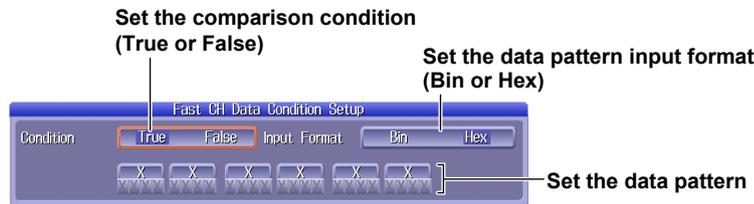
• **When the Data Type Is User**

Select the check boxes for the items that you want to use as comparison conditions

Set the comparison condition (Data = a; Data ≠ a; a ≤ Data; Data ≤ b; a ≤ Data ≤ b; Data<a, b<Data)

Set reference values a and b

Every Slow CH Mode

Press the **Every Slow CH** soft key.

The DLM2000 searches for slow channel messages.

* When using Every Slow CH to search, if necessary, select the message type using the slow channel message type menu in "Setting the Serial Bus (Setup)" (page 12-22).

Slow CH ID/Data Mode

Press the **Slow CH ID/Data** soft key to display the following menu.

Set the search conditions

* When using Slow CH ID/Data to search, if necessary, select the message type using the slow channel message type menu in "Setting the Serial Bus (Setup)" (page 12-22).

Setting Search Conditions (Condition Setup)

Press the **Condition Setup** soft key. The screen that appears varies depending on the slow channel message type setting.

The DLM2000 searches on the AND of slow channel ID and data conditions. Items whose check boxes are selected are used as search conditions.

Set ID/Data reference values a and b in hexadecimal or decimal notation according to the decode display setting in "SEARCH SENT Menu" (page 12-21).

- **When the Message Type Is Short**

  When the data comparison condition is Data = a; Data ≠ a; a ≤ Data; Data ≤ b; a ≤ Data ≤ b; or Data < a, b < Data
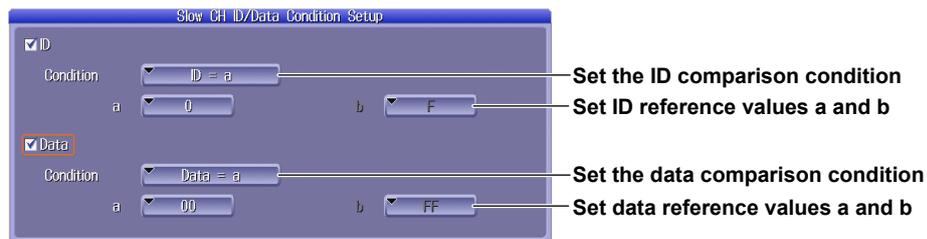
Set the ID comparison condition
Set ID reference values a and b
Set the data comparison condition
Set data reference values a and b

  When the data comparison condition is True or False

Set the data comparison condition
Set the data pattern input format
Set the data pattern

  Setting ID/Data Reference Values a and b

Decode display setting		Hex	Dec
Selectable range for reference values a and b	ID	0 to F	0 to 15
	Data	00 to FF	0 to 255

- **When the Message Type Is Enhanced**

  When the ID and Data Message Formats Are Set to "12bit data, 8bit ID"

  - **When the data comparison condition is Data = a; Data ≠ a; a ≤ Data; Data ≤ b; a ≤ Data ≤ b; or Data < a, b < Data**
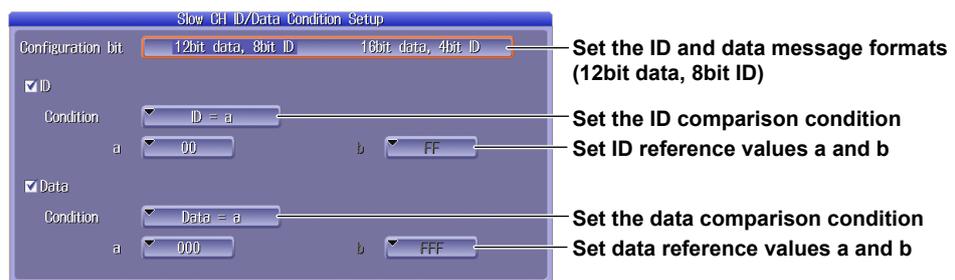
Set the ID and data message formats (12bit data, 8bit ID)
Set the ID comparison condition
Set ID reference values a and b
Set the data comparison condition
Set data reference values a and b

  - **When the data comparison condition is True or False**

Set the data comparison condition
Set the data pattern input format
Set the data pattern

  Setting ID/Data Reference Values a and b

Decode display setting		Hex	Dec
Selectable range for reference values a and b	ID	00 to FF	0 to 255
	Data	000 to FFF	0 to 4095

When the ID and Data Message Formats Are Set to "16bit data, 4bit ID"

- **When the data comparison condition is Data = a; Data ≠ a; a ≤ Data; Data ≤ b; a ≤ Data ≤ b; or Data < a, b < Data**
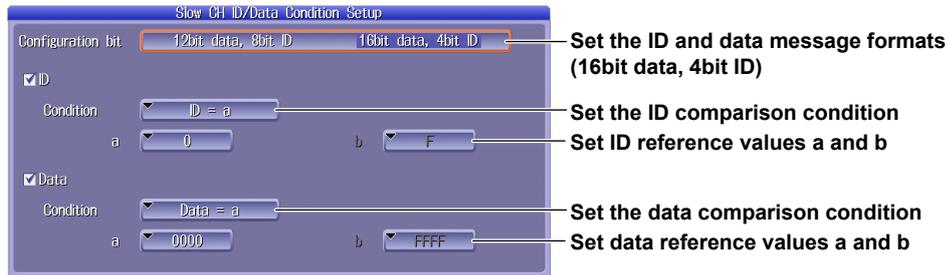
Set the ID and data message formats (16bit data, 4bit ID)

Set the ID comparison condition

Set ID reference values a and b

Set the data comparison condition

Set data reference values a and b

- **When the data comparison condition is True or False**

Set the data comparison condition

Set the data pattern input format

Set the data pattern

Setting ID/Data Reference Values a and b

Decode display setting		Hex	Dec
Selectable range for reference values a and b	ID	0 to F	0 to 15
	Data	0000 to FFFF	0 to 65535

Error Mode

Press the **Error** soft key and then the **Error Type Or** soft key to display the following menu. The DLM2000 searches for various errors that are set to ON.

Turn on or off the detection of Successive CAL Pulses[1], Nibble Number, Nibble Data Value, Fast CH CRC, Status and Communication[2], and Slow CH CRC errors

1 Not selectable when Successive Calibration Pulses is set to OFF for Customize Error Factor in "Setting the Format (Format)" (page 12-23).

2 Selectable when the Bit 0 or Bit 1 check box is selected under Status and Communication for Customize Error Factor in "Setting the Format (Format)" (page 12-23).

The DLM2000 triggers when it detects various types of errors.

Executing Searches

After setting the search type, press the **Search** soft key to execute the search. If the DLM2000 finds points that match the search conditions (detected points), it shows numbers (0, 1, 2, etc.) from the left of the waveform display in the order that the points are detected.

Setting the Detected Point Numbers

After setting the detected point number, you can display the waveform for the corresponding detected point on the zoom window.

Setting the Zoom Position

You can change the zoom position, which is the point on the waveform that is zoomed in on.

12.6 Analyzing and Searching PSI5 Airbag Signals (Option)

This section explains the following settings (which are used when analyzing or searching PSI5 Airbag signals):

- Serial bus signal analysis and search displays
- Serial bus signal types
- Analysis

  Auto setup, sync signal, data frame source, bit rate, data length, error detection method, sync noise rejection, clock tolerance, and the level and hysteresis used to detect the sync signal or data frame source state

- Decoded display
- List display

  List size, display position, and zoom linking

- Trend display

  Source, display, cursor measurement on/off, auto scale

- Zoom position
- Analysis number
- Search

  Zoom window, search type, and search execution

Select the Number of SERIAL BUS (Serial Bus)

Press **SHIFT+SEARCH** (SERIAL BUS), the **Serial Bus** soft key to display the following menu.

Select which serial bus to set (Serial Bus1 to Serial Bus4).

SEARCH PSI5 Airbag Menu

Press the **Type** soft key. From the setup menu that appears, select **PSI5 Airbag**. The following menu appears.
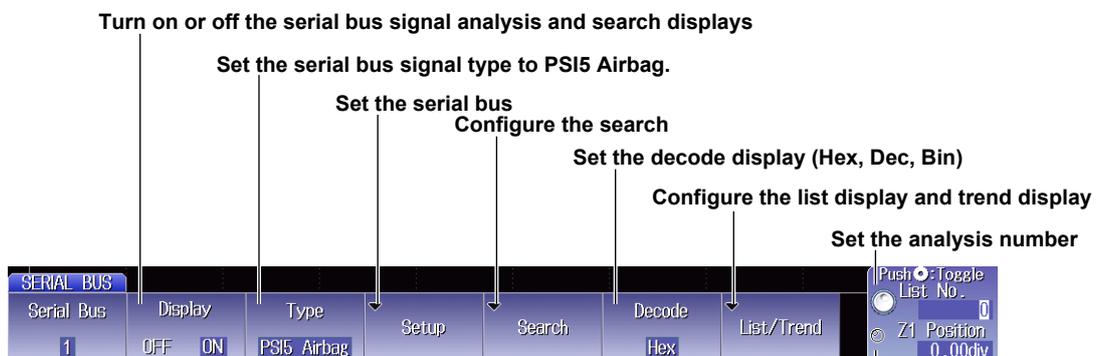
Turn on or off the serial bus signal analysis and search displays

Set the serial bus signal type to PSI5 Airbag.

Set the serial bus

Configure the search

Set the decode display (Hex, Dec, Bin)

Configure the list display and trend display

Set the analysis number

Set the zoom position
This sets the zoom position for the window selected during zoom window configuration (described later).

Setting the Serial Bus (Setup)

Press the **Setup** soft key to display the following menu.

Auto Setup (Auto Setup)

After setting the sync signal and data frame source, press the **Auto Setup** soft key to automatically configure the serial bus settings. While the serial bus is being configured, Auto Setup changes to Abort. If you want to stop serial bus configuration, press the **Abort** soft key.
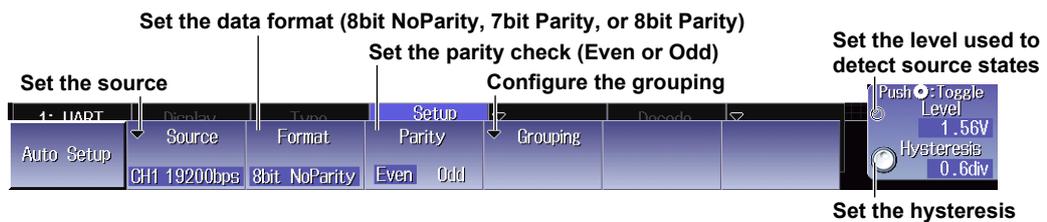
Execute automatic setup
Set the sync signal (CH1 to CH4, X)
Set the data frame source

Setting the Data Frame Source (Data)

Set the data frame source (CH1 to CH4)
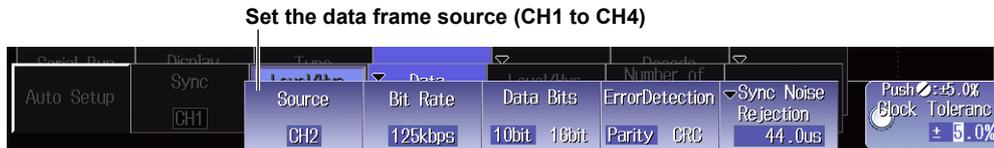
Bit rate, data length, error detection method, sync noise rejection, clock tolerance, number of slots, level, and hysteresis are set automatically.

• When the sync signal (Sync) source is CH1 to CH4, the DLM2000 triggers on the rising edge of the sync pulse.
• When the sync signal source is X, the DLM2000 triggers on the start bit of data frames.

After running auto setup, you can display decoded results and change settings by using the manual setup feature explained in the following section.
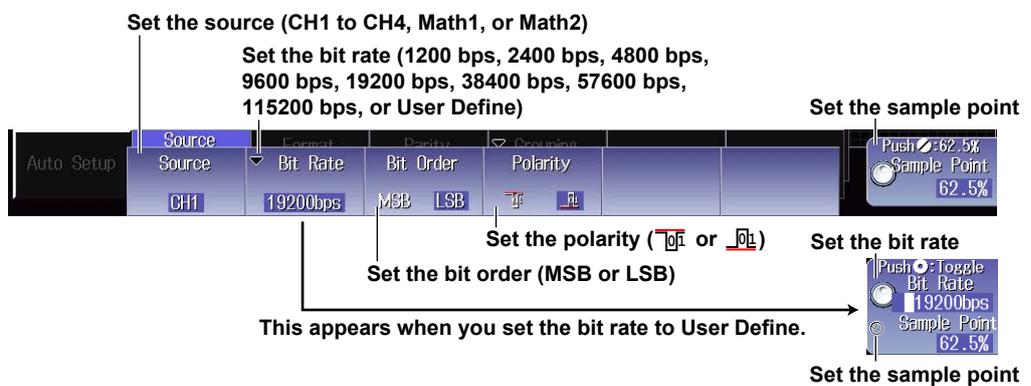The auto setup feature will not work properly on some input signals.

Manual Setup

Note

Using the CH4 Terminal and Logic Signal Input Port
If you perform an analysis or execute a search when using the logic signal input ports for input, you cannot specify CH4 as the source. Press the CH4 key in advance to enable input from the CH4 terminal.

Set the sync signal
Set the data frame source
Set the number of slots
Set the level used to detect data frame source states

Set the hysteresis of the data frame source

This appears when you press this Level/Hys soft key.

Set the level used to detect the state of the sync signal

This appears when you press this Level/Hys soft key.

Set the hysteresis of the sync signal
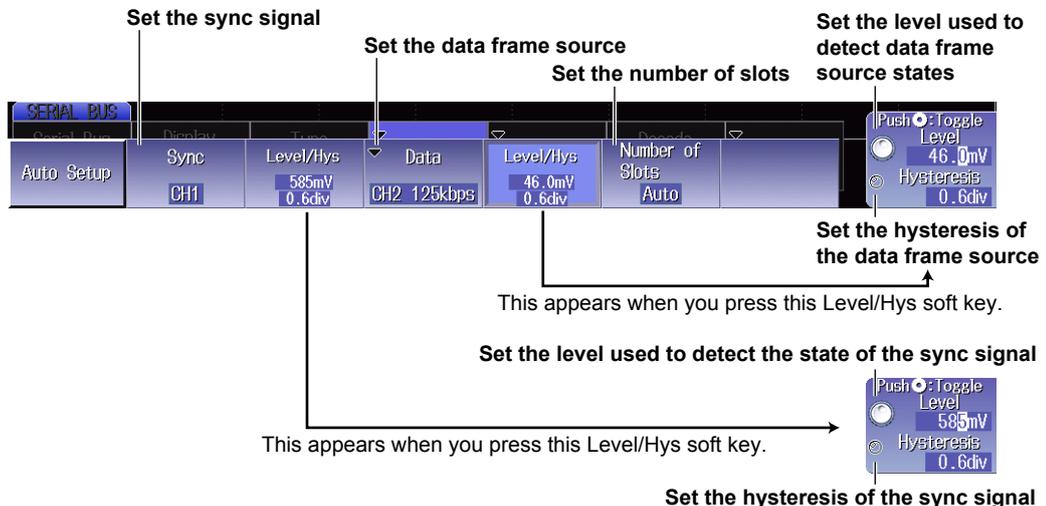
Setting the Sync Signal (Sync)

Press the **Sync** soft key. The menu that appears varies depending on the specified sync signal source.

• **When the Source Is Set to a Channel from CH1 to CH4, Math1, or Math2**

Set the sync signal (CH1 to CH4, Math1, Math2)

Set the level used to detect the state of the sync signal

Set the hysteresis

• **When the Source Is X**

Set the sync signal (X)

Set the level used to detect data frame source states, explained in the next section

Set the hysteresis

Setting the Data Frame Source (Data)

Press the **Data** soft key to display the following menu.

Set the data frame source (CH1 to CH4, Math1, Math2)

Set the bit rate (125kbps, 189kbps, User Define)

Set the data length (10bit, 16bit)

Set the error detection method (Parity, CRC)[1]

Set the sync noise rejection[2]

Set the clock tolerance

Set the bit rate

This appears when you set the bit rate to User Define.

Set the clock tolerance

1 When the data length is 16 bit, the error detection method is fixed to CRC.
2 When the sync signal source is X, the sync noise rejection is set to OFF, and the sync noise rejection menu does not appear.

Setting Sync Noise Rejection (Sync Noise Rejection)

Press the **Sync Noise Rejection** soft key to display the following menu.

Turn on or off the rejection mode

Set the rejection end

Setting the Number of Slots (Number of Slots)

Press the **Number of Slots** soft key to display the following menu.

Set the slot number to Auto or a number from 1 to 6. If you do not specify Auto, set the number of slots the same as the number of data frames.

- **When Auto Is Specified**

  The following menu appears. From this point, there are no more steps to set the number of slots.

- **When a Number from 1 to 6 Is Specified**

  The following menu appears.

Example when the number of slots is set to 6

Set the time range of each slot

Number of slots: 6

Press the Slot soft key

Select the slot for setting the start position

Select the last slot for setting the end position

Set the start position of each slot and the end position of the last slot

Configuring the List Display (List/Trend - List)

Press the **List/Trend** soft key and then the **List** soft key. The decoded results are listed for serial buses whose analysis and search displays (Display) are on.

If one display setting of Serial Bus 1 to 4 is on

List of analysis results

Analysis number

Set the analysis number

Turn zoom linking on or off

Set the list size and the display position to Full Screen, Half(Upper), or Half(Lower)

Data before the trigger position (on the left side of the waveform display) is assigned analysis numbers in descending order (–1, –2, and so on). Data after the trigger position (on the right side of the waveform display) is assigned analysis numbers in ascending order (0, 1, 2, and so on).

If several display settings of Serial Bus 1 to 4 are on

Select the list

The selected list is displayed expanded.

The setting menu changes to the serial bus menu for the selected list.

Configuring the Trend Display (List/Trend - Trend)

Selecting the Trend Number (Trend)

Press the **List/Trend** soft key, the **Trend** soft key, and then the **Trend** soft key again to display the following menu.

Select the number from Trend1 to Trend4 that you want to set

Trend Menu

Turn the trend display on or off

Set the display source (Slot1 to Slot6)*

Configure the display

Turn cursor measurement on or off

Set the cursor positions

When set to on, set the cursor positions

*   The selectable range of display source varies depending on the number-of-slots setting (page 12-34) on the Setup menu.

Configuring the Display (Display Setup)

Press the **Display Setup** soft key to display the following menu.

Executes auto scaling

Set the range to display the trend of (Main, Zoom1, or Zoom2)

Turn the VT waveform display on or off

Set the vertical scale of the trend display

Executing Automatic Scaling

Press the **Auto Scale Exec** soft key.

The upper and lower limits are set so that the difference between the maximum data value and minimum data value in the window selected with H-Range covers 80% of the vertical scale of the Trend window.

Search Setup (Search)

Press the **Search** soft key to display the following menu.

Set the zoom window (Zoom1 or Zoom2)

Set the search type

Execute the search

This appears when a point that matches the specified search conditions is found.

Set the detected point number

Set the zoom position

Configuring the Zoom Windows

You can configure zoom windows Zoom1 and Zoom2 when they are displayed. Zoom1 is automatically displayed during the automatic setup of the analysis settings.

Setting the Search Type

Press the **Mode** soft key to display the following menu.

Sync mode[*]

Start bit mode

Frame in Slot mode[*]

Data mode

Error mode

*   These modes will not be available if the sync signal source (page 12-33) is set X.

Sync Mode

Press the **Sync** soft key.

The DLM2000 searches for the rising edge of sync pulses. Sync mode will not be available if the sync signal source (page 12-33) is set X.

Start Bit Mode

Press the **Start Bit** soft key.

The DLM2000 searches for the start bit of data frames.

Frame in Slot Mode

Press the **Frame in Slot** soft key to display the following menu.

The DLM2000 searches for data frames included in the selected slot. Frame in Slot mode will not be available if the sync signal source (page 12-33) is set X.

Selecting the Slot Number

- **When the number of slots on the Setup menu is set to a number from 1 to 6**[*]
  1 to N
  where N is the specified number of slots
- **When the number of slots on the Setup menu is set to Auto**[*]
  1 to 6

* See "Manual Setup" on pages 12-32 to 12-34.

Data Mode

Press the **Data** soft key to display the following menu.

Set the search conditions

Setting Search Conditions (Condition Setup)

Press the **Condition Setup** soft key to display the following screen.

The DLM2000 searches on the AND of slot and data conditions. Items whose check boxes are selected are used as search conditions.

- **When the Comparison Condition Is True or False**

Clear the check box to remove from search conditions

Select the slot number

Data (always selected)

Set the comparison condition

Set the data pattern input format

When data length* is 10bit

When data length* is 16bit

Set the data pattern
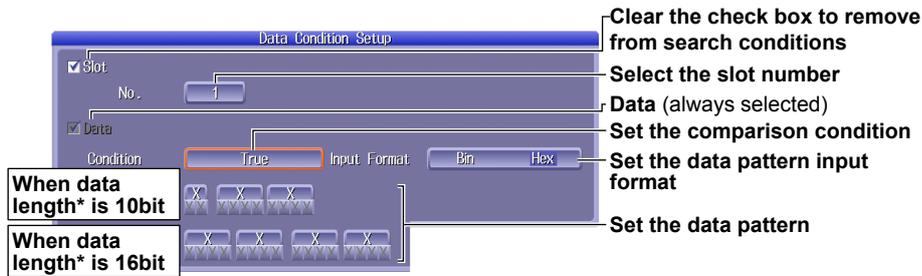
* See "Manual Setup" on pages 12-32 to 12-34.

- **When the Comparison Condition Is Data = a; Data ≠ a; a ≤ Data; Data ≤ b; a ≤ Data ≤ b; or Data < a, b < Data**
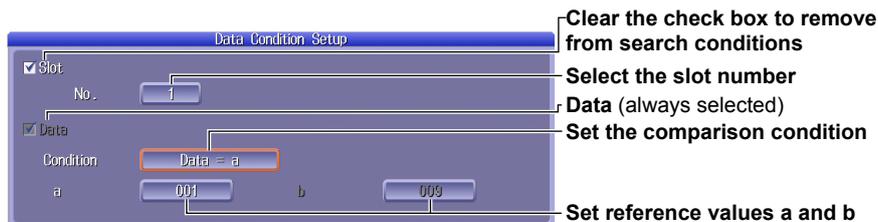
Clear the check box to remove from search conditions

Select the slot number

Data (always selected)

Set the comparison condition

Set reference values a and b

- **Selecting the Slot Number**
  - When the number of slots on the Setup menu is set to a number from 1 to 6[*]
    1 to N
    where N is the specified number of slots
  - When the number of slots on the Setup menu is set to Auto[*]
    1 to 6

  [*] See "Manual Setup" on pages 12-32 to 12-34.

- **Setting Reference Values a and b**

Data length*	10bits		16bits	
Decode display setting	Hex, Bin	Dec	Hex, Bin	Dec
Selectable range	200 to 1FF	–512 to 511	8000 to 7FFF	–32768 to 32767

  [*] See "Manual Setup" on pages 12-32 to 12-34.

Error Mode
Press the **Error** soft key and then the **Error Type OR** soft key to display the following menu.
The DLM2000 searches for various errors that are set to ON.

Turn on or off the detection of Frame, Clock, Start Bit, Parity/CRC, Frame Number, and Slot Boundary errors

Executing Searches
After setting the search type, press the **Search** soft key to execute the search. If the DLM2000 finds points that match the search conditions (detected points), it shows numbers (0, 1, 2, etc.) from the left of the waveform display in the order that the points are detected.

Setting the Detected Point Numbers
After setting the detected point number, you can display the waveform for the corresponding detected point on the zoom window.

Setting the Zoom Position
You can change the zoom position, which is the point on the waveform that is zoomed in on.

12.7 Analyzing and Searching UART Signals (Option)

This section explains the following settings (which are used when analyzing or searching UART signals):

- Serial bus signal analysis and search displays
- Serial bus signal types
- Analysis
  Auto setup, source, format, parity, grouping, the level used to detect the source state, and hysteresis
- Decoded display
- List display
  List size and display position, grouping, detailed display, and zoom linking
- Zoom position
- Analysis and data numbers
- Search
  Zoom window, search type, and search execution

► **"Analyzing and Searching Serial Bus Signals" and "Analyzing and Searching UART Signals (Option)" in the Features Guide**

Select the Number of SERIAL BUS (Serial Bus)

Press **SHIFT**+**SEARCH** (SERIAL BUS), the **Serial Bus** soft key to display the following menu.

Select which serial bus to set (Serial Bus1 to Serial Bus4).

SEARCH UART Menu

Press the **Type** soft key. From the setup menu that appears, select **UART** to display the following menu.

Turn on or off the serial bus signal analysis and search displays
Set the serial bus signal type to UART
Set the serial bus
Configure the search
Set the decode display (Hex, Bin, or ASCII)

Set the data number or analysis number
When grouping (described later) is off, this sets the data number. When grouping is on, this sets the analysis number.

Configure the list display

Set the zoom position
This sets the zoom position for the window selected during zoom window configuration (described later).

Setting the Serial Bus (Setup)

Press the **Setup** soft key to display the following menu.

Auto Setup (Auto Setup)

After setting the source, press the **Auto Setup** soft key to automatically configure the serial bus settings. While the serial bus is being configured, Auto Setup changes to Abort. If you want to stop serial bus configuration, press the **Abort** soft key.

Execute automatic setup

Set the source (CH1 to CH3, CH4 or LOGIC)

The auto setup feature automatically configures the bit rate, sample point, level, and hysteresis and then triggers on the UART signal's Stop Bit.

After running auto setup, you can display decoded results and change settings by using the manual setup feature explained in the following section.

The auto setup feature will not work properly on some input signals.

Manual Setup

Set the data format (8bit NoParity, 7bit Parity, or 8bit Parity)

Set the parity check (Even or Odd)

Set the source

Configure the grouping

Set the level used to detect source states

Set the hysteresis

Setting the Source (Source)

Press the **Source** soft key to open one of the menus shown below. The menu that appears varies depending on the specified source.

Note

Using the CH4 Terminal and Logic Signal Input Port

When you perform an analysis or execute a search, you cannot use the CH4 terminal and logic signal input ports as the source at the same time. Specify the source that you want to use in advance by pressing either the CH4 key or the LOGIC key.

- **When the Source Is Math1, Math2, or from CH1 to CH4**

Set the source (CH1 to CH4, Math1, or Math2)

Set the bit rate (1200 bps, 2400 bps, 4800 bps, 9600 bps, 19200 bps, 38400 bps, 57600 bps, 115200 bps, or User Define)

Set the sample point

Set the polarity

Set the bit rate

Set the bit order (MSB or LSB)

This appears when you set the bit rate to User Define.

Set the sample point

• **When the Source Is LOGIC (On models with the logic signal input port)**

Set the source (LOGIC)

Set the bit rate (1200 bps, 2400 bps, 4800 bps, 9600 bps, 19200 bps, 38400 bps, 57600 bps, 115200 bps, or User Define)

Set the sample point

Set the polarity (or)

Set the bit order (MSB or LSB)

Set the source bit (Bit0 to Bit7)

Set the bit rate

This appears when you set the bit rate to User Define.

Set the sample point

Configuring the Grouping (Grouping)

Press the **Grouping** soft key to display the following menu.

Turn grouping on or off

Set the byte space

Configuring the List Display (List)

Press the **List** soft key on the SEARCH UART menu to display the decoded results as a list.

When Grouping Is Set to OFF

If one display setting of Serial Bus 1 to 4 is on

List of analysis

Data from the leftmost side of the waveform display

The data that corresponds to the selected data number is highlighted.

If a framing error is detected
An * is appended.

If a parity error is detected
An x is appended.

If both a framing error and a parity error are detected
The * used for marking framing errors is appended

Turn zoom linking on or off

Set the grouping (set this to OFF)

Set the data

Set the list size and the display position to Full Screen, Half(Upper), or Half

If several display settings of Serial Bus 1 to 4 are on

Select the list   **The selected list is displayed expanded**

The setting menu changes to the serial bus menu for the selected list.

When Grouping Is Set to ON

List of analysis results

Analysis number

If multiple errors are detected in one piece of data, the DLM2000 only displays the framing error indication.
Framing Error or Parity Error

This is the list of analysis results that is displayed when you press the Detail soft key.
All data for the specified analysis number is displayed.

The data that corresponds to the selected data number is highlighted.

The same marks are appended to the data numbers if an error is detected as when grouping is off.

This appears when you press the **Detail** soft key.

Set the data number

Set the grouping (set this to ON)

Set the analysis number

Turn zoom linking on or off

Set the list size and the display position to Full Screen, Half(Upper), or Half(Lower)

Data before the trigger position (on the left side of the waveform display) is assigned analysis numbers in descending order (–1, –2, and so on). Data after the trigger position (on the right side of the waveform display) is assigned analysis numbers in ascending order (0, 1, 2, and so on).

Search Setup (Search)

Press the **Search** soft key on the SEARCH UART menu to display the following menu.

Set the zoom window (Zoom1 or Zoom2)

Set the search type (Every Data, Error, or Data)
▶ section 2.14

Execute the search

This appears when a point that matches
the specified search conditions is found.

**Set the detected
point number**

Set the zoom position
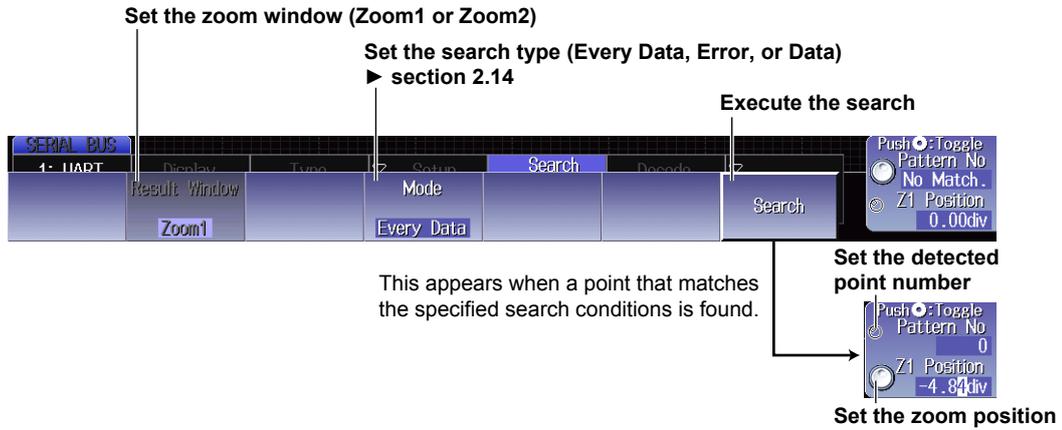
Configuring the zoom windows

You can configure zoom windows Zoom1 and Zoom2 when they are displayed. Zoom1 is automatically displayed during the automatic setup of the analysis settings.

Setting the search type

You can set this setting in the same way that you set the trigger type to Every Data, Error, or Data. For details, see section 2.14.

Executing searches

After setting the search type, press the **Search** soft key to execute the search. If the DLM2000 finds points that match the search conditions (detected points), it shows numbers (0, 1, 2, etc.) from the left of the waveform display in the order that the points were detected.

Setting the detected point numbers

After setting the detected point number, you can display the waveform for the corresponding detected point on the zoom window.

Setting the zoom position

You can change the zoom position, which is the point on the waveform that is zoomed in on.

12.8 Analyzing and Searching I²C Bus Signals (Option)

This section explains the following settings (which are used when analyzing or searching I²C bus signals):

- Serial bus signal analysis and search displays
- Serial bus signal types
- Analysis
  Auto setup, SCL source, SDA source, the level used to detect the source state, and hysteresis
- Decoded display
- List display
  List size, position, details, and zoom linking
- Zoom position
- Analysis number
- Search
  Zoom window, search type, and search execution

Select the Number of SERIAL BUS (Serial Bus)

Press **SHIFT**+**SEARCH** (SERIAL BUS), the **Serial Bus** soft key to display the following menu.

Select which serial bus to set (Serial Bus1 to Serial Bus4).

SEARCH I2C Menu

Press the **Type** soft key. From the setup menu that appears, select **I2C** to display the following menu.

Turn on or off the serial bus signal analysis and search displays

Set the serial bus signal type to I2C

Set the serial bus

Configure the search

Configure the list display

Set the analysis number

Set the decode display

Set the zoom position
This sets the zoom position for the window selected during zoom window configuration (described later).

Set the format (Hex, Bin, or ASCII)

Turns on or off the start/stop condition display

Code display example after decoding when set to ON

Start condition

Stop condition
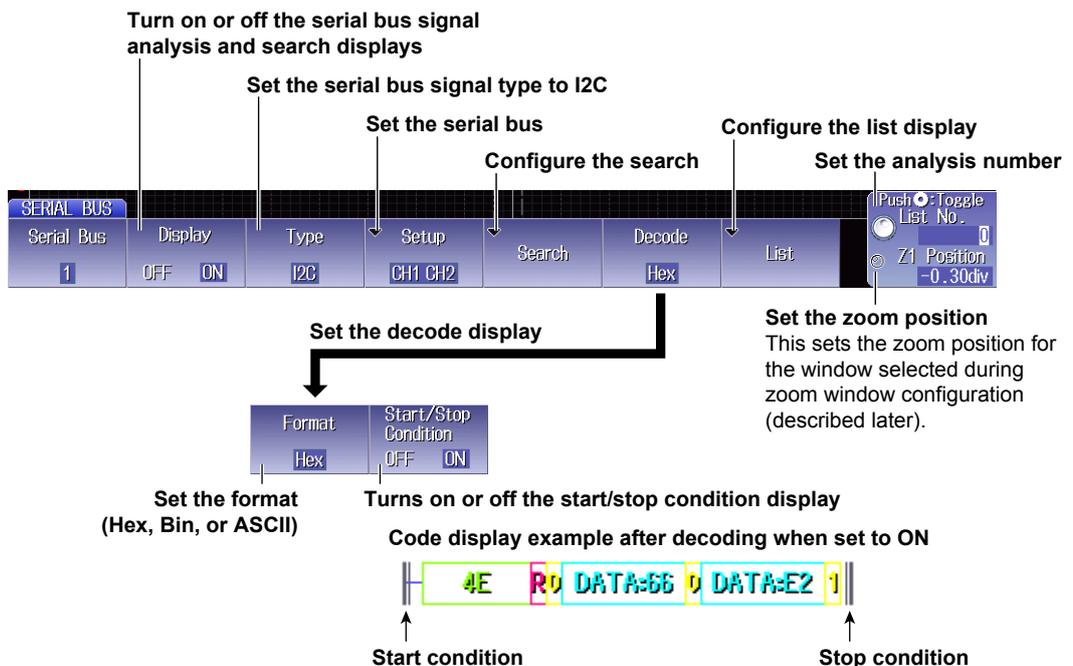
Setting the Serial Bus (Setup)

Press the **Setup** soft key to display the following menu.

