

DLM4000 Series Mixed Signal Oscilloscope

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

Thank you for purchasing the DLM4000 Series Mixed Signal Oscilloscope. This User's Manual explains how to use the DLM4000. 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 that a question arises.

List of Manuals

The following manuals, including this one, are provided as manuals for the DLM4000 series. Please read all manuals.

Manual Title	Manual No.	Description
DLM4000 Series Mixed Signal Oscilloscope Features Guide	IM DLM4038-01EN	The manual explains all the DLM4000 features other than the communication interface features. (included in the accompanying manual CD)
DLM4000 Series Mixed Signal Oscilloscope User's Manual	IM DLM4038-02EN	This manual. The manual explains how to operate the DLM4000. (included in the accompanying manual CD)
DLM4000 Series Mixed Signal Oscilloscope Getting Started Guide	IM DLM4038-03EN	Provided as a printed manual. This guide explains the handling precautions, basic operations, and specifications of the DLM4000. (included in the accompanying manual CD)
DLM4000 Series Mixed Signal Oscilloscope Communication Interface User's Manual	IM DLM4038-17EN	The manual explains the DLM4000 communication interface features and instructions on how to use them. (included in the accompanying manual CD)
Model DLM4038, DLM4058 Mixed Signal Oscilloscope	IM DLM4038-92Z1	Document for China

The "EN" and "Z1" in the manual numbers are the language codes.

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 2012
- 2nd Edition: June 2013
- 3rd Edition: February 2015
- 4th Edition: May 2015
- 5th Edition: January 2016
- 6th Edition: October 2016
- 7th Edition: October 2017
- 8th Edition: July 2018

Conventions Used in This Manual

Notes

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 user's 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 the proper operation of the software.

Unit

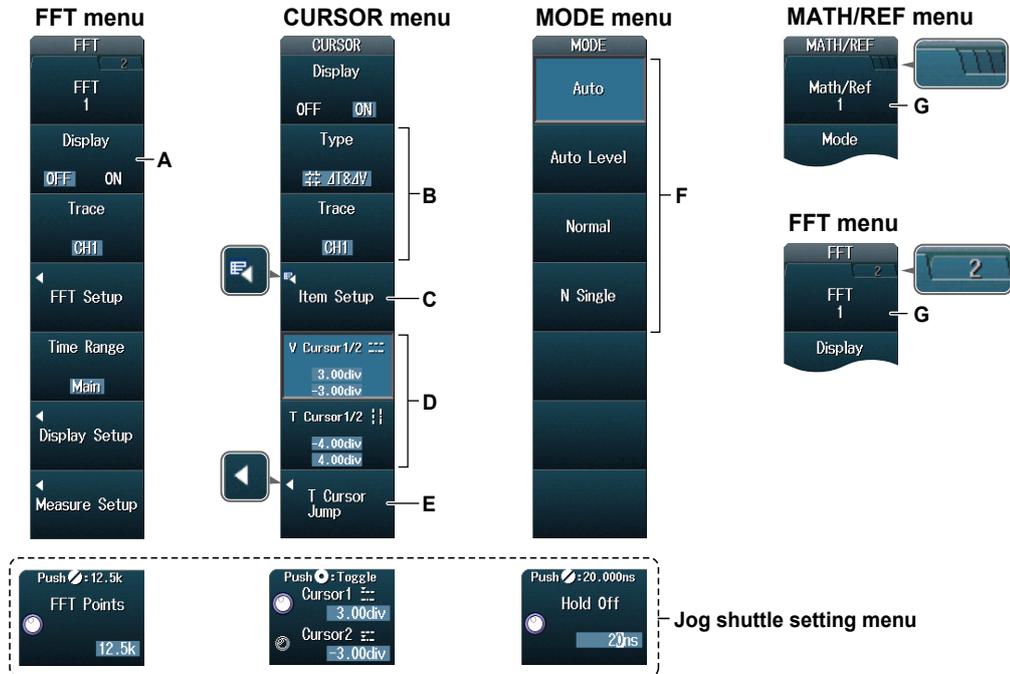
k	Denotes 1000. Example: 100 kS/s (sample rate)
K	Denotes 1024. Example: 720 KB (file size)

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.



- A: The selection switches each time you press the soft key.
- B: A selection menu appears when you press the soft key.
Press the soft key that corresponds to the appropriate setting.
- C: A dialog box or the keyboard appears when you press the soft key.
Use the jog shuttle and the SET key (●) to configure the settings.
- D: Pressing the soft key selects the item that you can control using the jog shuttle. The jog shuttle setup menu, which appears at the bottom end of the setup menu, shows the selected item.
- E: A related setup menu appears when you press the soft key.
- F: Pressing a soft key selects the corresponding option in the soft key menu.
- G: Selects which item to configure when configuring a feature that consists of multiple items that operate with different settings, such as the Math1 to Math4 and FFT1 and FFT2 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.	Nothing changes from this point.
	From this point, the display position of measured values switches between outside the waveform area and inside the area each time you press ESC.	

RESET Key (⊘) Operation

If you press RESET when you are using the jog shuttle to set a value or select an item, the setting is reset to its default value (depending on the operating state of the DLM4000, the setting may not be reset).



SET Key (⊙) Operations

The operation varies as indicated below depending on what you are setting.

- **When There Are Two Values to Set in the Jog Shuttle Setup Menu**

The setting that the jog shuttle sets switches each time you press the SET key.

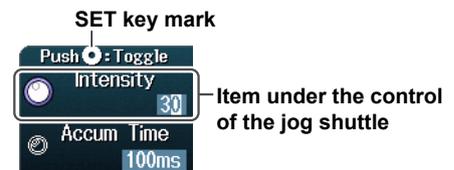
- **When the Jog Shuttle and SET Key Marks (⊙+⊙) Are Displayed in the Setup Menu**
Press SET to confirm the selected item.

- **When You Are Setting a Value**

Moving the SET key up or down increases or decreases the value.
Moving the SET key to the left and right changes which digit to set.

- **When Selecting the Item to Set**

Moving the SET key up, down, left, and right moves the cursor.



How to Enter Values in Setup Dialog Boxes

1. Use the keys to display the appropriate setup dialog box.
2. Turn the **jog shuttle**, or move the **SET** key (●) up, down, left, or right to move the cursor to the appropriate item.
3. Press the **SET** key (●). The operation varies depending on the selected item.

How to Clear Setup Dialog Boxes

Press **ESC** to clear the setup dialog box from the screen.

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 right 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

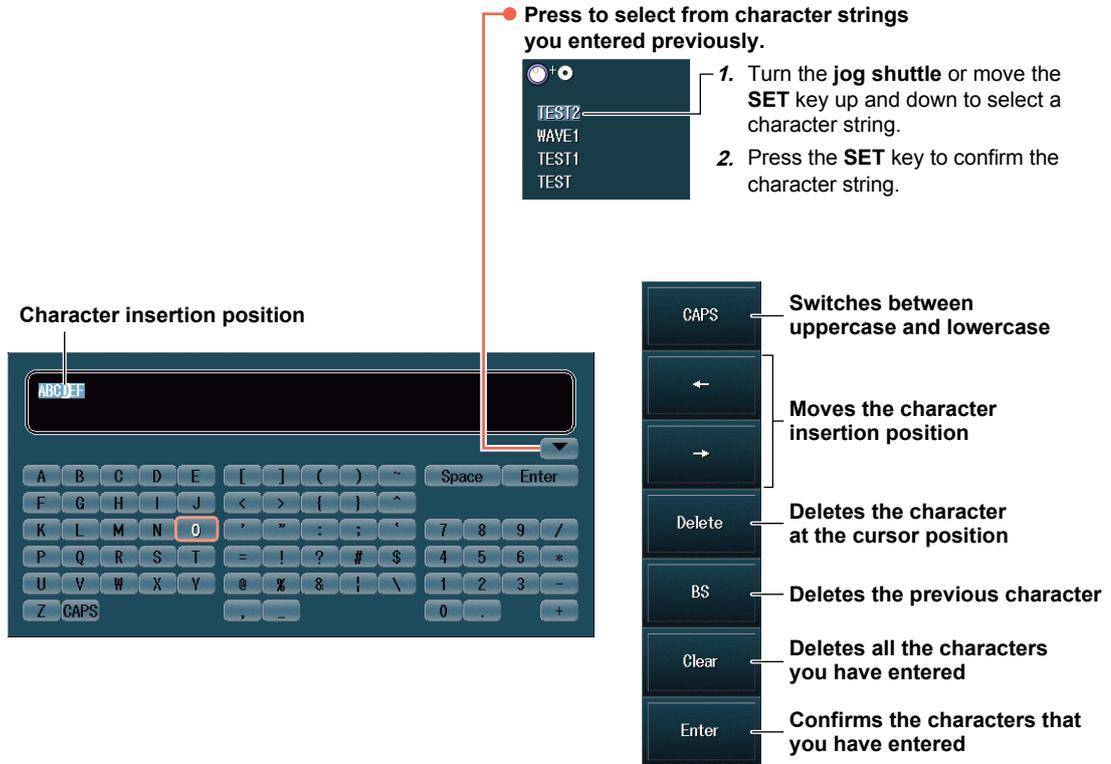
Select the appropriate item using the soft keys, and change the value using the jog shuttle and the SET key. This manual sometimes describes this operation simply as “using the jog shuttle.”

Note

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

Entering Character Strings

Use the keyboard that appears on the screen to enter character strings such as file names and comments. Use the jog shuttle and the SET key to operate the keyboard and enter a character string.



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 has already been 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 **Delete** soft key to delete the character at the cursor.
 - 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 **SET** to enter the selected character string.
4. Press the **Enter** soft key, or move the cursor to Enter on the keyboard, and press **SET** 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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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

- Turning the waveform display on and off
- Input coupling
- Probe
- Turning the inverted waveform display on and off
- Linear scaling
- Label display
- Bandwidth limit
- Offset

UTILITY Preference menu

- Turning offset cancelling on and off

SCALE knob

- Vertical scale

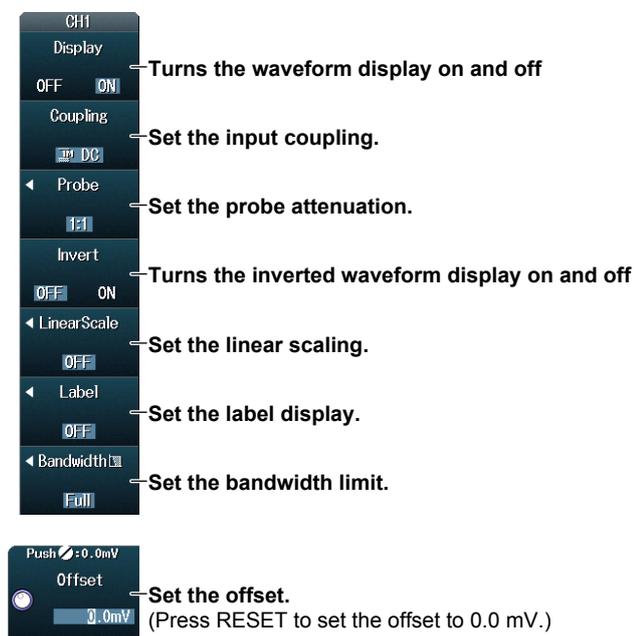
◆ POSITION knob

- Vertical position

► [“Vertical Axis \(Analog Signal\)” in the Features Guide](#)

CH Menu

Press a key from **CH1** to **CH8** to display the following menu.



Note

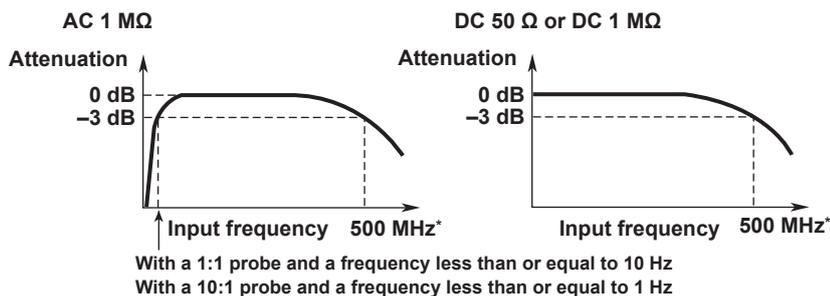
- Channel keys (from CH1 to CH8) whose waveforms are displayed are illuminated. You can press channel keys that are not illuminated to turn their waveform displays on. You can press channel keys that are illuminated turn their waveform displays off.
- When interleave mode (see section 3.1 for details) is on, you cannot display the waveforms for CH2, CH4, CH6, or CH8.

Setting the Input Coupling (Coupling)

- AC: Displays the waveform produced from only the AC component of the input signal through 1 M Ω .
- DC: Displays the waveform produced from both the DC and AC components of the input signal through 1 M Ω .
- DC50: Displays the waveform produced from both the DC and AC components of the input signal through 50 M Ω .
- GND: Displays the ground level.

Input Coupling Settings and Frequency Response

The frequency responses when the DLM4000 is set to AC, DC, or DC50 are shown below. Please note that when set to AC, the DLM4000 does not acquire low frequency signals or low frequency components, as seen in the following figure.



* The high-frequency -3 dB point differs according to the model and the voltage scale settings.



CAUTION

- The maximum input voltage for 1 M Ω 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 a 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

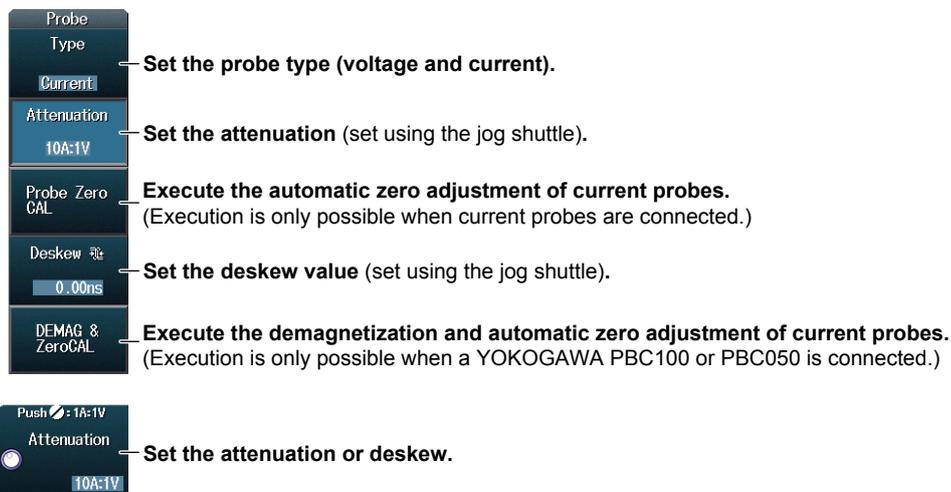


ATTENTION

- La tension d'entrée maximale pour une entrée de 1 M Ω 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 appliquez 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.



The screenshot shows the 'Probe' menu with the following options and annotations:

- Type**: **Current** — Set the probe type (voltage and current).
- Attenuation**: **10A:1V** — Set the attenuation (set using the jog shuttle).
- Probe Zero CAL** — Execute the automatic zero adjustment of current probes. (Execution is only possible when current probes are connected.)
- Deskew**: **0.00ns** — Set the deskew value (set using the jog shuttle).
- DEMAG & ZeroCAL** — Execute the demagnetization and automatic zero adjustment of current probes. (Execution is only possible when a YOKOGAWA PBC100 or PBC050 is connected.)

Below the main menu is a sub-menu for 'Attenuation' with the following options:

- Push**: **1A:1V** — Set the attenuation or deskew.
- Attenuation**: **10A:1V**

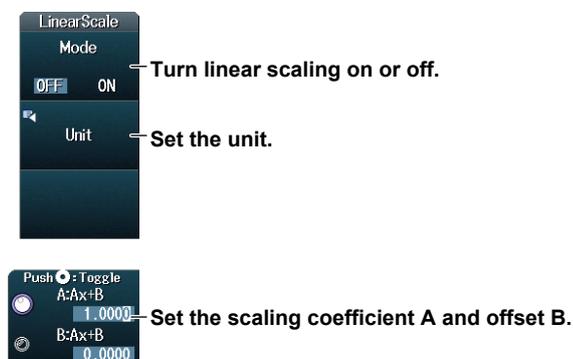
Note

When a current probe with a YOKOGAWA probe interface (such as a the PBC100 or PBC050 probe) is connected to the DLM4000, you can execute demagnetization and automatic zero adjustment from the DLM4000.

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.



The screenshot shows the 'LinearScale' menu with the following options and annotations:

- Mode**: **OFF** **ON** — Turn linear scaling on or off.
- Unit** — Set the unit.

Below the main menu is a sub-menu for 'Toggle' with the following options:

- Push**: **Toggle** — Set the scaling coefficient A and offset B.
- A:Ax+B**: **1.0000**
- B:Ax+B**: **0.0000**

Setting the Label Display (Label)

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



The screenshot shows the 'Label' menu with the following options and annotations:

- Display**: **OFF** **ON** — Turns labels on and off
- Name**: **CH1** — Set the label.

1.1 Setting the Vertical Axis for Analog Signals

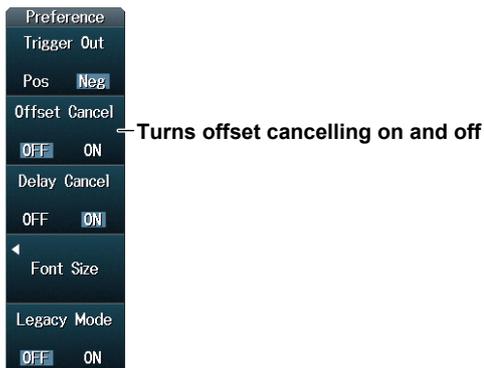
Setting the Bandwidth (Bandwidth)

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



UTILITY Preference Menu

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



Turning Offset Cancelling 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 a key from **CH1** to **CH8** 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 \blacklozenge POSITION knobs illuminates in the color assigned to the selected channel (the color around the CH key).
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.

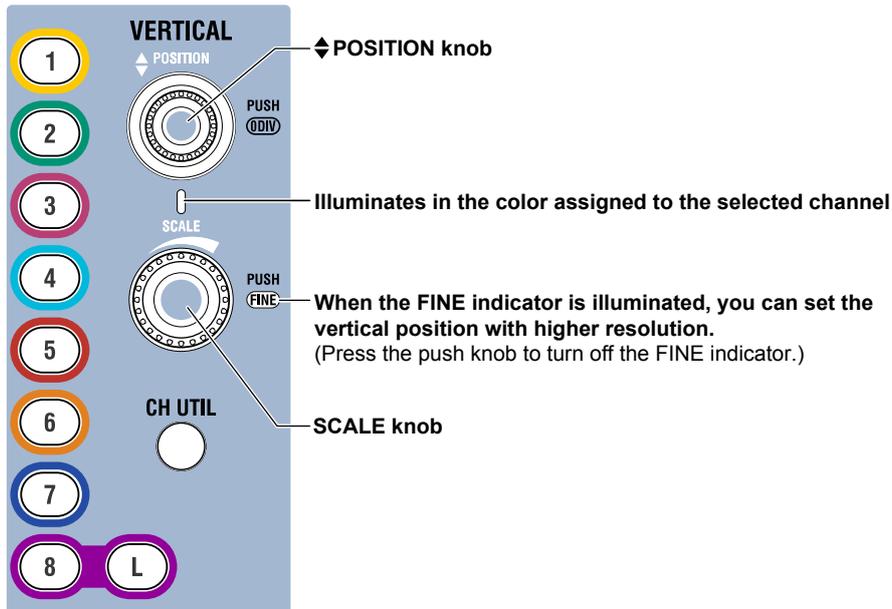
Displays the vertical scale and input impedance for each channel



Setting the Waveform Vertical Position (◆ POSITION knob)

1. Press a key from **CH1** to **CH8** 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 (the color around the CH key).
2. Turn the ◆ **POSITION** knob to set the vertical position.

Push the ◆ **POSITION** knob to set the vertical position to 0.00 div.



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 8-bit LOGIC(L)

This section explains the following settings (which are related to the vertical axis for LOGIC(L) signals).

LOGIC(L) menu

- Turning the LOGIC(L) display on and off
- Turning the display on and off and setting the label, threshold level, and noise rejection for each bit
- Turning the bus display on and off and setting the bus bit assignments, labels, and format
- Turning the state display on and off and setting the clock source; clock source polarity, detection level, and hysteresis; and the state assignment
- Bit and bus display order
- Deskewing

SCALE knob

- Display size

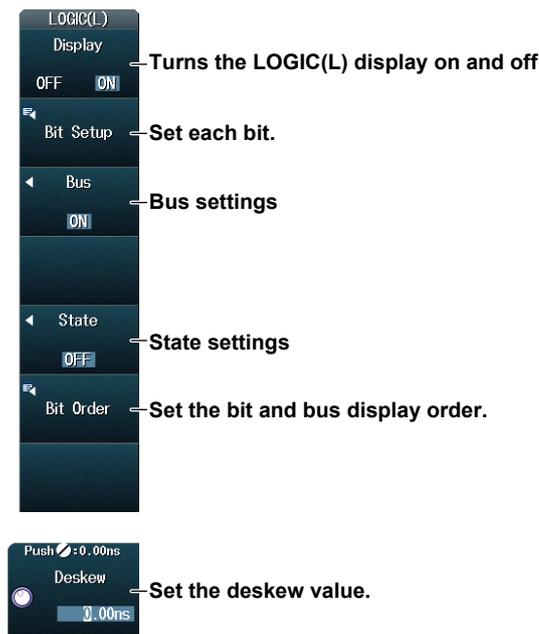
◆ POSITION knob

- Vertical position

► [“Vertical Axis \(Logic Signal\)” in the Features Guide](#)

LOGIC(L) Menu

Press L to display the following menu.



Note

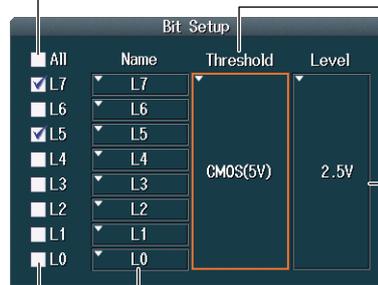
- If you press the L key when it is not illuminated, the key illuminates, and the LOGIC(L) display turns on. Logic signal waveforms are displayed in the CH8 waveform display area.
- If you press the L key when it is illuminated, the key turns off, and the LOGIC(L) display turns off.

Bit Settings (Bit Setup)

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

For Logic Probes Other Than the 701989

Turns the display on or off for all bits



Set the threshold level preset (CMOS(5 V), CMOS(3.3 V), CMOS(2.5 V), CMOS(1.8 V), ECL, Userdef).
Selecting a preset automatically sets the threshold level.

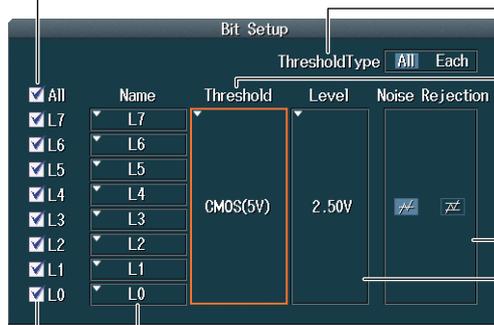
Set the threshold level.
If you change the automatically specified value, the preset setting changes to "Userdef."

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

For the 701989 Logic Probe

- When the Threshold Type is All

Turns the display on or off for all bits



The threshold type is set to All.

Set the threshold level preset (CMOS(5 V), CMOS(3.3 V), CMOS(2.5 V), CMOS(1.8 V), ECL, Userdef).
Selecting a preset automatically sets the threshold level.

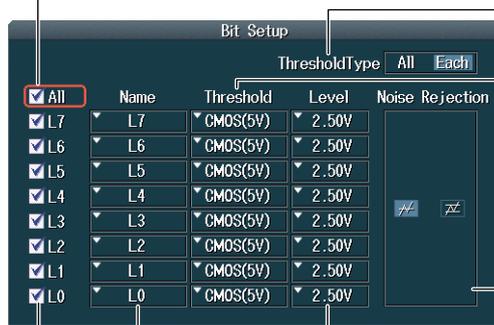
Set the noise rejection (\overline{A} , \overline{Z}).

Set the threshold level.
If you change the automatically specified value, the preset setting changes to "Userdef."

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

- When the Threshold Type is Each

Turns the display on or off for all bits



The threshold type is set to Each.

Set the threshold level preset (CMOS(5 V), CMOS(3.3 V), CMOS(2.5 V), CMOS(1.8 V), ECL, Userdef).

- Selecting a preset automatically sets the threshold level.
- When the threshold type is Each, set the threshold level for each bit.

Set the noise rejection (\overline{A} , \overline{Z}).

Set the threshold level.

- When the threshold type is Each, set the threshold level for each bit.
- If you change the automatically specified value, the preset setting changes to "Userdef."

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

Note

For logic probes other than the 701989, the threshold type is All and the ThresholdType setting does not appear.

1.2 Setting the Vertical Axis for 8-bit LOGIC(L)

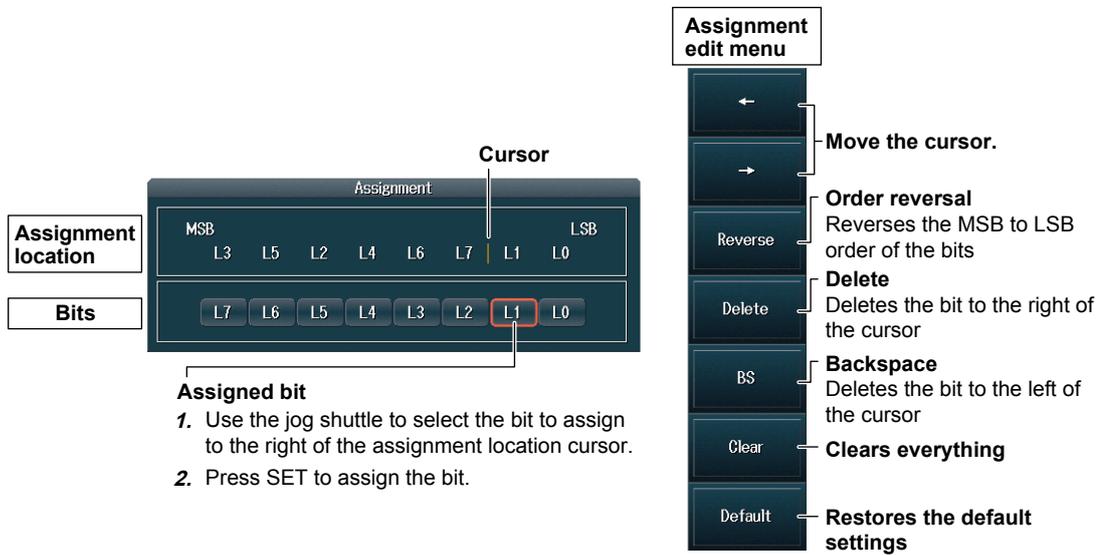
Bus Settings (Bus)

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



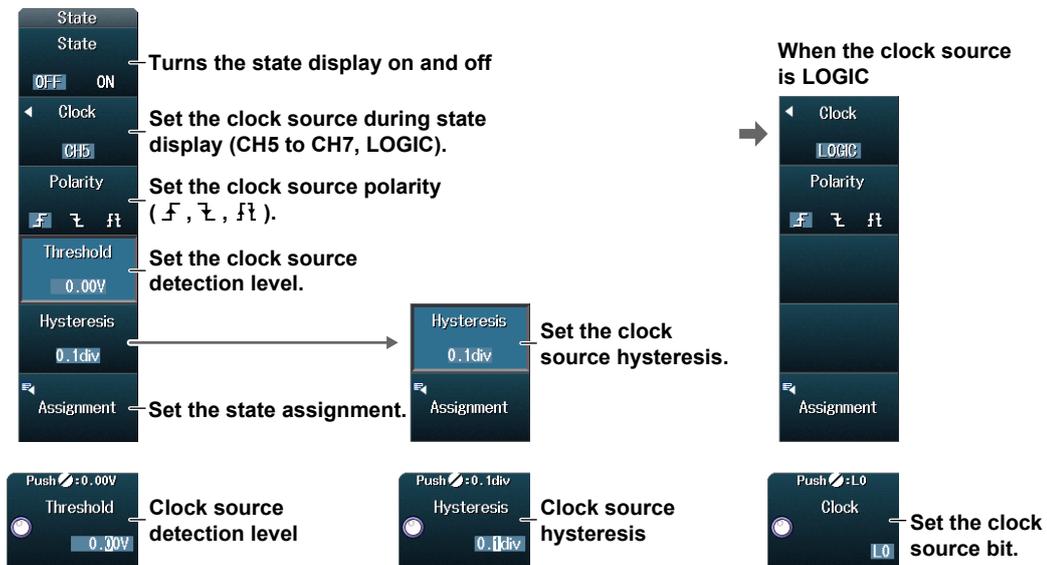
Bus Bit Assignments

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



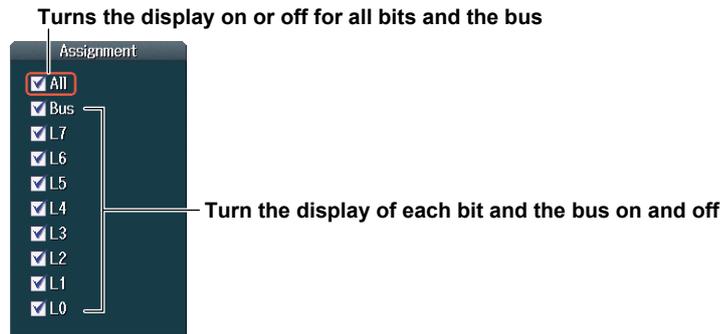
State Settings (State)

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



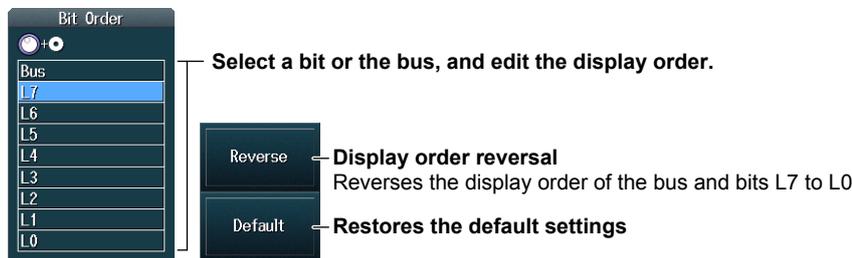
State Assignment

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



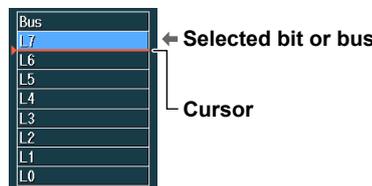
Setting the Display Order of Bits and the Bus (Bit Order)

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

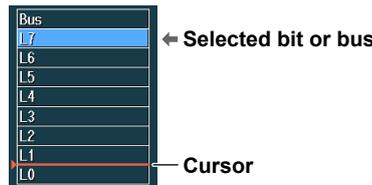


1. Turn the **jog shuttle** or move the **SET** key up and down to select the bit or bus to move. The selected bit or bus cell is highlighted.

2. Press **SET**. The selected bit or bus is confirmed as the bit or bus that will be moved, and a cursor is displayed below the cell of the selected bit or bus.



3. Turn the **jog shuttle** or move the **SET** key up and down to move the cursor to the place where you want to move the bit or bus.



4. Press **SET**. The selected bit or bus is moved to the cursor position.



The change affects the bit and bus display order along the vertical axis of the screen.