Auto Setup (Auto Setup)

After setting the SCL and SDA sources, press the **Auto Setup** soft key to automatically configure the serial bus settings. While the serial bus is being configured, Auto Setup changes to Abort. If you want to stop serial bus configuration, press the **Abort** soft key.

Execute automatic setup

Set the SCL source (CH1 to CH3, CH4 or LOGIC)

Set the SDA source (CH1 to CH3, CH4 or LOGIC)
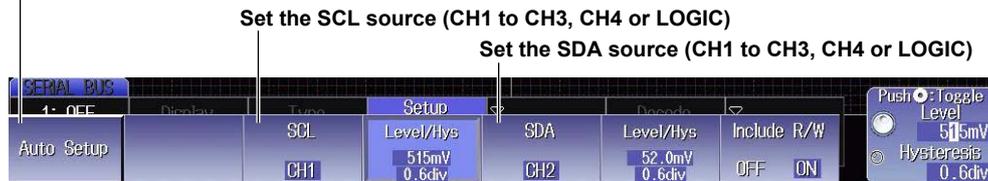
The DLM2000 sets the level and hysteresis and triggers on the start condition of the I^{2}C bus signal. After running auto setup, you can display decoded results and change settings by using the manual setup feature explained in the following section.

The auto setup feature will not work properly on some input signals.

> ### Note
> Auto setup is not possible when state display is applied to a LOGIC bit set as the SCL or SDA source.

Manual Setup

Setting the SCL Source and the SDA Source (SCL, SDA)

> ### Note
> **Using the CH4 Terminal and Logic Signal Input Port**
> When you perform an analysis or execute a search, you cannot use the CH4 terminal and logic signal input ports as the source at the same time. Specify the source that you want to use in advance by pressing either the CH4 key or the LOGIC key.

- **When the Source Is Math1, Math2, or from CH1 to CH4**

Set the level used to detect source states

Set the SCL and SDA sources (CH1 to CH4, Math1, or Math2)

Press this **Level/Hys** soft key to set the level and hysteresis of the SCL source.

Press this **Level/Hys** soft key to set the level and hysteresis of the SDA source.

→ **Set the hysteresis**

- **When the Source Is LOGIC (On models with the logic signal input port)**

Set the SCL and SDA sources (LOGIC)

Press this **Source Bit** soft key to set the source bit of the SCL source.

Press this Source Bit soft key to set the **source bit** of the SDA source.

→ **Set the source bit (Bit0 to Bit7)**
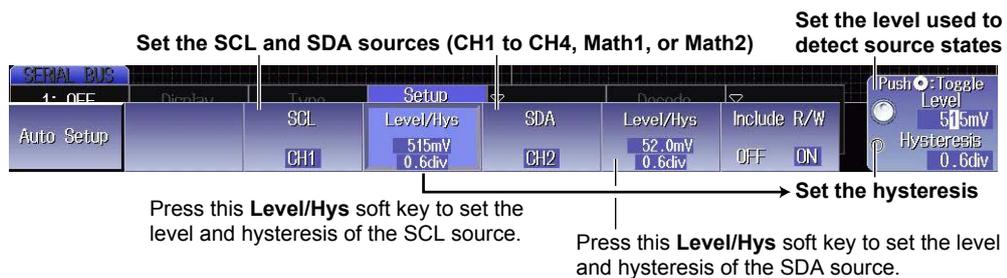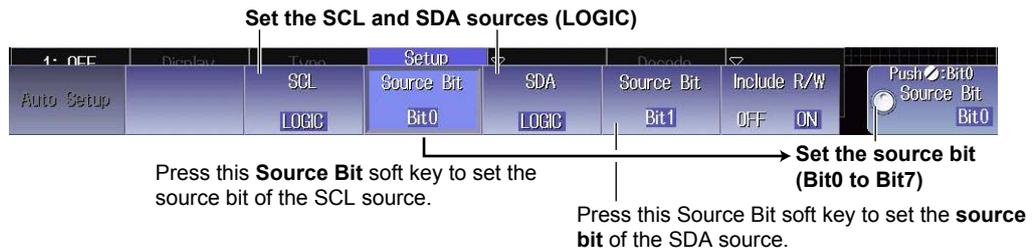
R/W Bit Inclusion (Include R/W)

Specify whether to include the R/W bit (ON) or omit it (OFF) in the address pattern when setting or displaying it.

This setting is reflected in the following situations where the address pattern is set or displayed.

- When setting the search conditions (Address is set on the Condition Setup screen) if search type is Adr Data or General Call (when Second Byte is Master Adr).
- When the decoded display is visible.
- When the 1st and 2nd address boxes on the list display are visible.

Specify whether to include or omit the R/W bit

ON: Include the R/W bit when setting or displaying the address pattern.

OFF: Omit the R/W bit when setting or displaying the address pattern.

Configuring the List Display (List)

Press the **List** soft key on the SEARCH I2C menu to display the decoded results in a list.

If one display setting of Serial Bus 1 to 4 is on

List of analysis results

Analysis number

This is the list of analysis results that is displayed when you press the Detail soft key.
All data for the specified analysis number is displayed.

The data that corresponds to the selected data number is highlighted.

This appears when you press the **Detail** soft key.

Set the data number

Turn zoom linking on or off

Set the analysis number

Set the list size and the display position to Full Screen, Half(Upper), or Half(Lower)

Data before the trigger position (on the left side of the waveform display) is assigned analysis numbers in descending order (–1, –2, and so on). Data after the trigger position (on the right side of the waveform display) is assigned analysis numbers in ascending order (0, 1, 2, and so on).

If several display settings of Serial Bus 1 to 4 are on

Select the list **The selected list is displayed expanded**

The setting menu changes to the serial bus menu for the selected list.

Search Setup (Search)

Press the **Search** soft key on the SEARCH I2C menu to display the following menu.

Set the zoom window (Zoom1 or Zoom2)

Set the search type (EveryStart, Adr Data, NON ACK, General Call, Start Byte, or HS Mode).
► section 2.15

Execute the search

This appears when a point that matches the specified search conditions is found.

Set the detected point number

Set the zoom position

Configuring the zoom windows

You can configure zoom windows Zoom1 and Zoom2 when they are displayed. Zoom1 is automatically displayed during the automatic setup of the analysis settings.

Setting the search type

You can set this setting in the same way that you set the trigger type to EveryStart, Adr Data, NON ACK, General Call, Start Byte, and HS Mode. For details, see section 2.15.

Executing searches

After setting the search type, press the **Search** soft key to execute the search. If the DLM2000 finds points that match the search conditions (detected points), it shows numbers (0, 1, 2, etc.) from the left of the waveform display in the order that the points were detected.

Setting the detected point numbers

After setting the detected point number, you can display the waveform for the corresponding detected point on the zoom window.

Setting the zoom position

You can change the zoom position, which is the point on the waveform that is zoomed in on.

12.9 Analyzing and Searching SPI Bus Signals (Option)

This section explains the following settings (which are used when analyzing or searching SPI bus signals):

- Serial bus signal analysis and search displays
- Serial bus signal types
- Analysis
  Auto setup, wiring system, bit order, clock source, data source, chip select source, the level used to detect the source state, hysteresis, and polarity
- Decoded display
- List display
  List size, position, details, and zoom linking
- Zoom position
- Analysis number
- Search
  Zoom window, search conditions, and search execution

► "Analyzing and Searching Serial Bus Signals" and "Analyzing and Searching SPI Bus Signals (Option)" in the Features Guide

Select the Number of SERIAL BUS (Serial Bus)

Press **SHIFT**+**SEARCH** (SERIAL BUS), the **Serial Bus** soft key to display the following menu.

Select which serial bus to set (Serial Bus1 to Serial Bus4).

SEARCH SPI Menu

Press the **Type** soft key. From the setup menu that appears, select **SPI** to display the following menu.

Turn on or off the serial bus signal analysis and search displays
Set the serial bus signal type to SPI
Set the serial bus
Configure the search
Set the decode display (Hex, Bin, or ASCII)
Configure the list display
Set the analysis number
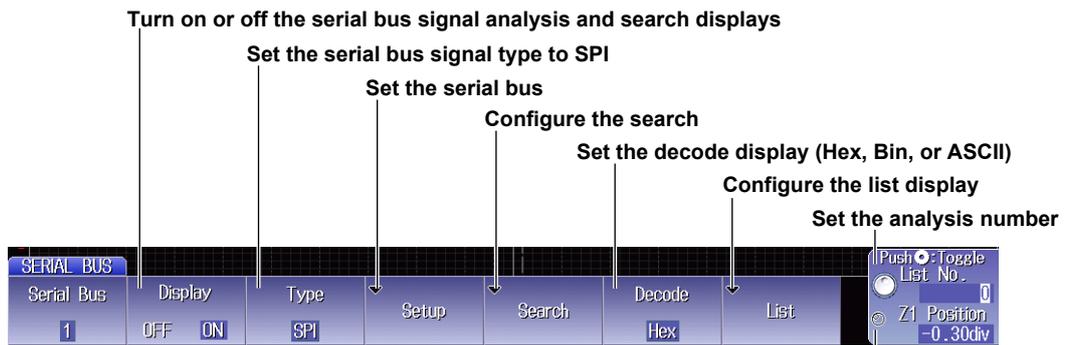
Set the zoom position
This sets the zoom position for the window selected during zoom window configuration (described later).

Setting the Serial Bus (Setup)

Press the **Setup** soft key to display the following menu.

Auto Setup (Auto Setup)

After setting the wiring system and the clock, data, and chip select sources, press the **Auto Setup** soft key to automatically configure the serial bus settings. While the serial bus is being configured, Auto Setup changes to Abort. If you want to stop serial bus configuration, press the **Abort** soft key.

When Wiring System Is 3 Wire

Set the clock source (CH1 to CH3, CH4 or LOGIC)

Execute automatic setup

    Set the data1 source (CH1 to CH3, CH4 or LOGIC)

    Set the wiring system to 3 Wire

    Set the chip select source (CH1 to CH3, CH4 or LOGIC)

1: SPI	Display	Type	Setup		Decode	
Auto Setup	Mode	Data Setup	Clock	Data1		CS(SS)
	3 Wire 4 Wire		CH1 ⌐	CH2		CH4 L

When Wiring System Is 4 Wire

Set the clock source (CH1 to CH3, CH4 or LOGIC)

Set the data1 source (CH1 to CH3, CH4 or LOGIC)

Set the data2 source (CH1 to CH3, CH4 or LOGIC)

Execute automatic setup

    Set the wiring system to 4 Wire

    Set the chip select source (CH1 to CH3, CH4 or LOGIC)

1: SPI	Display	Type	Setup		Decode	
Auto Setup	Mode	Data Setup	Clock	Data1	Data2	CS(SS)
	3 Wire 4 Wire		CH1 ⌐	CH2	CH3	CH4 L

The auto setup feature automatically configures the level and hysteresis and then triggers on the SPI signal's first data byte.

After running auto setup, you can display decoded results and change settings by using the manual setup feature explained in the following section.

The auto setup feature will not work properly on some input signals.

Note

Auto setup is not possible when state display is applied to any of the LOGIC bits set at the clock, Data1, Data2, or chip select.

Manual Setup

Press the **Clock**, **Data1**, **Data2**, or **CS(SS)** soft key to open one of the menus shown below. The menu that appears varies depending on the source that is specified in the pressed soft key's menu.

Note

Using the CH4 Terminal and Logic Signal Input Port

When you perform an analysis or execute a search, you cannot use the CH4 terminal and logic signal input ports as the source at the same time. Specify the source that you want to use in advance by pressing either the CH4 key or the LOGIC key.

Setting the Clock Source (Clock)

• **When the Source Is Math1, Math2, or from CH1 to CH4**
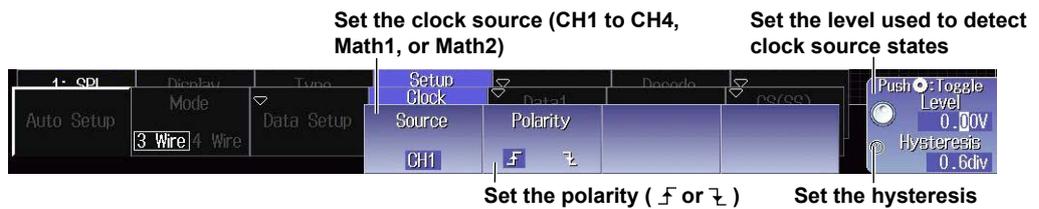
Set the clock source (CH1 to CH4, Math1, or Math2)　　　Set the level used to detect clock source states

Set the polarity (ƒ or ￪)　　　Set the hysteresis

• **When the Source Is LOGIC (On models with the logic signal input port)**

Set the source bit (Bit0 to Bit7)

Set the clock source (LOGIC)

Set the polarity (ƒ or ￪)
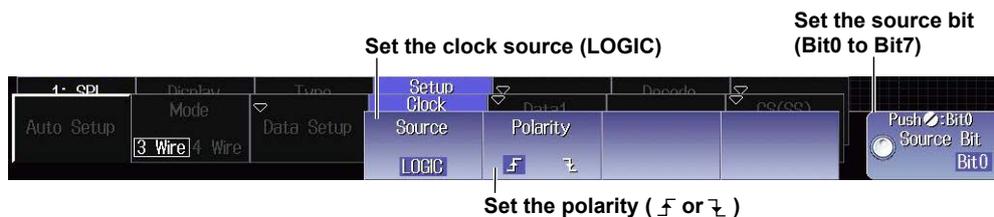
Setting the Data1 or Data2 Sources (Data1 and Data2)

This section shows how to set the Data1 source. You can set the Data2 source in the same manner. When the wiring system is 4 Wire, set the Data2 source.

• **When the Source Is Math1, Math2, or from CH1 to CH4**

Set the data1 source (CH1 to CH4, Math1, or Math2)　　　Set the level used to detect data1 source states

Set the hysteresis

• **When the Source Is LOGIC (On models with the logic signal input port)**

Set the data1 source (LOGIC)　　　Set the source bit (Bit0 to Bit7)
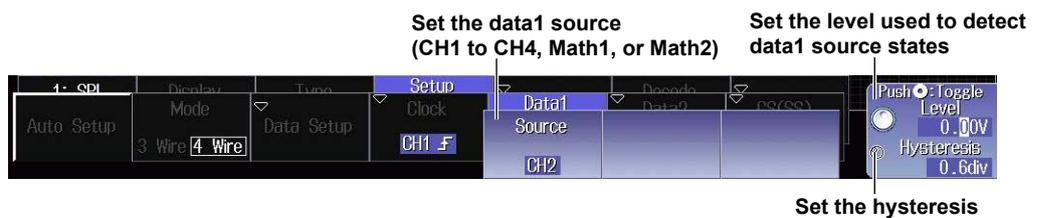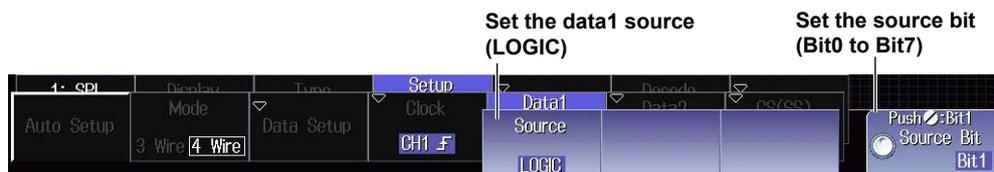
Setting the Chip Select Source (CS (SS))

• **When the Source Is Math1, Math2, or from CH1 to CH4**

Set the chip select source
(CH1 to CH4, Math1, or Math2)

Set the level used to detect
chip select source states

Set the hysteresis

Set the active state (H or L)

• **When the Source Is LOGIC (On models with the logic signal input port)**

Set the chip select source
(LOGIC)

Set the source bit
(Bit0 to Bit7)

Set the active state (H or L)
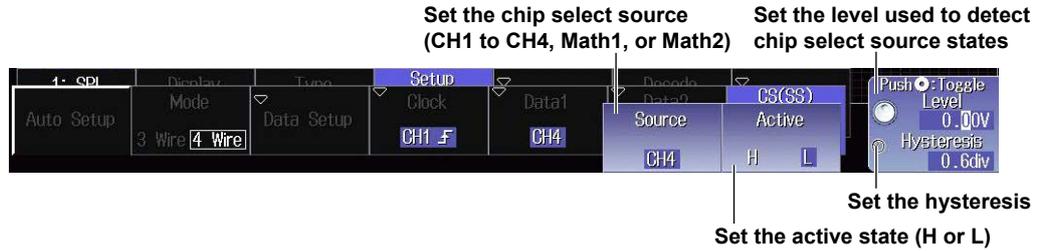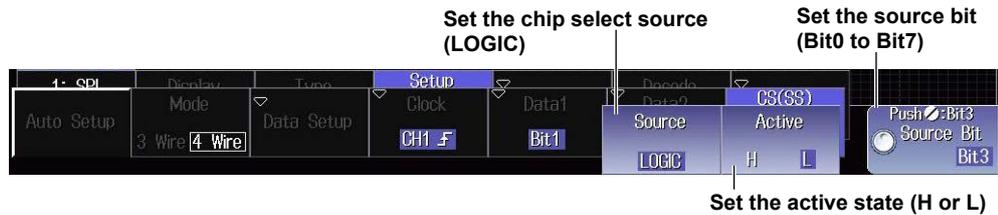
• **When the Source Is X (Ignore)**

Set the chip select source (X)

Turn grouping on or off

Set the idle time
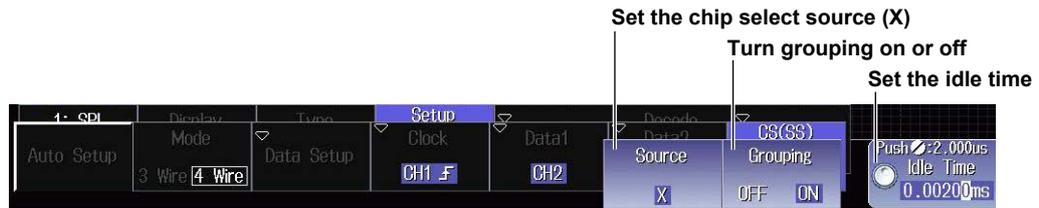
Setting the Data Format (Data Setup)

Press the **Data Setup** soft key to display the following menu.
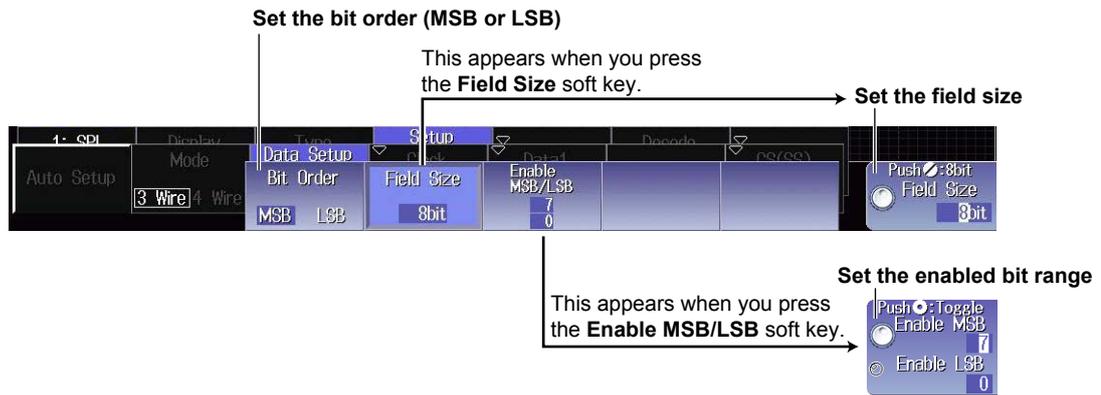
Set the bit order (MSB or LSB)

This appears when you press
the **Field Size** soft key.

Set the field size

Set the enabled bit range

This appears when you press
the **Enable MSB/LSB** soft key.

Configuring the List Display (List)

Press the **List** soft key on the SEARCH SPI menu to display the decoded results as a list.

In the analysis configuration shown two pages earlier, when the wiring system is set to 3 Wire, the contents of Data1 are displayed in a list. When the wiring system is set to 4 Wire, the contents of Data1 and Data2 are both displayed in a list.

If one display setting of Serial Bus 1 to 4 is on

List of analysis results

Analysis number

This is the list of analysis results that is displayed when you press the Detail 1 or Detail 2 soft key.
All data for the specified analysis number is displayed.

The data that corresponds to the selected data number is highlighted.

This appears when you press the **Detail 1** or **Detail 2** soft key.

Set the data number

Set the analysis number

Turn zoom linking on or off

Set the list size and the display position to Full Screen, Half(Upper), or Half(Lower)

Data before the trigger position (on the left side of the waveform display) is assigned analysis numbers in descending order (–1, –2, and so on). Data after the trigger position (on the right side of the waveform display) is assigned analysis numbers in ascending order (0, 1, 2, and so on).

If several display settings of Serial Bus 1 to 4 are on

Select the list

The selected list is displayed expanded

The setting menu changes to the serial bus menu for the selected list.

Search Setup (Search)

Press the **Search** soft key on the SEARCH SPI menu to display the following menu.

Set the zoom window (Zoom1 or Zoom2)

Set the search conditions.
► section 2.16

Execute the search

This appears when a point that matches the specified search conditions is found.

Set the detected point number

Set the zoom position

Configuring the zoom windows

You can configure zoom windows Zoom1 and Zoom2 when they are displayed. Zoom1 is automatically displayed during the automatic setup of the analysis settings.

Setting the search conditions

You can set search conditions in the same way that you set trigger conditions. For details, see section 2.16.

Executing searches

After setting the search conditions, press the **Search** soft key to execute the search. If the DLM2000 finds points that match the search conditions (detected points), it shows numbers (0, 1, 2, etc.) from the left of the waveform display in the order that the points were detected.

Setting the detected point numbers

After setting the detected point number, you can display the waveform for the corresponding detected point on the zoom window.

Setting the zoom position

You can change the zoom position, which is the point on the waveform that is zoomed in on.

12.10 Analyzing and Searching FlexRay Bus Signals (Option)

This section explains the following settings (which are used when analyzing or searching FlexRay bus signals):

- Serial bus signal analysis and search displays
- Serial bus signal types
- Analysis
  Auto setup, source, bit rate, analysis channel, sample point, the level used to detect the source state, and hysteresis
- Decoded display
- List display
  List size, display position, and zoom linking
- Zoom position
- Analysis number
- Search
  Jumping to the specified field, zoom window, search type, and search execution

► "Analyzing and Searching Serial Bus Signals" and
"Analyzing and Searching FlexRay Bus Signals (Option)"
in the Features Guide

Select the Number of SERIAL BUS (Serial Bus)

Press **SHIFT**+**SEARCH** (SERIAL BUS), the **Serial Bus** soft key to display the following menu.

Select which serial bus to set (Serial Bus1 to Serial Bus4).

SEARCH FlexRay Menu

Press the **Type** soft key. From the setup menu that appears, select **FlexRay** to display the following menu.
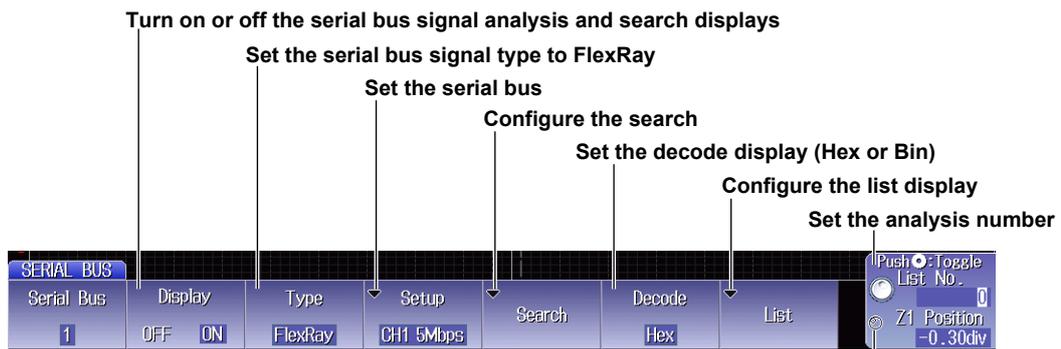
Turn on or off the serial bus signal analysis and search displays
Set the serial bus signal type to FlexRay
Set the serial bus
Configure the search
Set the decode display (Hex or Bin)
Configure the list display
Set the analysis number

Set the zoom position
This sets the zoom position for the window selected during zoom window configuration (described later).

Setting the Serial Bus (Setup)

Press the **Setup** soft key to display the following menu.

Auto Setup (Auto Setup)

After setting the source, press the **Auto Setup** soft key to automatically configure the serial bus settings. While the serial bus is being configured, Auto Setup changes to Abort. If you want to stop serial bus configuration, press the **Abort** soft key.

Execute automatic setup

Set the source (CH1 to CH4)
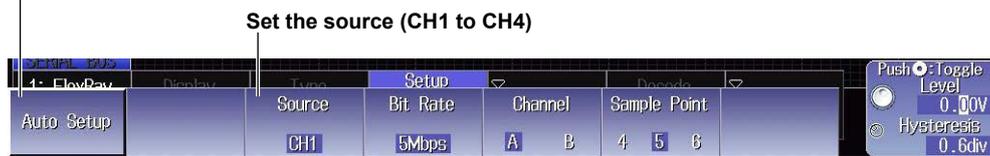
The auto setup feature automatically configures the bit rate, analysis channel, sample point, level, and hysteresis and triggers on the start of frame (SOF) of the FlexRay bus signal.

After running auto setup, you can display decoded results and change settings by using the manual setup feature explained in the following section.

The auto setup feature will not work properly on some input signals.

Manual Setup

Note

Using the CH4 Terminal and Logic Signal Input Port

If you perform an analysis or execute a search when using the logic signal input ports for input, you cannot specify CH4 as the source. Press the CH4 key in advance to enable input from the CH4 terminal.

Set the bit rate (2.5 Mbps, 5 Mbps, or 10 Mbps)

Set the bus channel (A or B)

Set the number of sample points (4, 5, or 6)

Set the source (CH1 to CH4, Math1, or Math2)

Set the level used to detect source states

Set the hysteresis

Setting the List Display (List)

Press the List soft key to display the decoded results as a list.

If one display setting of Serial Bus 1 to 4 is on

List of analysis results

Analysis number

Set the analysis number

Set the list size and the display position to Full Screen, Half(Upper), or Half(Lower)

Turn zoom linking on or off

Data before the trigger position (on the left side of the waveform display) is assigned analysis numbers in descending order (–1, –2, and so on). Data after the trigger position (on the right side of the waveform display) is assigned analysis numbers in ascending order (0, 1, 2, and so on).

If several display settings of Serial Bus 1 to 4 are on

Select the list   **The selected list is displayed expanded**

The setting menu changes to the serial bus menu for the selected list.

Search Setup (Search)

Press the Search soft key to display the following menu.

Jump to the specified field (ID, Payload Length, Header CRC, Cycle Count, or CRC)

Set the zoom window (Zoom1 or Zoom2)

Set the search type (Frame Start, Error, or ID/Data)
► section 2.17

Execute the search

This appears when a point that matches the specified search conditions is found.

Set the detected point number

Set the zoom position

Jumping to the specified field

Jumps to the field in the data frame that corresponds to the specified detected point number (Pattern No).

Configuring the zoom windows

You can configure zoom windows Zoom1 and Zoom2 when they are displayed. Zoom1 is automatically displayed during the automatic setup of the analysis settings.

Setting the search type

You can set this setting in the same way that you set the trigger type to Frame Start, Error, or ID/Data. For more details, see section 2.17.

Executing Searches

After setting the search type, press the Search soft key to execute the search. If the DLM2000 finds points that match the search conditions (detected points), it shows numbers (0, 1, 2, etc.) from the left of the waveform display in the order that the points were detected.

Setting the detected point numbers

After setting the detected point number, you can display the waveform for the corresponding detected point on the zoom window.

Setting the zoom position

You can change the zoom position, which is the point on the waveform that is zoomed in on.

12.11 Analyzing and Searching User-Defined Serial Bus Signals

This section explains the following settings (which are used when analyzing or searching user-defined serial bus signals):

- Serial bus signal analysis and search displays
- Serial bus signal types
- Analysis
  Bit rate, data source, clock source, chip select source, latch source, the level used to detect the source state, hysteresis, and polarity
- Decoded display and decoding start point
- Zoom position
- Search
  Zoom window, search conditions, and search execution

► **"Analyzing and Searching Serial Bus Signals" and**
"Analyzing and Searching User-Defined Serial Bus Signals (User Define)"
in the Features Guide

Select the Number of SERIAL BUS (Serial Bus)

Press **SHIFT**+**SEARCH** (SERIAL BUS), the **Serial Bus** soft key to display the following menu.

Select which serial bus to set (Serial Bus1 to Serial Bus4*).

*   SERIAL BUS2, SERIAL BUS3, and SERIAL BUS4, are only available on 4-channel models.

SEARCH User Define Menu

Press the **Type** soft key. From the setup menu that appears, select **User Define** to display the following menu.
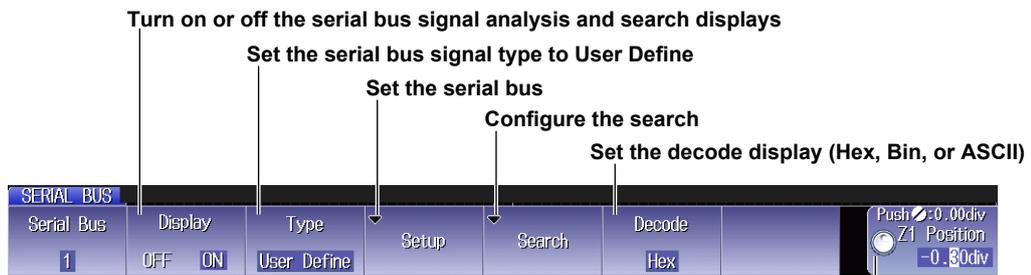
Turn on or off the serial bus signal analysis and search displays

Set the serial bus signal type to User Define

Set the serial bus

Configure the search

Set the decode display (Hex, Bin, or ASCII)

Set the zoom position
This sets the zoom position for the window selected during zoom window configuration (described later).

Setting the Serial Bus (Setup)

Press the **Setup** soft key to open one of the menus shown below. The menu that appears varies depending on whether the clock is on or off.

Note

Using the CH4 Terminal and Logic Signal Input Port

If you perform an analysis or execute a search when using the logic signal input ports for input, you cannot specify CH4 as the source. Press the CH4 key in advance to enable input from the CH4 terminal.

When the Clock Is Off
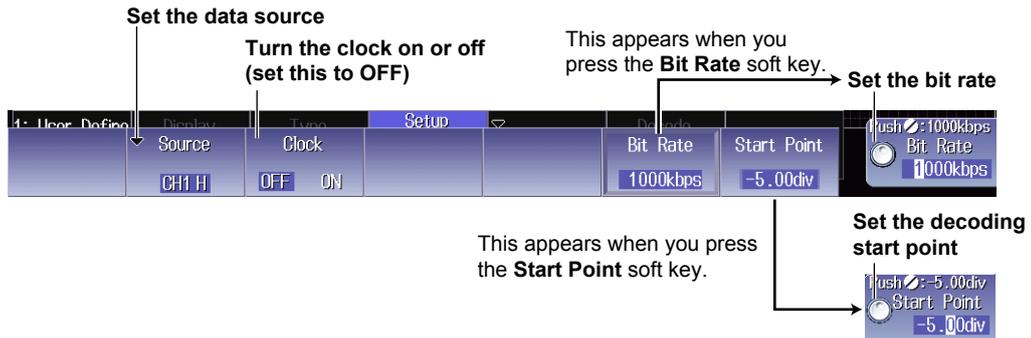
Setting the Data Source (Source)

Press the **Source** soft key to display the following menu.
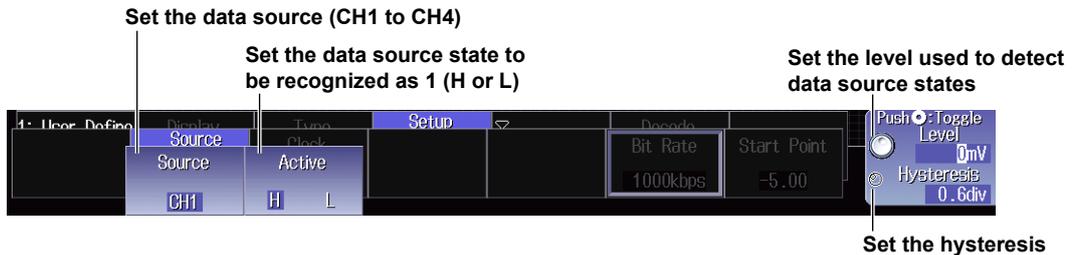
Set the analysis source.

When the Clock Is On
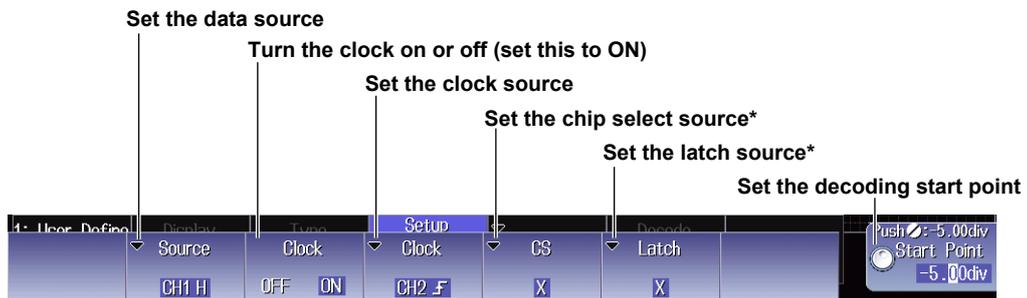
* The chip select source and latch source can only be set on 4-channel models.