Deskew (Deskew)

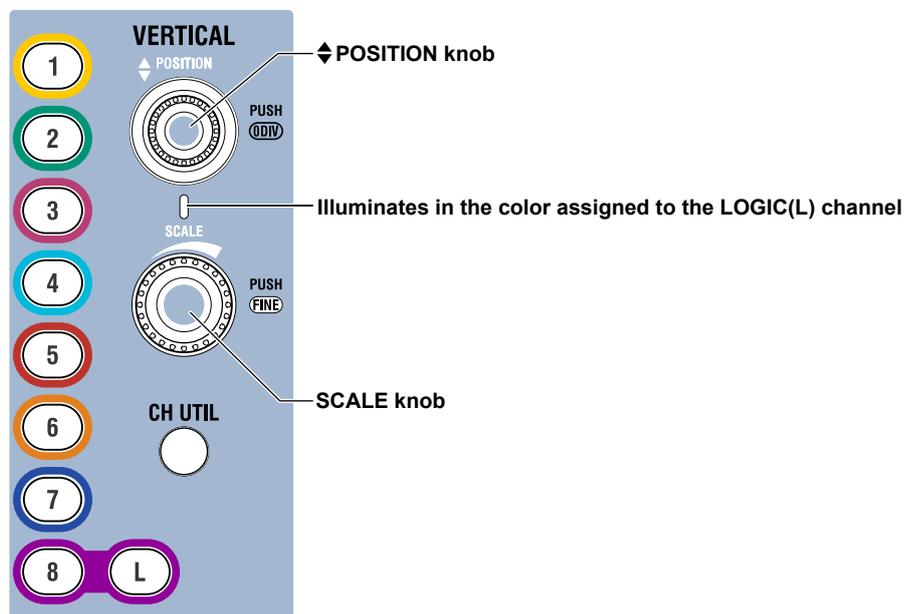
Set the adjustment values for the time offsets (skew) between the logic signal and other signals, which are caused by the use of different types of probes. Deskewing is performed on all eight bits collectively.

Setting the Display Size (SCALE)

1. Press **L**. The **SCALE** knob now controls the LOGIC(L) channel scale.
 - The L key illuminates brightly.
 - The LED between the **SCALE** and **POSITION** knobs illuminates in the color assigned to the LOGIC(L) channel (the color around the L key).
2. Turn the **SCALE** knob to set the display size.

Setting the Vertical Position (POSITION knob)

1. Press **L**. The **POSITION** knob now controls the LOGIC(L) setting.
 - The L key illuminates brightly.
 - The LED between the **SCALE** and **POSITION** knobs illuminates in the color assigned to the LOGIC(L) channel (the color around the L key).
2. Turn the **POSITION** knob to set the vertical position.



1.3 Setting the Vertical Axis for 16-bit LOGIC(A|B) (Option)

This section explains the following settings (which are related to the vertical axis for LOGIC(A|B) signals).

LOGIC(A|B) menu

- Turning the LOGIC(A|B) display on and off
- Turning the display on and off and setting the label, threshold level, and noise rejection for each bit
- Turning the Bus2 and Bus3 displays on and off and setting the bus bit assignments, labels, and format
- Turning the state display on and off and setting the clock source; clock source polarity, detection level, and hysteresis; and the state assignment
- Bit and bus display order
- Deskewing

SCALE knob

- Display size

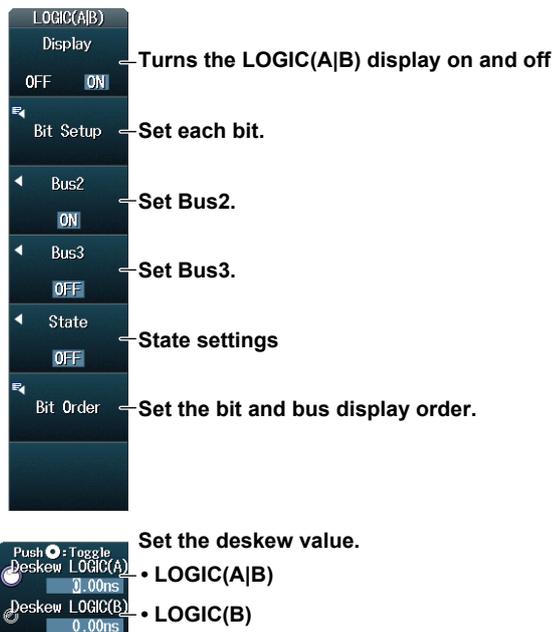
◆ POSITION knob

- Vertical position

► [“Vertical Axis \(Logic Signal\)” in the Features Guide](#)

LOGIC(A|B) Menu

Press A|B to display the following menu.



Note

- If you press the A|B key when it is not illuminated, the key illuminates, and the LOGIC(A|B) display turns on.
- If you press the A|B key when it is illuminated, the key turns off, and the LOGIC(A|B) display turns off.

1.3 Setting the Vertical Axis for 16-bit LOGIC(A|B) (Option)

Bit Settings (Bit Setup)

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

The following procedural examples use the configuration screen for when the logic probes connected to the LOGIC(A) and LOGIC(B) ports are not 701989 and that for when the logic probes are 701989. If different logic probes are connected to the LOGIC(A) and LOGIC(B) ports, the configuration screen will display a combination of each probe's settings.

When the Logic Probes Connected to A and B Are Not 701989

Turn the display on or off for B0 to B7 collectively.

Turn the display on or off for each bit.

Turn the display on or off for A0 to A7 collectively.

Turn the display on or off for each bit.

	Name	Threshold	Level
<input type="checkbox"/>	All		
<input checked="" type="checkbox"/>	B7	CMOS(5V)	2.5V
<input type="checkbox"/>	B6		
<input checked="" type="checkbox"/>	B5		
<input type="checkbox"/>	B4		
<input type="checkbox"/>	B3		
<input type="checkbox"/>	B2		
<input type="checkbox"/>	B1		
<input type="checkbox"/>	B0		
<input checked="" type="checkbox"/>	All	CMOS(5V)	2.5V
<input checked="" type="checkbox"/>	A7		
<input checked="" type="checkbox"/>	A6		
<input checked="" type="checkbox"/>	A5		
<input checked="" type="checkbox"/>	A4		
<input checked="" type="checkbox"/>	A3		
<input checked="" type="checkbox"/>	A2		
<input checked="" type="checkbox"/>	A1		
<input checked="" type="checkbox"/>	A0		

Set the label for each bit.

Set the threshold level.
If you change the automatically specified value, the preset setting changes to "Userdef."

Set the threshold level preset (CMOS(5 V), CMOS(3.3 V), CMOS(2.5 V), CMOS(1.8 V), ECL, Userdef).
Selecting a preset automatically sets the threshold level.

Note

For logic probes other than the 701989, the threshold type is All and the ThresholdType setting does not appear.

When the Logic Probes Connected to A and B Are 701989

- When the Threshold Type is All

Turn the display on or off for B0 to B7 collectively.

Turn the display on or off for each bit.

Turn the display on or off for A0 to A7 collectively.

Turn the display on or off for each bit.

Set the label for each bit.

Set the threshold level. If you change the automatically specified value, the preset setting changes to "Userdef."

Set the threshold level preset (CMOS(5 V), CMOS(3.3 V), CMOS(2.5 V), CMOS(1.8 V), ECL, Userdef). Selecting a preset automatically sets the threshold level.

Set the noise rejection (A, Z).

Set the threshold type of B0 to B7 to All.

Set the threshold type of A0 to A7 to All.

- When the Threshold Type is Each

Turn the display on or off for B0 to B7 collectively.

Turn the display on or off for each bit.

Turn the display on or off for A0 to A7 collectively.

Turn the display on or off for each bit.

Set the label for each bit.

Set the threshold level. If you change the automatically specified value, the preset setting changes to "Userdef."

Set the threshold level preset (CMOS(5 V), CMOS(3.3 V), CMOS(2.5 V), CMOS(1.8 V), ECL, Userdef). Selecting a preset automatically sets the threshold level.

Set the noise rejection (A, Z).

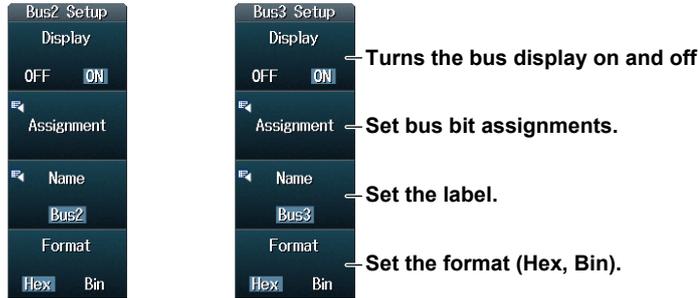
Set the threshold type of B0 to B7 to Each.

Set the threshold type of A0 to A7 to Each.

1.3 Setting the Vertical Axis for 16-bit LOGIC(A|B) (Option)

Bus2 and Bus3 Settings (Bus2, Bus3)

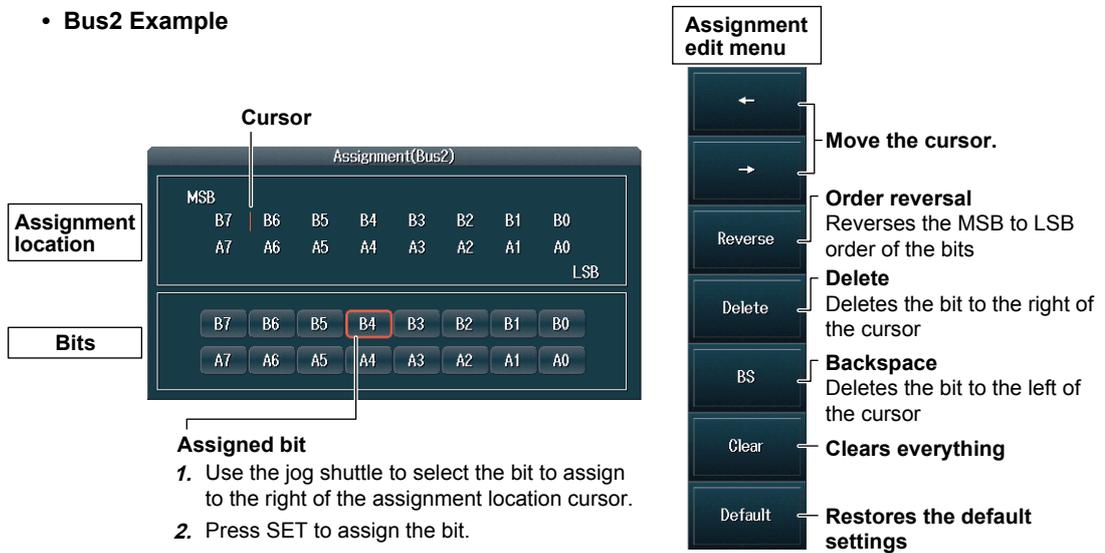
Press the **Bus2** or **Bus3** soft key to display the following menu.



Bus Bit Assignments

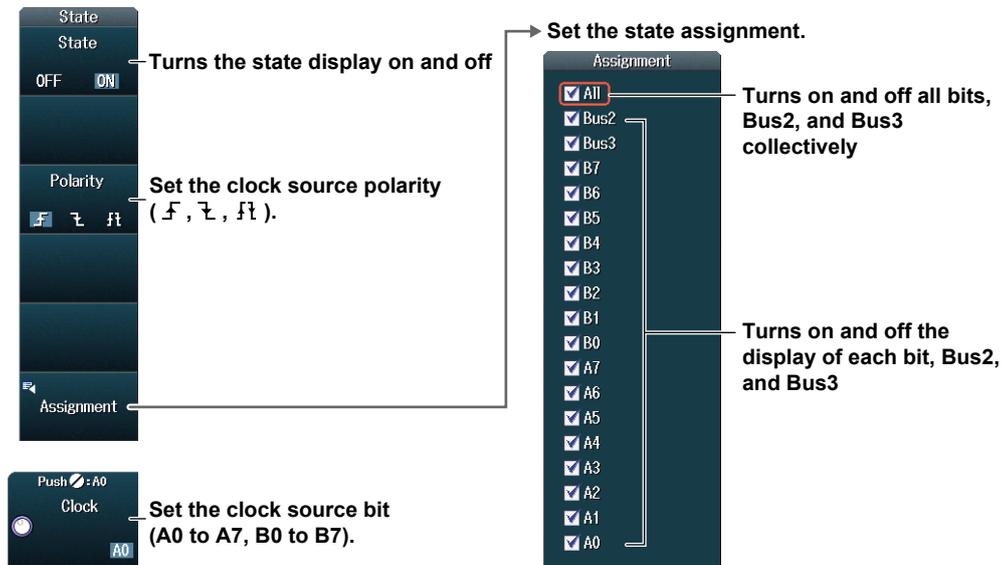
Press the **Assignment** soft key to display the following screen.

• Bus2 Example



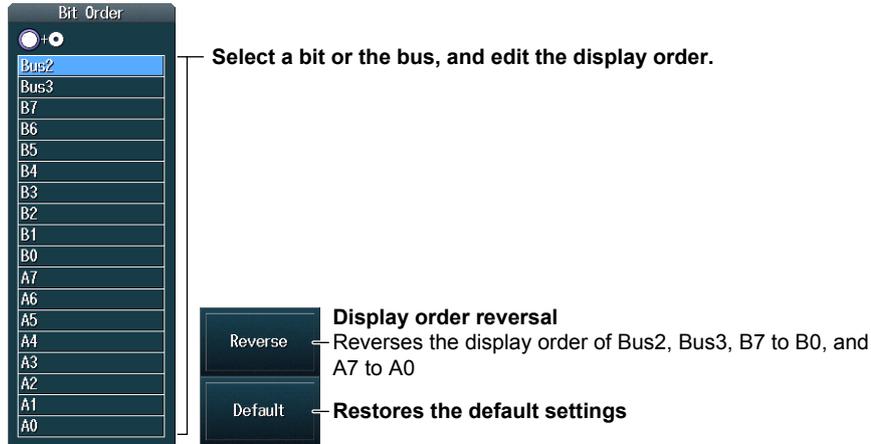
State Settings (State)

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



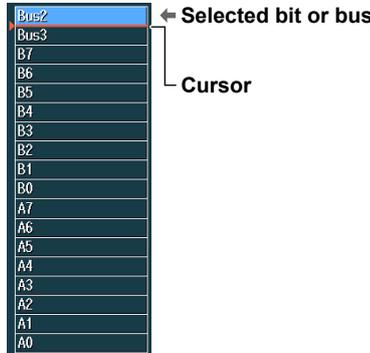
Setting the Display Order of Bits and the Bus (Bit Order)

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

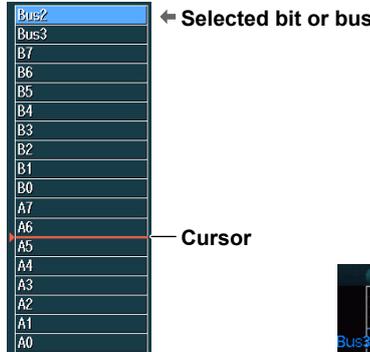


1. Turn the **jog shuttle** or move the **SET** key up and down to select the bit or bus to move. The selected bit or bus cell is highlighted.

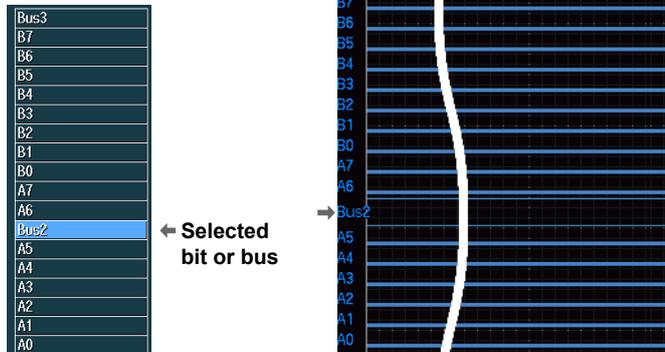
2. Press **SET**.
The selected bit or bus is confirmed as the bit or bus that will be moved, and a cursor is displayed below the cell of the selected bit or bus.



3. Turn the **jog shuttle** or move the **SET** key up and down to move the cursor to the place where you want to move the bit or bus.



4. Press **SET**.
The selected bit or bus is moved to the cursor position.



The change affects the bit and bus display order along the vertical axis of the screen.