If you press the **Source** soft key and specify one of the channels from CH1 to CH4, you can then set the respective source conditions.

Setting the Data Source (Source)

The menu is the same as the one shown above for when the clock is off.

Setting the Clock Source (Clock)

Press the **Clock** soft key to display the following menu.

Set the clock source (CH1 to CH4)

Set the timing for data source sampling (⌐ or ⌐)

Set the level used to detect clock source states

Set the hysteresis

Specify which clock source edge causes the data source to be sampled.

Setting the Chip Select Source (CS)

Press the **CS** soft key to display the following menu.

Set the chip select source (CH1 to CH4, or X)

Set the chip select source state to be recognized as the data source (L or H)

Set the level used to detect chip select source states

Set the hysteresis
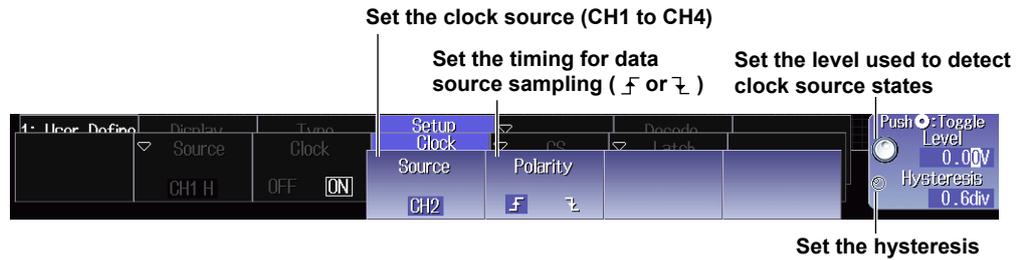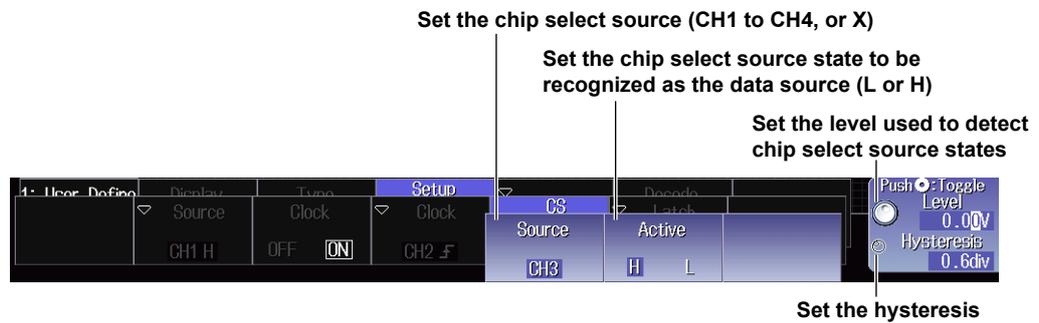
When the data source is sampled in sync with the clock source, use the chip select source to control the period for which the DLM2000 tests the data source.

Setting the Latch Source (Latch)

Press the **Latch** soft key to display the following menu.

Set the latch source (CH1 to CH4, or X)

Set the timing for data source pattern comparison (⌐ or ⌐)

Set the level used to detect latch source states

Set the hysteresis
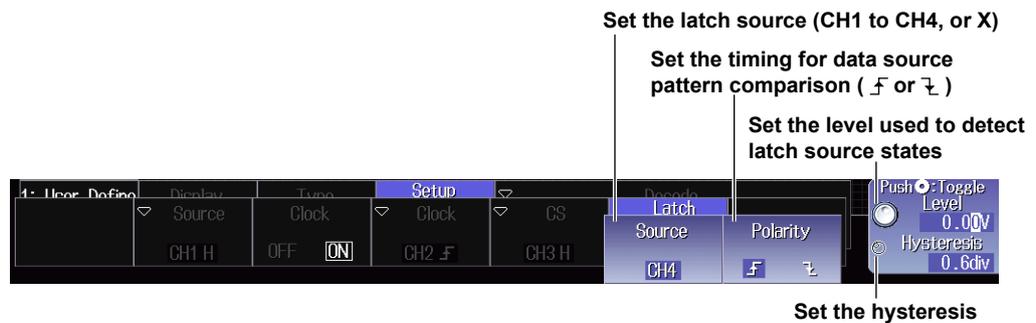
Specify the timing at which the data source pattern sampled in sync with the clock source is compared with the specified pattern.

Search Setup (Search)

Press the **Search** soft key on the SEARCH User Define menu to display the following menu.
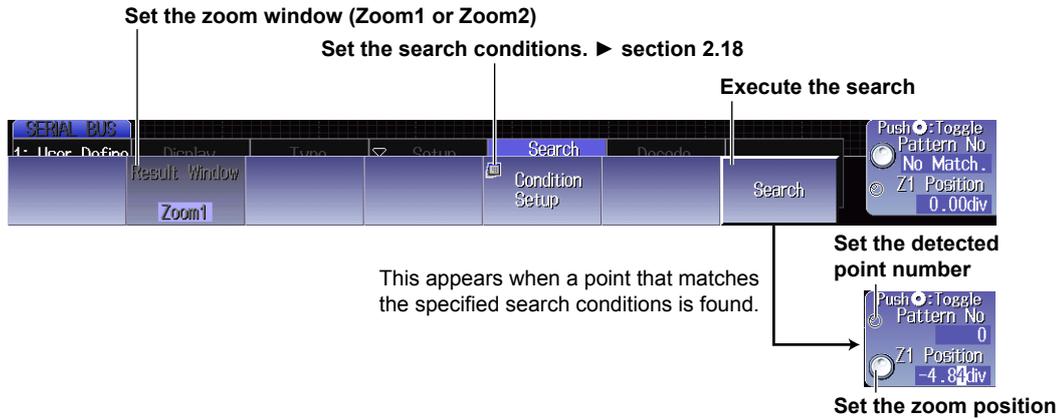
Set the zoom window (Zoom1 or Zoom2)

Set the search conditions. ► section 2.18

Execute the search

This appears when a point that matches the specified search conditions is found.

Set the detected point number

Set the zoom position

Configuring the zoom windows

You can configure zoom windows Zoom1 and Zoom2 when they are displayed. Zoom1 is automatically displayed during the automatic setup of the analysis settings.

Setting the search conditions

You can set search conditions in the same way that you set trigger conditions. For details, see section 2.18.

Executing searches

After setting the search conditions, press the **Search** soft key to execute the search. If the DLM2000 finds points that match the search conditions (detected points), it shows numbers (0, 1, 2, etc.) from the left of the waveform display in the order that the points were detected.

Setting the detected point numbers

After setting the detected point number, you can display the waveform for the corresponding detected point on the zoom window.

Setting the zoom position

You can change the zoom position, which is the point on the waveform that is zoomed in on.

13.1 Displaying Waveform Histograms

This section explains the following settings (which are used when displaying a histogram of the frequency of data occurrence in a specified area):

• Histogram
• Source waveform
• Source axis
• The range over which the frequency is counted

► **"Displaying the Frequency Distribution of a Waveform" in the Features Guide**

ANALYSIS Histogram Menu

Press **ANALYSIS** and then the **Histogram** soft key to display the following menu.

Select whether to set Hist1 or Hist2*
Turn the histogram display on or off
Set the source waveform (CH1 to CH4, Math1, or Math2)
Set the source axis (Vertical or Horizontal)
Set the range over which to count the frequency

Set the upper and lower or right and left limits
Set the right and left limits
Set the upper and lower limits
Set the source window (Main, Zoom1, or Zoom2)

* Hist2 is only available on 4-channel models.

13.2 Measuring Histogram Parameters

This section explains the following settings (which are used when measuring histogram parameters):

- Measurement mode
- Measurement items
- Cursor measurement

► **"Measurement (Measure Setup)" in the Features Guide**

ANALYSIS Histogram Menu

Press **ANALYSIS** and then the **Histogram** soft key to display the following menu.

Configure parameter or cursor measurements

Set the cursor position (Cursor1 or Cursor2)

Set measurement items (This menu item only appears when the measurement mode is set to Param.)

Set the measurement mode

Setting Measurement Items (Item)

Press the **Item** soft key to display the following screen.
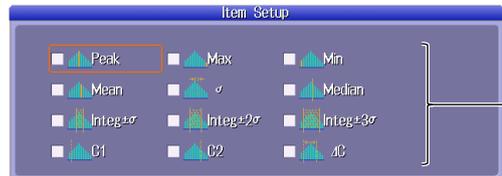
Select the measurement items that you want to use

14.1   Power Supply Analysis Types

This section explains how to set the power supply analysis type.

ANALYSIS Power Analysis Menu

Press **ANALYSIS** and then the **Power Analysis** soft key to display the following menu.

Select whether to set analysis number PWR1 or PWR2

      Set the power supply analysis type
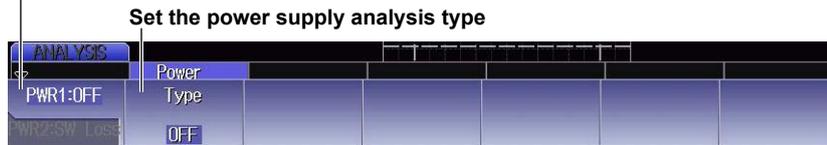
Setting the Power Supply Analysis Type (Type)

Press the **Type** soft key to display the following menu.

    Do not analyze

      Analyze switching loss

        Analyze the safe operating area

          Perform harmonic analysis

            Measure the Joule integral
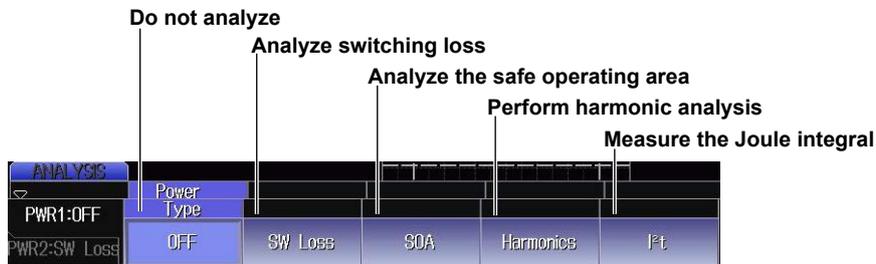
Note

Power supply analysis and power measurement of the power supply analysis feature cannot be executed simultaneously. If any of the power measurement items, PWR1 or PWR2, is set to ON, the power supply analysis is set to OFF. If power supply analysis is set to something other than OFF, all power measurements are set to OFF.

14.2 Analyzing Switching Loss

This section explains the following settings (which are used when analyzing switching loss):
- Probe
- Measurement conditions
  Cycle mode, device, RDS or Vce value, measurement items, measurement source window, and measurement time period
- Power trace display
- Scaling

► **"Switching Loss Analysis (SW Loss)" in the Features Guide**

ANALYSIS Power Analysis Menu

Press **ANALYSIS** and then the **Power Analysis** soft key to display the following menu.

Select whether to set PWR1 or PWR2*
Set Type to SW Loss
Configure the probe
Set the measurement conditions
Show or hide the power trace
Set the scaling (Auto or Manual)
► section 6.6
Set the center point and the sensitivity

* PWR2 is only available on 4-channel models.

Configuring the Probe (ProbeSetup)

Press the **ProbeSetup** soft key to display the following menu.

Set the input channel (CH1:CH2 or CH3:CH4)
Set the probe attenuation and voltage-to-current conversion ratio (set using the jog shuttle)
Set each channel's deskew value (set using the jog shuttle)
Specify the reference trace
Execute auto deskewing
Set the probe attenuation and voltage-to-current conversion ratio or the deskew value
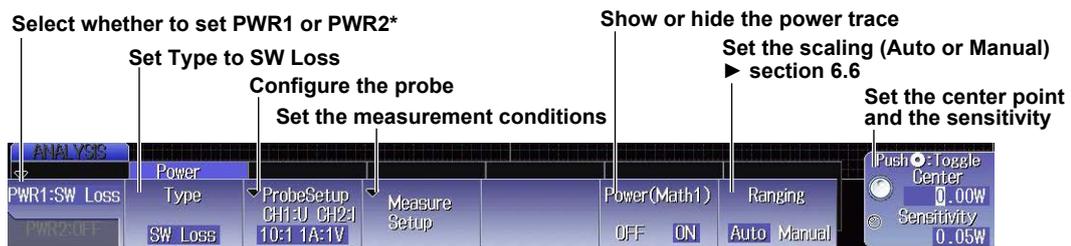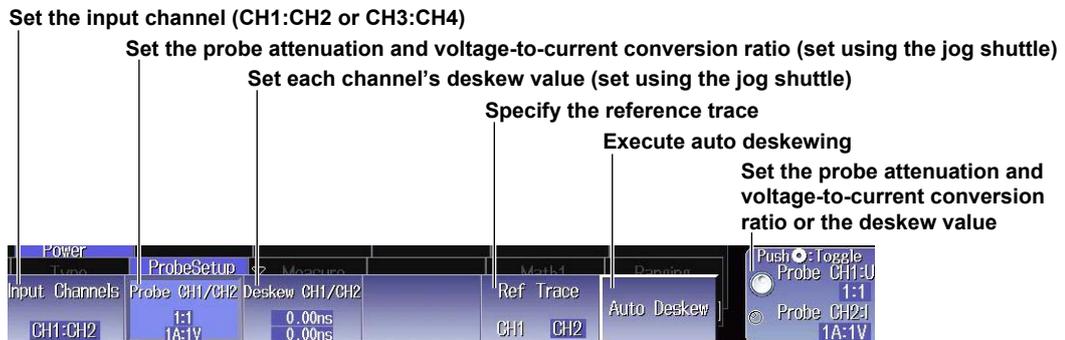
Note

- If you set the power supply analysis type to SW Loss, automated measurement of waveform parameters is enabled. The measured values from the measurement items set on the MEASURE menu and the switching loss measurement items are displayed on the screen.
  A maximum of 20 measurement items can be displayed. If measured switching loss values are not displayed, reduce the number of MEASURE menu measurement items.
  ► section 9.1
- If you turn Power(Math1) or Power(Math2) on, the power trace is displayed on the screen. If you then press MATH/REF key, the following menu is displayed.

Operation is fixed to Power
Source is fixed to the channel specified on the ProbeSetup menu.
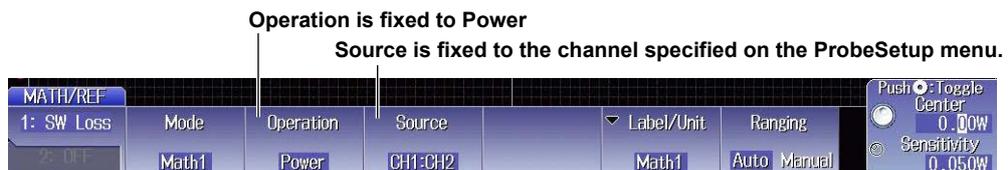
If you turn Power(Math1) or Power(Math2) off, the normal computation setup menu is displayed when you press MATH/REF.

Setting Measurement Conditions (Measure Setup)

Press the **Measure Setup** soft key to display the following menu.

Turn cycle mode on or off

Set the device (MOSFET, BJT/IGBT, or OFF)*

Configure the RDS or Vce value*

Set the reference levels for voltage channels*
► section 9.1

Set the measurement source window
► section 9.1

Configure the measurement time period

Set measurement items

Select the measurement items that you want to use

Set the watt hour unit (Wh or J)
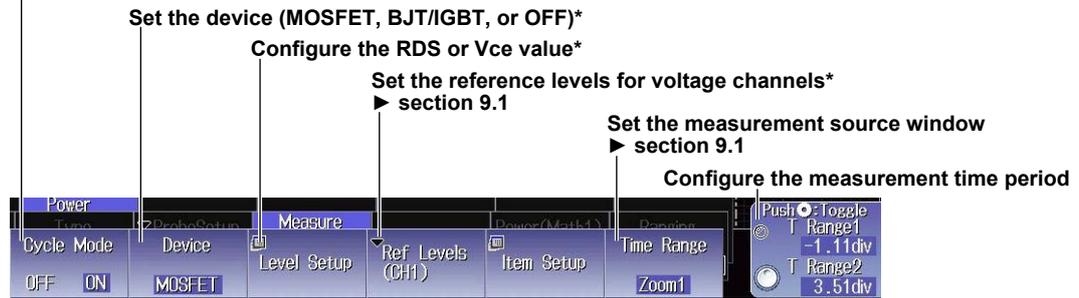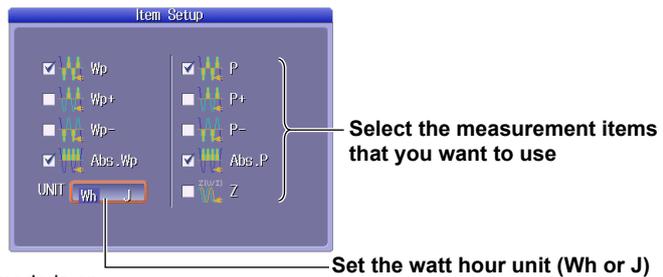
* These can only be set when cycle mode is on.

Configuring the RDS or Vce Value (Level Setup)

Set the RDS (on) or Vce (SAT) value

Set the current and voltage levels
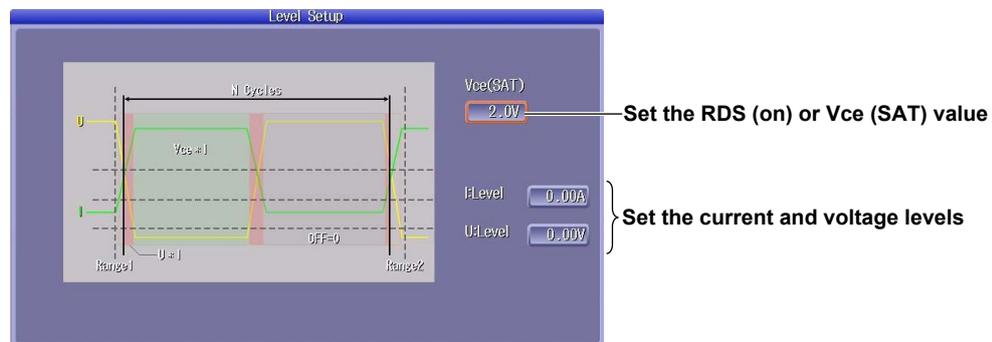
Note

If you turn cycle mode on, the Cycle Mode setting changes to N Cycle on the MEASURE menu's Item Setup screen (see page 9-1).

14.3 Performing Safe Operating Area Analysis

This section explains the following settings (which are used when performing safe operating area analysis):
- Probe
- Showing and hiding VT waveforms
- Cursor display

► **"Safe Operating Area Analysis (SOA)" in the Features Guide**

ANALYSIS Power Analysis Menu

Press ANALYSIS and then the Power Analysis soft key to display the following menu.

Select whether to set PWR1 or PWR2*

Set Type to SOA

Configure the probe ► section 14.2

Turn the VT waveform display window on or off

Configure the measurement time period (T Range1 and T Range2)

Configure the cursor display

Set the vertical or horizontal cursor position

Set the horizontal cursor position (set using the jog shuttle)

Set the vertical cursor position (set using the jog shuttle)

Turn the cursor display on or off

* PWR2 is only available on 4-channel models.

Note

If you set the power supply analysis type to SOA, XY waveforms are automatically displayed on the screen. If you press **SHIFT+DISPLAY** (X-Y) and then press the **Display** soft key, both the XY window and the SOA disappear.

14.4 Performing Harmonic Analysis

This section explains the following settings (which are used when performing harmonic analysis):

- Probe
- Applicable class
- Harmonic grouping
- Scale

- List size
- Analysis start point
- EUT's power supply voltage

► **"Harmonic Analysis (Harmonics)" in the Features Guide**

ANALYSIS Power Analysis Menu

Press A**NALYSIS** and then the **Power Analysis** soft key to display the following menu.

Select whether to set PWR1 or PWR2*

Set Type to Harmonics

Configure the probe
► section 14.2

Configure the applicable class

Set the harmonic grouping (OFF, Type1, or Type2)

Set the list size and the display position to Full Screen, Half(Upper), or Half(Lower)

Set the analysis start point and power supply voltage
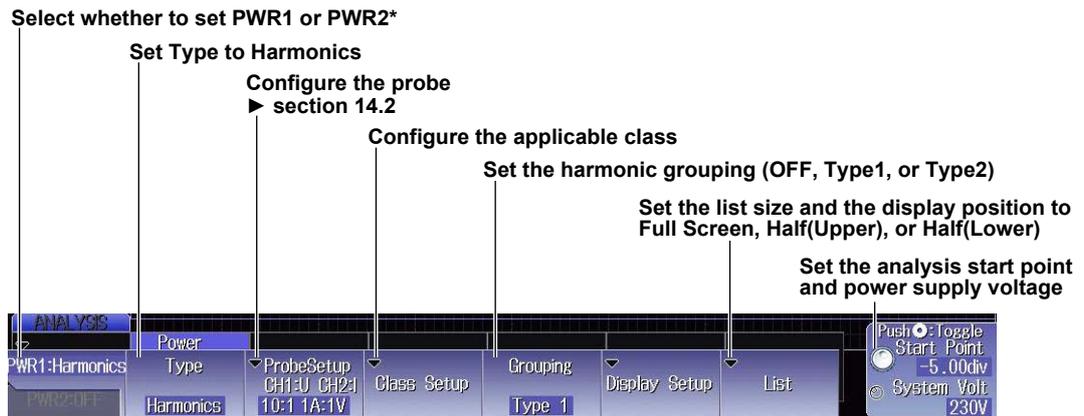
Configure the display
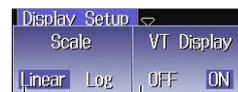
Turn the VT waveform display window on or off

Set the scale (Linear or Log)

* PWR2 is only available on 4-channel models.

Configuring the Applicable Class (Class Setup)

Press the Class Setup soft key to display the following menu.

Set the applicable class

Obtain the EUT's power factor[2]

Set whether the active power exceeds 25 W (True) or not (False)[1]

Set the EUT's fundamental current[1]

Set the power factor[2]

When the applicable class is D

Set the EUT's active power
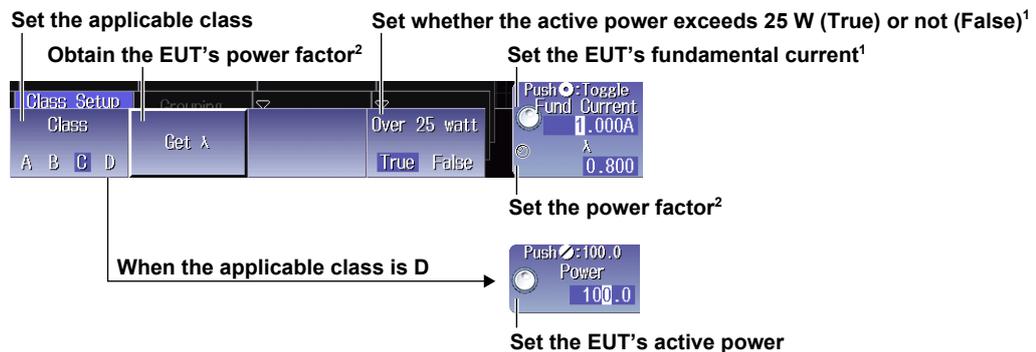
1 These can only be set when the applicable class is C.
2 These can only be set or obtained when the applicable class is C and the active power exceeds 25 W.

Note

While obtaining λ (the power factor), Get λ changes to Abort. It may take time to obtain λ if the record length is long. To stop obtaining λ, press the Abort soft key.

14.5 Measuring the Joule Integral

This section explains the following settings (which are used when measuring the Joule integral):

- Probe
- Measurement conditions
- Measurement window and measurement time period
- Joule integral waveform display
- Auto scaling

► **"Measuring Inrush Current by Measuring the Joule Integral (I²t)"**
in the Features Guide

ANALYSIS Power Analysis Menu

Press **ANALYSIS** and then the **Power Analysis** soft key to display the following menu.

Select whether to set PWR1 or PWR2*

Set Type to I²t

Configure the probe
► section 14.2

Set the measurement conditions

Show or hide the Joule integral waveform

Execute automatic scaling

Set the center point and the sensitivity
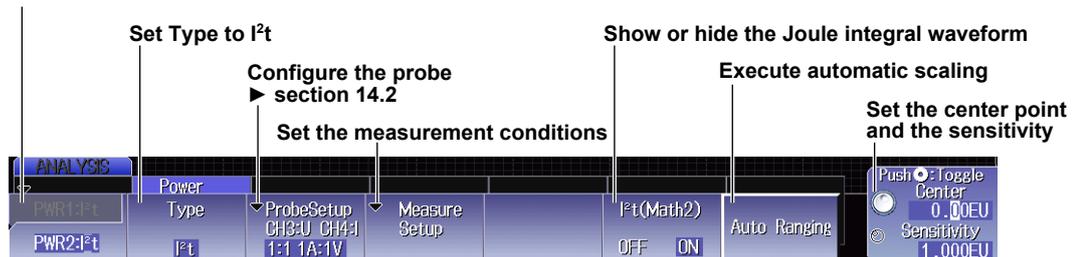
* PWR2 is only available on 4-channel models.

Setting Measurement Conditions (Measure Setup)

Press the **Measure Setup** soft key to display the following menu.

Turn Joule integration on or off

Set the measurement source window
► section 9.1

Configure the measurement time period
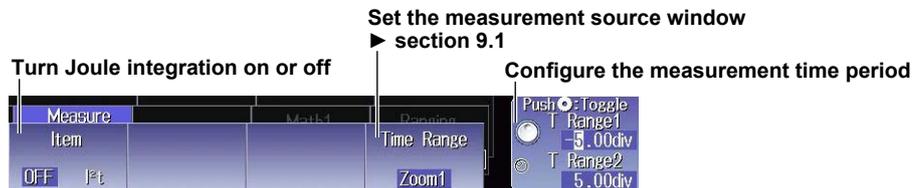
Note

- If you set the power supply analysis type to I²t, automated measurement of waveform parameters is enabled. The measured values from the measurement items set on the MEASURE menu and the Joule integral measurement items are displayed on the screen.
  A maximum of 20 measurement items can be displayed. If measured Joule integral values are not displayed, reduce the number of MEASURE menu measurement items.
  ► section 9.1

- If you turn I²t(Math1) or I²t(Math2) on, the Joule integral waveform is displayed on the screen. If you then press MATH/REF, the following menu is displayed.

Operation is fixed to I²t

Source is fixed to the channel specified on the ProbeSetup menu.
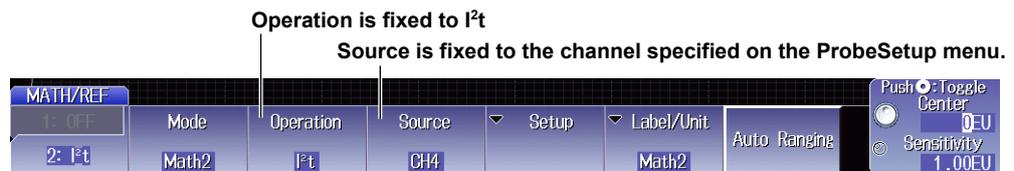
If you turn I²t(Math1) or I²t(Math2) off, the normal computation setup menu is displayed when you press MATH/REF.

14.6 Measuring Power

This section explains the following settings (which are used when measuring power).
• Turning power measurement on and off
• Probe
• Measurement conditions
    Measurement items, reference levels for time measurements, measurement location indicator, measurement source window, and measurement time range

► **"Power Measurement (Power Measurement)" in the Features Guide**

ANALYSIS Power Measurement Menu

Press **ANALYSIS** and then the **Power Measurement** soft key to display the following menu.

Select which power measurement to set (PWR1 or PWR2)

Turns power measurement on and off.

Configure the probe.

Set the measurement conditions.
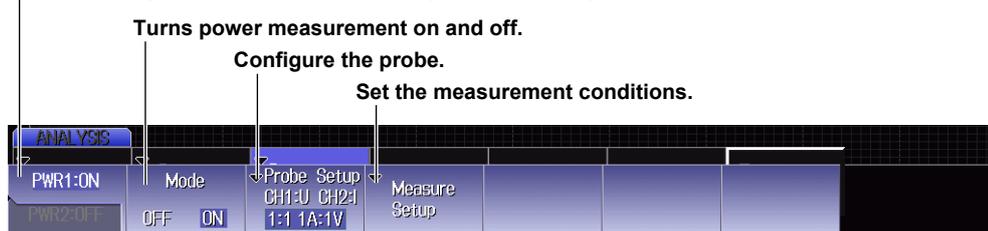
The voltage and current input channels are fixed as follows:

Power Measurement	Voltage Input Channel	Current Input Channel
PWR1	CH1	CH2
PWR2	CH3	CH4

Configuring the Probe (Probe Setup)

Press the **Probe Setup** soft key to display the following menu.

Set the probe attenuation and voltage-to-current conversion ratio (using the jog shuttle).

Set the reference trace.

Executes auto deskewing

Set the probe attenuation and voltage-to-current conversion ratio.

Set each channel's deskew value.

Set each channel's deskew value (using the jog shuttle).

Setting Measurement Conditions (Measure Setup)

Press the **Measure Setup** soft key to display the following menu.

Set the measurement items.

Set the reference levels for time measurements.

Set the measurement location indicator.
Select the items to display from the items
selected in Item Setup.

Set the calculation that uses
automated measurement values.

Set the measurement source window.

Configure the time range.
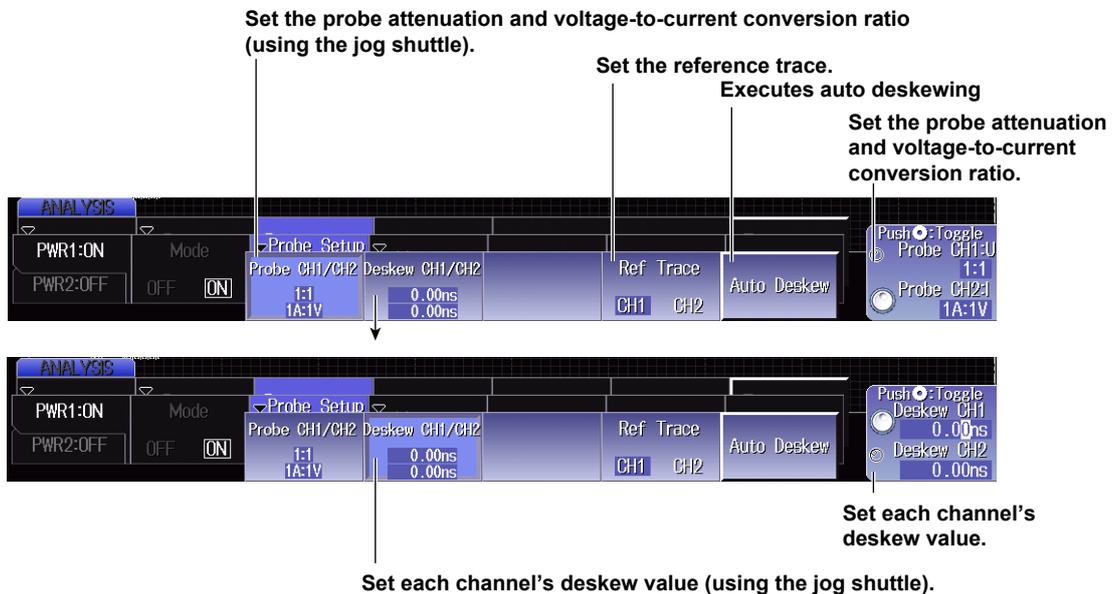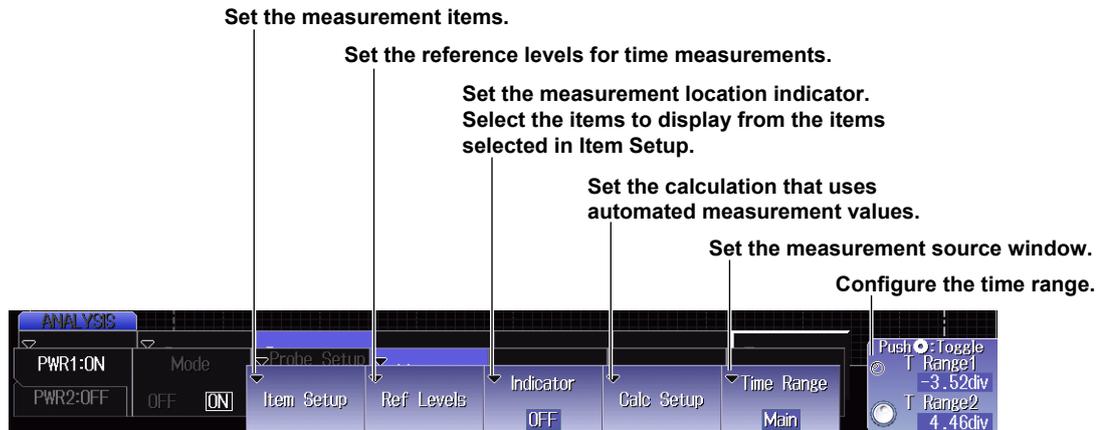
Setting the Measurement items (Item Setup)

Press the **Item Setup** soft key to display the following menu.

Clears the check boxes of all the measurement items.
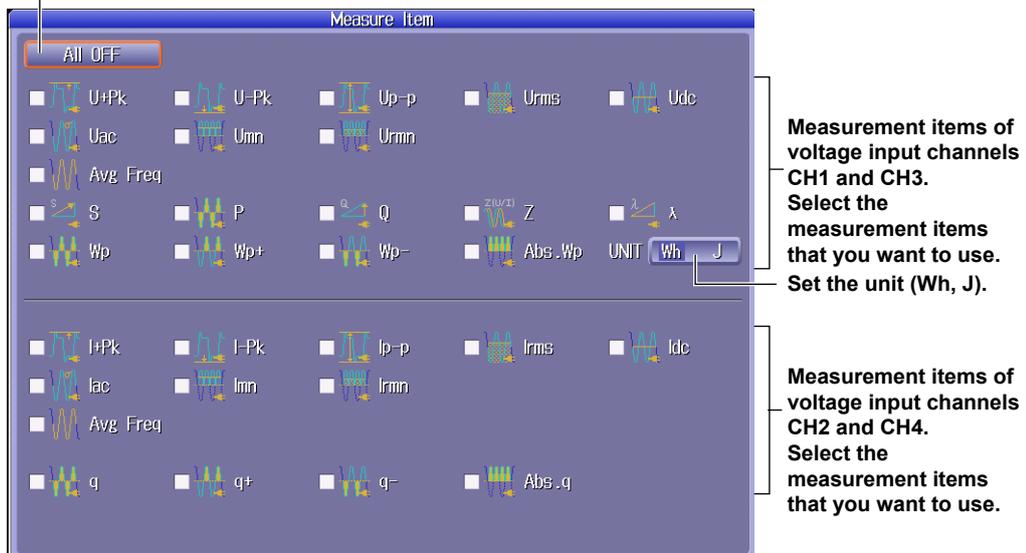
Measurement items of
voltage input channels
CH1 and CH3.
Select the
measurement items
that you want to use.
Set the unit (Wh, J).

Measurement items of
voltage input channels
CH2 and CH4.
Select the
measurement items
that you want to use.

Setting the Reference Levels for Time Measurements (Ref Levels)

Press the **Ref Levels** soft key to display the following menu.

Set the unit for the distal, mesial, and proximal reference levels (% or Unit).

Set the distal value (using ⬤ and the jog shuttle).

Set the mesial value (using ⬤ and the jog shuttle).

Set the proximal value (using ⬤ and the jog shuttle).

Set the mode for determining high and low levels
(Auto, Max-Min, Histogram).

Set Up a Calclation That Uses Automated Measurement Value.

Press the **Calc Setup** soft key to display the following menu.

Select the expressions to use.

Enter the name using up to 8 characters.

Enter the unit using up to 4 characters.

Set the expressions.

You can include the automated measurement values of waveform parameters to expressions.

Define an expression by combining computation source waveforms and operators.

15.1 Displaying History Waveforms

This section explains the following settings (which are used when displaying history waveforms, waveforms that were previously saved to acquisition memory):

- Display mode
- Averaging
- Highlighting of the selected record number
- Display range (start and end record numbers)
- List of timestamps
- Replay
- Gradation mode

► **"Displaying and Searching History Waveforms" in the Features Guide**

HISTORY Menu

Press **History** (〰🕒〰) to display the following menu.

Set the display mode

Setting the Display Mode (Mode)

One: Only displays the waveform corresponding to the selected record number.[1]

All: Overlays all selected waveforms.[2] All waveforms except the waveform corresponding to the selected record number[1] are displayed in an intermediate color.

Accumulate: Overlays all selected waveforms.[2] The frequency of data occurrence is represented by intensity (Intensity) or by color (Color).

1 Specify the highlighted waveform with Select No.
2 Specify with Start and End No.

When the Display Mode Is Set to One or All

Set the display mode (One, All)
Turn averaging on or off
Set the highlight display* (set using the jog shuttle)
Configure the display range* (set using the jog shuttle)
Show the list of timestamps
Execute a replay
Configure the display range or set the highlight display
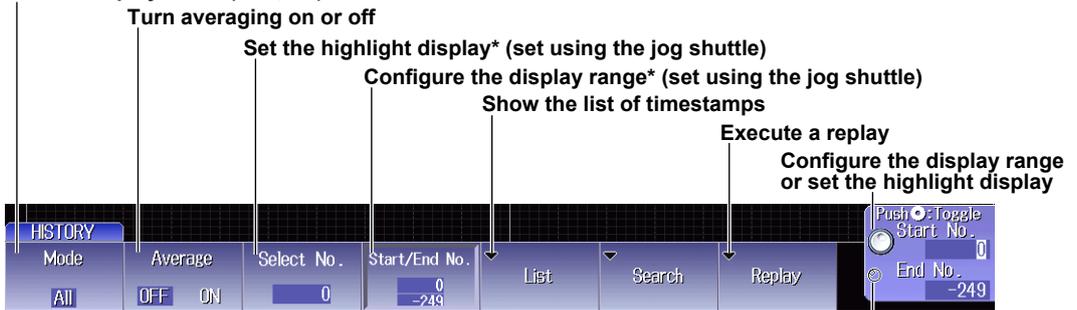
The end record number

* The Select No., Start/End No., and Replay soft keys menu appear when averaging is off.

When the Display Mode Is Set to Accumulate

Set the display mode (Accumulate)
Set the gradation mode (Intensity or Color)
Configure the display range (Start No., End No.)

Displaying a List of Timestamps (List)

Press the **List** soft key to display the following screen.

Record number

Triggered time

The difference between the triggered time of the current data and the data before it

List of timestamps

Jump to the latest record number

Jump to the oldest record number

Jump to the record number whose data contains the triggers with the most time between them

Jump to the record number whose data contains the triggers with the least time between them

Note

Notes about Configuring the History Feature
- When the acquisition mode is set to Average and the sampling mode is set to Repetitive, you cannot use the history feature.
- When the display is in roll-mode, you cannot use the history feature.
- If you stop waveform acquisition, the DLM2000 only displays waveforms that have been acquired completely.

Notes about Recalling Data Using the History Feature
- Waveform acquisition stops when you display the History menu. You cannot display history waveforms while waveform acquisition is in progress.
- You can start waveform acquisition when the History menu is displayed. However, you cannot change the history feature settings while waveform acquisition is in progress.
- The settings are restricted so that the following relationship is retained: Last record (End) ≤ Select No ≤ First record (Start).
- When you load waveform data from the specified storage medium, history waveforms up to that point are cleared. The loaded waveform data is placed in record number zero. If you load a file containing multiple waveforms, the latest waveform is placed in zero, and earlier waveforms are placed in order to record numbers –1, –2, and so on.
- Computation and automated measurement of waveform parameters are performed on the waveform of the record number specified by Select No. You can analyze old data as long as you do not overwrite the acquisition memory contents by restarting waveform acquisition. If Average is set to ON, analysis is performed on the averaged waveform.
- History waveforms are cleared when you turn the power off.

Replay (Replay)

Press the **Replay** soft key to display the following menu.

Set the replay speed, there are seven speed settings

Set the record number

The record number to start replaying

The replay speed

Display the latest history waveform

Replay waveforms toward newer waveforms

Stop replay

Replay waveforms toward older waveforms

Display the oldest history waveform

Increase the speed by one level

Decrease the speed by one level
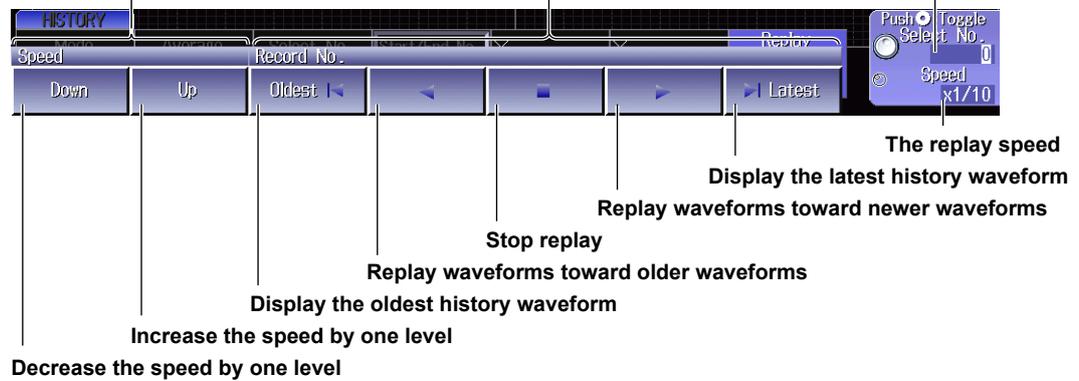
Note

If you change the vertical sensitivity, vertical position, time axis setting, trigger position, or other relevant settings and then display the preview, you cannot search for or replay history waveforms.

15.2 Searching History Waveforms

This section explains the following settings (which are used when searching history waveforms):
- Search condition
- Search Conditions (1 to 4)
  Search criterion, search waveform, search range mode, and search window
- Executing searches
- Finishing searches

► "Searching History Waveforms (Search)" in the Features Guide

HISTORY Menu

Press **HISTORY** (⟲) to display the following menu.

Set the display mode to One or All   Search history waveforms

Searching History Waveforms (Search)

Press the **Search** soft key to display the following menu.

Set the search condition (Simple, AND, OR).

When the Search Condition Is Set to Simple

Set the search condition (Simple)
Set the waveform to search
Set the search source window (Main, Zoom1, Zoom2)
Set the search range (rectangular zone)
Starts searching
Finishes the search

- **Setting the Waveform to Search (Trace)**
  You can select the waveform to search from the settings below.
  CH1 to CH4, Math1, Math2, XY1, or XY2

- **Setting the Search Range (Rectangular Zone)**
  You can set the search range mode in the same manner that you set the reference range type for GO/NO-GO determination. For more information, see section 2.21. Read all instances of "determination" as "search" in section 2.22.

When the Search Condition Is Set to AND or OR

Execute the search

Set the search condition (AND, OR) **Finish the search**

**Select reference condition 1 to 4
(1 or 2 on 2-channel models)**

Set the search source window (Main, Zoom1, or Zoom2)

Set the search range mode (RectZone, WaveZone, PolygonZone, or Parameter)

Set the waveform to search

Set the search criterion (IN, OUT, or X)

- **Setting the Waveform to Search (Trace)**

  You can select the waveform to search from the settings below.
  CH1 to CH4/LOGIC,* Math1, Math2, XY1, XY2, FFT1, or FFT2

  * The DLM2000 performs the search on the CH4 or LOGIC waveform, depending on which channel's key is illuminated. Specify the channel that you want to search in advance by pressing either the CH4 key or the LOGIC key.

  When the reference condition number and the waveform to search are set as follows, there are some search ranges that cannot be set.
  - When you set the waveform to search to XY1 or XY2, you cannot set the search range mode to WaveZone.
  - When you set the waveform to search to LOGIC, FFT1, or FFT2, you can only set the search range mode to Parameter.
  - When the reference condition is 2 or 4 and the waveform to search is Math1 to Math4, you can only set the search range mode to Parameter.

- **Setting the Search Range Mode (Mode)**

  You can set the search range mode in the same manner that you set the reference range type for GO/NO-GO determination. For more information, see section 2.21. Read all instances of "determination" as "search" in section 2.22.

16.1 Loading Roll Paper Into the Built-In Printer (Option)

This section explains how to load roll paper into the optional built-in printer.

Roll Paper for Printers

Only use roll paper specifically made for use with the DLM2000 series. The DLM2000 comes with one set of roll paper included. Use this when you first load roll paper into the built-in printer. When you require a new supply of roll paper, please contact your nearest YOKOGAWA dealer.

Part Number: B9988AE
Specifications: Heat sensitive paper, 10 m
Minimum Quantity: 10 rolls

Handling Roll Paper

The roll paper is made of heat sensitive paper that changes color thermochemically. Please read the following points carefully.

Storage Precautions

The heat-sensitive paper changes color gradually at temperatures of approximately 70°C or higher. The paper can be affected by heat, humidity, or chemicals, whether something has been recorded on it or not. As such, please follow the guidelines listed below.
* Store the paper in a cool, dry, and dark place.
* Use the paper as quickly as possible after you break its protective seal.
* If you attach a plastic film that contains plasticizing material such as vinyl chloride film or cellophane tape to the paper for a long time, the recorded sections will fade due to the effect of the plasticizing material. Use a holder made of polypropylene to store the roll paper.
* When starching the record paper, do not use starches containing organic solvents such as alcohol or ether. Doing so will change the paper's color.
* We recommend that you make copies of the recordings if you intend to store them for a long period of time. Because of the nature of heat-sensitive paper, the recorded sections may fade.

Handling Precautions

* Only use genuine, YOKOGAWA-supplied roll paper.
* If you touch the roll paper with sweaty hands, there is a chance that you will leave fingerprints on the paper, thereby blurring the recorded sections.
* If you rub the surface of the roll paper against something hard, there is a chance that the paper will change color due to frictional heat.
* If the roll paper comes into contact with products such as chemicals or oil, there is a chance that the paper will change color or that the recorded sections will disappear.

Attaching the Roll Paper

⚠️

CAUTION

- Do not touch the print head. If you do, you may burn yourself.
- Do not touch the roll paper cutter section at the end of the printer cover. Doing so may cause injury.

French

⚠️

ATTENTION

- Ne pas toucher la tête d'impression. Vous pourriez vous brûler.
- Ne pas toucher la section du coupe-papier à l'extrémité du cache de l'imprimante. Vous pourriez vous blesser.

1.

Raise the handle.

2.

Printer cover　　**OPEN COVER button**

Press the OPEN COVER button to open the printer cover.

3.

Set the roll paper with the same orientation as shown in the figure

Roll paper cutter section

Print head

4.

Guide

Align the ends of the roll paper with the guides and set the roll in place.

5.

Close the cover and press LOCK on the center of the cover until you hear a click.

16.2 Printing on the Built-in Printer (Option)

This section explains the following settings (which are used when printing on the optional built-in printer):

- Print destination
- Print mode
- Additional information
- Comments
- Magnification
- Time range

► **"Printing on the Built-in Printer (BuiltIn)" in the Features Guide**

PRINT BuiltIn Menu

Press **SHIFT+PRINT** (MENU), the **Print To** soft key, and then the **BuiltIn** soft key to display the following menu.

Set the print destination to BuiltIn

Set the print mode

Turn the printing of additional information on or off

Specify comments

Set the magnification to x2.0(2Page), x5.0(5Page), or x10.0(10Page)*

Set the print source window* (Main, Zoom1, or Zoom2)

Set the print range*
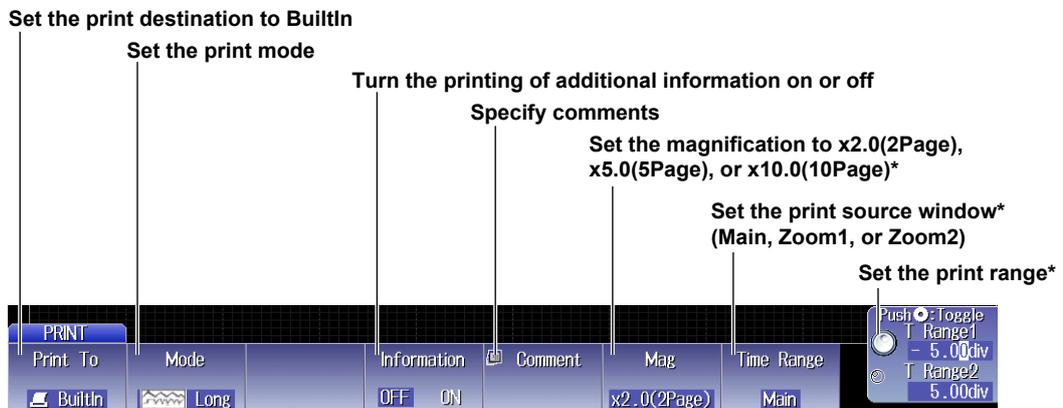
* This is displayed when the print mode is set to Long.

Setting the Print Mode (Mode)

Hardcopy:　The entire DLM2000 screen is printed.

Normal:　The waveform area of the DLM2000 screen is printed. The menu is not printed.

Long:　As in Normal mode, the entire DLM2000 screen is printed, but the time axis is magnified from 2 to 10 times. The selectable magnification settings vary depending on the TIME/div and record length values.

16.3 Printing on a USB Printer

This section explains the following settings (which are used when printing on a USB printer):
- Print destination
- Print mode
- Printer type
- Color
- Comments

PRINT USB Menu

Press **SHIFT+PRINT** (MENU), the **Print To** soft key, and then the **USB** soft key to display the following menu.

Set the print destination to USB
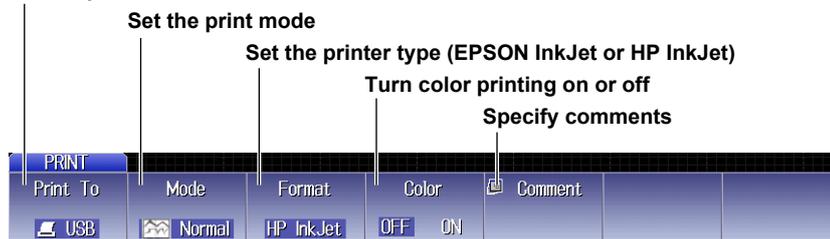
    Set the print mode

        Set the printer type (EPSON InkJet or HP InkJet)

           Turn color printing on or off

              Specify comments

PRINT				
Print To	Mode	Format	Color	Comment
USB	Normal	HP InkJet	OFF ON	

Setting the Print Mode (Mode)

Hardcopy: The entire DLM2000 screen is printed.

Normal: The waveform area of the DLM2000 screen is printed. The menu is not printed.

16.4 Printing on a Network Printer (Option)

This section explains the following settings (which are used when printing on a network printer):
- Print destination
- Print mode
- Printer type
- Color
- Comments

► **"Printing on a Network Printer (Network)" in the Features Guide**

PRINT Network Menu

Press **SHIFT+PRINT** (MENU), the **Print To** soft key, and then the **Network** soft key to display the following menu.
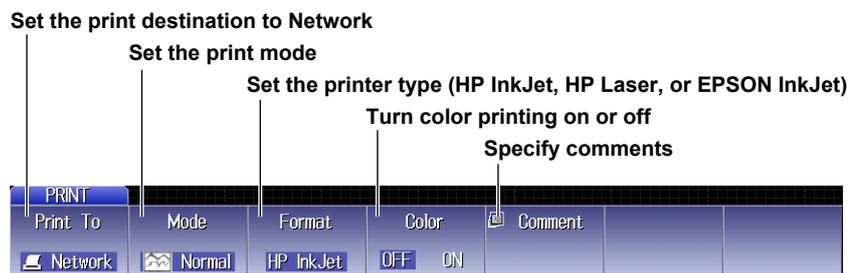
Set the print destination to Network

Set the print mode

Set the printer type (HP InkJet, HP Laser, or EPSON InkJet)

Turn color printing on or off

Specify comments

PRINT					
Print To	Mode	Format	Color	Comment	
Network	Normal	HP InkJet	OFF ON		

Setting the Print Mode (Mode)

Hardcopy: The entire DLM2000 screen is printed.

Normal: The waveform area of the DLM2000 screen is printed. The menu is not printed.

Note

You must configure the network printer in advance by following the instructions in section 18.8.

16.5 Saving Screen Captures to Files

This section explains the following settings (which are used when saving screen captures to files):

- Print destination
- Save mode
- Data format
- Color data
- Background transparency (transparent or opaque)
- Save destination
- File name

PRINT File Menu

Press **SHIFT+PRINT** (MENU), the **Print To** soft key, and then the **File** soft key to display the following menu.

Set the print destination to File.

Set the save mode (Hardcopy, Normal, Wide).

Set the data format to PNG.

Set the color data (OFF, ON, ON(Rev.), ON(Gray)).

Set the save destination.

Set the file name.

Sets the background to transparent (Transparent) or opaque (Normal).

Sets the inclusion of setting information (Information) on and off.*

Set the data format to BMP or JPEG.
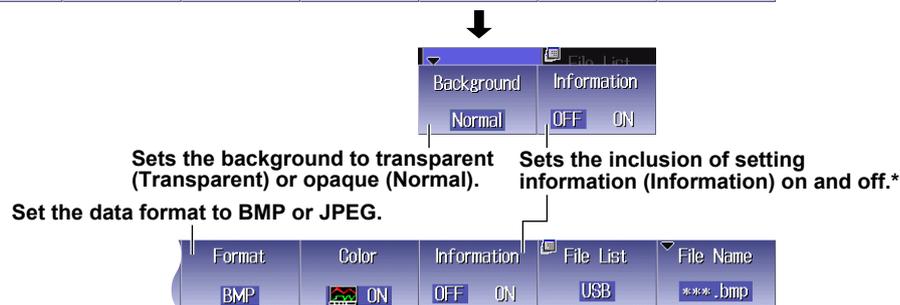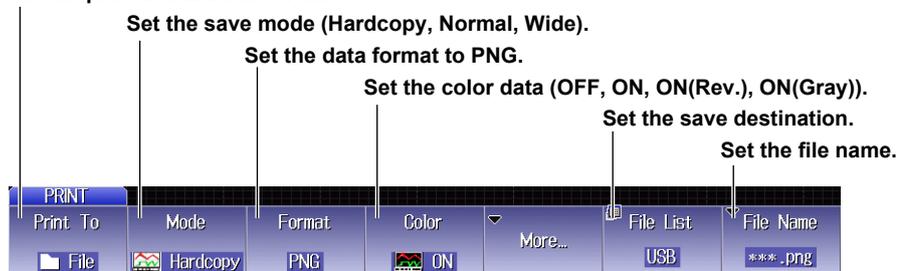
* This can be set when the print destination is set to File and the save mode is set to Hardcopy or Normal.

Setting the Save Mode (Mode)

Hardcopy: The entire DLM2000 screen is saved.

Normal: The waveform area of the DLM2000 screen is saved. The menu is not saved.

Wide: As in Normal mode, the entire DLM2000 screen is saved, but the time axis is magnified by a factor of two.

Including Setting Information (Information)

When save mode is set to hardcopy (Hardcopy) or normal (Normal), channels, triggers, waveform acquisition, and other setting information can be included in waveform screen captures.

OFF: Setting information is not included.

ON: Setting information is included.

Setting the Save Destination (File List)

Specify the drive or folder to save files to in the same way as for the file feature. For details, see section 17.2.

Assigning File Names (File Name)

As with the file feature, you can save files with automatically generated names using sequence numbers or dates, or save the files with specific file names. For details, see section 17.2.

Screen Capture Examples

a. When the save conditions are set as follows

Save mode (Mode): Hardcopy   Data format (Format): PNG   Color data (Color): ON(Rev.)
Background (Background): Normal   Setting information (Information): ON
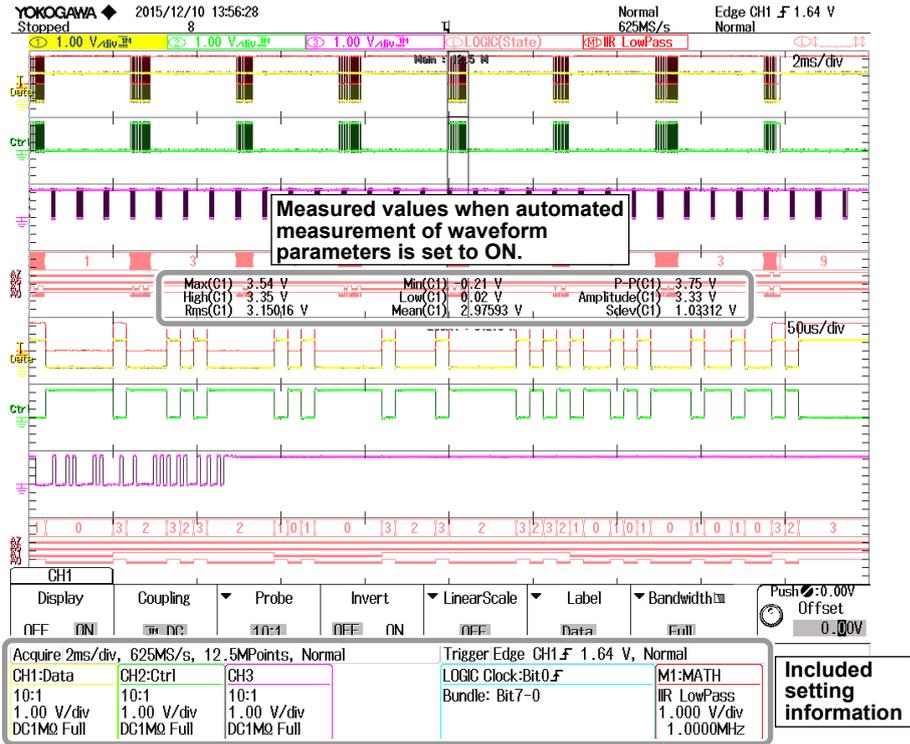
b. When ESC is pressed from the condition of a to hide the menu and the measured values of waveform parameters are displayed at the bottom of the screen
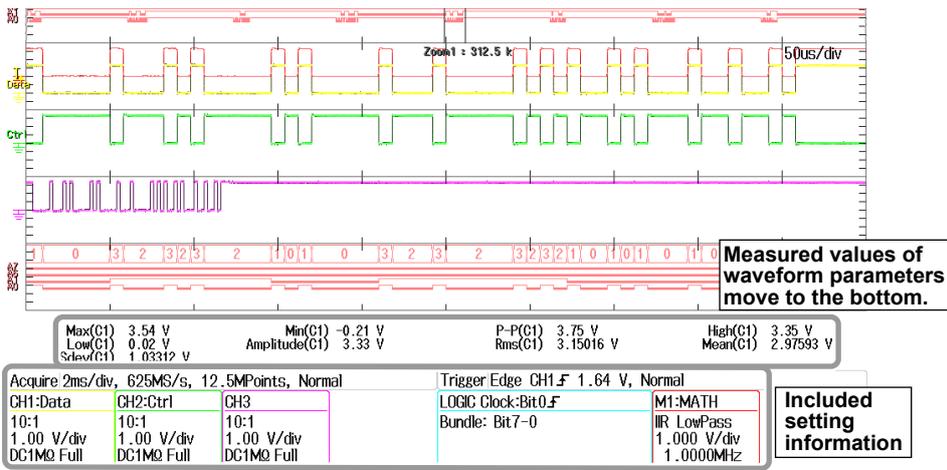
16.6 Printing and Saving Screen Capture Data to Multiple Output Destinations at the Same Time

This section explains the following settings (which are used when printing and saving screen-capture and waveform data to multiple output destinations at the same time):

• Output destination
• Saving screen captures to files
• Printing screen captures on the built-in printer (option)
• Printing screen captures on a USB printer
• Printing screen captures on a network printer (option)
• Saving waveform data

► **"Printing and Saving Screen Captures to Multiple Destinations (Multi)"**
in the Features Guide

PRINT Multi Menu

Press **SHIFT+PRINT** (MENU), the **Print To** soft key, and then the **Multi** soft key to display the following menu.

Set the output destination to Multi
Set whether to save to a file (OFF or ON)
Set whether to print on the built-in printer (OFF or ON)*
Set whether to print on the USB printer (OFF or ON)
Set whether to print on the network printer (OFF or ON)*
Set whether to save waveform data (OFF or ON)

PRINT					
Print To	📁 File	🖨 BuiltIn	🖨 USB	🖨 Network	📁 Waveform
🖨 Multi	OFF ON	OFF ON	OFF ON	OFF ON	OFF ON
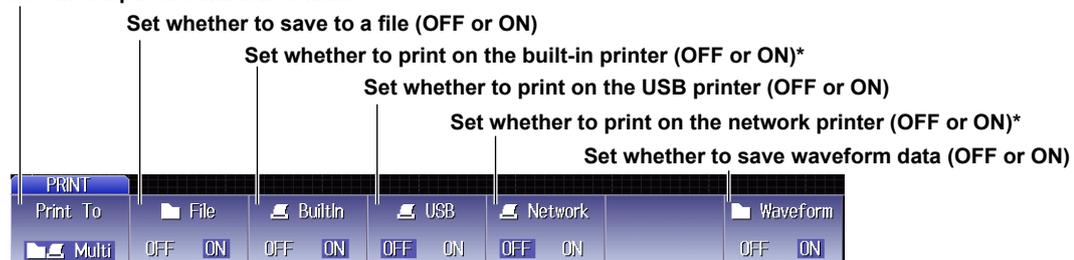
*   Optional

The DLM2000 outputs screen-capture and waveform data according to the PRINT menu or FILE menu settings. For details on those settings, see the following sections.

• Saving screen captures to files
  ► section 16.5
• Printing screen captures on the built-in printer (option)
  ► section 16.2
• Printing screen captures on a USB printer
  ► section 16.3
• Printing screen captures on a network printer (option)
  ► section 16.4
• Saving waveform data
  ► section 17.2

Note

When you are executing action-on-trigger or GO/NO-GO determination, if Print To is set to Multi, you cannot print or save screen captures.

17.1   Connecting USB Storage Media to the USB Port

CAUTION

Do not remove the USB storage medium or turn off the power when the media (internal memory or USB storage media) access icon is blinking in the center of the screen or when the USB storage media access indicator is blinking. Doing so may damage the storage medium or corrupt its data.

Access icon

French

ATTENTION

Ne retirez pas le support de stockage USB et ne mettez pas l'alimentation hors tension lorsque l'icône d'accès au support (mémoire interne ou stockage USB) clignote au centre de l'écran ou que le voyant d'accès au support de stockage USB clignote. Vous risqueriez d'endommager le support de stockage ou les données qu'il contient.

Icône d'accès

When connecting a USB storage medium to the DLM2000 USB port, connect the USB cable directly as shown in the figure below. You can connect/disconnect a USB cable at any time regardless of whether the DLM2000 is on or off (hot-plugging is supported). Connect the type A connector of the USB cable to the DLM2000, and connect the type B connector to the storage medium. If you connect a USB storage device when the power switch is on, the device becomes available for use after the DLM2000 identifies it.
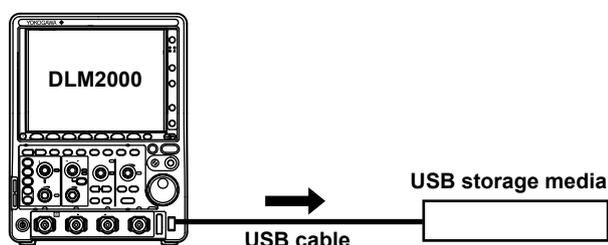
Note
- Connect USB storage media directly, not through a USB hub.
- Only connect a compatible USB keyboard, mouse, printer, or storage device to the USB connector for peripherals.
- Do not connect and disconnect multiple USB devices repetitively. Provide a 10-second interval between removal and connection.
- Do not connect or remove USB cables from the time when the DLM2000 is turned on until key operation becomes available (approximately 20 to 30 seconds).
- You can use USB storage media that are compatible with USB Mass Storage Class Ver. 1.1.
- The supported formats of USB storage media are FAT32 and FAT16.
- The DLM2000 can handle up to 4 storage media. If the connected medium is partitioned, the DLM2000 treats each partition as a separate storage medium. As such, the DLM2000 can handle up to 4 partitions. On models with the /C9 option, if the USB storage media format is FAT32, the DLM2000 can identify only a single storage medium.

Confirming What Connected USB Storage Media Can Be Used

Press **FILE**, and then press the **Utility** soft key to display the media that can be used.

17.2 Saving Waveform Data

This section explains the following settings (which are used when saving waveform data):
- Save destination
- File name
- Data format
- Waveform to save
- History range
- Window to be saved
- Data compression
- Saving waveform data

► **"Saving Waveform Data (Waveform)" in the Features Guide**

File Waveform (Save) Menu

Press **FILE** and then the **Waveform(Save)** soft key to display the following menu.

Set the save destination
Set the file name
Set the data type to Binary (.wdf extension) or ASCII (.csv extension)
Set the waveform to save (All, CH1 to CH4, LOGIC,* Math1, or Math2)
Set the history range
Set the window to be saved and data compression
Save waveform data
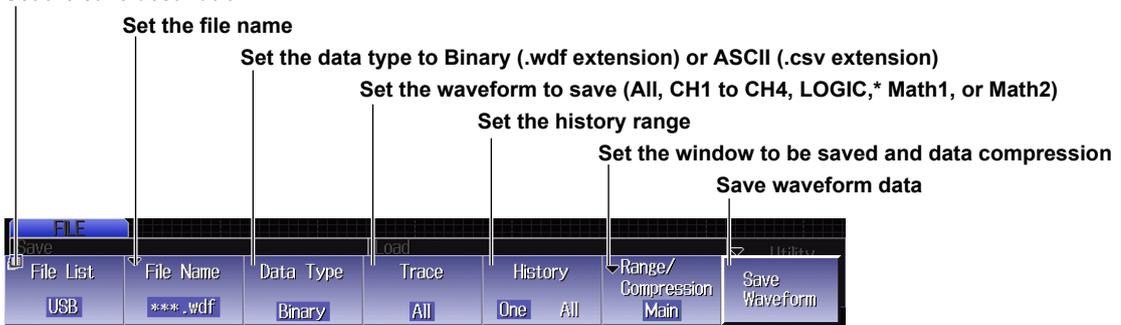
* The DLM2000 saves data from the CH4 or LOGIC waveform, depending on which channel's key is illuminated.
Specify the channel that you want to save in advance by pressing either the CH4 key or the LOGIC key.

Setting the Save Destination (File List)

Press the **File List** soft key to display the following screen.
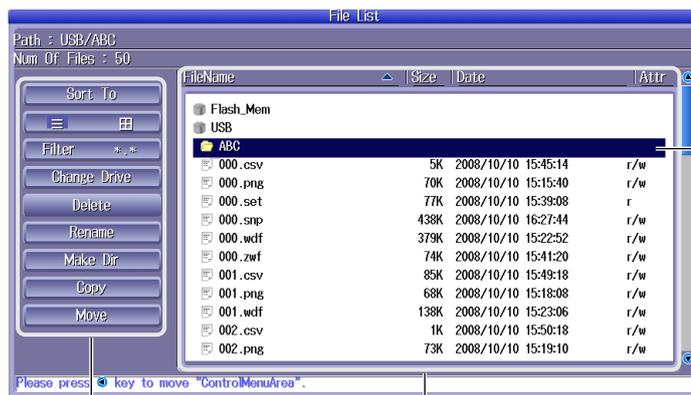
The destination drive or folder
Move the cursor using the jog shuttle or the SET key and then press the SET key to select the destination.

Operation menu

File list

For more information on file operations, see section 17.8.

Note

You can also set the save destination drive by using the Change Drive item on the operations menu.

Assigning File Names (File Name)

Press the **File Name** soft key to display the following menu.

Specify comments
Set the file name
Set auto naming
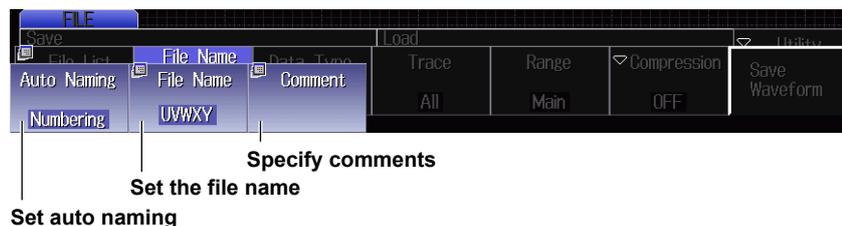
Setting Auto Naming (Auto Naming)

OFF: Disables the auto naming feature. The name that you specify using the File Name setting is used. If a file with the same name exists in the save destination folder, an overwrite confirmation dialog box is displayed.