1.3 Setting the Vertical Axis for 16-bit LOGIC(A|B) (Option)

Deskew (Deskew)

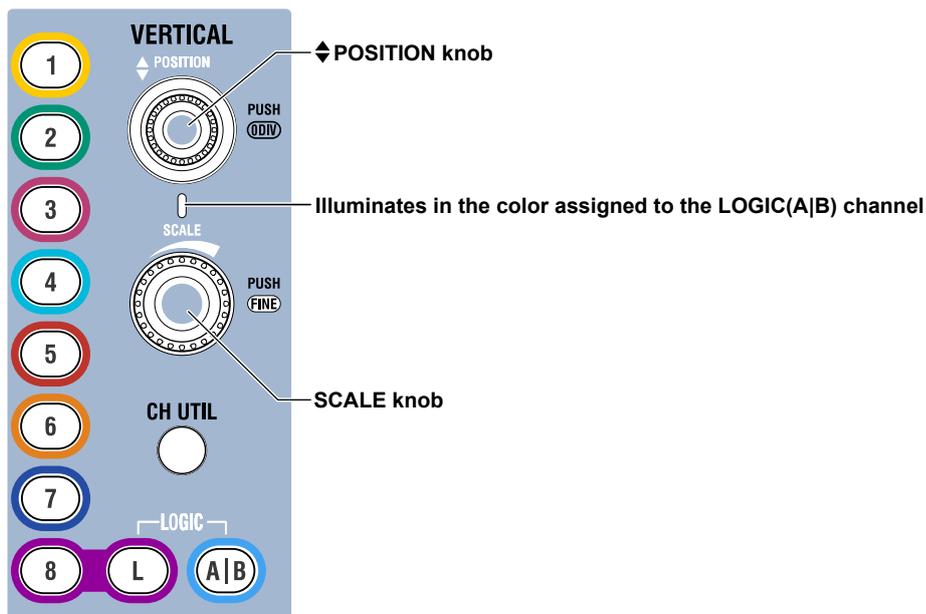
Set the adjustment values for the time offsets (skew) between the logic signal and other signals, which are caused by the use of different types of probes. Deskewing is performed on all eight bits collectively for LOGIC(A) and LOGIC(B).

Setting the Display Size (SCALE)

1. Press **A|B**. The **SCALE** knob now controls the LOGIC(A|B) channel scale.
 - The A|B key illuminates brightly.
 - The LED between the **SCALE** and **POSITION** knobs illuminates in the color assigned to the LOGIC(A|B) channel (the color around the A|B key).
2. Turn the **SCALE** knob to set the display size.

Setting the Vertical Position (POSITION knob)

1. Press A|B. The **POSITION** knob now controls the LOGIC(A|B) setting.
 - The A|B key illuminates brightly.
 - The LED between the **SCALE** and **POSITION** knobs illuminates in the color assigned to the LOGIC(A|B) channel (the color around the A|B key).
2. Turn the **POSITION** knob to set the vertical position.



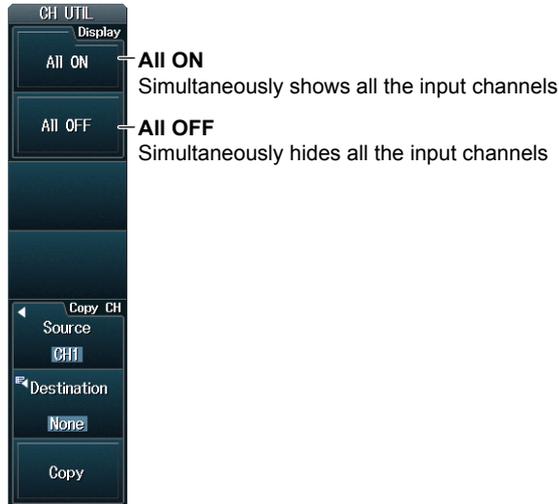
1.4 All ON/All OFF

You can simultaneously show or hide all the input channel waveforms.

► [“Channel Utility \(CH UTIL\)” in the Features Guide](#)

Channel Utility (CH UTIL)

Press **CH UTIL** to display the following menu.



Note

Analog signal input channel CH8 and logic signal input port LOGIC(L) cannot measure signals simultaneously. The signal that corresponds to the last key that you pressed, either CH8 or L, can be measured. Therefore, “All ON” will be applied to the channel or port that corresponds to the last key that you pressed. If a logic probe is not connected, the “All ON” feature will not be applied to the LOGIC(L) or LOGIC(A|B) ports.

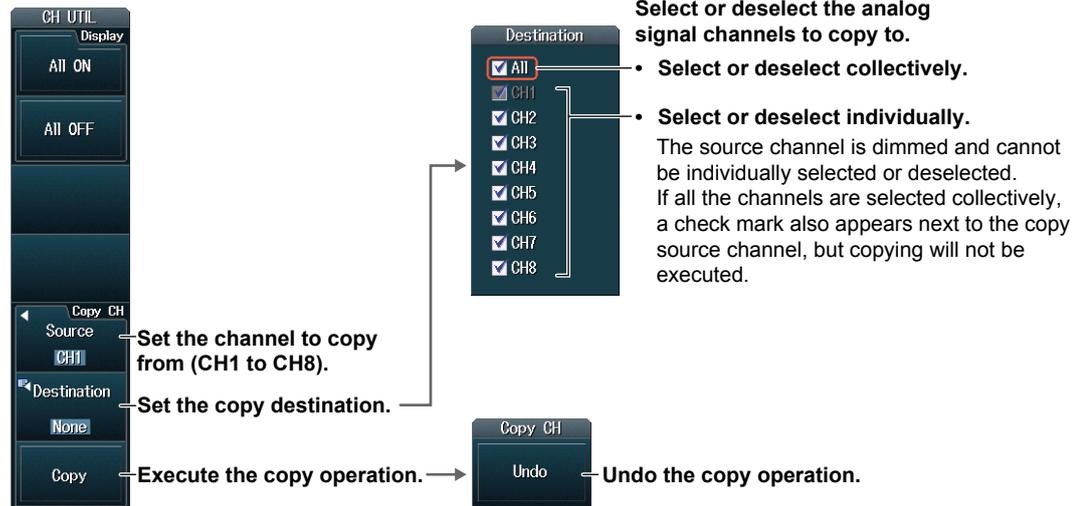
1.5 Copying Channel Information (Analog Signals)

You can copy the setup information of an analog signal input channel to other analog signal input channels.

► “Copying Channel Information (Copy CH)” in the Features Guide

Copying Channel Information (Copy CH)

Press **CH UTIL** to display the following menu.



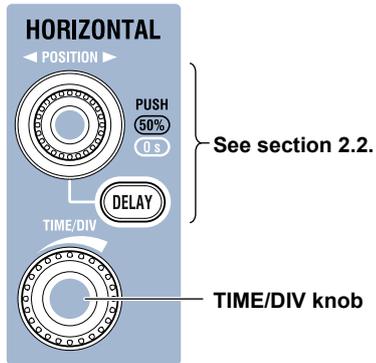
1.6 Configuring the Horizontal Axis (Time axis)

Set the time per grid (1 div) 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](#)



2.1 Setting the Trigger Mode and Trigger Hold-off Time

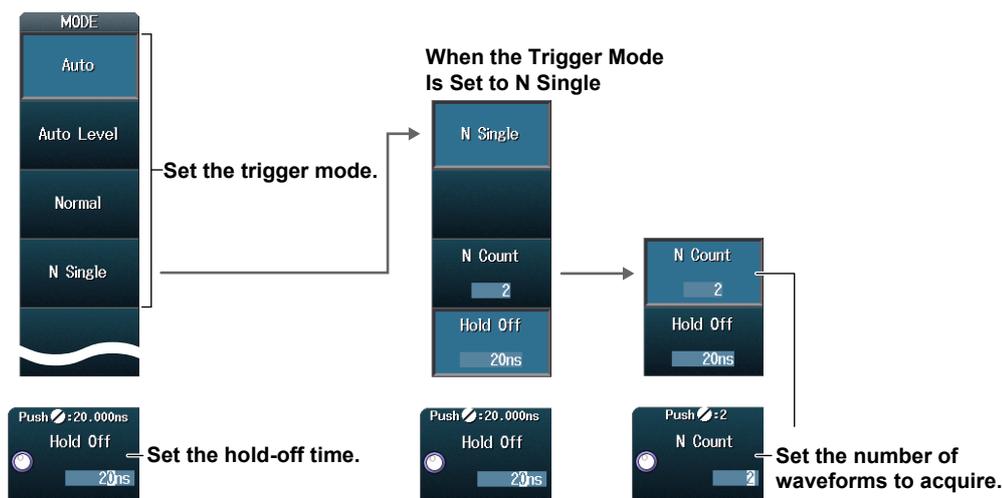
This section explains the following settings (which are used when updating the displayed waveform).

- 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.



Setting the Trigger Mode (Mode)

- Auto:** If the trigger conditions are met within approximately 100 ms, the DLM4000 updates the displayed waveforms on each trigger occurrence. If not, the DLM4000 automatically updates the displayed waveforms. If the time axis is set to a value that would cause the display to switch to roll mode, the roll mode display will be enabled.*
- * For information about the time axis setting and the roll mode display, see chapter 3 of the Features Guide, IM DLM4038-01EN.
- Auto Level:** If a trigger occurs before a timeout, the DLM4000 updates the waveform in the same way that it does in Auto mode. If a trigger does not occur before a timeout, the DLM4000 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 DLM4000 only updates the waveform display when the trigger conditions are met.
- N Single:** The DLM4000 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 DLM4000 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 (Hold Off)

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

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
- Delay cancelling
- Trigger delay

► “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.



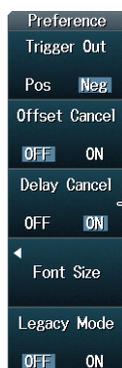
- * You can set the trigger delay even when waveforms are not being acquired.

3. Press the DELAY key again.

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

Turning Delay Cancelling On or Off (Delay Cancel)

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



Turns delay cancelling on and off

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

ON: Measures time with the trigger position set to 0 s (does not apply the delay to time measurement)

OFF: Measures time with the trigger point set to 0 s (applies the delay to time measurement)

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, 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 opens varies depending on the specified trigger source.

When the Trigger Source Is a Channel from CH1 to CH8

When the Window Comparator Is Off

EDGE

Source
CH1 — Set the trigger source (CH1 to CH8).

Slope
F L — Set the trigger slope (F, L).

Coupling
AC DC — Set the trigger coupling (AC, DC).

HF Rejection
OFF — Set the HF rejection (OFF, 20 MHz, 15 kHz).

Noise Rejection
A Z — Set the noise rejection (A, Z).

Window
OFF ON — Set the window comparator (OFF).

Push = 0.00V
CH1 Level
0.02V — Set the trigger level.

When the Window Comparator Is On

EDGE

Source
CH1

Polarity
IN OUT — Set the trigger slope to in or out (IN, OUT).

Coupling
AC DC

HF Rejection
OFF

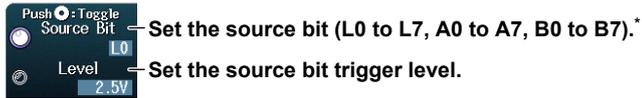
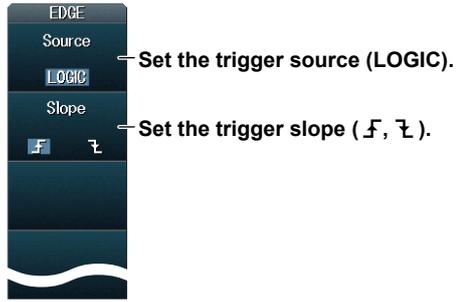
Noise Rejection
A Z

Window
OFF ON — Set the window comparator (ON).

Push = Toggle
CH1 Center
0.00V — Set the window center point.

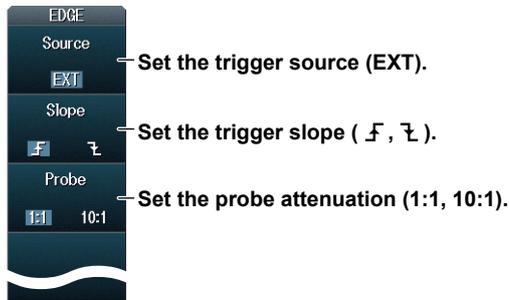
Width
1.00V — Set the window width.

When the Trigger Source Is LOGIC

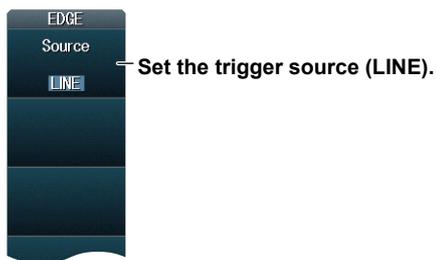


* A0 to A7 and B0 to B7 are available on models with the /L16 options.

When the Trigger Source Is EXT (External Trigger Signal)



When the Trigger Source Is LINE (the DLM4000 Power Source)



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.

Set the trigger source pattern.

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

Select \uparrow , \downarrow , or \updownarrow when the window comparator is off.
 Select \approx or \neq when the window comparator is on.
 * Channels with check marks become trigger sources.
 Selecting the All check box selects the check boxes of all channels at once, and all channels become trigger sources. Clearing the check box of any channel clears the All check box.

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

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

Example: When a logic probe other than the 701989 is connected to the LOGIC(L) port on a model without the /L16 option

Set the trigger level.

Set the trigger coupling (AC, DC).

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

Set the noise rejection (\neq , \approx).

Set the window comparator.

Set the threshold level preset (CMOS(5 V), CMOS(3.3 V), CMOS(2.5 V), CMOS(1.8 V), ECL, Userdef).
 Selecting a preset automatically sets the threshold level.

Set the threshold level.
 If you change the automatically specified value, the preset setting changes to “Userdef.”

2.4 Triggering on the OR of Multiple Edge Triggers

Example: When the 701989 logic probes are connected to the logic signal input ports on a model with the /L16 option

Set the trigger level.

Set the trigger coupling (AC, DC).

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

Set the noise rejection ($\overline{\wedge}$, $\overline{\vee}$).

Set the window comparator.

/L16 option

Set threshold type* (All, Each).
If the threshold type is set to Each, for each bit, select a threshold level preset, or set the value directly.

Set the threshold level.
If you change the automatically specified value, the preset setting changes to "Userdef."

Set the threshold level preset (CMOS(5 V), CMOS(3.3 V), CMOS(2.5 V), CMOS(1.8 V), ECL, Userdef).
Selecting a preset automatically sets the threshold level.

Set the noise rejection ($\overline{\wedge}$, $\overline{\vee}$)*.

* The threshold type setup menu for a logic signal and the noise rejection setup menu appear only when a 701989 logic probe is connected to the corresponding logic signal input port.

Configuring the Window Comparator (Window)

Window

Window OFF ON — Turn the window comparator on or off.

Center(Level) 0.00V — Set the window center point.

Width 1.00V — Set the window width.

2.5 Triggering on Edge Conditions

This section explains the following settings (which are used when triggering on edge conditions).

- Trigger source
 - Logic combination
 - Level used to detect whether qualifications are met
 - Trigger condition
- Qualification

► “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.

ENHANCED

- Type — Set the trigger type to Edge Qualified.
- Edge Qualified
- Source — Set the trigger source.
 - CH1 F
- Qualification — Set the qualifications.
- Logic — Set the logic combination (AND, OR).
 - AND OR
- Condition — Set the trigger condition (True, False).
 - True False
- Level/Coupling — Set the trigger level, trigger coupling, HF rejection, noise rejection, and the window comparator.
 - section 2.4

Setting the Trigger Source (Source)

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

When the Trigger Source Is a Channel from CH1 to CH8

Source

- Source — Set the trigger source (CH1 to CH8).
 - CH1
- Slope — Set the trigger slope, trigger coupling, HF rejection, noise rejection, and the window comparator.
 - F ↗
 - section 2.3
- Coupling — AC DC
- HF Rejection — OFF
- Noise Rejection — /Z /Z
- Window — OFF ON

CH1 Level — Set the level used to detect whether qualifications are met.

- 0.00V

When the Trigger Source Is LOGIC

Source

- Source — Set the trigger source (LOGIC).
 - LOGIC
- Slope — Set the trigger slope.
 - F ↗
 - section 2.3
- Source Bit — Set the source bit (L0 to L7, A0 to A7, B0 to B7).*
- Level — Set the level used to detect whether qualifications are met.
 - L0
 - 2.50V

When the Trigger Source Is EXT (External trigger signal)

Source

- Source — Set the trigger source (EXT).
 - EXT
- Slope — Set the trigger slope and probe attenuation.
 - F ↗
 - section 2.3
- Probe — 1:1 10:1
- Ext Level — Set the level used to detect whether qualifications are met.
 - 0.000V

* A0 to A7 and B0 to B7 are available on models with the /L16 options.