Numbering:The DLM2000 automatically adds a three-digit number from 000 to 999 after the common name specified using the File Name setting and saves files.

Date: The DLM2000 uses an 8-character file name that is produced based on the date and time using base-36 numbers (0 to 9 and A to Z). The file name specified using the File Name setting is not used.

Time in units of 100 ms
0 ms = 0000, 100 ms = 0001, ..., 59 min 59 s 900 ms = ORRZ
Hour 0 = 0, ..., hour 9 = 9, hour 10 = A, ..., hour 23 = N
1st = 1, ..., 10th = A, ..., 31st = V
Jan. = 1, ..., Oct. = A, Nov. = B, Dec. = C
2000 = 0, ..., 2010 = A, ..., 2035 = Z

Date2:   The file name is the date and time (down to ms) when the file is saved. The file name specified for the File Name setting is ignored.

20100630_121530_100   **(2010/06/30 12:15:30.100)**
Year
Month
Day
Hour
Minute
Second
ms

Assigning File Names (File Name)

You can set the file name that is used when the auto naming feature is turned off or the common file name that is used when the auto naming feature is set to Numbering.

Setting a Comment (Comment)

You can add a comment that consists of up to 128 characters when you save a file. You do not have to enter a comment. All characters, including spaces, can be used in comments.

Data Type Setting (Data Type)

Binary: Data is saved in binary format (the extension is .wdf).
ASCII: Data is saved in ASCII format (the extension is .csv).
ASCII with TimeInfo.:   All data is saved in ASCII format with time information (the extension is .csv).

Setting the History Range (History)

Of the waveforms that are selected to be saved on the Trace menu, set which range of history waveforms to save.

One: The single waveform that is specified with Select No. on the HISTORY menu* will be saved.

All: All history waveforms within the range bounded by Start No. and End No. on the HISTORY menu* will be saved. If you search for history waveforms, and then select All, only the detected waveforms will be saved.

    * The menu that appears when HISTORY ( ) is pressed

History Range One and All Settings

The history range is fixed to One or All depending on the display mode (Mode) on the HISTORY menu and the type of data to be saved (Data Type).

Display Mode (Mode) on the HISTORY Menu		One	All	Accumulate
Type of data to be saved (Data Type)	Binary	One or All selectable	One or All selectable	Fixed to All
	ASCII	Fixed to One	Fixed to One	Fixed to One
	ASCII with TimeInfo.	Fixed to One	Fixed to One	Fixed to One

Note

> If Average on the HISTORY menu is set to ON, only a single set of averaged waveform data will be saved regardless of the display mode specified on the HISTORY menu, the type of data to be saved, and the history range.

Setting the Window to Be Saved and Data Compression (Range/Compression)

Press the **Range/Compression** soft key to display the following menu.

Set the window to be saved (Main, Zoom1, Zoom2)

Set data compression
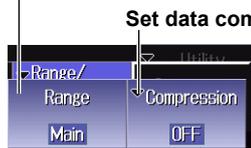
Setting Data Compression (Compression)

When the window to be saved is set to Main, press the **Compression** soft key to display the following menu.

Set the number of data points   Set the number of data points

If the window to be saved is set to Main, you can save waveform data by compressing or sampling it. If you want to save waveform data whose record length exceeds is 1.25 Mpoints to a file in ASCII format, the data must be compressed. If the window to be saved is set to Zoom1 or Zoom2, data compression is not possible. Therefore, waveform data whose number of data points on the window to be saved exceeds 1.25 Mpoints cannot be saved to a file in ASCII format.

OFF: All of the data in the specified range is saved without compression or sampling. Binary files can be loaded into the DLM2000.

p-p: The waveform data is P-P compressed so that the number of data points is equal to the specified number and then saved. You cannot load compressed data into the DLM2000.

Decim: The data is sampled (decimated) so that the number of data points is equal to the specified number and then saved. You cannot load sampled data into the DLM2000.

17.3 Saving Setup Data

This section explains the following settings (which are used when saving setup data):
You can save setup data to a file or to three different internal memory locations.

- Save destination
- File name
- Internal memory details
- Saving setup data

► **"Saving Setup Data (Setup)" in the Features Guide**

File Setup (Save) Menu

Press **FILE** and then the **Setup(Save)** soft key to display the following menu.

Set the save destination for the file. ► section 17.2

Set the file name. ► section 17.2

Save setup data to a file

FILE					
Save			Load		▽ Utility
File List	File Name	Save Setup	to InternalMemory		
USB	001 .set		Detail	#1 #2 #3	

Save setup data to internal memory areas #1 to #3

Set the details to save to internal memory
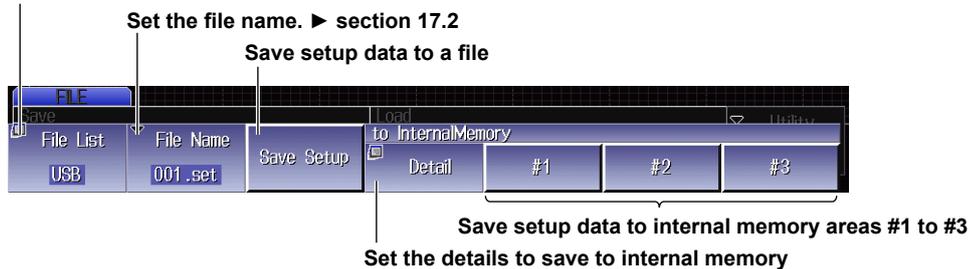
Saving Setup Data (Save Setup)

Save setup data to a file with a .set extension.

Saving Setup Data (to InternalMemory; from #1 to #3)

Save setup data to internal memory areas #1 to #3.

Setting Internal Memory Details (to InternalMemory; Detail)

Press the **Detail (to InternalMemory)** soft key to display the following screen.

The date and time when the setup data was saved

Specify comments

Detail				
	Date	Time	Comment	Protect
#1	2008/09/12	10:15:52	TEST	☑
#2	2008/09/24	14:26:26		☐
#3				☐
			Delete All	

Select the checkboxes for the setup data that you want to protect

Delete all setup data saved to internal memory areas #1 to #3
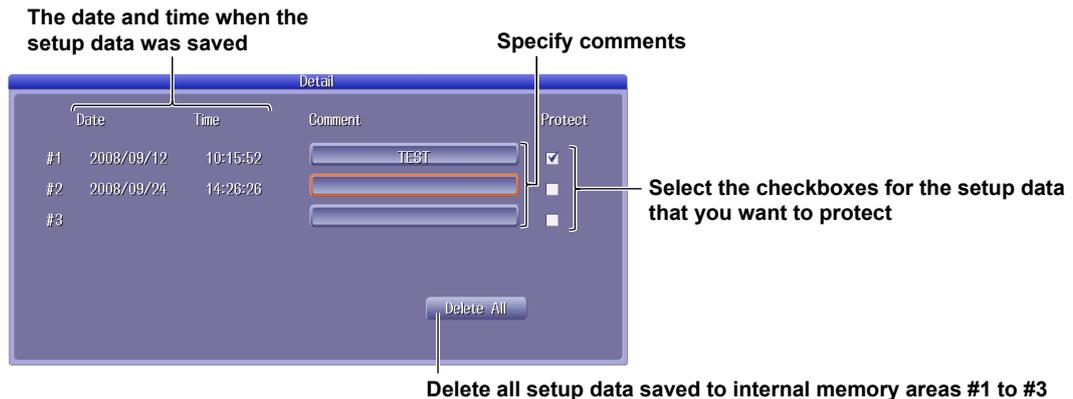
17.4 Saving Other Types of Data

This section explains the following settings (which are used when saving screen captures, waveform zone data, snapshot waveform data, automated measurement values of waveform parameters, serial bus analysis results, FFT results, histogram data, and the list of timestamps):

- Save destination
- File name
- Data type to save
- Data format
- Color data
- Waveform zone number
- Serial bus
- FFT
- Histogram
- List of timestamps
- Saving data

► **"Saving Other Types of Data (Others)" in the Features Guide**

File Others (Save) Menu

Press **FILE** and then the **Others(Save)** soft key to display the following menu.

Set the save destination. ► section 17.2

    Set the file name. ► section 17.2

        Set the data type to save

Setting the Data Type to Save (Data Type)

Screen Image: Save the display to a PNG, BMP, or JPEG file.
- You can select whether to include setting information such as channels, triggers, and waveform acquisition, in waveform screen captures. For details on screen captures that include setting information, see section 16.5.
- Screen captures that can be saved on the FILE menu are those that correspond to Normal save mode on the SHIFT+PRINT menu.

Wave-Zone: Save the waveform zone to a file with a .zwf extension.

Snap: Save the waveform data captured in a snapshot to a file with .snp extension.

Measure: Save the results of automatic waveform parameter measurement to a file in CSV format.

Serial Bus: Save the results of the serial bus analysis specified by Bus1 or Bus2 to a file in CSV format.

FFT: Save the computed result specified by FFT1 or FFT2 to a file in CSV format. Up to 250 Kpoints of data can be saved.
- When Freq Info. is set to ON, all data is saved with frequency information.
- When Freq Info. is set to OFF, all data is saved without frequency information.

Press **FILE**, the **Others (Save)** soft key, the **Data Type** soft key, and then the **More...** soft key to display the following menu.

Histogram: Save the waveform or waveform parameter histogram specified by Hist1 or Hist2 to a file in CSV format.

History List: Save the list of timestamps to a file in CSV format.

Note

The serial bus analysis results are saved according to the settings made on the HISTORY menu. If the history mode is set to One, the analysis results of the specified record number's waveform are saved. If the history mode is set to All or Accumulate, the analysis results of all the displayed waveforms are saved.

When Data Type Is Screen Image

Set Data Type to Screen Image.
Set the data format to PNG.
Set the color data (OFF, ON, ON(Rev.), or ON(Gray)).
Save the screen capture.

Sets the background to transparent (Transparent) or opaque (Normal).
Sets the inclusion of setting information (Information) on and off.
Set the data format to BMP or JPEG.

When Data Type Is Wave-Zone

Set Data Type to Wave-Zone
Set the waveform zone to save (from #1 to #4)
Save the waveform zone

You can save waveform zones #1 to #4 to different files.

When Data Type Is Snap

Set Data Type to Snap
Save a snapshot waveform

When Data Type Is Measure

Set Data Type to Measure
Save the automated measurement values of waveform parameters

When Data Type Is Serial Bus (When saving signals other than SENT)

Set Data Type to Serial Bus

Set the serial bus (Serial bus1 to Serial bus4)

Set the history range (One, All) ▶section 17.2

Save the serial bus analysis results

FILE						
Save			Load			Utility
File List	File Name	Data Type	Serial Bus		History	Save
USB	***.CSV	Serial Bus	1		One All	Serial Bus
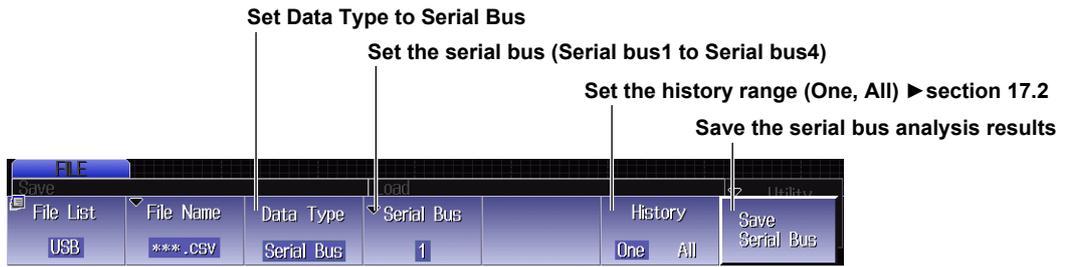
When Data Type Is Serial Bus (When saving SENT signals)

Set Data Type to Serial Bus

Set the serial bus (Serial bus1 to Serial bus4)

Set the display type (List, Trend Waveform)

Set the history range (One, All) ▶section 17.2

Save the serial bus analysis results

FILE						
Save			Load			Utility
File List	File Name	Data Type	Serial Bus	Type	History	Save
USB	***.CSV	Serial Bus	1	List	One All	Serial Bus
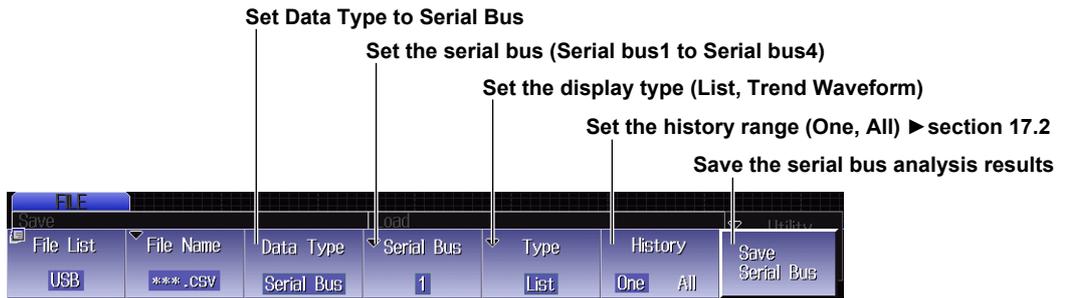
⬇ When the display type is set to Trend Waveform

FILE						
Save			Load			Utility
File List	File Name	Data Type	Serial Bus	Type	Setup	Save
USB	***.CSV	Serial Bus	1	Trend Waveform		Serial Bus

⬇

FILE						
Save			Load			Utility
File List	File Name	Data Type	Serial Bus	Trend	TimeInfo.	Compression
USB	***.CSV	Serial Bus	2	1	OFF ON	OFF

Select the trend data to save (Trend1 to 4)

Turns the inclusion of time information on and off

Set data compression (OFF, p-p, Decim) ▶section 17.2

When Data Type Is FFT

Set Data Type to FFT

Enable or disable the including of frequency information

FILE						
Save			Load			Utility
File List	File Name	Data Type	FFT1	FFT2	Freq Info.	Save FFT
USB	002.csv	FFT			OFF ON	

Set the FFT to use (FFT1 or FFT2)

Save the FFT results
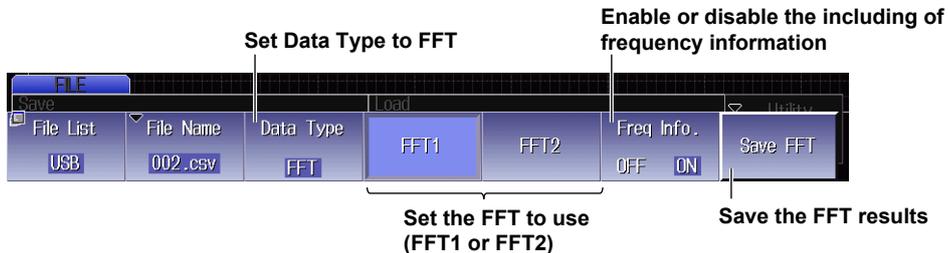
When Data Type Is Histogram

Set Data Type to Histogram

**Set the histogram to use
(Hist1 or Hist2)**

Save the histogram data

When Data Type is History List

Set Data Type to History List   **Save the list of timestamps**

17.5 Loading Waveform Data

This section explains the following settings (which are used when loading waveform data):
- Displaying file information
- Loading waveform data into reference waveforms
- Loading waveform data into channels

► **"Loading Waveform Data (Waveform)" in the Features Guide**

File Waveform (Load) Menu

Press **FILE** and then the **Waveform(Load)** soft key to display the following menu.

Operation menu
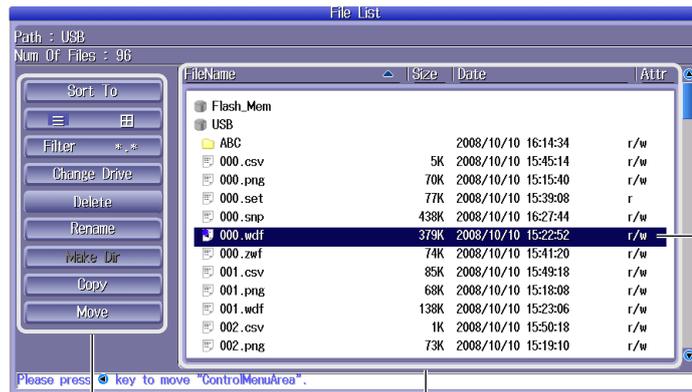
File list

The file to load
Move the cursor using the jog shuttle or the SET key and then press the SET key to select the file.

Display file information

Load waveform data into reference waveforms Ref1(Math1) or Ref2(Math2)

Load waveform data into channels

Selecting Files

Select the file to load from the file list. ► section 17.8

Loading Waveform Data into Reference Waveforms (Load to Ref1(Math1), Load to Ref2(Math2))

You can specify waveform data files that have .wdf extensions and load them as reference waveforms. Reference waveforms are treated as part of the computation feature. They can be displayed by setting the Math1 or Math2 Mode to REF1 or REF2.

Loading Waveform Data into Channels (Load to Channels)

You can specify waveform data files that have .wdf extensions and load them with setup data. Loaded data is cleared when you start measurement.

Note

To load a file saved from the waveform data of multiple channels as a reference waveform, use Load to Channels to load the waveform into channels, and then load the waveform as a computation reference waveform. For details, see section 6.7.

17.6 Loading Setup Data

This section explains the following settings (which are used when loading setup data):
Both the method for loading setup data that has been saved to a file and the method for loading setup data that has been saved in the internal memory are explained.
- Displaying file information
- Internal memory details
- Loading setup data

► **"Loading Setup Data (Setup)" in the Features Guide**

File Setup (Load) Menu

Press **FILE** and then the **Setup(Load)** soft key to display the following menu.

Display file information

Load the setup data file

Load setup data from internal memory areas #1 to #3

Set the details to load from internal memory.
► **section 17.3**
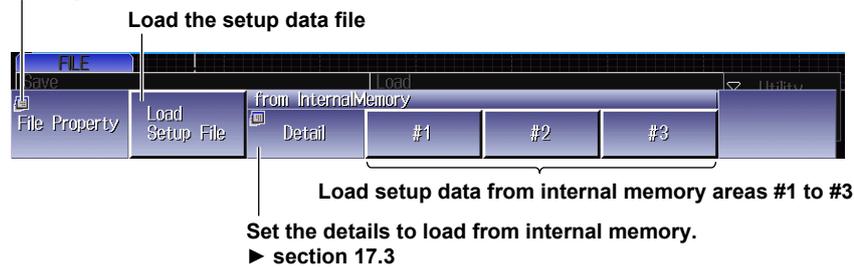
Selecting Files

Select the file to load from the file list. ► section 17.8

Loading Setup Data (Load Setup File)

Select a setup data file that has a .set extension and load it.

Loading Setup Data (from InternalMemory; from #1 to #3)

Load setup data from internal memory areas #1 to #3.

17.7 Loading Other Types of Data

This section explains the following settings (which are used when loading waveform zones, polygonal zones, snapshot waveforms, or serial bus waveform symbol data):

- Displaying file information
- Data type to load
- Loading data

► **"Loading Other Types of Data (Others)" in the Features Guide**

File Others (Load) Menu

Press **FILE** and then the **Others(Load)** soft key to display the following menu.

Display file information

Set the data type to load

Selecting Files

Select the file to load from the file list. ► section 17.8

Setting the Data Type to Load (Data Type)

Wave-Zone: Load waveform zone files that have .zwf extensions that you created on the DLM2000 into internal memory areas Zone1 to Zone4.

Polygon-Zone: Load polygonal zone files that have .msk extensions that you created with the Mask Editor software into internal memory areas Zone1 to Zone4.

Snap: Load snapshot waveform files that have .snp extensions that you have saved.

Symbol: Load physical value/symbol definition files that have .sbl extensions that you have edited using the Symbol Editor tool.

When Data Type Is Wave-Zone

Set Data Type to Wave-Zone

Load waveform zones from internal memory areas Zone1 to Zone4.

When Data Type Is Polygon-Zone

Set Data Type to Polygon-Zone

Load polygonal zones from internal memory areas Zone1 to Zone4.

When Data Type Is Snap

Set Data Type to Snap

Load snapshot waveforms

When Data Type Is Symbol

Set Data Type to Symbol

Load serial bus waveform symbol data

17.8 File Operations

This section explains the following settings (which are used when performing various file operations from the file list or the file utility menu):

- Sorting the file list
- Display format
- Selecting the type of file to list
- Changing storage media
- Deleting files and folders
- Changing file and folder names
- Creating folders (directories)
- Copying files and folders
- Moving files and folders
- Displaying file information
- File protection
- Selecting files (All Set/All Reset and Set/Reset)

The File List (File List)

Blue: Selected
(Highlight an item with the cursor and press the SET key (⬤))

Red: Highlighted
(The item is only included in operations while it is highlighted by the cursor)

File path
Number of files

File name, size, save date and time, and attributes

Sort the file list — **Sort To**
Set the display format —
Select the type of file to list — **Filter** *.*
Change the storage medium — **Change Drive**
Delete files and folders — **Delete**
Rename files and folders — **Rename**
Create folders (directories) — **Make Dir**
Copy files and folders — **Copy**
Move files and folders — **Move**

File List

Path : USB
Num Of Files : 96

FileName	Size	Date	Attr
Flash_Mem			
USB			
ABC		2008/10/10 16:14:34	r/w
000.csv	5K	2008/10/10 15:45:14	r/w
000.png	70K	2008/10/10 15:15:40	r/w
000.set	77K	2008/10/10 15:39:08	r
000.snp	438K	2008/10/10 16:27:44	r/w
000.wdf	379K	2008/10/10 15:22:52	r/w
000.zwf	74K	2008/10/10 15:41:20	r/w
001.csv	85K	2008/10/10 15:49:18	r/w
001.png	68K	2008/10/10 15:18:08	r/w
001.wdf	138K	2008/10/10 15:23:06	r/w
002.csv	1K	2008/10/10 15:50:18	r/w
002.png	73K	2008/10/10 15:19:10	r/w

Please press ⬤ key to move "ControlMenuArea".

Operation menu ⟵⟶ **File list**

Cursor (select the file or folder)

Move the SET key (⬤) to the left or right to switch between operation areas.

Switching Between the Operation Menu and the File List

Move the **SET** key (⬤) to the left or right.

Moving the Cursor

Rotate the **jog shuttle** or move the **SET** key (⬤) up or down in either the operation menu or the file list.

Selecting Items

To select the item highlighted by the cursor, press the **SET** key (⬤). When you select the item highlighted by the cursor, the following blue icon appears: ▣.

Sorting the List (Sort To)

Select **Sort To** on the operation menu to display the following screen.

Sort by file name in ascending order
Sort by file name in descending order
Sort by file size in ascending order
Sort by file size in descending order
Sort by date in ascending order
Sort by date in descending order
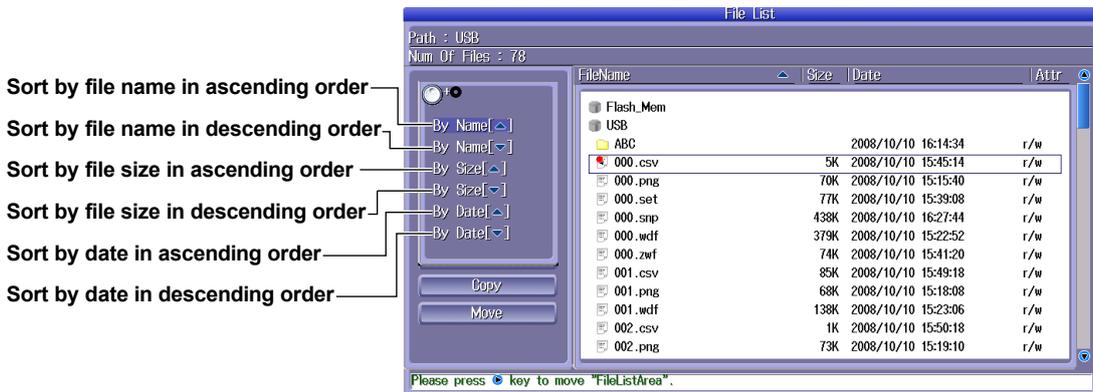
Display Format

Select a display format on the operation menu to display one of the following screens.
Press **SET** to switch between display formats.

List display

Display format (list and thumbnail displays, in that order)
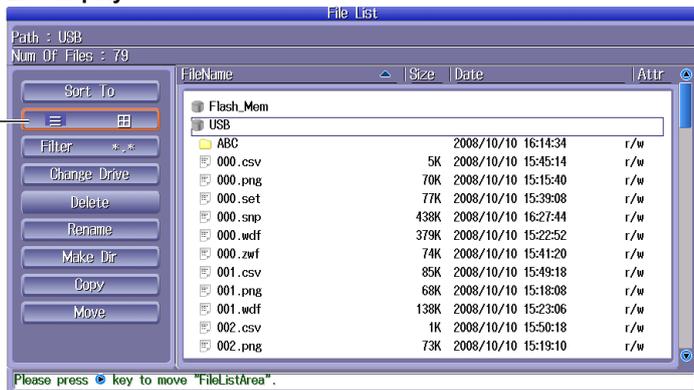
Thumbnail display
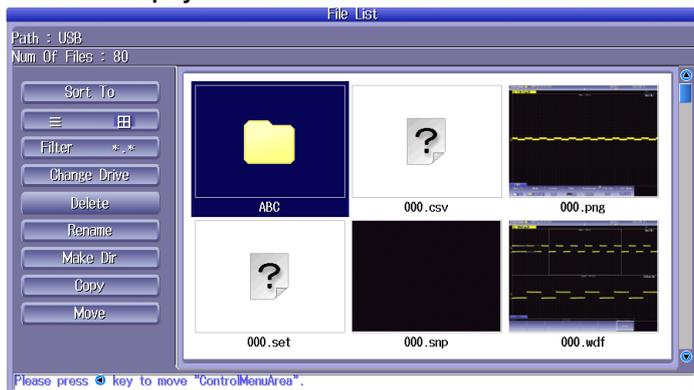
Selecting the Type of File to List (File Filter)

Select **Filter** on the operation menu to display the following screen.
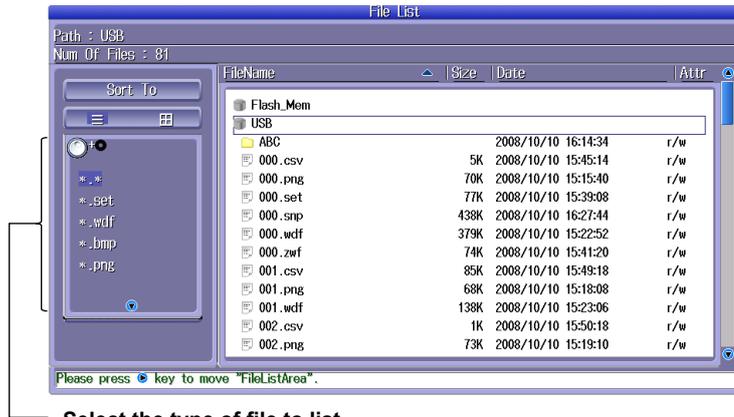
Select the type of file to list

.:	**All files**
*.set:	**Setup files**
*.wdf:	**Waveform files**
*.bmp:	**Image files (BMP)**
*.png:	**Image files (PNG)**
*.jpg:	**Image files (JPEG)**
*.zwf:	**Waveform zone files**
*.msk:	**Polygonal zone files**
*.snp:	**Snapshot waveform files**
*.sbl:	**Symbol definition files**
*.csv:	**CSV files**

Changing the Storage Medium (Change Drive)

Select **Change Drive** on the operation menu to display the following screen.

Internal memory
External USB memory
Network drive
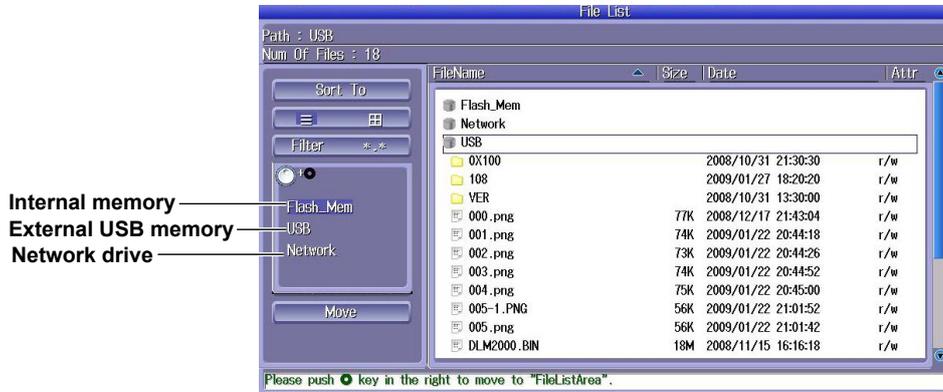
Note

You can also change the storage medium by highlighting the drive you want to change in the file list and pressing the SET key.

Deleting Files and Folders (Delete)

Select the file or folder that you want to delete from the file list.

Select **Delete** on the operation menu to display the following screen.

The file to delete
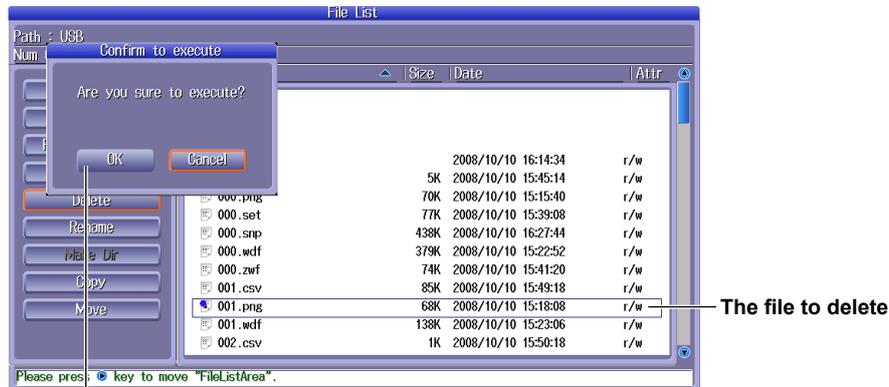
Delete files or folders

Note

You can delete multiple files at the same time by selecting them with the jog shuttle and the SET key.

Renaming Files and Folders (Rename)

Select the file or folder that you want to rename from the file list.

Select **Rename** on the operation menu to display the following screen.

Use a keyboard to input the new file or folder name

Press the ENTER key on the keyboard or the ENTER soft key to confirm the name.

The file to rename
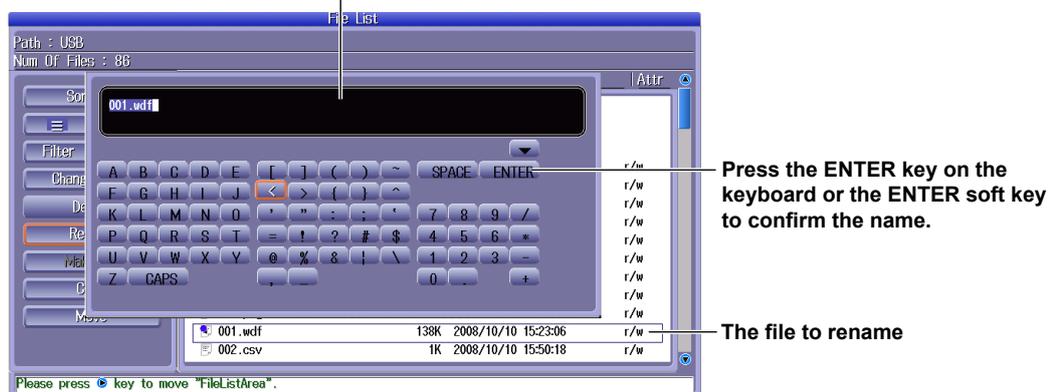
Making Folders (Make Dir)

Select the drive or folder that you want to make the new folder in from the file list.

Select **Make Dir** on the operation menu to display the following screen.

Use a keyboard to input the new folder name
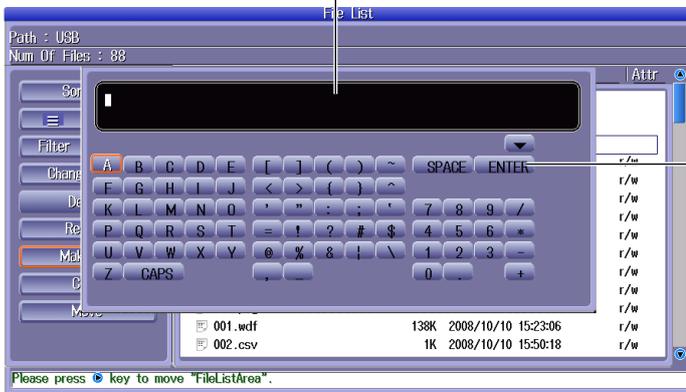
Press the ENTER key on the keyboard or the ENTER soft key to confirm the name.

Copying Files and Folders (Copy)

Select the file or folder that you want to copy from the file list.

Select **Copy** on the operation menu to display the following screen.

File list you are copying from
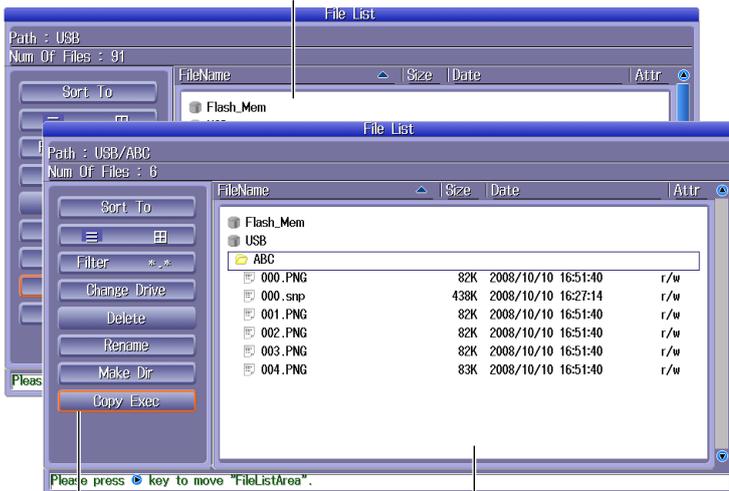
Execute the copy operation   **File list you are copying to**

Select the drive and folder on the file list that you are copying to.

Select **Copy Exec** on the operation menu to display the following screen.

Copy the file or folder

Note

- You can copy multiple files at the same time by selecting them with the jog shuttle and the SET key.
- You can perform file operations on the file list that you are copying to as well.