Setting the Qualifications (Qualification)

Press the **Qualification** soft key to open a menu. The menu that appears varies depending on the specified trigger source.

When the Trigger Source Is a Channel from CH1 to CH8 or LOGIC

Example: When the Trigger Source Is CH1

Qualification

CH1	\uparrow	\downarrow	X	L7	H	L	X																																																																
CH2	H	L	X	L6	H	L	X																																																																
CH3	H	L	X	L5	H	L	X																																																																
CH4	H	L	X	L4	H	L	X																																																																
CH5	H	L	X	L3	H	L	X																																																																
CH6	H	L	X	L2	H	L	X																																																																
CH7	H	L	X	L1	H	L	X																																																																
CH8	IN	OUT	X	L0	H	L	X																																																																
<table border="1"> <tr> <td>A7</td> <td>H</td> <td>L</td> <td>X</td> <td>B7</td> <td>H</td> <td>L</td> <td>X</td> </tr> <tr> <td>A6</td> <td>H</td> <td>L</td> <td>X</td> <td>B6</td> <td>H</td> <td>L</td> <td>X</td> </tr> <tr> <td>A5</td> <td>H</td> <td>L</td> <td>X</td> <td>B5</td> <td>H</td> <td>L</td> <td>X</td> </tr> <tr> <td>A4</td> <td>H</td> <td>L</td> <td>X</td> <td>B4</td> <td>H</td> <td>L</td> <td>X</td> </tr> <tr> <td>A3</td> <td>H</td> <td>L</td> <td>X</td> <td>B3</td> <td>H</td> <td>L</td> <td>X</td> </tr> <tr> <td>A2</td> <td>H</td> <td>L</td> <td>X</td> <td>B2</td> <td>H</td> <td>L</td> <td>X</td> </tr> <tr> <td>A1</td> <td>H</td> <td>L</td> <td>X</td> <td>B1</td> <td>H</td> <td>L</td> <td>X</td> </tr> <tr> <td>A0</td> <td>H</td> <td>L</td> <td>X</td> <td>B0</td> <td>H</td> <td>L</td> <td>X</td> </tr> </table>								A7	H	L	X	B7	H	L	X	A6	H	L	X	B6	H	L	X	A5	H	L	X	B5	H	L	X	A4	H	L	X	B4	H	L	X	A3	H	L	X	B3	H	L	X	A2	H	L	X	B2	H	L	X	A1	H	L	X	B1	H	L	X	A0	H	L	X	B0	H	L	X
A7	H	L	X	B7	H	L	X																																																																
A6	H	L	X	B6	H	L	X																																																																
A5	H	L	X	B5	H	L	X																																																																
A4	H	L	X	B4	H	L	X																																																																
A3	H	L	X	B3	H	L	X																																																																
A2	H	L	X	B2	H	L	X																																																																
A1	H	L	X	B1	H	L	X																																																																
A0	H	L	X	B0	H	L	X																																																																

/L16 option

Set the trigger slope for the trigger source signal.

- Select \uparrow , \downarrow , or X when the window comparator is off.
- Select \nearrow , \searrow , or X 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.

When the Trigger Source Is EXT (External trigger signal)

The same menu appears as that shown above for when the trigger source is a channel from CH1 to CH8 or LOGIC. Because the trigger source is an external signal (EXT), you can specify all of the signal states for CH1 to CH8 and LOGIC as qualifications.

2.6 Triggering on State Conditions

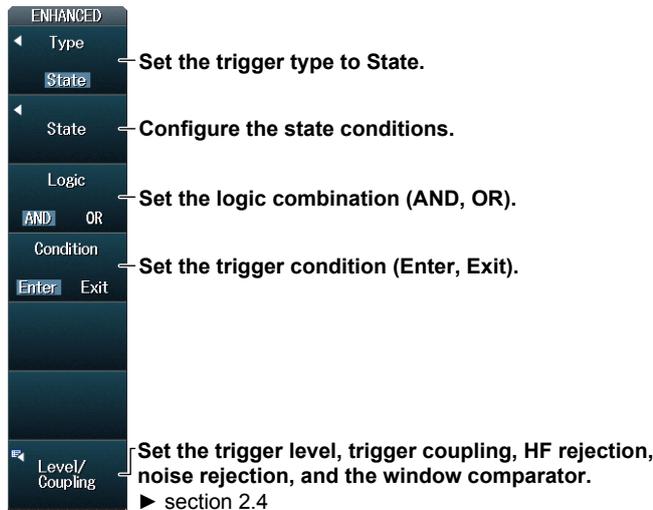
This section explains the following settings (which are used when triggering on state conditions).

- State condition
 - Clock source and the Level used to detect the pattern
- Logic combination
- Trigger condition

► “State Trigger [ENHANCED]” in the Features Guide

ENHANCED State Menu

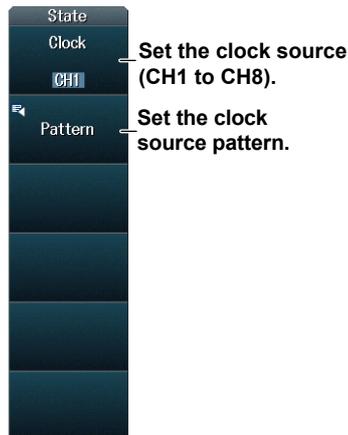
Press **ENHANCED** and then the **Type** soft key. From the setup menu that appears, select **State** to display the following menu.



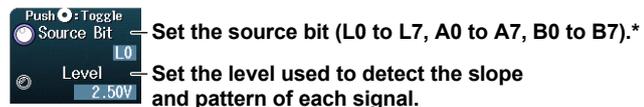
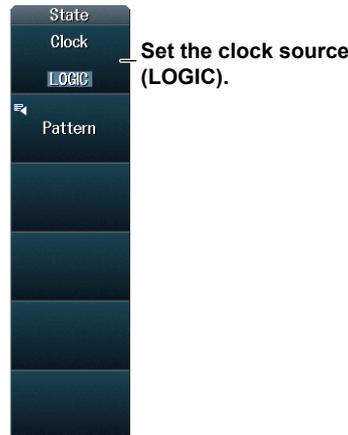
Setting the State Conditions (State)

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

When the Clock Source is a Channel from CH1 to CH8



When the Clock Source is LOGIC



When the Clock Source is Not Specified



* A0 to A7 and B0 to B7 are available on models with the /L16 options.

2.6 Triggering on State Conditions

Setting the Clock Source Pattern

Press the **Pattern** soft key to display a menu. The menu that is displayed varies depending on the specified clock source.

- **When the Clock Source Is a Channel from CH1 to CH8 or LOGIC**

Example: When the Clock Source Is CH1

Pattern

CH1	F	L	X	L7	H	L	X
CH2	H	L	X	L6	H	L	X
CH3	H	L	X	L5	H	L	X
CH4	H	L	X	L4	H	L	X
CH5	H	L	X	L3	H	L	X
CH6	H	L	X	L2	H	L	X
CH7	H	L	X	L1	H	L	X
CH8	IN	OUT	X	L0	H	L	X

A7	H	L	X	B7	H	L	X
A6	H	L	X	B6	H	L	X
A5	H	L	X	B5	H	L	X
A4	H	L	X	B4	H	L	X
A3	H	L	X	B3	H	L	X
A2	H	L	X	B2	H	L	X
A1	H	L	X	B1	H	L	X
A0	H	L	X	B0	H	L	X

/L16 option

Set the slope for the clock source signal.

- Select **F** or **L** when the window comparator is off.
- Select **↘** or **↗** when the window comparator is on.

Set the patterns 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.

- **When the Clock Source Is Not Specified**

The same menu appears as that shown above for when the clock source is a channel from CH1 to CH8 or LOGIC. Because no clock source is specified, you can specify all of the signal states for CH1 to CH8 and LOGIC as state conditions.

2.7 Triggering on Pulse Width

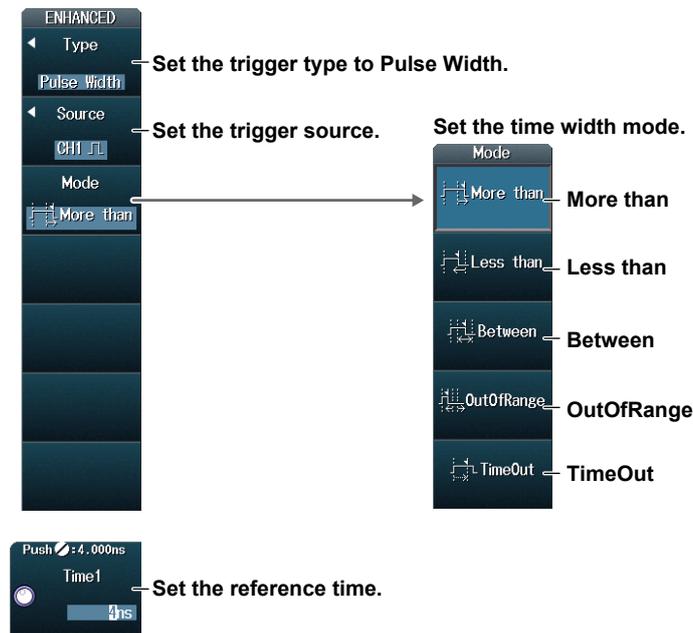
This section explains the following settings (which are used when triggering on pulse width).

- 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.



Setting the Trigger Source (Source)

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

When the Trigger Source Is a Channel from CH1 to CH8

Source
Source
CH1

Polarity

Coupling
AC DC

HF Rejection
OFF

Noise Rejection

Window
OFF ON

Set the trigger source (CH1 to CH8).

Set the polarity.
• Select or when the window comparator is off.
• Select IN or OUT when the window comparator is on.

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

CH1 Level
0.00V

Set the trigger level.

When the Trigger Source Is LOGIC

Source
Source
LOGIC

Polarity

Source Bit
L0

Level
2.50V

Set the trigger source (LOGIC).

Set the polarity (,)

Set the source bit (L0 to L7, A0 to A7, B0 to B7).*

Set the source bit trigger level.

When the Trigger Source Is EXT (External trigger signal)

Source
Source
EXT

Polarity

Probe
10:1

Ext Level
0.000V

Set the trigger source (EXT).

Set the polarity (,)

Set the probe attenuation (1:1, 10:1).

Set the trigger level.

* A0 to A7 and B0 to B7 are available on models with the /L16 options.

Setting the Time Width Mode (Mode)

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 DLM4000 to trigger.

- More than: The pulse width must be longer than reference time Time1.
- Less than: The pulse width must be shorter than reference time 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.
- Timeout: The pulse width must be longer than reference time Time1.

Setting the Reference Times (Time1 and Time2)

When the Time Width Mode Is More than, Less than, or TimeOut



Set reference time Time1.

When the Time Width Mode is Between or OutOfRange



Set reference time Time1.

Set reference time Time2.

2.8 Triggering on State Width

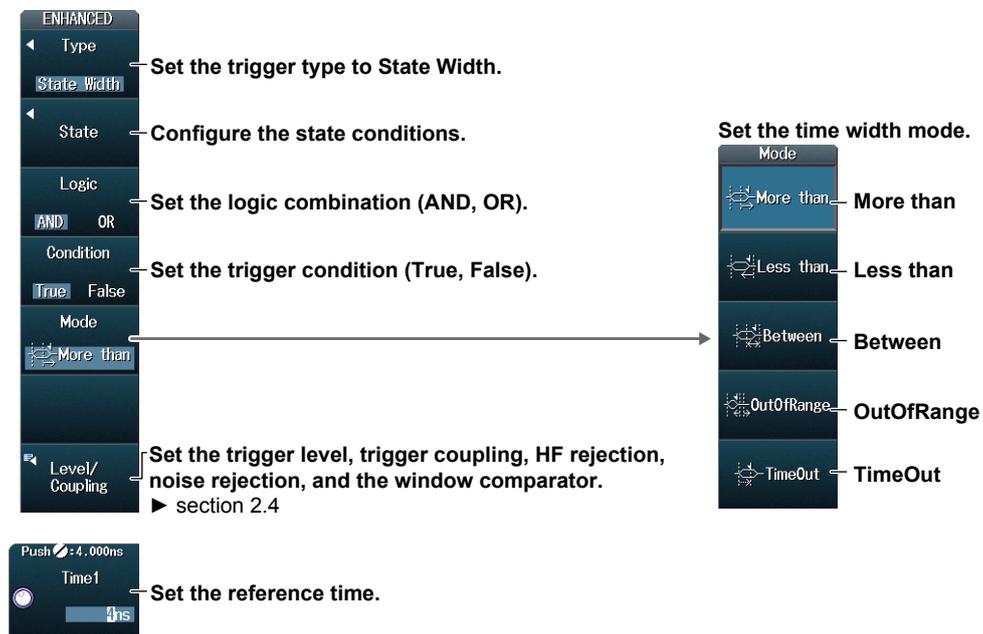
This section explains the following settings (which are used when triggering on state conditions).

- State condition
 - Clock source and the level used to detect the the pattern
- 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.



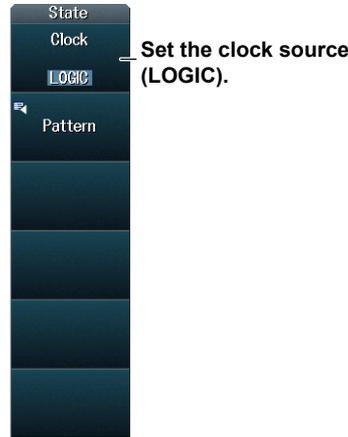
Setting the State Conditions (State)

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

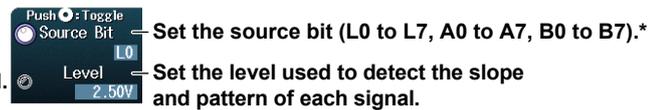
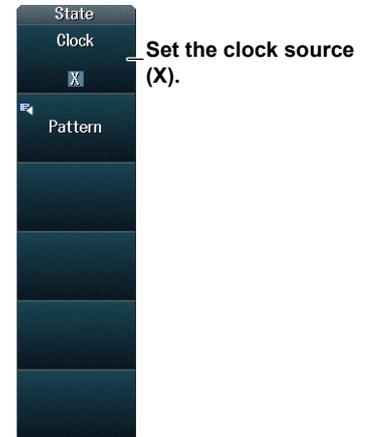
When the Clock Source Is a Channel from CH1 to CH8



When the Clock Source Is LOGIC



When the Clock Source Is Not Specified



* A0 to A7 and B0 to B7 are available on models with the /L16 options.

Setting the Clock Source Pattern

Press the **Pattern** soft key to display a menu. The menu that is displayed varies depending on the specified clock source.

- **When the Clock Source Is a Channel from CH1 to CH8 or LOGIC**

Example: When the Clock Source Is CH1

Set the slope for the clock source signal.

- Select **F** or **L** when the window comparator is off.
- Select **≠** or **≠** when the window comparator is on.

Set the patterns 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.

/L16 option

- **When the Clock Source Is Not Specified**

The same menu appears as that shown above for when the clock source is a channel from CH1 to CH8 or LOGIC. Because no clock source is specified, you can specify all of the signal states for CH1 to CH8 and LOGIC as state conditions.

2.8 Triggering on State Width

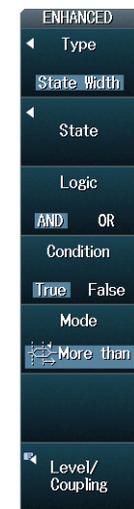
Setting the Time Width Mode (Mode)

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 DLM4000 to trigger.

- More than: Triggers when the period during which the state condition is met or not met is longer than reference time Time1 and the condition changes
- Less than: Triggers when the period during which the state condition is met or not met is shorter than reference time Time1 and the condition changes
- Between: Triggers 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: Triggers 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
- TimeOut: Triggers when the period during which the state condition is met or not met is longer than reference time Time1

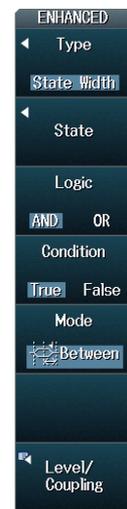
Setting the Reference Times (Time1 and Time2)

When the Time Width Mode Is More than, Less than, or TimeOut



Set reference time Time1.

When the Time Width Mode is Between or OutOfRange



Set reference time Time1.

Set reference time Time2.