Moving Files and Folders (Move)

Select the file or folder that you want to move from the file list.

Select **Move** on the operation menu to display the following screen.

File list you are moving from

Execute the move operation

File list you are moving to
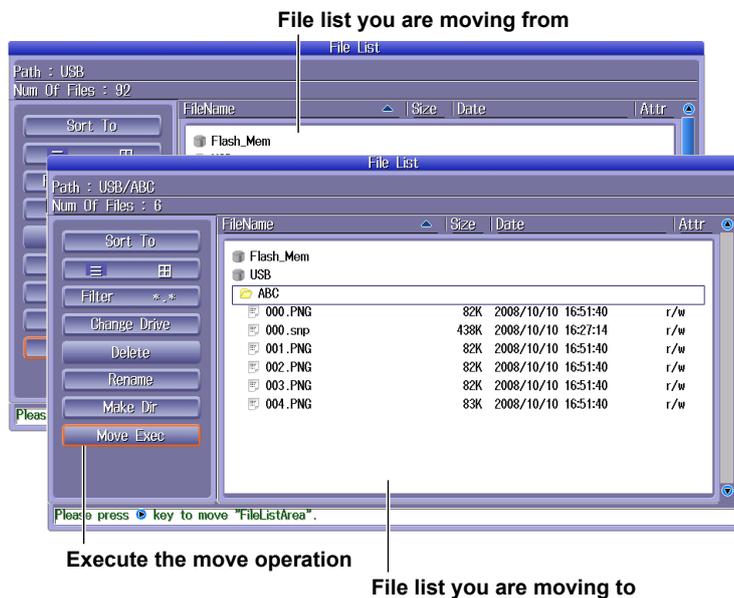
Select the drive and folder on the file list that you are moving to.

Select **Move Exec** on the operation menu to display the following screen.
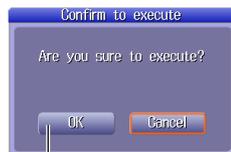
Move the file or folder

Note

- You can move multiple files at the same time by selecting them with the jog shuttle and the SET key.
- You can perform file operations on the file list that you are moving files to as well.

File Utility Menu

Press **FILE**, and then press the **Utility** soft key to display the following menu.

Display file information **Turn protection on or off** **All Set/All Reset** **Set/Reset**
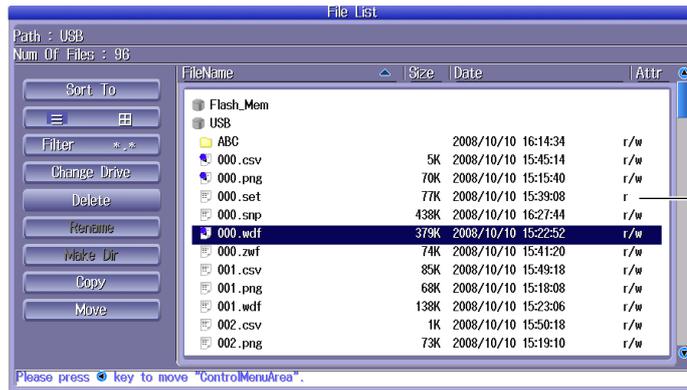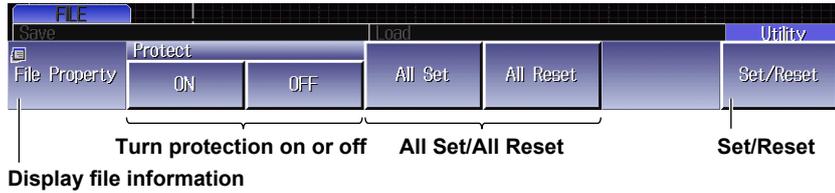
The attributes for a file with protection turned on look like this.

Turning Protection On or Off (Protect ON/OFF)

Turn protection on or off for the selected file. The change is reflected in the file attributes, displayed under the Attr column in the file list.

Protection	File Attribute	Description
ON	r	File protection is on for the selected file. The file has read-only access, it is write-protected and cannot be deleted.
OFF	r/w	File protection is off for the selected file. The file has read and write access.

All Set/All Reset

All Set: Select all files displayed. Selected file icons are displayed in blue.

All Reset: Deselect all files displayed.

Set/Reset

Invert the selection status of the file highlighted by the cursor. This is the same function as when you press the SET key. Selected file icons are displayed in blue.

18.1   Connecting the DLM2000 to a Network

This section explains how to connect the DLM2000 to a network.

Optional Ethernet Interface Specifications

There is a 1000BASE-T port located on the rear panel of the DLM2000.

Item	Specifications
Ports	1
Electrical and mechanical specifications	IEEE802.3
Transmission system	Ethernet (1000BASE-T, 100BASE-TX, 10BASE-T)
Communication protocol	TCP/IP
Supported services	Server: FTP, HTTP (Web), and VXI-11
	Client: FTP (Net Drive), SMTP (Mail), SNTP, LPR (Net Print), DHCP, and DNS
Connector type	RJ-45

Ethernet 1000BASE-T port

RJ-45 modular jack
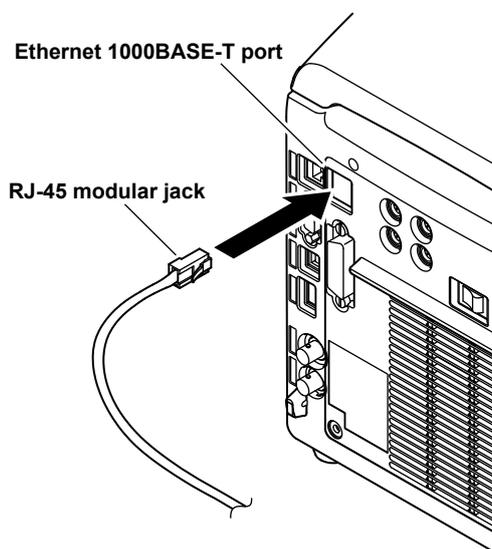
Items Required to Connect the DLM2000 to a Network

Cable

Use one of the following types of network cable that conforms to the transfer speed of your network.
- A UTP (Unshielded Twisted-Pair) cable
- An STP (Shielded Twisted-Pair) cable

Connection Procedure

To Connect to a PC over a Network

1. Turn off the DLM2000.
2. Connect one end of a UTP (or STP) cable to the ETHERNET 1000BASE-T port on the rear panel.
3. Connect the other end of the UTP (or STP) cable to a hub or router.
4. Turn on the DLM2000.

Hub or router that supports 1000BASE-T

PC

DLM2000

Straight UTP or STP cable
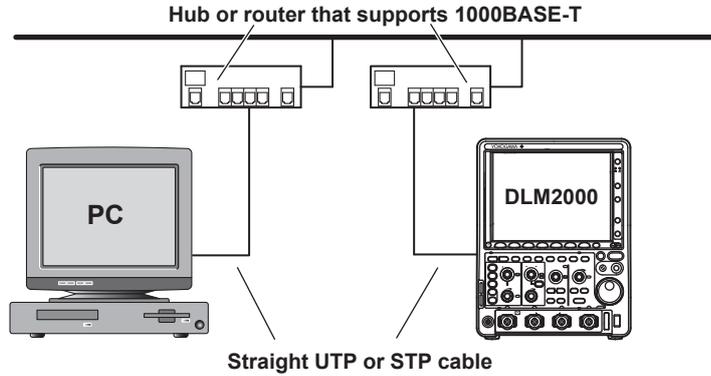
To Connect to a PC through a Hub or Router

1. Turn off the DLM2000.
2. Connect one end of a UTP (or STP) cable to the ETHERNET 1000BASE-T port on the rear panel.
3. Connect the other end of the UTP (or STP) cable to a hub or router.
4. Connect the PC to the hub or router in the same way.
5. Turn on the DLM2000.

Hub or router that supports 1000BASE-T

PC

DLM2000

Straight UTP or STP cable
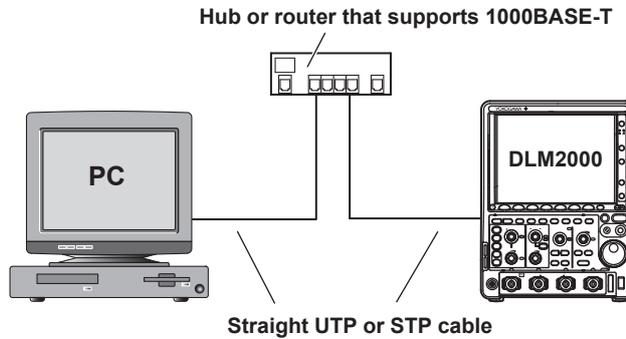
Note

- Use a hub or router that conforms to the transfer speed of your network.
- When you connect a PC to the DLM2000 through a hub or router, the PC must be equipped with an auto switching 1000BASE-T/100BASE-TX/10BASE-T network card.
- Do not connect the DLM2000 to a PC directly. Direct communication without a hub or router is not guaranteed to work.

18.2 Configuring TCP/IP Settings

This section explains the following TCP/IP settings (which are used when connecting to a network):
- DHCP (IP address, subnet mask, and default gateway)
- DNS (domain name, DNS server IP address, and domain suffix)

► **"TCP/IP (TCP/IP)" in the Features Guide**

UTILITY Network Menu

Press **UTILITY** and then press the **Network** soft key to display the following menu.

Configure TCP/IP

Configuring TCP/IP (TCP/IP)

Press the **TCP/IP** soft key to display the following screen.
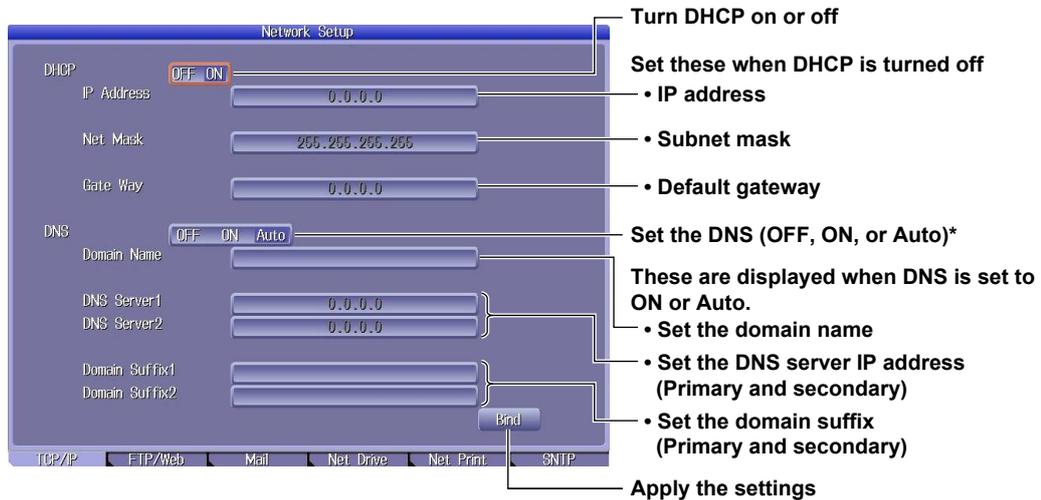
* Auto is displayed when DHCP is turned on.

DNS Settings (DNS)

OFF: Disable the DNS.

ON: Enable the DNS. Set the domain name, the DNS server IP address, and the domain suffix.

Auto: Enable the DNS. After you set the domain suffix, the domain name and the DNS server IP address are set automatically. This option can only be selected when DHCP is on.

18.3 Accessing the DLM2000 from a PC (FTP Server)

This section explains the following settings (which are used when accessing the DLM2000 from a PC on a network):
- User name
- Password
- Timeout
- Executing FTP client software

► **"FTP Server (FTP/Web Server)" in the Features Guide**

UTILITY Network Menu

Press **UTILITY** and then press the **Network** soft key to display the following menu.

**Configure the FTP/Web server settings**

Configuring the FTP Server (FTP/Web Server)

Press the **FTP/Web Server** soft key to display the following screen.

Settings for accessing the DLM2000 from a PC
- **Turns the FTP server ON and OFF**
- **Turns the Web server ON and OFF**
- **Enter the user name using up to 30 characters**
- **Enter the password using up to 15 characters**
- **Set the timeout value (0 to 3600 s)**

Apply the settings
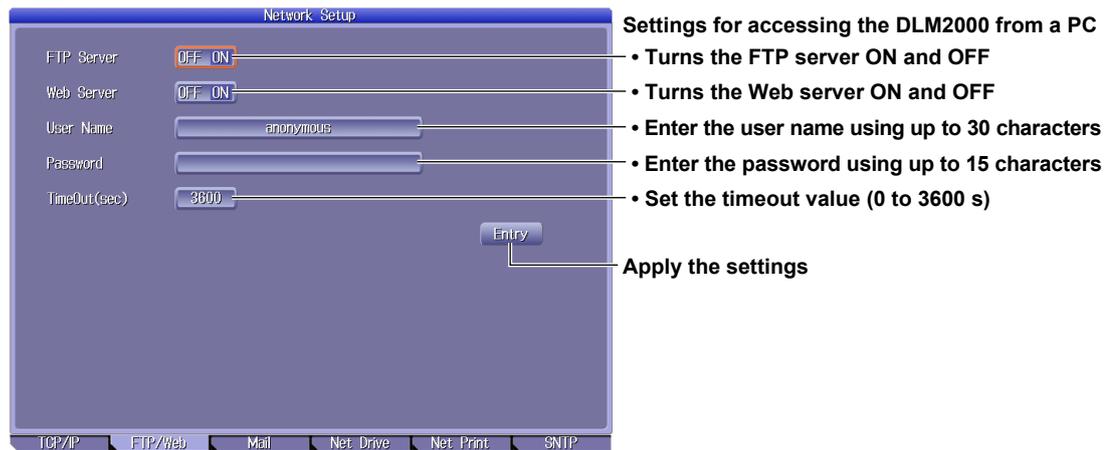
Executing FTP Client Software

Execute FTP client software on a PC.

Input the user name and password that you set on the DLM2000's network setup screen shown above, and connect to the DLM2000.

> **Note**
> If you set the user name to "anonymous," you can connect to the DLM2000 without entering a password.

18.4 Monitoring the DLM2000 Display from a PC (Web Server)

This section explains the following settings (which are used when connecting to the DLM2000 from a PC over a network to show the DLM2000's display on the PC and to start and stop waveform acquisition from the PC):

• User name
• Password
• Timeout
• Connecting to the DLM2000 from a PC

► **"Web Server (FTP/Web Server)" in the Features Guide**

UTILITY Network Menu

Press **UTILITY** and then press the **Network** soft key to display the following menu.

Configure the FTP/Web server settings

UTILITY		Network			
Calibration	TCP/IP	FTP/Web Server	Mail	Net Drive	Net Print	SNTP

Configuring the Web Server (FTP/Web Server)

Press the **FTP/Web Server** soft key to display the following screen.

Network Setup

FTP Server	OFF ON
Web Server	OFF ON
User Name	anonymous
Password	
TimeOut(sec)	3600
	Entry

Settings for accessing the DLM2000 from a PC
• **Turns the FTP server ON and OFF**
• **Turns the Web server ON and OFF**
• **Enter the user name using up to 30 characters**
• **Enter the password using up to 15 characters**
• **Set the timeout value (0 to 3600 s)**

Apply the settings

TCP/IP | FTP/Web | Mail | Net Drive | Net Print | SNTP

Connecting to the DLM2000 from a PC

Open a Web browser on a PC that is connected to a network and type the DLM2000's IP address as follows: http://xxx.xxx.xxx.xxx/

where xxx.xxx.xxx.xxx is the IP address.

Input the user name and password that you set on the DLM2000's network setup screen shown on the previous page, and connect to the DLM2000.

The following page appears.

Start waveform acquisition

Stop waveform acquisition

Capture the screen image
Captures an image of the full screen.

Stop updating the screen

Setting the Screen Update Rate
Select an update rate of 2s, 5s, 10s, 30s, or 60s.

Start updating the screen
Screen is updated automatically
at the specified update rate.

Manually update the screen

Close the Web browser
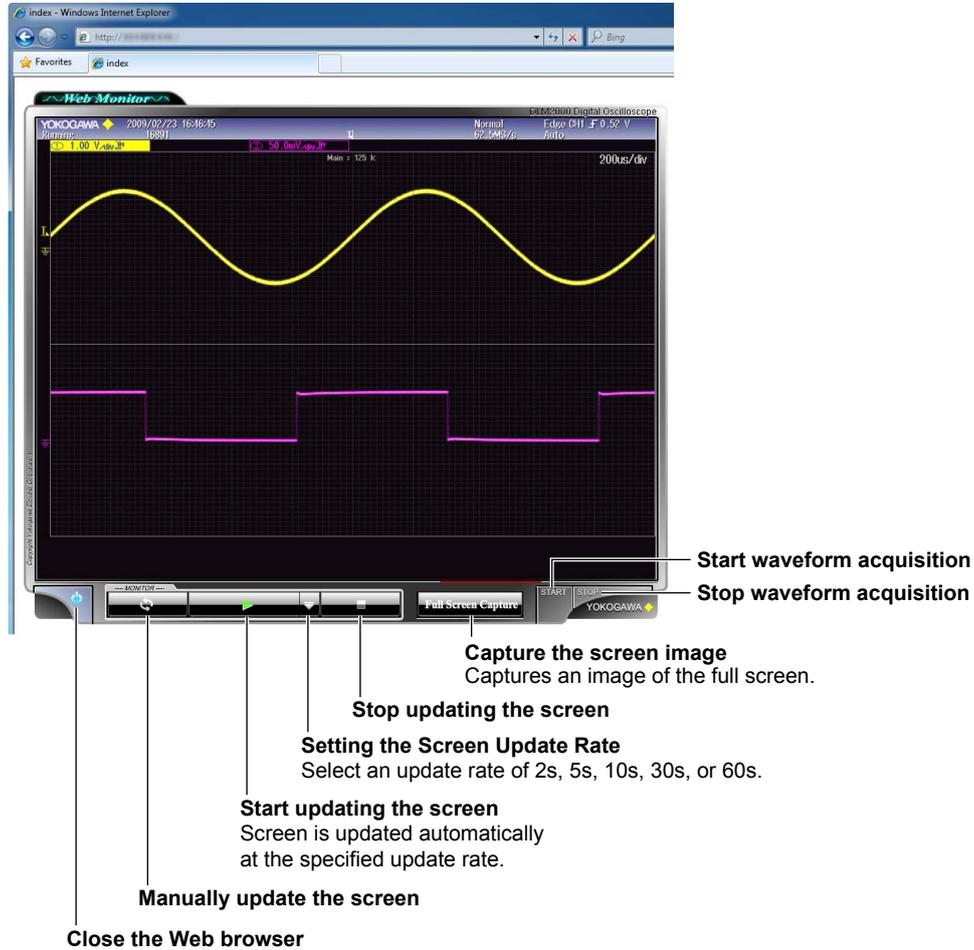
Note

- Disable the pop-up blocker feature on your Web browser when you capture the screen image.
- If you set the user name to "anonymous," you can connect to the DLM2000 without entering a password.

18.5 Connecting to a Network Drive

This section explains the following settings (which are used when accessing a network drive (Net Drive) through an Ethernet connection to read or save various DLM2000 data):

• FTP server (file server)
• User name
• Password
• FTP passive mode
• Timeout
• Connecting to and disconnecting from network drives

► **"Network Drive (Net Drive)" in the Features Guide**

UTILITY Network Menu

Press **UTILITY,** and then press the **Network** soft key to display the following menu.

Configure a network drive and connect to it
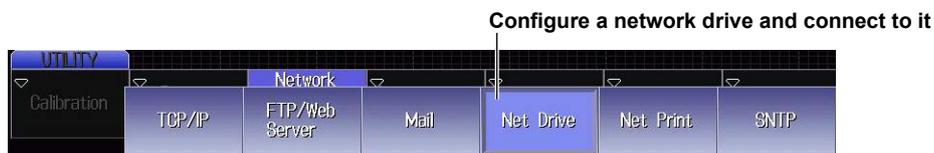
Configuring a Network Drive and Connecting to It (Net Drive)

Press the **Net Drive** soft key to display the following screen.

Settings used to connect to a network drive
• **Enter the FTP server's host name**
• **Enter the user name**
• **Enter the password using up to 14 characters**
• **Turn FTP passive mode on or off**
• **Set the timeout value (0 to 60 s)**
Disconnect from the network drive
Connect to the network drive
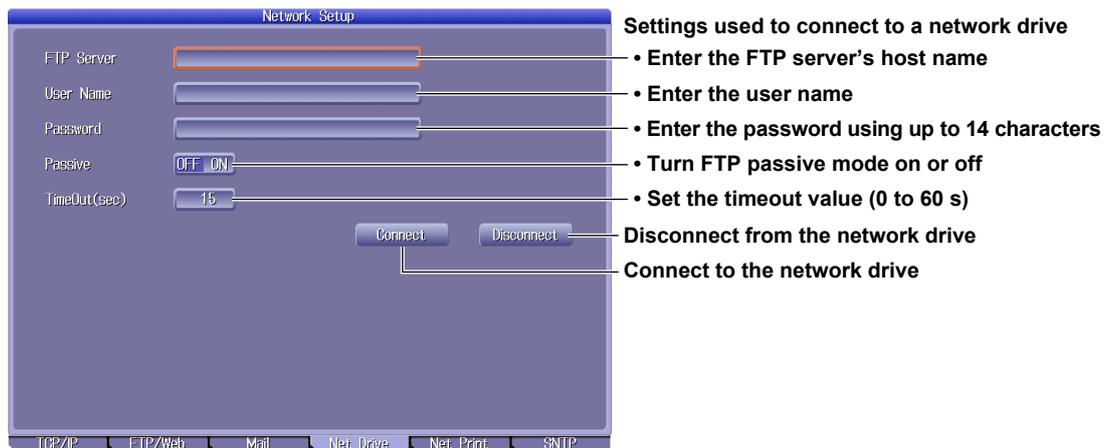
18.6 Configuring Mail Transmission (SMTP client function)

This section explains the following settings (which are used when transmitting mail to a specified mail address on a network):

- Mail server
- Mail address
- Comments
- Attaching image files
- Timeout
- User Authentication
- Sending a test mail

► **"Mail (Mail)" in the Features Guide**

UTILITY Network Menu

Press **UTILITY** and then press the **Network** soft key to display the following menu.
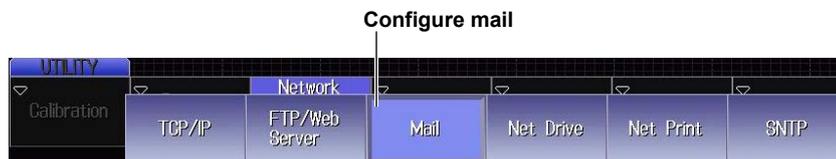
Configure mail

Configuring Mail (Mail)

Press the **Mail** soft key to display the following screen.

Set the mail server
IP address or host name and domain name (When DNS is enabled)

Set the recipient email address

Specify comments

Set whether to attach an image file or not (OFF or ON)

Set the timeout value (1 to 60 s)

Set the user authentication to ON or OFF

Set these when POP3 before SMTP is turned on
• Set the encryption type (U/P, APOP)
• Set the name of the POP3 server
• Set the user name
• Set the password

Send a test mail

18.7 Using SNTP to Set the Date and Time

This section explains how to use SNTP to set the date and time of the DLM2000.

- SNTP server
- Timeout
- Executing time adjustment
- Automatic adjustment

UTILITY Network Menu

Press **UTILITY** and then press the **Network** soft key to display the following menu.

Configure SNTP

Configuring SNTP (SNTP)

Press the **SNTP** soft key to display the following screen.

Set the SNTP server
IP address or host name and domain name
(When DNS is enabled)

Set the timeout value (1 to 60 s)

Execute time adjustment

Turn automatic adjustment on or off
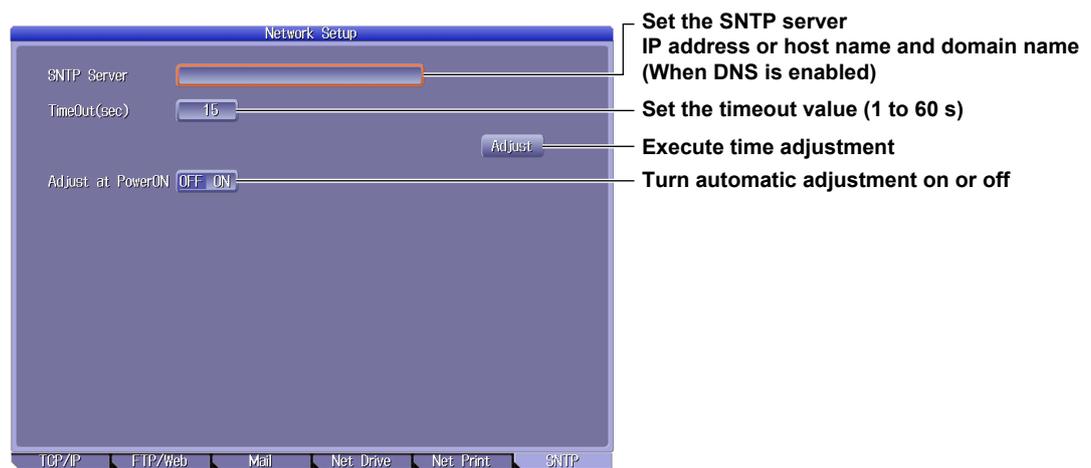
18.8 Setting a Network Printer

This section explains the following settings (which are used when printing screen images to a network printer):
- LPR server
- LPR name
- Timeout

UTILITY Network Menu
Press **UTILITY** and then press the **Network** soft key to display the following menu.

Configure network printer

Configuring Network Printer (Net Print)
Press the **Net Print** soft key to display the following screen.

Set the LPR server
IP address or host name and domain name (When DNS is enabled)

Set the LPR name, the name of the shared printer that the DLM2000 will connect to

Set the timeout value (0 to 60 s)
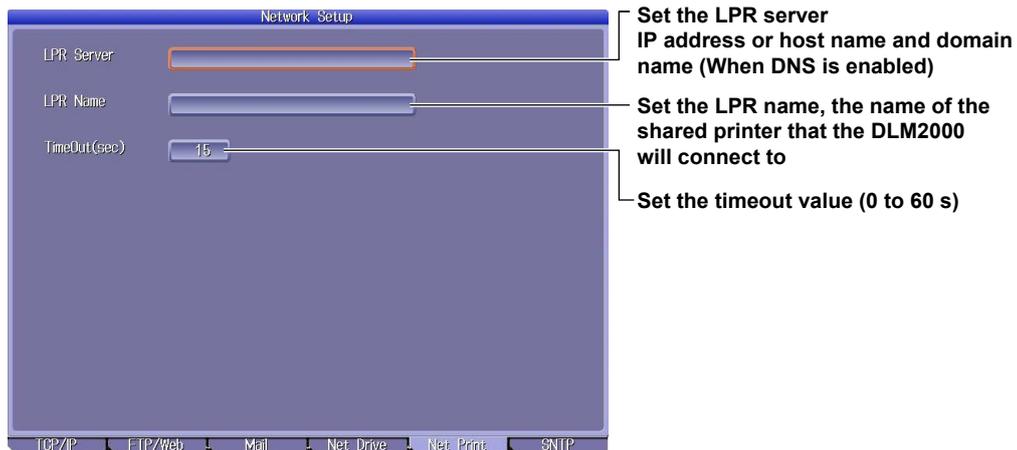
19.1   External Trigger Input (TRIG IN/EXT)

⚠️

CAUTION

Only apply signals that meet the following specifications. Signals that do not meet the specifications may damage the DLM2000, because of factors such as excessive voltage.

French

⚠️

ATTENTION

N'appliquer que des signaux correspondant aux spécifications suivantes. Les autres signaux pourraient endommager le DLM2000 en raison de divers facteurs, notamment la tension excessive.

External Trigger Input Terminal

This terminal is used when an external signal is used as the trigger source.

The external trigger input terminal is the terminal labeled TRIG IN on the rear panel of the DLM2024, DLM2034, and DLM2054. It is the terminal labeled EXT on the front panel of the DLM2022, DLM2032, and DLM2052.

Item	Specifications
Connector type	BNC
Maximum input voltage	±40 V (DC + ACpeak) or 28 Vrms when the frequency is 10 kHz or less
Input frequency bandwidth	DC to 100 MHz
Input impedance	Approx. 1 MΩ, approx. 20 pF
Input range	±2 V (DLM2024, DLM2034, and DLM2054)
	±1 V (for the ±1 V range on the DLM2022, DLM2032, and DLM2052)
	±10 V (for the ±10 V range on the DLM2022, DLM2032, and DLM2052)
Trigger sensitivity	0.1 Vp-p (DLM2024, DLM2034, and DLM2054)
	0.1 Vp-p (for the ±1 V range on the DLM2022, DLM2032, and DLM2052)
	1 Vp-p (for the ±10 V range on the DLM2022, DLM2032, and DLM2052)
Trigger level	±2 V. The resolution is 5 mV (on the DLM2024, DLM2034, and DLM2054).
	±1 V. The resolution is 5 mV (for the ±1 V range on the DLM2022, DLM2032, and DLM2052).
	±10 V. The resolution is 50 mV (for the ±10 V range on the DLM2022, DLM2032, and DLM2052).

Input Terminal

**DLM2024, DLM2034,
and DLM2054
(On the rear panel)**
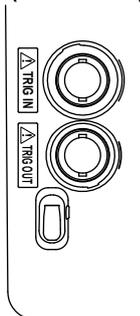
**DLM2022, DLM2032,
and DLM2052
(On the front panel)**

⚠️ 1 MΩ/ 20 pF ≤ 40 Vpk
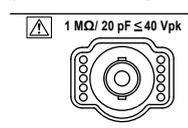
19.2 Trigger Output (TRIG OUT)

⚠️

CAUTION

Do not short the TRIG OUT terminal or apply external voltage to it. Doing so may damage the DLM2000.

French

⚠️

ATTENTION

Ne pas court-circuiter la borne TRIG OUT et ne pas appliquer de tension de sortie. Cela pourrait endommager le DLM2000.

Trigger Output Terminal

A 3.3 V CMOS level signal is output when the DLM2000 triggers. The signal level is normally high but goes low when the DLM2000 triggers.

Item	Specifications
Connector type	BNC
Output level	3.3 V CMOS
Output impedance	Approx. 50 Ω
Output logic	Negative logic (⊔) and positive logic (⊓) switchable
Output delay	50 ns or less
Output hold time	For negative logic, the low level is 800 ns min. and the high level is 50 ns min.
	For positive logic, the high level is 800 ns min. and the low level is 50 ns min.

Output Terminal

DLM2024, DLM2034, and DLM2054
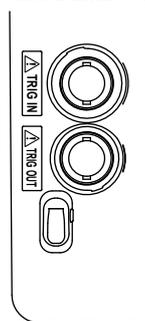
DLM2022, DLM2032, and DLM2052
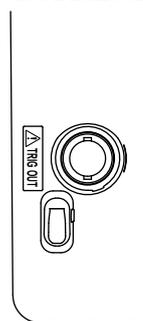
Output Timing
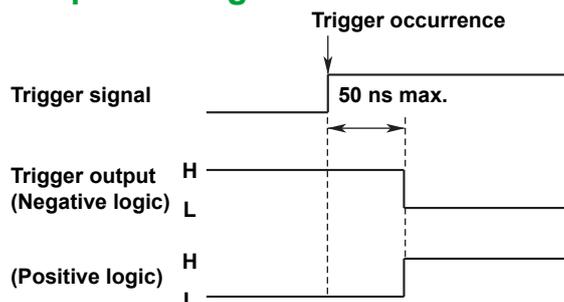
Low Level and High Level Hold Times
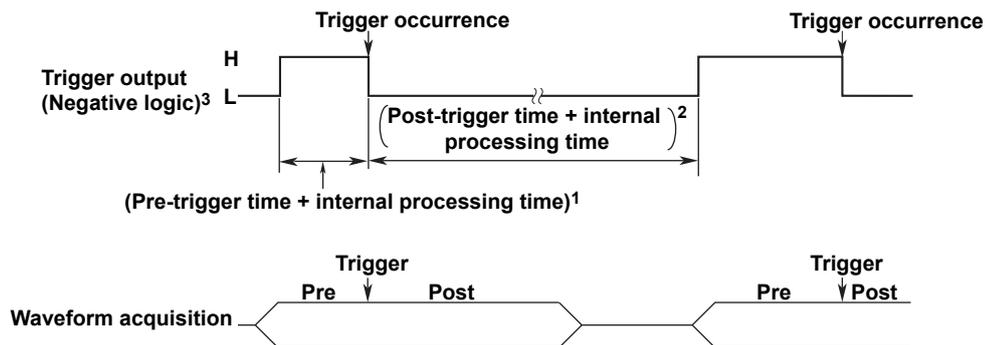
1 HIGH (high level)[3] period: The sum of pre-trigger time and internal processing time. The minimum period is 50 ns.
2 LOW (low level)[3] period: The sum of post-trigger time and internal processing time. The minimum period is 800 ns.
3 When you select positive logic, the definitions of high and low given here are reversed.

Setting the Output Logic

You can set the output logic for the signal transmitted from the trigger output terminal.

UTILITY Preference Menu

Press **UTILITY** and then press the **Preference** soft key to display the following menu.

Set the output logic (Pos: positive logic or Neg: negative logic)

19.3 Video Signal Output (VIDEO OUT)

⚠ CAUTION

- Only connect the DLM2000 to a monitor after turning both the DLM2000 and the monitor off.
- Do not short the VIDEO OUT terminal or apply external voltage to it. Doing so may damage the DLM2000.

French

⚠ ATTENTION

- Ne brancher le DLM2000 sur un moniteur qu'après avoir mis hors tension le DLM2000 et le moniteur.
- Ne pas court-circuiter la borne VIDEO OUT et ne pas appliquer de tension de sortie. Cela pourrait endommager le DLM2000.

Video Signal Output Terminal

You can use video signal output to display the DLM2000 screen on a monitor. Any multisync monitor that supports XGA can be connected.