2.9 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 the level used to detect the source state
- Trigger types and conditions

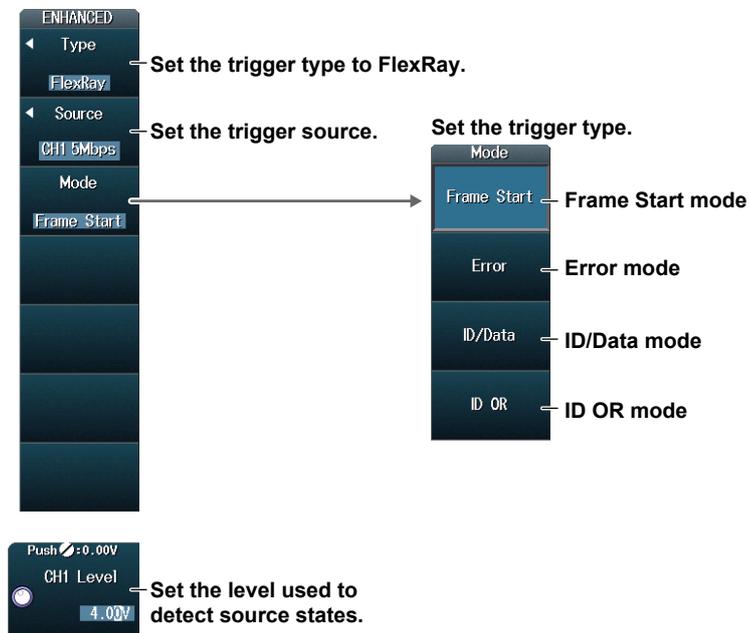
► “FlexRay Bus Trigger [ENHANCED, option]” in the Features Guide

Auto Setup

The DLM4000 can automatically set the trigger source level and bit rate from the received FlexRay bus signal and trigger on them. For details, see section 12.1.

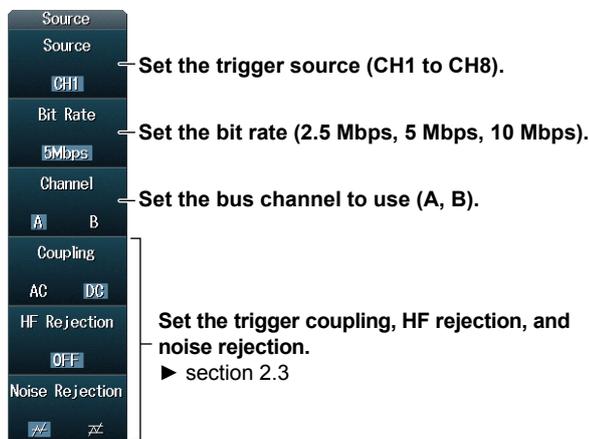
ENHANCED FlexRay Menu

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



Setting the Trigger Source (Source)

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



Trigger Type (Mode)

Frame Start Mode (Frame Start)

Press the **Mode** soft key and then the **Frame Start** soft key.
The DLM4000 triggers on the start of FlexRay bus signal frames.

Error Mode (Error)

Press the **Mode** soft key, 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)

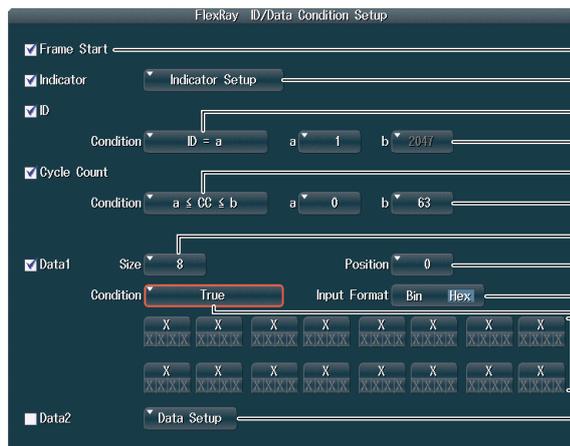
Setting Trigger Conditions (Condition Setup)

Press the **Mode** soft key, the **ID/Data** soft key, and then the **Condition Setup** soft key to display the following screen.

The DLM4000 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.

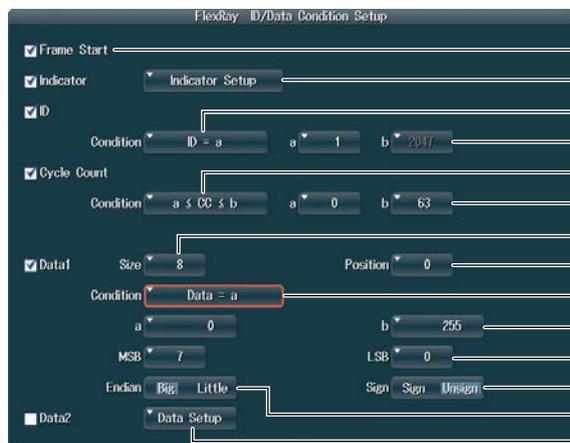


When the Comparison Condition of Data1 Is True or False



- 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)

Setting Trigger Conditions (Condition Setup)

Press the **Mode** soft key, the **ID OR** soft key, and then the **Condition Setup** soft key to display the following screen.

The DLM4000 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.

ID	ID Condition	a	b	Cycle Count Condition	a	b
<input checked="" type="checkbox"/> ID1	ID = a	1	2047	$a \leq CC \leq b$	0	63
<input checked="" type="checkbox"/> ID2	ID = a	1	2047	Don't Care	0	63
<input checked="" type="checkbox"/> ID3	ID = a	1	2047	Don't Care	0	63
<input checked="" type="checkbox"/> ID4	ID = a	1	2047	Don't Care	0	63

Annotations for ID1 and ID2:

- 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 ID2.

Additional screen elements:

- ENHANCED
- Type: FlexRay
- Source: CH1 5Mbps
- Mode: ID OR
- Condition Setup
- Push -0.00V
- CH1 Level: 4.00V

2.10 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

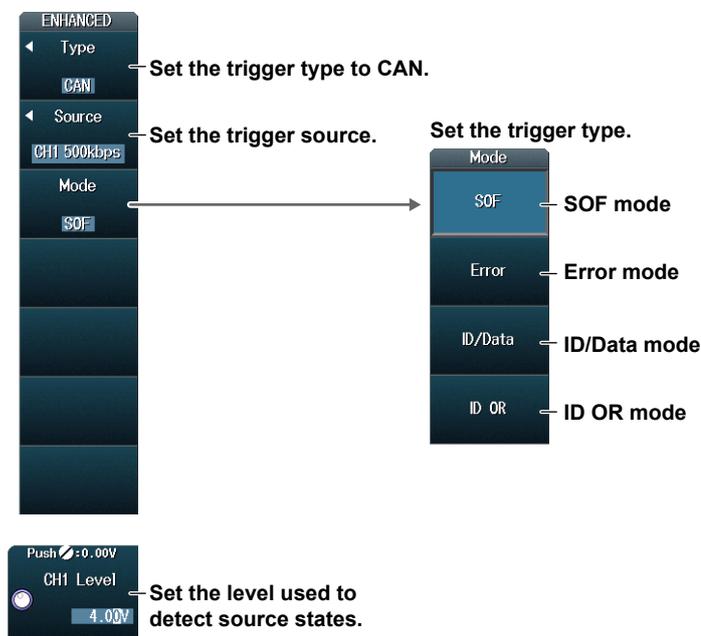
► [“CAN Bus Trigger \[ENHANCED, option\]” in the Features Guide](#)

Auto Setup

The DLM4000 can automatically set the trigger source level and bit rate from the received CAN bus signal and trigger on them. For details, see section 12.2.

ENHANCED CAN Menu

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



Setting the Trigger Source (Source)

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



Set the trigger source (CH1 to CH8).

Set the bit rate (33.3 kbps, 83.3 kbps, 125 kbps, 250 kbps, 500 kbps, 1 Mbps, User Define).

Set the recessive level (H, L).

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



Set the sample point.

When the Bit Rate Is Set to User Define



Set the bit rate.

Set the sample point.

Trigger Type (Mode)

SOF (Start of Frame) Mode

Press the **Mode** soft key and then the **SOF** soft key.

The DLM4000 triggers on the start of CAN bus signal frames.

Error Mode (Error)

Press the **Mode** soft key, 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 DLM4000 triggers on error frames (when the error flag is active) or when it detects various errors.

ID/Data Mode (ID/Data)

Setting Trigger Conditions (Condition Setup)

Press the **Mode** soft key, the **ID/Data** soft key, and then the **Condition Setup** soft key to display the following screen.

The DLM4000 triggers 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 trigger conditions.

ENHANCED

Type

CAN

Source

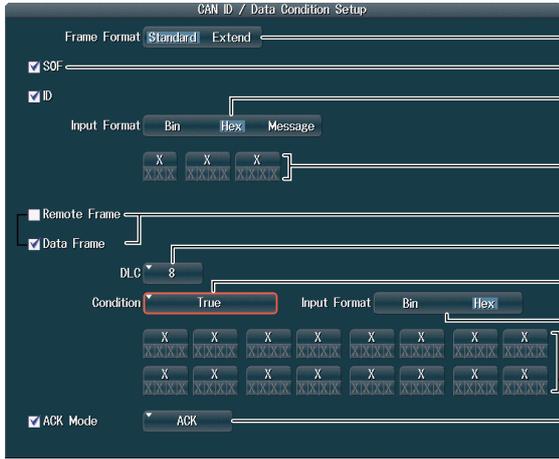
CH1 500kbps

Mode

ID/Data

Condition Setup

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



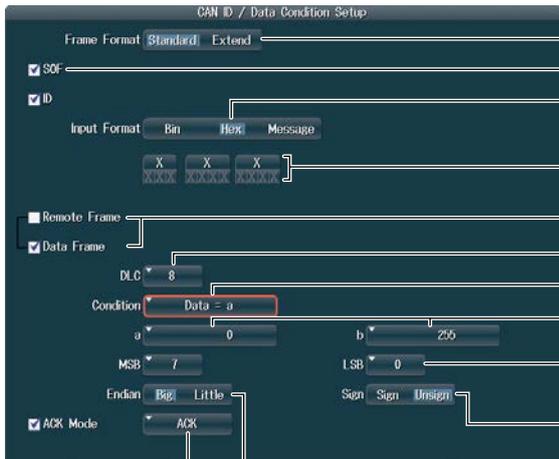
- Set the frame format.
- SOF (always selected)
- Set the ID input format (Bin, Hex).
- Set the ID bit pattern.
- If you select Extend for the frame format, 29 bits are displayed here.
- Set the trigger source frame.
- Set the data length for the data field.
- Set the comparison condition.
- Set the data pattern input format.
- Set the data pattern.
- Set the ACK slot state.

Push = 0.00V

CH1 Level

4.00V

• **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 data length for the data field.
- Set the comparison condition.
- 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).
- 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 data reference values a and b.

ID OR Mode (ID OR)

Setting Trigger Conditions (Condition Setup)

Press the **Mode** soft key, the **ID OR** soft key, and then the **Condition Setup** soft key to display the following screen.

The DLM4000 triggers on the AND of the SOF, frame type (Remote Frame or Data Frame), and ACK conditions and of the condition of 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 (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 ACK slot state.

When ID Input Format Is Message

- SOF (always selected)
- Set the ID input format (Message).
- Select IDs from the list of messages loaded from the physical value/symbol definition file (.sbl).

2.11 Triggering on CAN FD Bus Signals (Option)

This section explains the following settings (which are used when 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

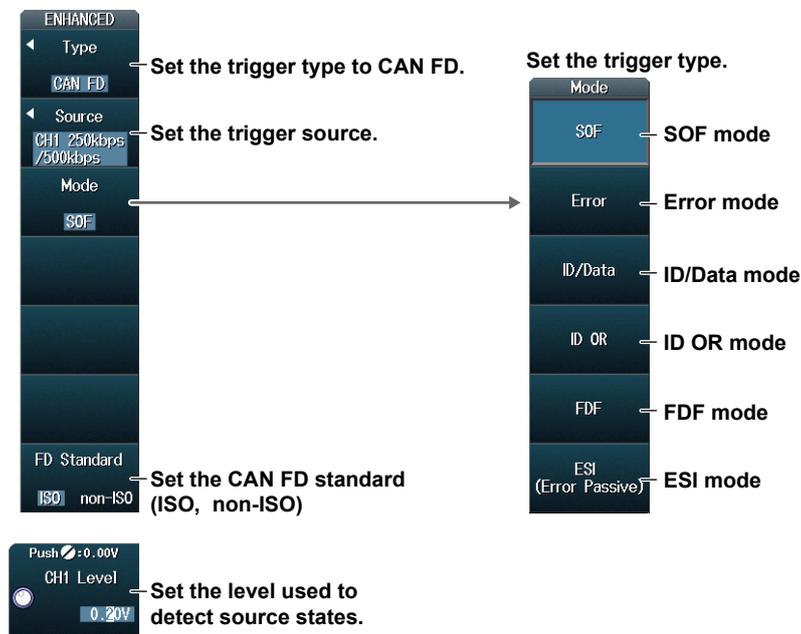
► [“CAN FD Bus Trigger \[ENHANCED, option\]” in the Features Guide](#)

Auto Setup

The DLM4000 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 12.3.

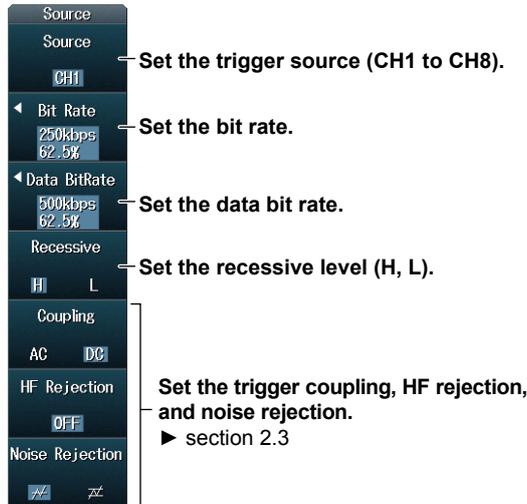
ENHANCED_CAN FD Menu

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

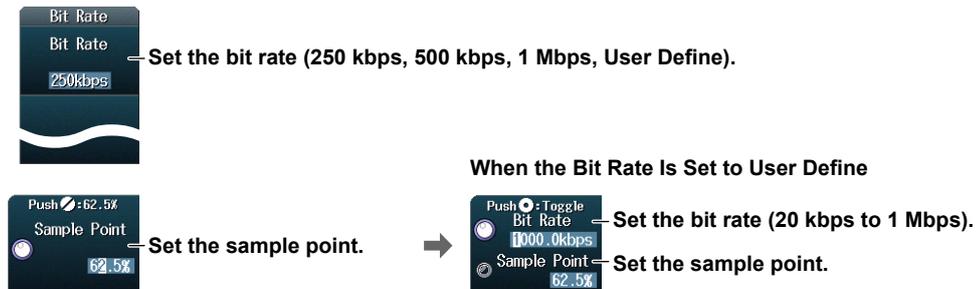


Setting the Trigger Source (Source)

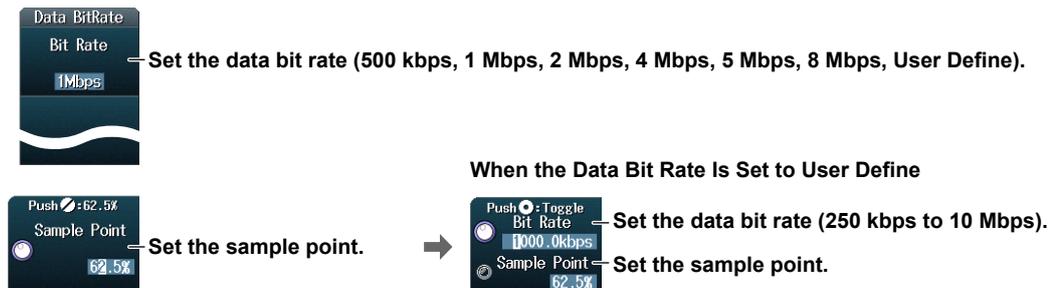
Press the **Source** soft key to display the following menu.



Setting the Bit Rate (Bit Rate)



Setting the Data Bit Rate (Data BitRate)



Trigger Type (Mode)

SOF (Start of Frame) Mode

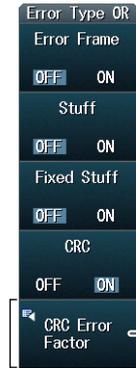
Press the **Mode** soft key and then the **SOF** soft key.

The DLM4000 triggers on the start of CAN FD bus signal frames.

Error Mode (Error)

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

When the CAN FD standard* is set to ISO

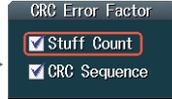


When the CAN FD standard* is set to non-ISO



Turn error detection on or off for Error Frame, Stuff, Fixed Stuff, and CRC errors.

Select the check boxes for the CRC error factors to detect.



CRC errors are not detected if both check boxes are cleared.

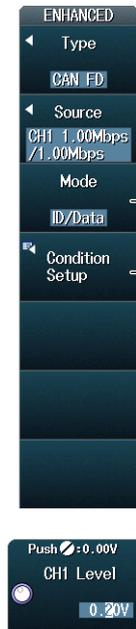
A menu that appears when CRC error detection is set to ON.

* For setting the CAN FD standard, see page 2-24.

The DLM4000 triggers on error frames (when the error flag is active) or when it detects various errors.

ID/Data Mode (ID/Data)

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



Set the trigger type to ID/Data.

Set the trigger conditions.

Setting Trigger Conditions (Condition Setup)

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

The DLM4000 triggers 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 trigger conditions.

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

The screenshot shows the 'CAN FD ID / Data Condition Setup' interface. The 'Condition' dropdown is set to 'True'. The 'Data Frame' checkbox is checked. The 'ACK Mode' is set to 'ACK'. The 'ID' input format is set to 'Hex', and the 'Data' input format is set to 'Hex'. The 'Size' is 8 bytes and the 'Position' is 0 bytes. The 'Data' pattern is shown as a grid of 'X's representing bits.

- 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.

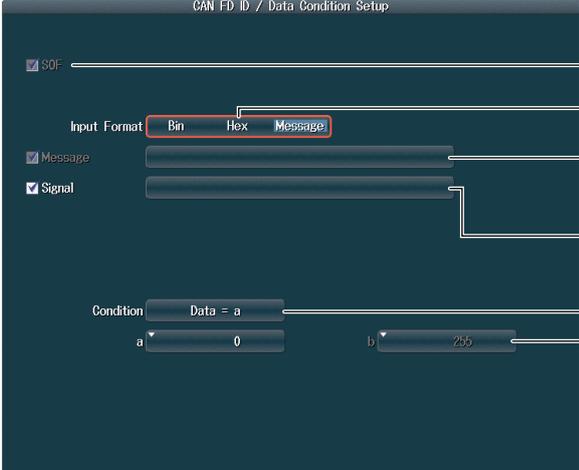
- **When the Comparison Condition Is Data = a; Data ≠ a; a ≤ Data; Data ≤ b; a ≤ Data ≤ b; or Data < a, b < Data**

The screenshot shows the 'CAN FD ID / Data Condition Setup' interface. The 'Condition' dropdown is set to 'Data = a'. The 'Data Frame' checkbox is checked. The 'ACK Mode' is set to 'ACK'. The 'ID' input format is set to 'Hex', and the 'Data' input format is set to 'Hex'. The 'Size' is 8 bytes and the 'Position' is 0 bytes. The 'Data' pattern is shown as a grid of 'X's representing bits. The 'MSB' is 7 and the 'LSB' is 0. The 'Endianness' is set to 'Big' and the 'Sign' is set to 'Sign'.

- 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 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.

2.11 Triggering on CAN FD Bus Signals (Option)

- When ID Input Format Is Message



The screenshot shows the 'CAN FD ID / Data Condition Setup' menu. It includes the following elements and annotations:

- SOF** (always selected) - points to the SOF checkbox.
- Set the ID input format (Message).** - points to the 'Message' button in the 'Input Format' section.
- Select an ID from the message list in the loaded physical value/symbol definition file (.sbl).** - points to the ID selection field.
- Select a data item from the signal list in the loaded physical value/symbol definition file (.sbl).** - points to the signal selection field.
- Set the comparison condition.** - points to the 'Data = a' field.
- Set data reference values a and b.** - points to the 'a' and 'b' value fields.

ID OR Mode (ID OR)

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



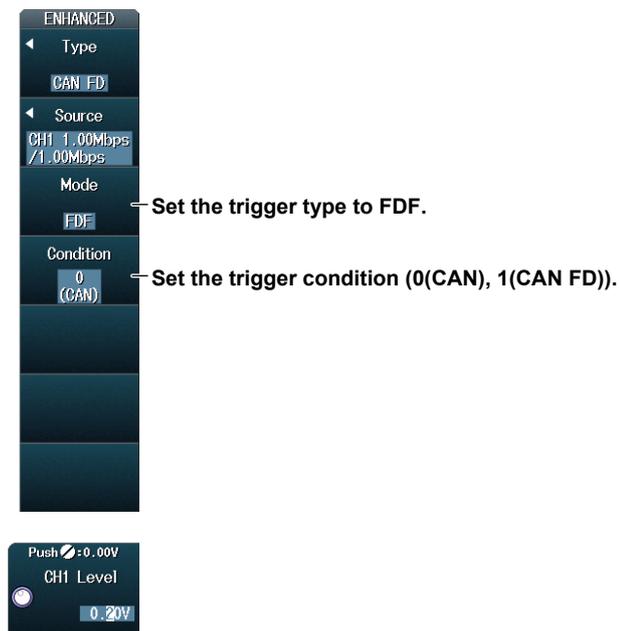
The screenshot shows the 'ID OR Mode' menu. It includes the following elements and annotations:

- Set the trigger type to ID OR.** - points to the 'ID OR' button in the 'Mode' section.
- Set the trigger conditions. ► "ID OR Mode" in section 2.10** - points to the 'Condition Setup' button.

Below the menu, a status bar shows: Push 0.00V, CH1 Level, 0.20V.

FDF Mode (FDF)

Press the **Mode** soft key and then the **FDF** soft key to display the following menu.



Setting Trigger Conditions (Condition)

Set the FDF bit state as a trigger condition.

- 0 (CAN): When the FDF bit is dominant, the DLM4000 assumes that the frame is a CAN bus signal frame and triggers.
- 1 (CAN FD): When the FDF bit is recessive, the DLM4000 assumes that the frame is a CAN FD bus signal frame and triggers.

ESI Mode (ESI (Error Passive))

Press the **Mode** soft key and then the **ESI (Error Passive)** soft key.

The DLM4000 triggers when the ESI bit is recessive (error passive).

2.12 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

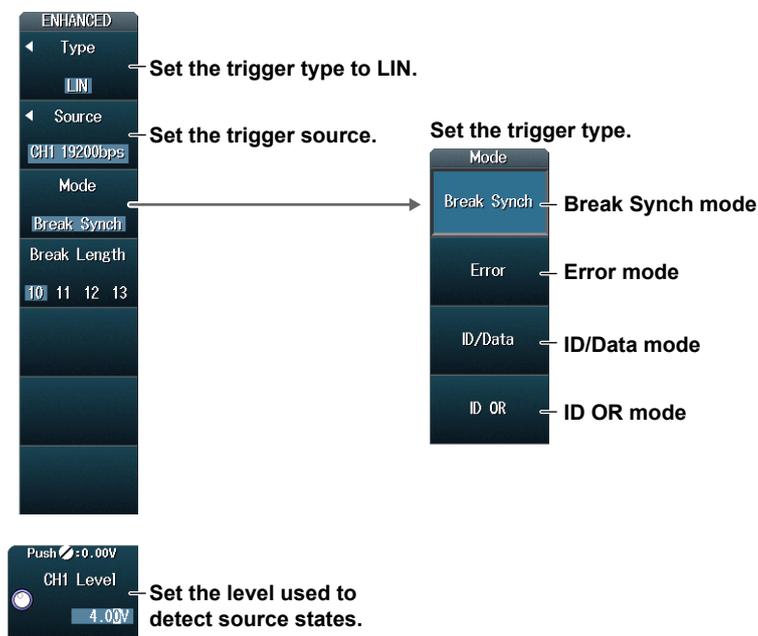
► “LIN Bus Trigger [ENHANCED, option]” in the Features Guide

Auto Setup

The DLM4000 can automatically set the trigger source level and bit rate from the received LIN bus signal and trigger on them. For details, see section 12.4.

ENHANCED LIN Menu

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



Setting the Trigger Source (Source)

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

The **Source** menu is shown with the following settings and annotations:

- Source:** CH1. Annotation: Set the trigger source (CH1 to CH8).
- Bit Rate:** 19200bps. Annotation: Set the bit rate (1200 bps, 2400 bps, 4800 bps, 9600 bps, 19200 bps, User Define).
- Coupling:** AC DC. Annotation: Set the trigger coupling, HF rejection, and noise rejection. (Refer to section 2.3)
- HF Rejection:** OFF
- Noise Rejection:** OFF

An arrow points to the **Bit Rate** menu, which is shown with the following settings:

- Bit Rate:** User Define
- Coupling:** AC DC
- HF Rejection:** OFF
- Noise Rejection:** OFF

Below the Bit Rate menu, a **Push = Toggle** button is shown with the following settings:

- Bit Rate:** 19200bps. Annotation: Set the bit rate.
- Sample Point:** 62.5%. Annotation: Set the sample point.

Trigger Type (Mode)

Break Synch Mode

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

The **ENHANCED** menu is shown with the following settings and annotations:

- Type:** LIN
- Source:** CH1 19200bps
- Mode:** Break Synch
- Break Length:** 10 11 12 13. Annotation: Set the low-pulse bit length that is used to detect breaks (10, 11, 12, 13).

The DLM4000 triggers when it detects a break field and then a synch field (Break Field + Synch Field).

Error Mode

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

The **Error Type OR** menu is shown with the following settings and annotations:

- Parity:** OFF ON. Annotation: Turn error detection on or off for Parity and Sync errors.
- Sync:** OFF ON

The DLM4000 triggers when it detects an error.

ID/Data Mode

Setting Trigger Conditions (Condition Setup)

Press the **Mode** soft key, the **ID/Data** soft key, and then the **Condition Setup** soft key to display the following screen.

The DLM4000 triggers on the AND of the Break Synchrony, ID, and Data conditions. Items whose check boxes are selected are used as trigger conditions.

When the Comparison Condition Is True or False

- Break Synchrony (always selected)
- ID
 - Input Format: Bin, Hex (Set the ID input format.)
 - Bit Pattern: X, X, X, X, X, X, X, X (Set the ID bit pattern.)
- Data
 - Size: 8 (Set the data length.)
 - Condition: True (Set the comparison condition.)
 - Input Format: Bin, Hex (Set the data pattern input format.)
 - Bit Pattern: X, X (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

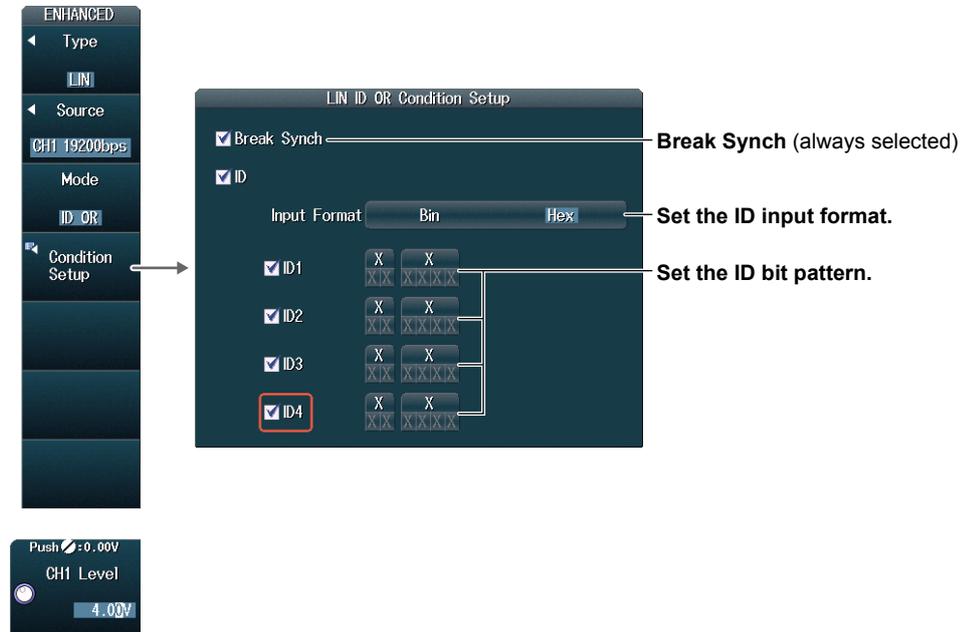
- Break Synchrony (always selected)
- ID
 - Input Format: Bin, Hex (Set the ID input format.)
 - Bit Pattern: X, X, X, X, X, X, X, X (Set the ID bit pattern.)
- Data
 - Size: 8 (Set the data length.)
 - Condition: Data = a (Set the comparison condition.)
 - a: 0 (Set data reference values a and b.)
 - b: 255 (Set data reference values a and b.)
 - MSB: 7 (Set the bit positions of the most significant bit (MSB) and the least significant bit (LSB) in the data that you will compare.)
 - LSB: 0 (Set the bit positions of the most significant bit (MSB) and the least significant bit (LSB) in the data that you will compare.)
 - Endian: Big, Little (Set whether to use a signed (Sign) or unsigned (Unsign) data format.)
 - Sign: Sign, Unsign (Set whether to use a signed (Sign) or unsigned (Unsign) data format.)

ID OR Mode

Setting Trigger Conditions (Condition Setup)

Press the **Mode** soft key, the **ID OR** soft key, and then the **Condition Setup** soft key to display the following screen.

The DLM4000 triggers on the AND of the Break Synch condition and the condition of one of the four IDs. Items whose check boxes are selected are used as trigger conditions.



2.13 Triggering on SENT Signals (Option)

This section explains the following settings (which are used when triggering on SENT signals).

- Trigger source
 - Bit rate and the level used to detect the source state
- Format
- Trigger type
 - Trigger condition

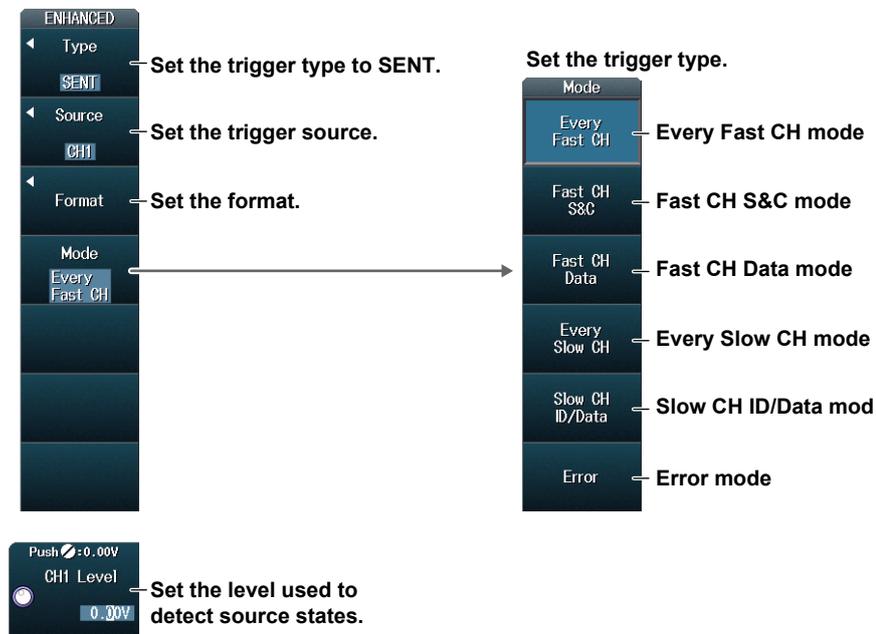
► [“SENT Trigger \[ENHANCED, option\]” in the Features Guide](#)

Auto Setup

The DLM4000 can automatically set the trigger source level and bit rate from the received SENT signal and trigger on them. For details, see section 12.6.