VIDEO OUT (XGA)

10

15 — **5**

11 — **1**

6
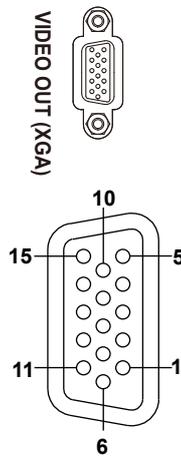
D-Sub 15-pin receptacle

Pin No.	Signal Name	Specifications
1	Red	0.7 Vp-p
2	Green	0.7 Vp-p
3	Blue	0.7 Vp-p
4	–	
5	GND	
6	GND	
7	GND	
8	GND	
9	–	
10	GND	
11	–	
12	–	
13	Horizontal sync signal	Approx. 47.9 kHz, TTL negative logic (⎍)
14	Vertical sync signal	Approx. 60 Hz, TTL negative logic (⎍)
15	–	

Connecting to a Monitor

1. Turn off the DLM2000 and the monitor.
2. Connect the DLM2000 and the monitor using an RGB cable.
3. Turn on the DLM2000 and the monitor.

Note

- An RGB video signal is always running through the VIDEO OUT terminal.
- The monitor display may flicker if you place the DLM2000 or some other device close to it.
- Depending on the type of monitor, parts of the DLM2000 display may be cut off.

19.4 GO/NO-GO Signal Output

Output signal

NO-GO OUT Signal

When the determination result is NO-GO, the output signal level (the TTL level) temporarily changes from high level (H) to low level (L).

GO OUT Signal

When the determination result is GO, the output signal level (the TTL level) temporarily changes from high level (H) to low level (L).

Signal Output Circuit Diagram
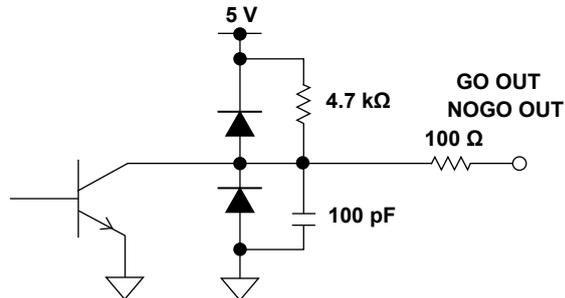
Output Connector

The format of the signal output connector and the pin arrangement are explained below.

Format

The connector uses an RJ-12 modular jack. Use a cable designed for GO/NO-GO determination, such as optional accessory 366973.

Pin Arrangement

GO/NO-GO

6 ⋮ **1**

Connector on the DLM2000
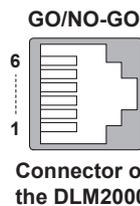
Pin No.	Signal Name	Logic
1	NC (no connection)	
2	NC (no connection)	
3	GO OUT	Negative logic
4	NO-GO OUT	Negative logic
5	GND	
6	NC (no connection)	

Output Timing
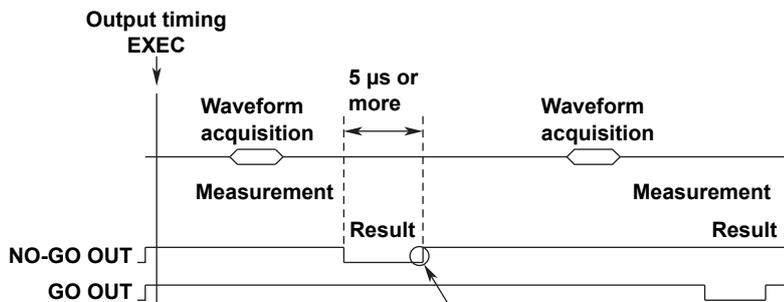
The signal remains low until the DLM2000 is ready to accept the next measurement. If you have specified an action to perform when conditions are true, this time is extended until that action is complete.

Connecting to Other Instruments

CAUTION

- Do not apply external voltage to the NO-GO OUT and GO OUT output pins. Doing so may damage the DLM2000.
- When connecting the GO/NO-GO determination signal output to another instrument, do not connect the wrong signal pin. Doing so may damage the DLM2000 or the connected instrument.
- Do not connect a USB cable to the GO/NO-GO output connector. Doing so may damage the DLM2000.

French

ATTENTION

- Ne pas appliquer de tension externe aux broches de sortie NO-GO OUT et GO OUT. Cela pourrait endommager le DLM2000.
- Lors de la connexion de la sortie de signal de détermination GO/NO-GO à un autre instrument, veiller à ne pas connecter les mauvaises broches de signal. Cela pourrait endommager le DLM2000 ou l'instrument connecté.
- Ne pas brancher de câble USB sur le connecteur de sortie GO/NO-GO. Cela pourrait endommager le DLM2000.

When connecting to an external instrument, use a cable designed for GO/NO-GO determination, such as optional accessory 366973.
Do not use this cable for any purpose other than performing GO/NO-GO determination with the DLM2000.

Specifications of the GO/NO-GO Cable (Optional accessory 366973)

Approx. 1.5 m

Connect to the GO/NO-GO output connector on the rear panel of the DLM2000

6
1

RJ-12 modular jack

Process the wires at the end of the stripped cable as necessary.
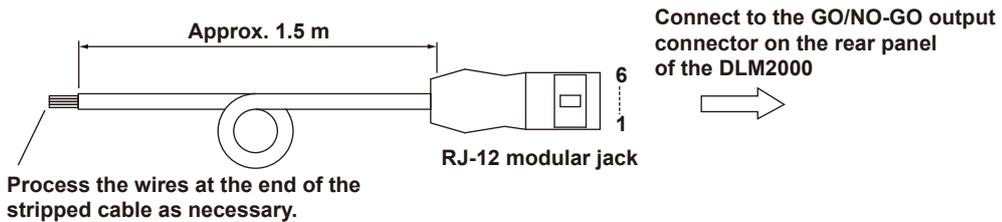
Color	Pin No.	Signal Name	Logic
Yellow	2	NC	
White	3	GO OUT	Negative logic
Green	4	NO-GO OUT	Negative logic
Blue	5	GND	

20.1 Turning the Click Sound On or Off, and Changing the Menu Language, Message Language, and USB Keyboard Language

This section explains the settings that you can use to turn the click sound on and off and change the menu language, message language, and USB keyboard language.

► **"System Configuration (System Configuration)" in the Features Guide**

UTILITY System Configuration Menu

Press **UTILITY** and then press the **System Configuration** soft key to display the following menu.

Turn the click sound on or off

Set the language options

Select the USB keyboard language
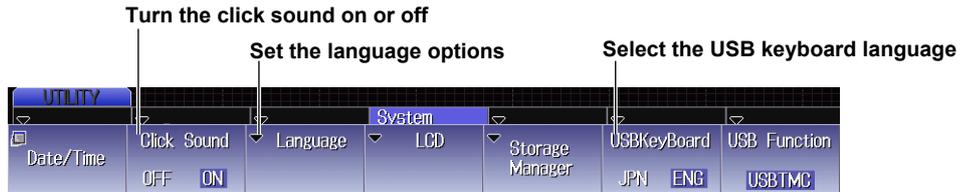
Setting the Language Options (Language)

Press the **Language** soft key to display the following menu.

Set the message language (Japanese, English, Chinese, Korean, Italian, French, German, Spanish, or Russian)

Set the menu language (Japanese, English, Chinese, Korean, Italian, French, German, Spanish, or Russian)

Note

Some terminology is always displayed in English.

Setting the USB Keyboard Language (USBKeyBoard)

You can use the following keyboards conforming to USB Human Interface Devices (HID) Class Ver. 1.1.

ENG: 104-key keyboards
JPN: 109-key keyboards

For details on how DLM2000 keys are mapped to the keys on a USB keyboard see appendix 4.

20.2 Configuring the Menu Display, Measured Value Font Size, and Default Values of Legacy Models

This section explains the following settings (which are used when setting the menu display; the font sizes of cursor-measurement values and automatically measured values; and default values):

* Menu theme
* Menu animation
* Measured value font size
* Default values of legacy models

  ► **"Preferences (Preference)" and "Returning to the Default Settings (DEFAULT SETUP)"**

  in the Features Guide

UTILITY Preference Menu

Press **UTILITY** and then press the **Preference** soft key to display the following menu.

Set the menu theme (1 to 3)

Turn menu animation on or off

Set whether the default values of legacy models are used

Set the font size of measured values (Small: 16 pt, Large: 24 pt)
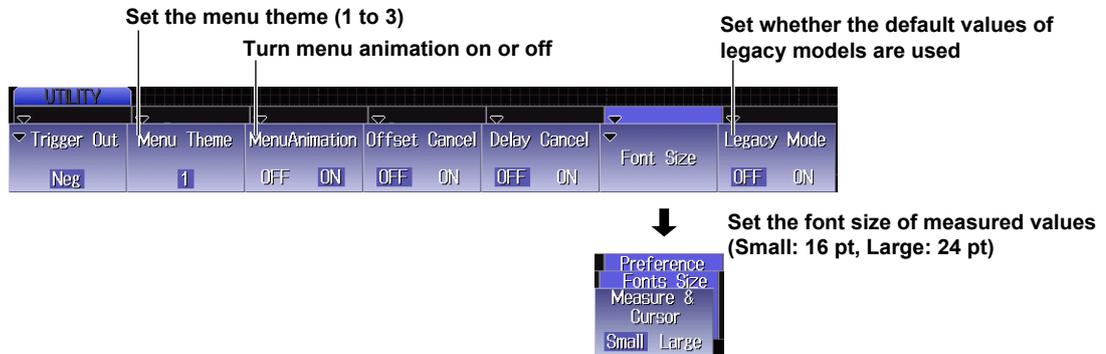
Setting the Menu Theme (Menu Theme)

You can set the color that the menu is displayed in.

Menu Theme 1
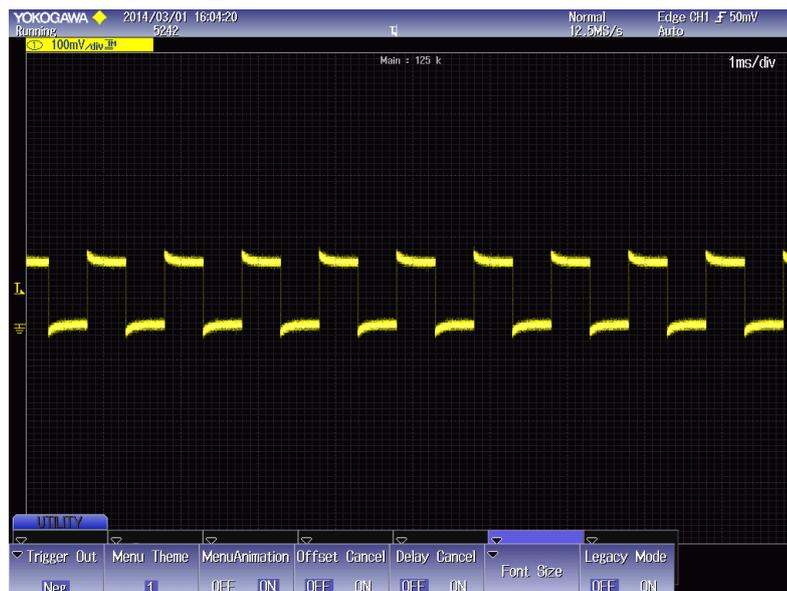
Menu Theme 2
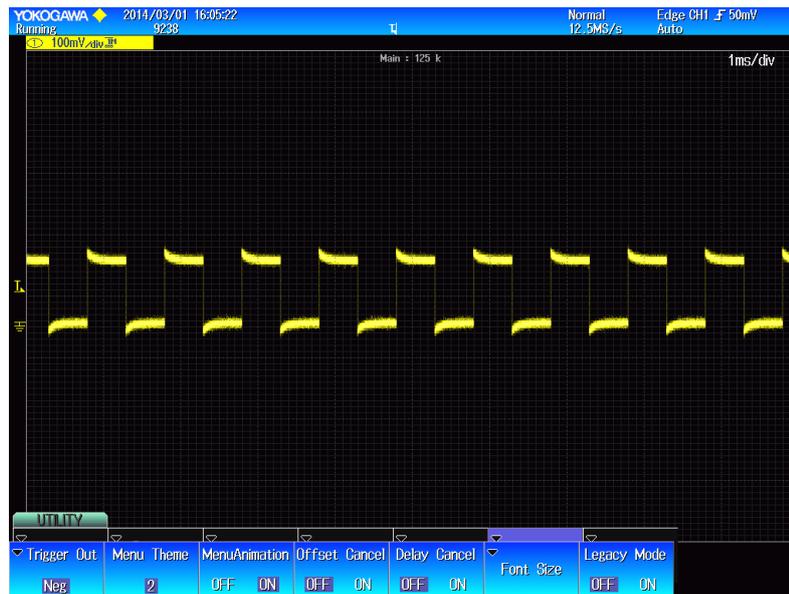
Menu Theme 3
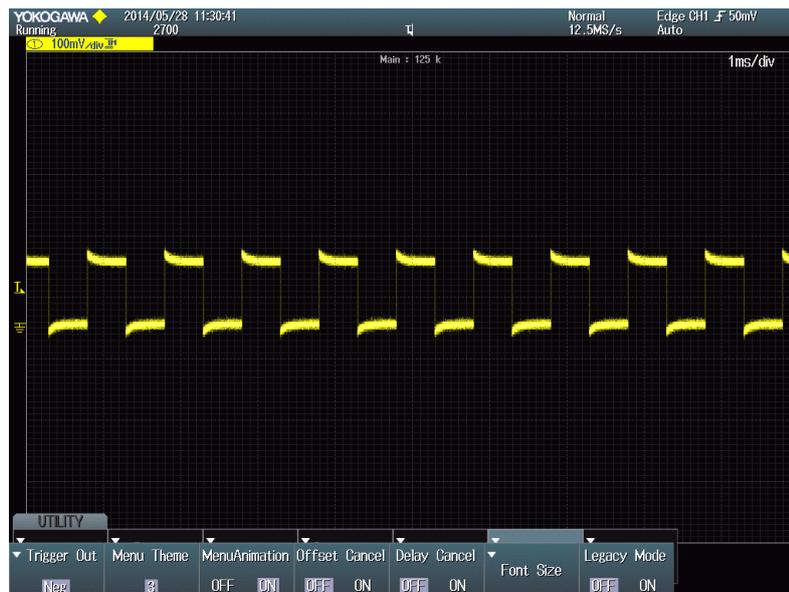
Setting Menu Animation (Menu Animation)

OFF: Do not show menu transitions when changing menus.

ON: Show menu transitions when changing menus.

Default Values of Legacy Models (Legacy Mode)

OFF: The default values are the DLM2000 factory default values.

ON: The default values are compatible with the DL1600 series and DL1700 series default values.

20.3 Viewing Setup Information (Overview)

This section explains how to view the current DLM2000 setup information.

UTILITY Overview Menu

Press **UTILITY** and then press the **Overview** soft key to display the following menu.

Display setup information 2

Display setup information 1
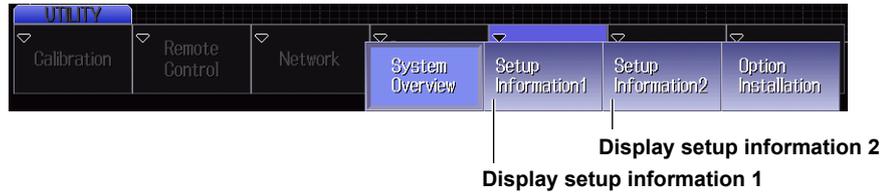
Displaying Setup Information 1 (Setup Information1)

Press the **Setup Information1** soft key to display the following screen.

Displaying Setup Information 2 (Setup Information2)

Press the **Setup Information2** soft key to display the following screen.

20.4 Using the DLM2000 as a USB Storage Device

This section explains the following settings (which are used when connecting the USB port on the rear of the DLM2000 to a PC through a USB cable and using the DLM2000 as a USB storage device):

► **"USB Communication (USB Function)" in the Features Guide**

UTILITY System Configuration Menu

Press **UTILITY**, and then press the **System Configuration** soft key to display the following menu.
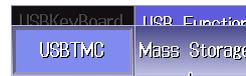
Set USB Function to Mass Storage

Note

- From a PC, you can access the DLM2000 internal memory as a storage device. You cannot access the DLM2000 network drives or the storage media connected to the DLM2000 USB ports.
- When USB communication is set to Mass Storage, a connected PC can use the DLM2000 as a read-only storage device.
- If you operate the files from the DLM2000, the DLM2000 will temporarily disconnect the connection from the PC so that the screen displayed on the PC can be refreshed.

When using a DLM2000 with firmware version earlier than 3.00 as a USB storage device
On models with firmware version earlier than 3.00, the mass storage feature for Windows XP and Windows Vista PCs is different from that for Windows 7. On models with firmware version earlier than 3.00, if the DLM2000 is accessed from a Windows XP or Windows Vista PC, the files on the DLM2000 internal memory can be read, deleted, and saved.

21.1 If a Problem Occurs

Faults and Corrective Actions

- If a message appears on the screen, see the following pages for reference.
- If servicing is necessary, or if the instrument does not operate properly even after you have attempted to deal with the problem according to the instructions in this section, contact your nearest YOKOGAWA dealer.

Description	Probable Cause	Corrective Action	Reference Section
The DLM2000 does not power on.	Using a power supply outside the ratings.	Use a correct power supply.	2.3*
Nothing is displayed.	The backlight is turned off.	Press any key.	4.4
	The screen is displayed with inappropriate colors.	Turn the power off, and then turn the power on again while pressing **RESET**.	3.6*
The display is odd.	The system is not operating properly.	Turn off the DLM2000 and then turn it back on.	2.3*
Keys do not work.	The keys are malfunctioning.	Perform a key test. If the test fails, servicing is required.	21.3
Triggering does not work.	The trigger settings are not appropriate.	Set the trigger conditions correctly.	Chapter 2 and section 4.3*
The measured values are not correct.	Insufficient warm-up.	Warm up the DLM2000 for 30 minutes after turning on the power.	—
	The DLM2000 has not been calibrated.	Calibrate the DLM2000.	3.8*
	The probe's phase has not been corrected.	Perform phase correction properly.	2.5*
	The probe attenuation is not correct.	Set an appropriate value.	1.1
	Offset voltage is applied.	Set the offset voltage to 0 V.	1.1
	Other causes.	Calibrate the DLM2000. If the measured values are still not correct, servicing is required.	3.8*
Cannot print to the built-in printer.	The printer head is damaged or worn out.	Servicing is required.	—
Cannot save to the specified storage medium.	The storage medium is not formatted.	Format the storage medium.	21.6
	No more free space on the storage medium.	Delete unneeded files or use another storage medium.	—
Unable to configure or control the DLM2000 through the communication interface.	The DLM2000 address used by the program is different from the specified address.	Match the address used in the program to the DLM2000 address.	Communication Interface User's Manual (IM 710105-17E)
	The interface is not used in a way that conforms to the electrical or mechanical specifications.	Use the interface in a way that conforms to the specifications.	

* Operation Guide IM 710105-03E

21.2 Messages and Corrective Actions

Messages

Messages may appear on the screen during operation. This section describes the error messages and how to respond to them. You can display the messages in the language that you specify through the operations explained in section 20.1. If servicing is necessary to solve the problem indicated by a message, contact your nearest YOKOGAWA dealer.

In addition to the following error messages, there are also communications error messages. These messages are explained in the Communication Interface User's Manual (IM 710105-17E).

Information

Code	Message and Corrective Action	Section
2	Turned on pressing the RESET key. All the settings will be initialized.	3.6*
3	Firmware is updated. All the settings are initialized.	—
4	Hardcopy is aborted.	—
5	File access is aborted.	—
6	Action-on-trigger is aborted.	2.21
7	Search aborted.	—
8	Search execution is completed, but no record was found that matched the conditions.	—
9	Search execution is completed, but no record was found that matched the pattern.	—
10	Statistical measurement is aborted.	Chapter 9
11	Analysis is aborted.	—
12	Data not detected. Execute again after changing settings or reacquiring waveforms.	—
13	The corresponding field was not found.	—
14	Action-on-trigger is completed.	2.21
15	The instrument is set to remote mode by the communication control. Press the SHIFT + CLEAR TRACE key to change to local mode.	—
16	Local lockout is set by the communication control. To operate using the keys, release the lockout using the communication control.	—
17	Firmware will be updated. Do you want to proceed? Note: It will take approx. 5 minutes. Please DO NOT power off the unit until the completion. Once the procedure is completed, the unit will reboot itself. We recommend you to save the setups before updating the firmware.	—
18	Updating Firmware. Note: Please DO NOT power off the unit. Once the procedure is completed, the unit will reboot itself.	—
19	Firmware is updated. Will be rebooted.	—
20	Any serial bus signal can not be detected.	Chapter 12
21	Serial bus automatic setting was aborted.	Chapter 12
22	The symbol/physical value file(.sbl) has not been loaded.	17.7
23	A contradiction in bit numbers of logic setting and symbol definition was detected. Check the symbol/ physical value file(.sbl).	—
24	Check the input voltage level and attenuation ratio.	Chapter 12
25	Automatic setting of the serial bus trigger failed.	12.4
27	Formatting is complete.	—
28	The front-panel power switch was not used to turn off the power.	2.3*
30	Calculating λ. Wait a while, and re-execute.	Chapter 14
31	USB Function has been switched to Mass Storage. In Mass Storage mode, only reading and writing of files are possible.	Chapter 20
32	USB Function has been switched to Mass Storage for Windows 7. In Mass Storage for Windows 7 mode, only reading of files is possible.	Chapter 20
33	Auto deskew was executed even though input signals were outside the specifications. Check whether current and differential probe offset adjustments have been executed properly.	—
60	Updating Firmware. Note: Please DO NOT turn off the power until processing is completed. And, DO NOT touch a keyboard.	—

* Operation Guide IM 710105-03E

File Errors

Code	Message and Corrective Action	Section
500	Data size larger than remaining capacity in media. Delete unnecessary files or use other media.	Chapter 17
501	File does not exist. Check the file name.	Chapter 17
502	Assigned path does not exist or no media. Check the path name and media.	Chapter 17
503	Writing prohibited in the media. Unlock write protection of the media.	Chapter 17
504	Insufficient remaining capacity in media. Delete unnecessary files or use other media.	Chapter 17
505	File not compatible. Check the file, firmware version of the unit or model name of the unit.	—
506	Save data do not exist. Check the content to be saved.	—
507	Save data do not exist. Check the content to be saved.	—
508	Unable to open file. The may be opened by other process. Try to open file later. If the problem still exist, service may be necessary.	Chapter 18
509	Access denied.	Chapter 17
510	File system error. Service is required.	—
511	Media error. Service is required.	—
512	Directory can not be deleted.	Chapter 17
513	File or Directory can not be moved to other media. If the problem occurs on other media, service may be required.	Chapter 17
514	Directory entry does not exist.	—
515	Media error. Service is required.	—
516	Media error. Service is required.	—
517	End of the file.	—
518	The same file or directory name exist. Remove the file/directory or change the current path.	Chapter 17
519	Target file of Move or Copy has a read only property.	Chapter 17
520	Assigned path does not exist or no media. Check the path name and media.	Chapter 17
521	Destination folder assigned to Copy / Move is the same as the origin or sub folder. Change the destination folder.	Chapter 17
522	No file name. Type in file name.	Chapter 17
523	Auto file name failure. Change the type of auto file name or change the header of the auto name.	Chapter 17
524	Improper file or path name. Check file / path name.	Chapter 17
525	Improper file or path name. Check file / path name.	Chapter 17
526	File is disintegrated. Check the file.	—
527	File system error. Service is required.	—
528	Illegal file name. The name contains prohibited characters. Change it to a different name.	Chapter 17
529	Illegal file name. The name is reserved by the system. Change it to a different name.	Chapter 17
530	Load failure. Number of vortex exceeded the maximum. Redefine the mask data.	—
531	Unable to open file. The may be opened by other process. Try to open file later. If the problem still exist, service may be necessary.	—
532	Unable to save. Compressed record size exceeded current record size. Change the compressed record size and execute again.	—
533	Assigned path does not exist. Check the network setting and configuration.	Chapter 18
534	Assigned path does not exist. Check the network setting and configuration.	Chapter 18
535	Assigned path does not exist. Check the network setting and configuration.	Chapter 18
536	File operation not supported in root directory. Please verify the path name.	Chapter 17
537	A file which contains multiple saved traces can not be loaded into Ref. Please load it into ACQ.	Chapter 17
538	A file which contains compressed waveform can not be loaded into the ACQ. Please load it into Ref.	Chapter 17
539	Unable to load a logic waveform to the reference waveform.	Chapter 17
540	Unable to load a file containing logic waveforms.	Chapter 17
541	Unable to load that file. Its extention is invalid.	Chapter 17
542	Cannot save file more than 2GB. Please either partially save the Zoom section, save in compressed format, or turn off unnecessary wave display.	Chapter 17
543	There is already a file. Do you overwrite?	Chapter 17
544	A file which contains multiple saved traces can not be loaded into Ref. Please load it into Channels.	Chapter 17
545	Cannot save all the data with record length exceeding 1.25M in ASCII (CSV format). Please either save in compressed format, partially save the Zoom section, or turn off unnecessary wave display.	Chapter 17
546	The number of files of a root directory is maximum. Delete unnecessary files or save at a subdirectory.	Chapter 17
547	The file save is unsupported in this setting.	Chapter 17

Printer Errors

Code	Message and Corrective Action	Section
550	Printer error. Confirm the printer status.	—
551	Cannot detect printer. Turn ON the printer. Check connectors.	—
552	Communication error. Check all connections and make sure all devices are on.	—
553	Paper not loaded correctly. Set the paper correctly.	16.1
554	Temperature error. Power off immediately.	—
555	Close the printer cover.	16.1
556	No built-in printer on this model. Check the specifications to see whether or not the optional printer is provided.	21.4
557	Image creation failure. Working memory space may be insufficient. Maintenance service is required.	—
558	Unable to print or save image with file property dialog.	Chapter 17

Network Errors

Code	Message and Corrective Action	Section
600	Invalid network parameter settings. Check the network parameters.	Chapter 18
601	Unable to connect to the server. Check the network settings and configuration.	Chapter 18
602	Invalid file server settings. Check the file server settings.	Chapter 18
603	Invalid fire wall settings. Check the fire wall settings.	Chapter 18
604	Cannot execute, while using a FTP server.	Chapter 18

Execution Errors

Code	Message and Corrective Action	Section
650	Running. Stop and execute again.	3.7*
651	Accessing file. Abort or wait until it is completed, and execute again.	—
652	Printing. Abort or wait until it is completed, and execute again.	—
653	Processing action-on-trigger. Abort or wait until it is completed, and execute again.	2.21
654	Processing zoom search. Abort or wait until it is completed, and execute again.	Chapter 11
655	Processing auto scroll. Abort or wait until it is completed, and execute again.	—
656	Processing history search. Abort or wait until it is completed, and execute again.	Chapter 15
657	Processing history replay. Abort or wait until it is completed, and execute again.	Chapter 15
658	Processing statistical measurement. Abort or wait until it is completed, and execute again.	Chapter 9
659	Analyzing serial bus data. Abort or wait until it is completed, and execute again.	Chapter 12
660	Zone edit in process. Terminate editing.	Chapter 2
661	Processing self test. Wait until it is completed.	—
662	Acquisition in process in N Single trigger mode. Press Start/Stop key or wait until the process is completed.	Chapter 2
663	Retrievable settings does not exist. The settings is created by either Initialize or Auto Setup.	—
664	Failed to execute statistical measurement. Waveform data may not exist. In Cycle statistic mode, improper setting may result in failure to recognize the cycle.	Chapter 9
665	Search target data does not exist. Execute search after analysis is completed.	—
666	Improper action setting. The saved data type is either Waveform group or Analysis group. This can be assigned from File menu.	Chapter 17
667	Retrievable data not found.	—
668	Failed to update firmware. Either the data file could be inappropriate or damaged.	—
669	Sending E-Mail. Wait until it is completed.	—
670	The corresponding field was not found.	—
671	Cannot be executed when the current probe setting is 100A:1V. Change the probe setting on the channel menu or the Power Analysis Setup menu.	Chapter 1
672	Auto Deskew was canceled because input signals were not detected. Check whether current or differential probe offset adjustments have been executed properly.	Chapter 1
673	Processing math on history. Abort or wait until it is completed, and execute again.	Chapter 15
674	Cannnot store because the data is locked. Release the lock through Store Detail.	Chapter 17
675	Serial bus automatic setting is in progress. Please wait.	Chapter 12
677	Cannot execute the user defined math function during roll mode. After acquisition stop, it will be executed.	3.7*
678	Cannot execute the search function during roll mode.	—
679	The data length that is necessary for FFT is short. Please make Time/div late.	Chapter 1
680	The data length that is necessary for the user defined math function is short. Please lower the order of the MEAN operator or change setting of Filter1(Filter2).	Chapter 6

Code	Message and Corrective Action	Section
681	The data length that is necessary for the harmonics analysis function is short.	—
682	The decode cannot be displayed, because the threshold level is not appropriate.	—
683	Cannot execute the math function, because the display of source is OFF.	Chapter 6
684	It's not available while running.	3.7*
693	Cannot execute, when the output of the print is "Multi".	16.6

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Setting Errors

Code	Message and Corrective Action	Section
800	Improper Date / Time setting.	3.4*
801	Not allowed unless waveforms are shown. Display waveforms.	Chapter 1
802	Source waveforms do not exist. Display source waveforms.	Chapter 3
803	Zone waveforms do not exist.	Chapter 2
804	Illegal expression.	Chapter 6
806	Invalid bit assignment in the logic group.	1.2
807	Unable to enable the trigger conditions. Set the clock source to another group or assign bits to the group.	2.6, 2.8
808	Cannot set this parameter with maximum record length.	—
809	Cannot change the setting of the Math operation, because power analysis is set.	—
810	Cannot set this parameter when A-trigger is not serial bus.	Chapter 2
811	This setting is necessary only in the case of ON display of Zoom1 and Zoom2.	Chapter 10
812	Cannot set this parameter during interleave mode.	—
813	This option is not available.	—
814	The Userdefined Math option is not available.	—
815	The LOGIC input option is not available.	—
816	This function is not supported.	—
817	The ID value cannot be set to 0.	12.4

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System Errors

Code	Message and Corrective Action	Section
900	Failed to backup setup data. Initializing will be executed. The setting data are not saved, because doing the main power supply(rear panel) OFF before doing the power switch (front panel) OFF.	2.3*
901	Fan stopped. Power off immediately. Maintenance service is required.	2.3*
903	Calibration failure. Disconnect the input and execute again. If it fails again, servicing is necessary.	—
904	Invalid Command.	—
905	This error No. is not defined.	—
906	Failed to update firmware. The internal media may be damaged. Maintenance service is required.	—
907	Calibration failure. Set V/div to the highest sensitivity and turn the coarse adjustment trimmer of the current probe so that the signal is within ±2 division from the center of the screen. If the calibration still fails, servicing is required.	Chapter 1
908	There is a problem to a probe power supply. Maintenance service is required.	—
911	There is a problem to a probe power supply. Maintenance service is required.	—
912	Failed to initialize the probe. Check the probe connection. If the probe still fails to be initialized, servicing is required.	
913	Failed to update firmware. Maintenance service is required.	—
914	Fail to update Flash ROM. Maintenance service is required.	—

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21.3 Carrying Out Self-Tests (Self Test)

This section explains the following settings (which are used when testing whether or not the DLM2000's memory, keyboard, and printer are functioning properly):

• Test type
• Test execution

► **"Self-Test (Self Test)" in the Features Guide**

UTILITY Self Test Menu
Press **UTILITY** and then press the **Self Test** soft key to display the following menu.

Set the test type

Setting the Test Type (Type)

Memory: Tests whether or not the internal CPU board RAM and ROM are operating properly. If they are operating properly, "Success" appears. If an error occurred, "Fail" appears.

KeyBoard: Tests whether or not the front panel keys are operating correctly and whether or not the soft keyboard accepts input properly.
   • The front panel keys are operating properly if the background color of the names of the keys that you press turns white or green.
   • Knobs are operating properly if you turn them slowly, press them, or tilt them depending on the type of knob and the background color of the names or arrows changes to white or green.
   • The soft keyboard is operating properly if you can enter the specified characters.

Printer: Tests whether or not the optional built-in printer is operating properly. The built-in printer is operating properly if the print density is correct. The built-in printer does not print properly if an error occurs.

Note

Accuracy is service test item. Under normal circumstances, you do not need to perform these tests.

Executing the Memory Test

Set the test type to Memory

Test the internal memory

Executing the Keyboard Test

Set the test type to KeyBoard

⬇ Test the soft keyboard   **Test the panel keys**
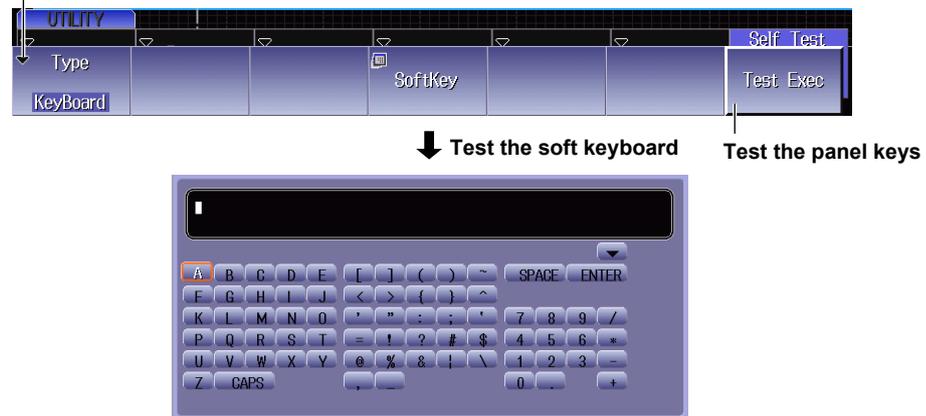
Executing the Printer Test

Set the test type to Printer

Test the printer
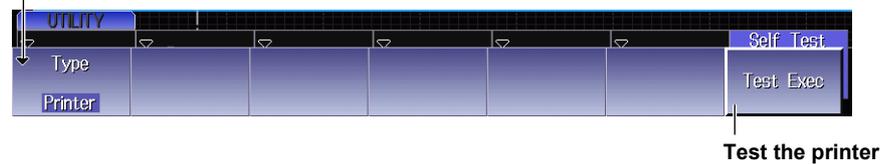
If an Error Occurs during a Self-Test

If an error occurs even after you carry out the following procedure, contact your nearest YOKOGAWA dealer.

- Execute the self-test again several times.
- Confirm whether or not the media being tested is properly inserted.
- Check that the paper is set properly in the built-in printer and that paper is not jammed.

21.4 Viewing System Information (Overview)

This section explains how to view the DLM2000 system information.

UTILITY Overview Menu

Press **UTILITY** and then press the **Overview** soft key to display the following menu.

View system information

Viewing System Information (System Overview)

Press the **System Overview** soft key to display the following screen.

Display Details

Model	Model
Record Length	Record length
Sample Rate	Maximum sample rate
Serial No.	Serial number (Instrument number)
Media Capacity	Total internal memory size
Options	Optional features installed on the DLM2000
Default Language	Default language
Firm Version	Firmware version number
Software Linkage Date	Firmware version date

21.5   Adding Options to the DLM2000

This section explains how to add options after you have purchased the DLM2000.
You can use this additional option license feature on 4-channel DLM2000 models with firmware version 3.00 and later.

► **"Overview (Overview)" in the Features Guide**

License Key

Have a license key ready.

Purchase a license key by contacting your nearest YOKOGAWA dealer. When making a purchase, please indicate the DLM2000 instrument number and the suffix code of the option you want to add.

UTILITY_Overview Menu

Press **UTILITY** and then press the **Overview** soft key to display the following menu.
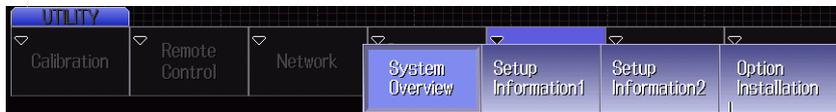
Add an option.

Adding an Option

Press the **Option Installation** soft key to display the following screen.
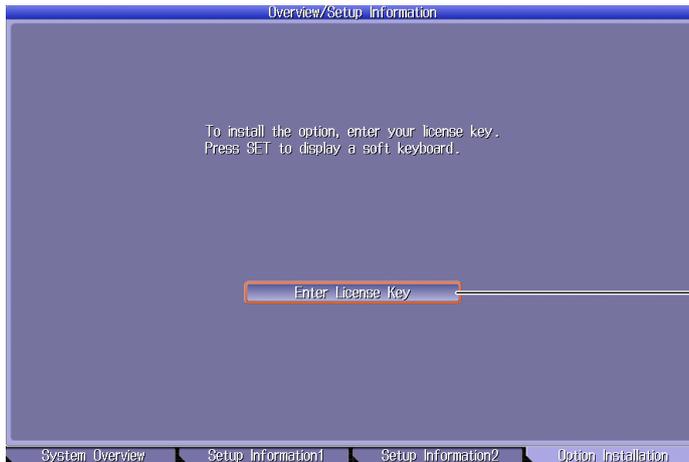
Enter the license key.
1. Press **SET** (⬤) to display a keyboard. Use it to enter the license key.
2. Press the **Enter** soft key. The additional option will be installed.

When the option is installed successfully, the following screen appears.
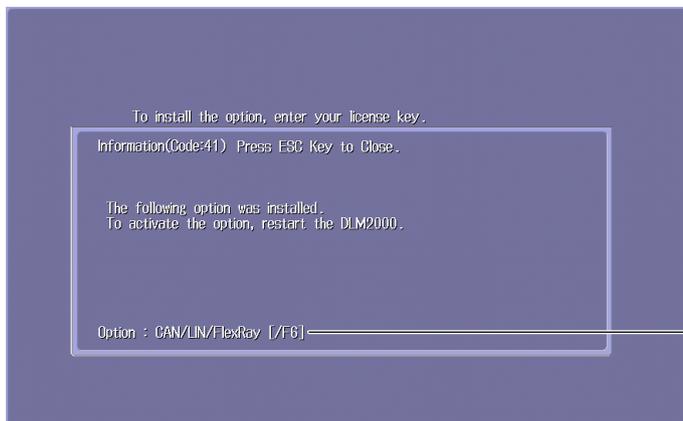
Additional option indication
The installed additional option is displayed.

Restarting

Restart the DLM2000. The additional option will be activated.

Viewing the System Information

To verify that the option has been installed, view the system information on the DLM2000 overview screen. For instructions on how to display the overview screen, see section 21.4.

Note

The SUFFIX (suffix code) inscribed in the name plate on the DLM2000 case indicates the installed options at the time of factory shipment. After you add options through additional option licenses, check the options on the DLM2000 overview screen.

21.6 Formatting Internal Memory

This section explains the following settings (which are used when formatting the DLM2000's internal memory):
- Storage management
- Formatting internal memory

► **"System Configuration (System Configuration)" in the Features Guide**

UTILITY System Configuration Menu

Press **UTILITY** and then press the **System Configuration** soft key to display the following menu.

Open the storage manager
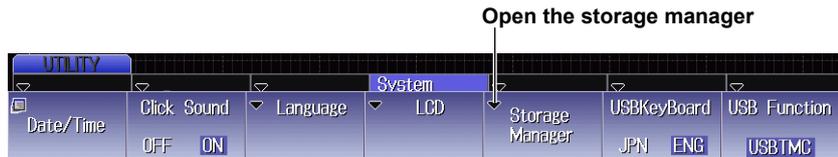
Storage Management (Storage Manager)

Press the **Storage Manager** soft key to display the following menu.

Format internal memory
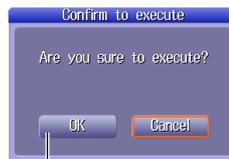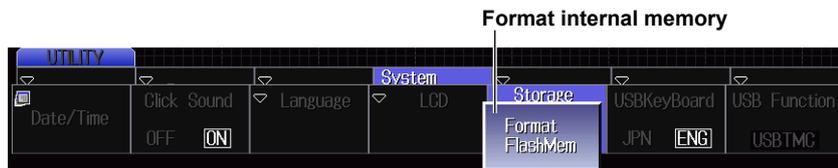
Confirm that you want to format internal memory.

CAUTION

If you format the internal memory, all saved data is erased.

French

ATTENTION

Si vous formatez la mémoire interne, toutes les données enregistrées sont effacées.

21.7 Recommended Part Replacement

The life and replacement period for expendable items varies depending on the conditions of use. Refer to the table below as a general guideline.

For part replacement and purchase, contact your nearest YOKOGAWA dealer.

Parts with Limited Service Life

Part Name	Service Life
Built-in printer	Under normal conditions of use, equivalent of 360 rolls of printer paper (part number: B9988AE)
LCD backlight	Under normal conditions of use, approximately 25,000 hours

Consumable Parts

We recommend replacing them at the following intervals.

Part Name	Recommended Replacement Interval
Cooling fan	3 years
Backup battery (lithium battery)	5 years

Appendix 1 How to Calculate the Area of a Waveform

IntegTY+

Sum of only the positive curve areas: $S_1 + S_2$
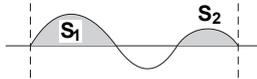
IntegTY

Sum of the positive and negative curve areas: $S_1 + S_3 - S_2$
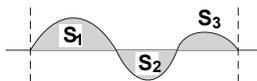
Integ for XY Display

Open

(1) When Each Y Data Point Corresponds to a Single X Data Point
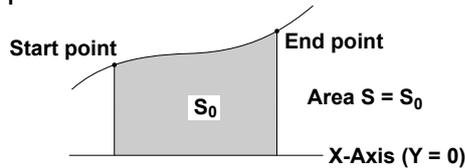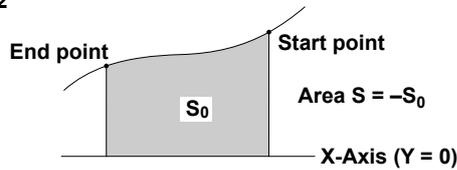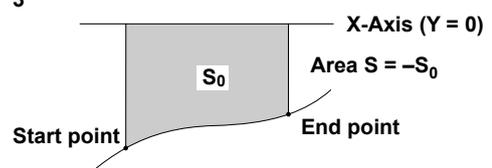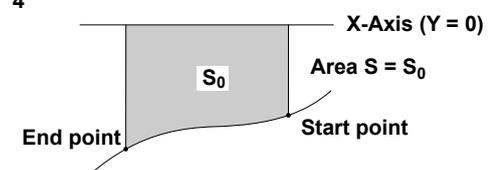
(2) When the Waveform Extends into the Negative Side
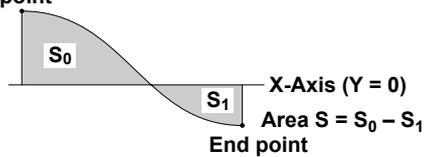
(3) When Multiple Y Data Corresponds to X Data

Close

(1) Multiple Loops

S_0

Area S = n × S_0
n: The number of loops

Start point,
end point

Waveform

(2) Non-Closed Curve

S_0

Area S = S_0
Area enclosed by a curve
connecting the start and
stop points

Start point

End point
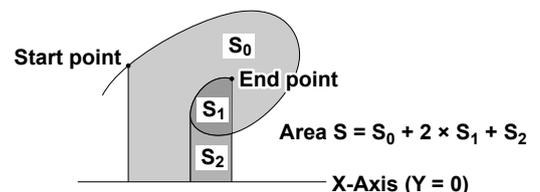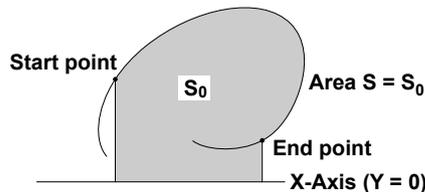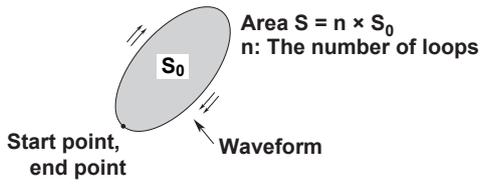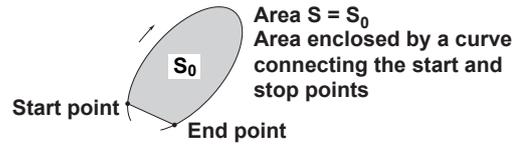
(3) Loop Tracing a Figure-Eight

S_1

S_0

Area S = |S_0 – S_1|

Start point

End point

(4) Loop Tracing a Spiral

S_1

S_0

Start point

Area S = 2 × S_0+ S1
The number of overlaps
varies according to the
number of loops.

End point
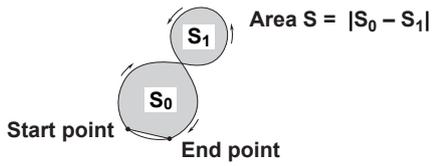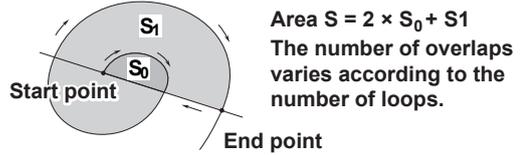
Appendix 2 User-Defined Computation

Digital Filter

Type

Type	Bandwidth
FIR	Lowpass, highpass, or bandpass
IIR	Lowpass, highpass, or bandpass

Filter Order

See the following table for the filter orders.

		2%	5%	10%	20%	30% (Cutoff[*])
FIR	Lowpass	88	36	18	9	8
	Highpass	159	65	33	17	13
IIR	Lowpass	4	4	4	3	2
	Highpass	4	4	4	4	3

* The cutoff percentage is with respect to the sample rate.

Filter Response

Filter	Pass-band Ripple	Attenuation Slope	Attenuation at the Stop-band	Phase
FIR	±0.3 dB	–40 dB at 1 oct (Lowpass),	–40 dB	Linear phase
		–40 dB at –1 oct (Highpass)	—	Linear phase
IIR	0 dB	–5 dB at 1/6 oct (Lowpass),	—	Non-linear phase
		–20 dB at –1 oct (Highpass)	—	Non-linear phase

Examples of Filter Frequency Response

f: Frequency (Hz)

FIR (low pass; 10% cutoff)
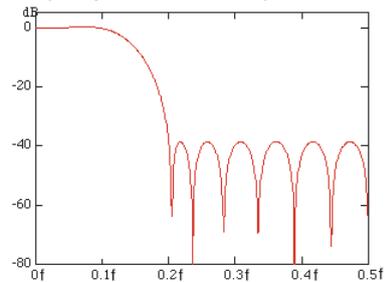
IIR (low pass; 10% cutoff)
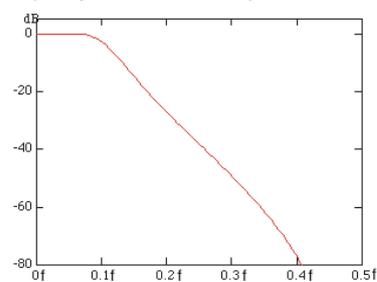
Note

Computations take more time with higher filter orders.

Hilbert Function (HLBT)

Normally, when we analyze real-time signals, it is useful to think of these signals as the real part of functions of complex variables, and to carry out the actual signal analysis using such functions.

If the real-time signal is considered to be the real part of the function, the imaginary part can be determined with the Hilbert transform of the real part.

The Hilbert transform does not change the order of the individual variables. Hilbert transform of a time signal results in another time signal.

The Hilbert transform procedure is as follows.

When a time-domain signal is transformed, the signal is first transformed into the frequency domain through Fourier transform. Next, the phase of each frequency component is shifted by –90 degrees if the frequency is positive and +90 degrees if the frequency is negative. Lastly, taking the inverse Fourier transform completes the Hilbert transform.

Example

• The Hilbert transform can be used to analyze an envelope waveform.
   AM (amplitude modulation):
   SQRT(C1 × C1 + HLBT(C1) × HLBT(C1))
   Demodulation of an FM Signal:
   DIF(PH(C1, HLBT(C1)))

Phase Function (PH)

Phase function PH(X1, Y1) computes $\tan^{-1}(X1/Y1)$.

The phase function takes the phase of the previous point into consideration and continues to sum even when the value exceeds $\pm\pi$ (the ATAN function reflects at $\pm\pi$).

The unit is radians.

$\theta2 = \theta1 + \Delta\theta2$ $\theta2 = \theta1 - \Delta\theta2$
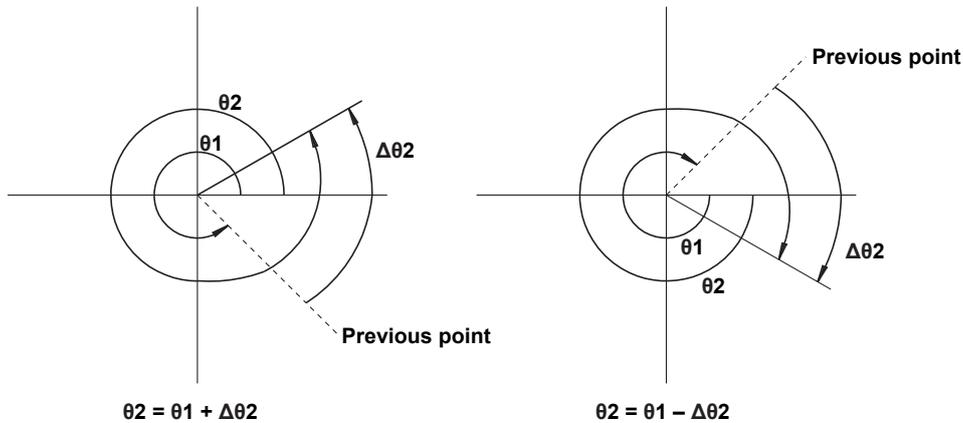
Differentiation and Integration

The computation of the differentiated value uses the 5th order Lagrange interpolation formula to derive a point of data from the five points of data before and after the target point.

The following equations use data f_0 to f_n with respect to sampling time x_0 to x_n. The derivative and integrated values corresponding to these data points are computed as follows:

Differentiation (DIFF)

Point x_k $f_k' = \dfrac{1}{12h}$ $[f_{k-2} - 8f_{k-1} + 8f_{k+1} - f_{k+2}]$

$h = \Delta x$ is the sampling interval (sec) (example: $h = 200 \times 10^{-6}$ at 5 kHz)

Integration (INTEG)

Point x_0 $I_0 = 0$

Point x_1 $I_1 = \dfrac{1}{2}(f_0 + f_1)h$

Point x_2 $I_2 = \dfrac{1}{2}(f_0 + f_1)h + \dfrac{1}{2}(f_1 + f_2)h = I_1 + \dfrac{1}{2}(f_1 + f_2)$

Point x_n $I_n = I_{n-1} + \dfrac{1}{2}(f_{n-1} + f_n)h$

Binary Conversion (BIN)

Performs binary conversion using the specified threshold levels.
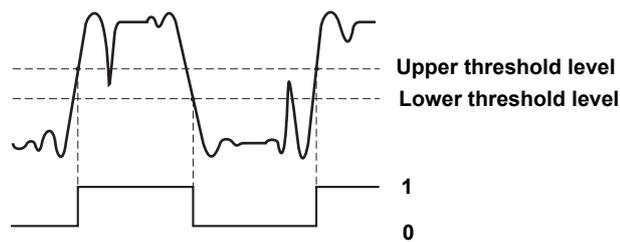
Pulse Width Computation

The signal is converted to binary values by comparing to the preset threshold level, and the time of the pulse width is plotted as the Y-axis value for that interval.

You can set the interval to one of the settings below.

PWHH: From a rising edge to the next rising edge.

PWHL: From a rising edge to the next falling edge.

PWLH: From a falling edge to the next rising edge.

PWLL: From a falling edge to the next falling edge.

PWXX: From a rising or falling edge to the next rising or falling edge.

FV: The inverse of PWHH.

DUTYH: Duty ratio of the high side of each period of the specified waveform.

DUTYL: Duty ratio of the low side of each period of the specified waveform.

Example 1, When the Interval Is Set to PWHH
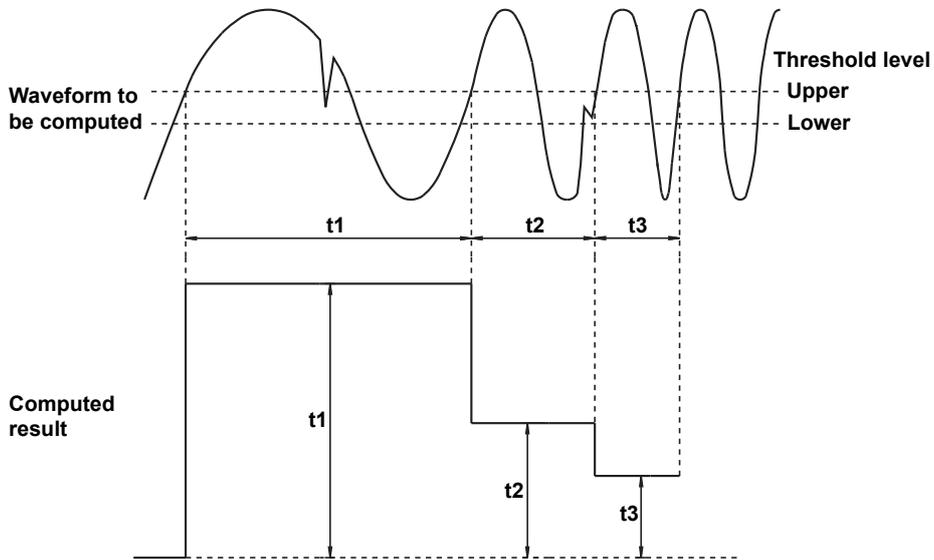
Example 2, When the Interval Is Set to DUTYH
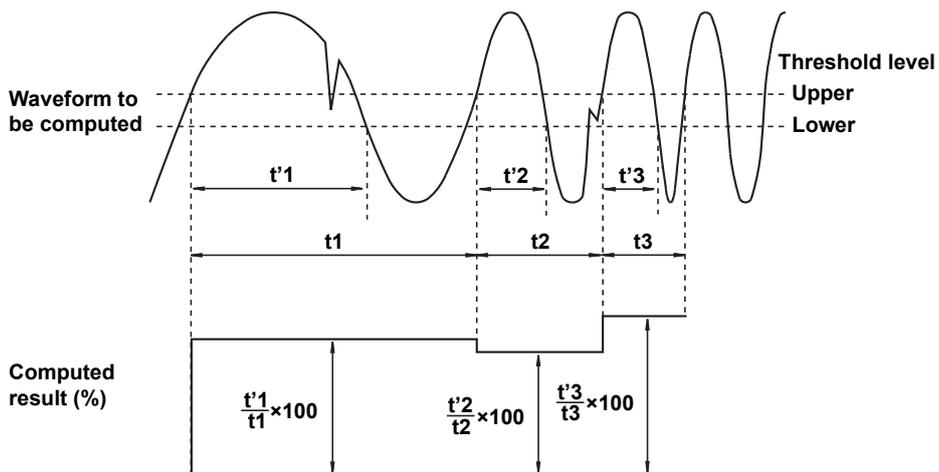
FFT Function

Each frequency component G of a linear spectrum is represented by $G = R + jI$, where R is the real part and I is the imaginary part.

Linear Spectrum

The linear spectrum can be directly determined with the FFT. Through this spectrum, the magnitude and phase of each frequency component included in the measured waveform can be found. The power spectrum and cross spectrum can also be determined from one or two linear spectrums. Because the FFT is a complex function, the linear spectrum produces the real part and imaginary part of the frequency components. The magnitude and phase of the linear spectrum can also be determined from this result.

The DLM2000 can determine the following spectrums.

Item	Equation	Computation
Real part	LS-REAL	R
Imaginary part	LS-IMAG	I
Magnitude	LS-MAG	$\sqrt{(R^2 + I^2)}$
Log magnitude	LS-LOGMAG	$20 \times \log \sqrt{(R^2 + I^2)}$
Phase	LS-PHASE	$\tan^{-1}(I/R)$

Log magnitude reference (0 dB): 1 Vpeak

Rms Value Spectrum

The rms value spectrum expresses the rms value of the magnitude of the linear spectrum. It does not contain phase information. The DLM2000 can determine the following spectrums.

tem	Equation	Computation
Magnitude	RS-MAG	$\sqrt{(R^2 + I^2)/2}$
Log magnitude	RS-LOGMAG	$20 \times \log \sqrt{(R^2 + I^2)/2}$

Log magnitude reference (0 dB): 1 Vrms

Power Spectrum

The power spectrum expresses the power (squared value) of each frequency component included in the measured signal. It is determined by taking the product of the linear spectrum and its complex conjugate. It does not contain phase information.

The DLM2000 can determine the following spectrums.

Item	Equation	Computation	
Magnitude	PS-MAG	DC component	$R^2 + I^2$
		AC component	$(R^2 + I^2)/2$
Log magnitude	PS-LOGMAG	DC component	$10 \times \log(R^2 + I^2)$
		AC component	$10 \times \log \{(R^2 + I^2)/2\}$

Log magnitude reference (0 dB): 1 Vrms^2

Power Spectrum Density

The power spectrum density expresses the power spectrum per unit frequency. It is determined by dividing the power spectrum by the frequency resolution Δf found during the analysis of the power spectrum. The computation varies depending on the window function.

Power spectrum density is used to compare power spectrums analyzed at different frequency bands. However, it is not necessary for signals having a line spectrum such as sine waves.

The DLM2000 can determine the following spectrums.

Item	Equation	Computation	
Magnitude	PSD-MAG	PS-MAG/Δf:	for rectangular windows
		PS-MAG/(1.5Δf):	for Hanning windows
		PS-MAG/(3.19693Δf):	for flat top windows
Log magnitude	PSD-LOGMAG	10 × logPS-MAG/Δf:	for rectangular windows
		10 × logPS-MAG/(1.5Δf):	for Hanning windows
		10 × logPS-MAG/(3.19693Δf):	for flat top windows

Log magnitude reference (0 dB): 1 Vrms^2

Cross Spectrum

The cross spectrum is determined from two signals. It is found by taking the product of the linear spectrum of one signal (Gy) and the complex conjugate (Gx*) of the linear spectrum of the other signal (Gx).

If the linear spectrums of the two signals are represented by

Gx = Rx + jIx
Gy = Ry + jIy

then the cross spectrum Gyx is

Gyx = Gy × Gx*
= (Ry + jIy)(Rx – jIx) = Ryx + jIyx

where Ryx = RyRx + IyIx and Iyx = RxIy – RyIx

The DLM2000 can determine the following spectrums.

Item	Equation	Computation	
Real part	CS-REAL	DC component	Ryx
		AC component	Ryx/2
Imaginary part	CS-IMAG	DC component	Iyx
		AC component	Iyx/2
Magnitude	CS-MAG	DC component	$\sqrt{(Ryx^2 + Iyx^2)}$
		AC component	$\sqrt{(Ryx^2 + Iyx^2)}/2$
Log magnitude	CS-LOGMAG	DC component	$10 \times \log\sqrt{(Ryx^2 + Iyx^2)}$
		AC component	$10 \times \log(\sqrt{(Ryx^2 + Iyx^2)}/2)$
Phase	CS-PHASE		$\tan^{-1}(Iyx/Ryx)$

Transfer Function

The transfer function expresses the frequency response of the input to and the output from the transfer system. The transfer function is determined by the ratio of the output linear spectrum (Gy) and the input spectrum (Gx) at each frequency. Also, as can be seen from the following equation, the transfer function can be defined as the ratio of the cross spectrum of the input and output (Gyx) and the input power spectrum (Gxx).

Transfer function = Gy/Gx = (Gy × Gx*)/(Gx × Gx*) = Gyx/Gxx
= (Ryx + jIyx)/(Rx^2 + Ix^2)

The DLM2000 can determine the following items.

Item	Equation	Computation
Real part	TF-REAL	$Ryx/(Rx^2 + Ix^2)$
Imaginary part	TF-IMAG	$Iyx/(Rx^2 + Ix^2)$
Magnitude	TF-MAG	$\sqrt{(Ryx^2 + Iyx^2)}/(Rx^2 + Ix^2)$
Log magnitude	TF-LOGMAG	$20 \times \log\sqrt{(Ryx^2 + Iyx^2)}/(Rx^2 + Ix^2)$
Phase	TF-PHASE	$\tan^{-1}(Iyx/Ryx)$

The magnitude of the transfer function shows the ratio of the magnitudes of the output linear spectrum and the input linear spectrum while the phase shows the phase difference of the two.

Coherence Function

The coherence function expresses the ratio of the output power generated by the input signal to the transfer system and the total output power.

Coherence function = Gyx × Gyx*/(Gxx × Gyy)

Item	Equation	Computation
Magnitude	CH-MAG	$(Ryx^2 + Iyx^2)/(Gxx × Gyy)$

If the output signal is due entirely to the input signal, the coherence function becomes 1. As the ratio decreases, it falls below 1. Thus, the coherence function always takes on a value between 0 and 1.

Note

On one data acquisition, the coherence function becomes 1 across all frequencies. Make sure to take the frequency average of the computation.

Time Windows

You can select from rectangular, Hanning, or flat top time windows.

The rectangular window is best suited to transient signals, such as impulse waves, which attenuate completely within the time window. The Hanning and flat top windows allow continuity of the signal by gradually attenuating the parts of the signal located near the ends of the time window down to the 0 level. Hence, they are best suited to continuous signals. The Hanning window provides a higher frequency resolution compared to the flat top window. However, the flat top window has a higher level of accuracy. When the waveform being analyzed is a continuous signal, consider the above characteristics in selecting the proper window to be applied.

Rectangular window: $W(t) = u(t) - u(t - T)$ $U(t) :$ **Step function**

Hanning window: $W(t) = 0.5 - 0.5\cos(2\pi\frac{t}{T})$

Flat top window: $W(t) = \{0.54 - 0.46\cos(2\pi\frac{t}{T})\}\dfrac{\sin\{2\pi(1 - 2t/T)\}}{2\pi(1 - 2t/T)}$
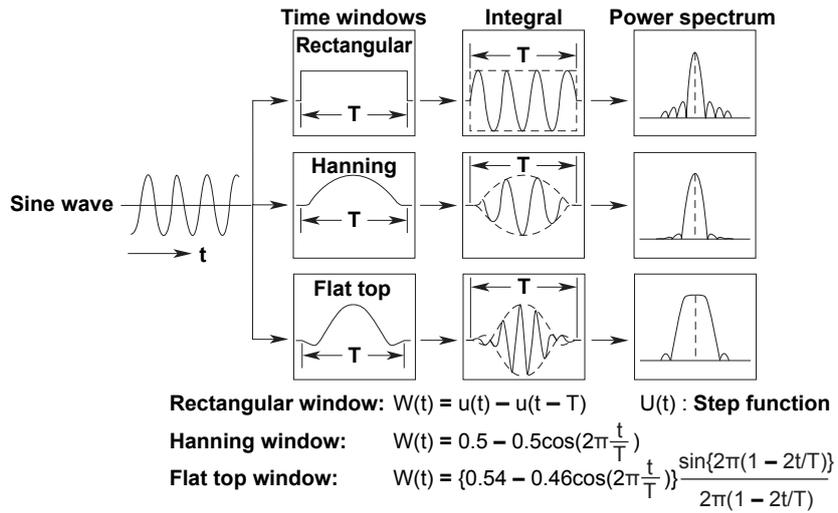
Notes When Executing the FFT Computation

Computation is normally performed on the sampled data in the acquisition memory. However, for waveforms that have been acquired in envelope mode, computation is performed on the maximum and minimum values per acquisition interval.

Appendix 3 ASCII Data File Format

The DLM2000 can save waveform data to ASCII files. The format of such files is given below.

	A	B	C	D	E
1	Header Size	15			
2	Model Name	DLM2000			
3	Comment				
4	BlockNumber	1	1	1	1
5	TraceName	CH1	CH2	CH3	CH4
6	BlockSize	12500	12500	12500	12500
7	VUnit	V	V	V	V
8	SampleRate	6250000	6250000	6250000	6250000
9	HResolution	1.60E−07	1.60E−07	1.60E−07	1.60E−07
10	HOffset	−1.00E−03	−1.00E−03	−1.00E−03	−1.00E−03
11	HUnit	s	s	s	s
12	DisplayBlockSize	12500	12500	12500	12500
13	DisplayPointNo.	1	1	1	1
14	Date	2008/9/25	2008/9/25	2008/9/25	2008/9/25
15	Time	20:52.3	20:52.3	20:52.3	20:52.3
16					
17	**Data**	6.30E−02	−1.00E−01	1.00E−01	1.00E−01
18		7.70E−02	−1.00E−01	1.00E−01	−2.00E−01
19		8.70E−02	0.00E+00	1.00E−01	1.00E−01
20		9.10E−02	−4.00E−01	2.00E−01	0.00E+00
21		9.40E−02	−2.00E−01	0.00E+00	−2.00E−01
22		9.60E−02	0.00E+00	1.00E−01	0.00E+00
		9.70E−02	2.00E−01	1.00E−01	1.00E−01

Header Size	The number of header lines.
Model Name	Name of the instrument (DLM2000).
Comment	Comment attached at the time the data file was saved.
BlockNumber	Block number for this group.
	When the block numbers vary depending on the waveform, this is the maximum block number.
TraceName	Name of each waveform.
BlockSize	The number of data points in one block for each waveform.
VUnit	Each waveform's Y-axis unit (this has no effect on the data).
SampleRate	The sample rate at the time of waveform acquisition.
HResolution	Each waveform's X-axis conversion coefficient, HResolution.
	X-axis value = HResolution × (Data No. – 1) + HOffset
HOffset	Each waveform's X-axis conversion coefficient, HOffset.
	X-axis value = HResolution × (Data No. – 1) + HOffset
HUnit	Each waveform's X-axis unit (this has no effect on the data).
DisplayBlockSize	The length of the data displayed on the screen (the display record length).
DisplayPointNo.	This number shows what point in memory is displayed on the left-most side of the display record length.
Date	Date when waveform acquisition completed.
Time	Time when waveform acquisition completed.

Appendix 4 USB Keyboard Key Assignments

DLM2000	USB Keyboard
ACQUIRE menu	CTRL+A
MATH/REF menu	CTRL+B
Execute PRINT	CTRL+C
DISPLAY menu	CTRL+D
ENHANCED menu	CTRL+E
FILE menu	CTRL+F
ACTION, GO/NO-GO menu	CTRL+G
HISTORY menu	CTRL+H
Execute DEFAULT SETUP	CTRL+I
Execute AUTO SETUP	CTRL+J
ANALYSIS menu	CTRL+K
LOGIC menu	CTRL+L
MEASURE menu	CTRL+M
CURSOR menu	CTRL+N
SEARCH menu	CTRL+O
Set the trigger level to 50%	CTRL+P
Execute CLEAR TRACE	CTRL+Q
Execute RESET	CTRL+R
SHIFT on	CTRL+S
TRIGGER MODE menu	CTRL+T
UTILITY menu	CTRL+U
Set VERTICAL POSITION to 0 div	CTRL+V
EDGE menu	CTRL+W
ZOOM2 menu	CTRL+X
B TRIG menu	CTRL+Y
ZOOM1 menu	CTRL+Z
CH1 menu	CTRL+1
CH2 menu	CTRL+2
CH3 menu	CTRL+3
CH4 menu	CTRL+4
Execute HELP	CTRL+@
Execute SET	CTRL+ENTER
Execute ESC	Esc
FFT menu	CTRL+SHIFT+B
PRINT MENU menu	CTRL+SHIFT+C
Set HORIZONTAL POSITION to 50%	CTRL+SHIFT+P
Switch the SCALE knob between FINE mode and 1-2-5 step mode	CTRL+SHIFT+V
Switch the ZOOM knob between FINE mode and 1-2-5 step mode	CTRL+SHIFT+Z or CTRL+SHIFT+X
Select soft key 1	F1
Select soft key 2	F2
Select soft key 3	F3
Select soft key 4	F4
Select soft key 5	F5
Select soft key 6	F6
Select soft key 7	F7
DELAY setup	F9
Execute SINGLE	F11
Execute RUN/STOP	F12
Execute SNAP SHOT	Pause
Increase the magnification (ZOOM knob)	CTRL+INSERT
Increase the vertical position (⬍ POSITION knob)	CTRL+HOME
Increase the trigger position (◀ POSITION ▶ knob)	CTRL+PAGE UP
Decrease the magnification (ZOOM knob)	CTRL+DELETE
Decrease the vertical position (⬍ POSITION knob)	CTRL+END
Decrease the trigger position (◀ POSITION ▶ knob)	CTRL+PAGE DOWN
Move ⬤ right	CTRL+RIGHT
Move ⬤ left	CTRL+LEFT
Move ⬤ down	CTRL+DOWN
Move ⬤ up	CTRL+UP

DLM2000	USB Keyboard
Increase the trigger level	INSERT
Decrease the trigger level	DELETE
Increase the vertical scale (SCALE knob)	HOME
Decrease the vertical scale (SCALE knob)	END
Increase the time axis setting (TIME/DIV knob)	PAGE UP
Decrease the time axis setting (TIME/DIV knob)	PAGE DOWN

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