ENHANCED_SENT Menu

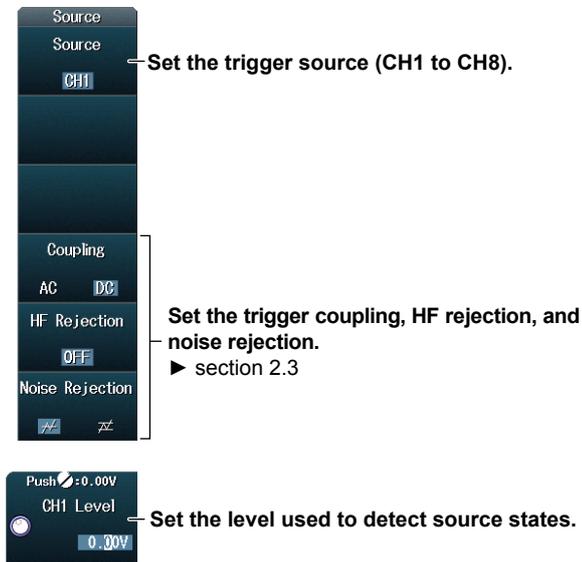
Press **ENHANCED** and then the **Type** soft key. From the setup menu that appears, select **SENT** to display the following menu.



Setting the Trigger Source (Source)

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

When the Trigger Source Is a Channel from CH1 to CH8



When the Trigger Source Is LOGIC(L) or LOGIC(A|B)

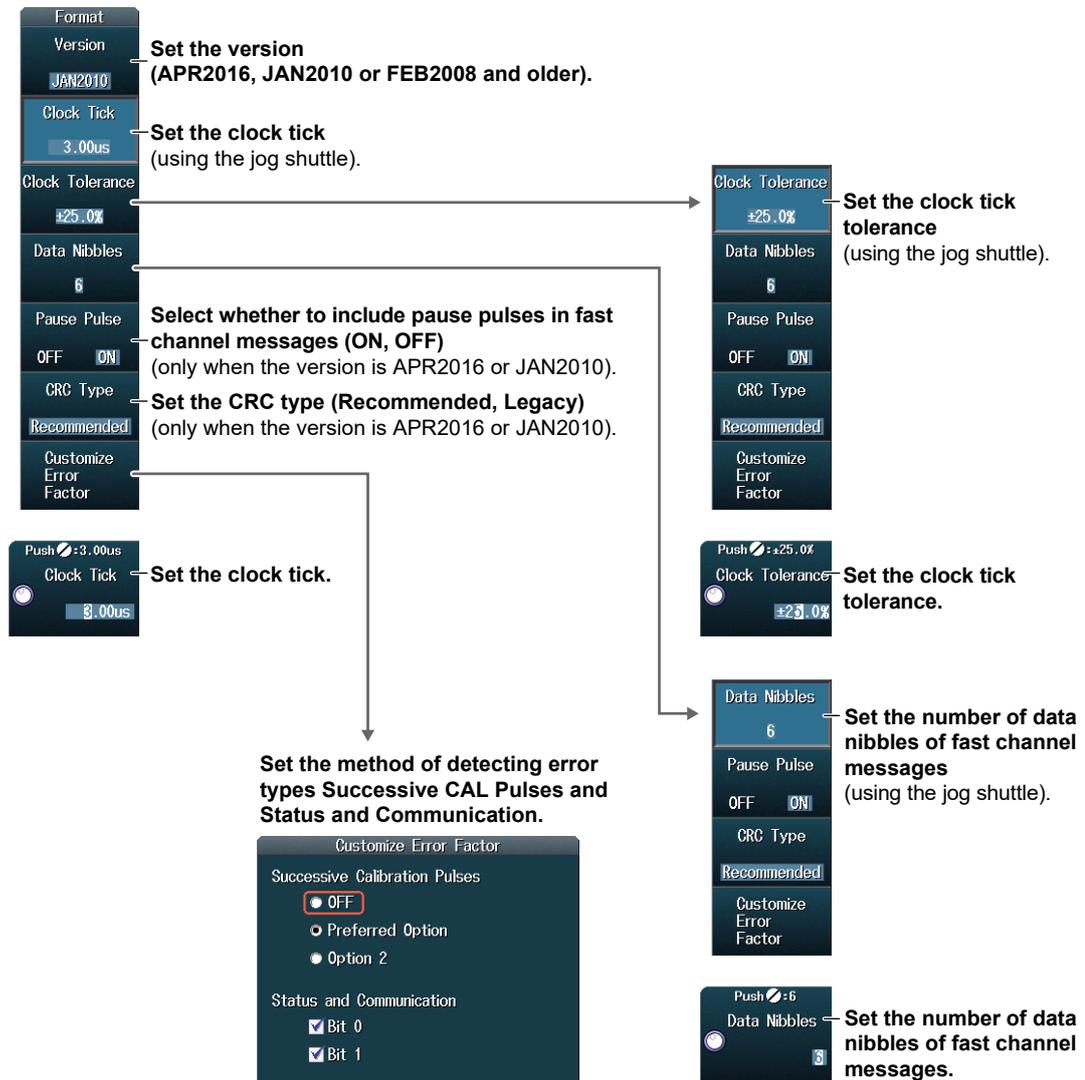


* You can select CH8 or LOGIC(L), depending on which channel's corresponding key (CH8 or L) is illuminated.

LOGIC(A|B), A0 to A7, and B0 to B7 are available on models with the /L16 option.

Setting the Format (Format)

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



Trigger Type (Mode)

Every Fast CH Mode

Press the **Mode** soft key and then the **Every Fast CH** soft key.
The DLM4000 triggers when it detects a fast channel message.

Fast CH S&C Mode

Setting Trigger Conditions (Condition Setup)

Press the **Mode** soft key, the **Fast CH S&C** soft key, and then the **Condition Setup** soft key to display the following screen.

The DLM4000 triggers on the status and communication bit pattern.

ENHANCED
Type
SENT
Source
CH1
Format
Mode
Fast CH S&C
Condition Setup

Fast CH Status and Communication
Input Format: Bin Hex
X
XXXXX

Set the status and communication ID input format (Bin, Hex).
Set the bit pattern.

Push = 0.00V
CH1 Level
0.00V

Fast CH Data Mode

Press the **Mode** soft key and then the **Fast CH Data** soft key to display the following menu.

ENHANCED
Type
SENT
Source
CH1
Format
Mode
Fast CH Data
Condition Setup
Fast CH Data Type
Nibble User
User Setup

When the Data Type Is User
Select the check boxes for the items that you want to use as comparison conditions.
Set the data size (0 to 24).*
Set the nibble byte order (Big, Little).

When the Version is set to APR2016
Check the check box when multiplexing signal.

Set the trigger conditions.
Set the data type (Nibble, User).

User	Size	Order
<input checked="" type="checkbox"/> Data1	12	Big Little
<input checked="" type="checkbox"/> Data2	12	Big Little
<input type="checkbox"/> Data3	0	Big Little
<input type="checkbox"/> Data4	0	Big Little

Push = 0.00V
CH1 Level
0.00V

* 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.

** When Multiplexing is checked, the data size of Data 1 is fixed to 4 bits to correspond to FC.

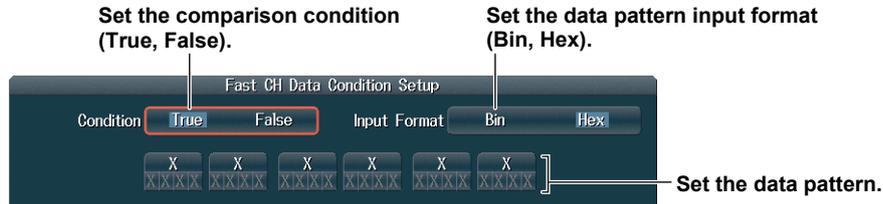
2.13 Triggering on SENT Signals (Option)

Setting Trigger Conditions (Condition Setup)

Press the **Condition Setup** soft key. The screen that appears varies depending on the fast channel data type setting.

The DLM4000 triggers on the AND of fast channel Data conditions. Items whose check boxes are selected are used as trigger conditions.

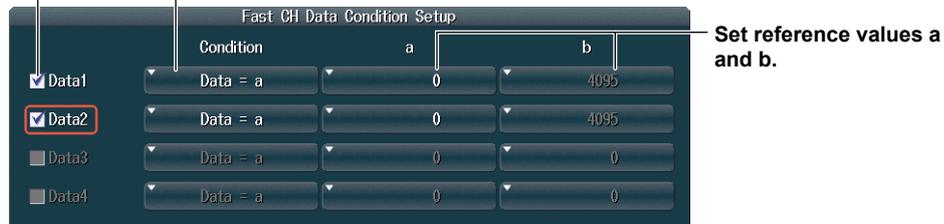
- **When the Data Type Is Nibble**



- **When the Data Type Is User**

Select the check boxes for the items that you want to use as comparison conditions.

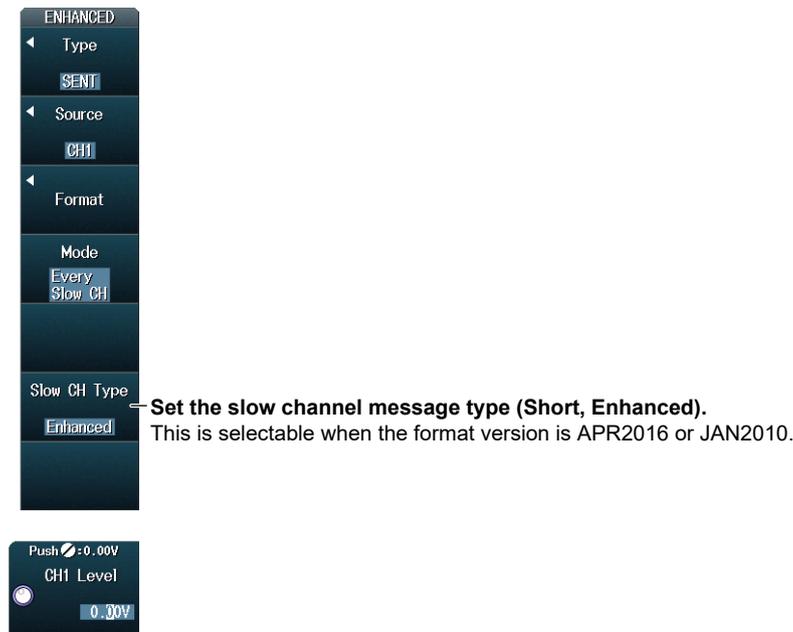
Set the comparison condition (Data = a; Data ≠ a; a ≤ Data; Data ≤ b; a ≤ Data ≤ b; Data < a, b < Data).



Every Slow CH Mode

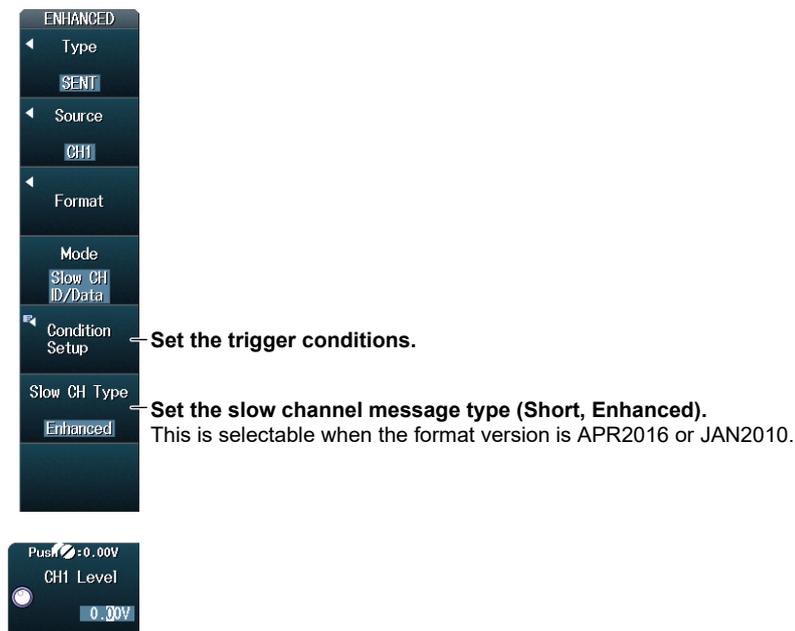
Press the **Mode** soft key and then the **Every Slow CH** soft key to display the following menu.

The DLM4000 triggers when it detects an “Every Slow CH” message.



Slow CH ID/Data Mode

Press the **Mode** soft key and then the **Slow CH ID/Data** soft key to display the following menu.



Setting Trigger Conditions (Condition Setup)

Press the **Condition Setup** soft key. The screen that appears varies depending on the slow channel message type setting.

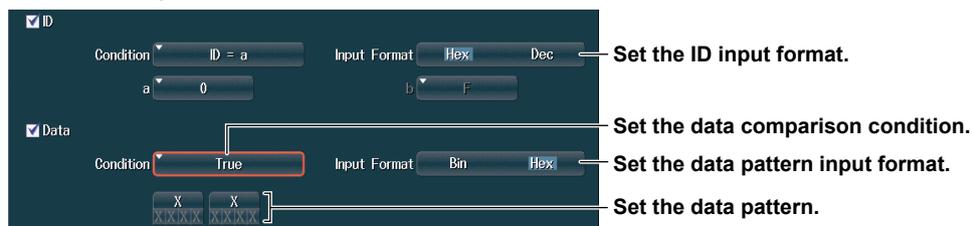
The DLM4000 triggers on the AND of the slow channel ID and Data conditions. Items whose check boxes are selected are used as trigger conditions. Set ID and data reference values a and b in Hex (hexadecimal) or Dec (decimal) according to the input format setting.

- **When the Message Type Is Short**

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



When the Comparison Condition Is True or False



Setting ID and Data Reference Values a and b

Input format 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

2.13 Triggering on SENT Signals (Option)

- When the Message Type Is Enhanced

When the ID and Data Message Formats Are Set to “12bit data, 8bit ID”

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

The screenshot shows the 'Slow CH ID/Data Condition Setup' dialog box. The 'Configuration bit' is set to '12bit data, 8bit ID'. The 'Input Format' is set to 'Hex'. The 'ID' checkbox is checked, and the 'Condition' is set to 'ID = a'. The 'a' value is 0 and the 'b' value is 255. The 'Data' checkbox is checked, and the 'Condition' is set to 'Data = a'. The 'a' value is 0 and the 'b' value is 4095.

Annotations:

- Set the ID and data message formats (12bit data, 8bit ID).
- Set the ID and data input format.
- 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 Comparison Condition Is True or False

The screenshot shows the 'Slow CH ID/Data Condition Setup' dialog box. The 'ID' checkbox is checked, and the 'Condition' is set to 'ID = a'. The 'a' value is 00 and the 'b' value is FF. The 'Input Format' is set to 'Hex'. The 'Data' checkbox is checked, and the 'Condition' is set to 'True'. The 'Input Format' is set to 'Bin'. The data pattern is set to 'XXXX XXXX XXXX XXXX'.

Annotations:

- Set the ID input format.
- Set the data comparison condition.
- Set the data pattern input format.
- Set the data pattern.

Setting ID and Data Reference Values a and b

Input format 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 Comparison Condition Is Data = a; Data ≠ a; a ≤ Data; Data ≤ b; a ≤ Data ≤ b; or Data < a, b < Data

The screenshot shows the 'Slow CH ID/Data Condition Setup' dialog box. The 'Configuration bit' is set to '16bit data, 4bit ID'. The 'Input Format' is set to 'Hex'. The 'ID' checkbox is checked, and the 'Condition' is set to 'ID = a'. The 'a' value is 0 and the 'b' value is 15. The 'Data' checkbox is checked, and the 'Condition' is set to 'Data = a'. The 'a' value is 0 and the 'b' value is 65535.

Annotations:

- Set the ID and data message formats (16bit data, 4bit ID).
- Set the ID and data input format.
- 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 Comparison Condition Is True or False

The screenshot shows the 'Slow CH ID/Data Condition Setup' dialog box. The 'ID' checkbox is checked, and the 'Condition' is set to 'ID = a'. The 'a' value is 0 and the 'b' value is F. The 'Input Format' is set to 'Hex'. The 'Data' checkbox is checked, and the 'Condition' is set to 'True'. The 'Input Format' is set to 'Bin'. The data pattern is set to 'XXXX XXXX XXXX XXXX'.

Annotations:

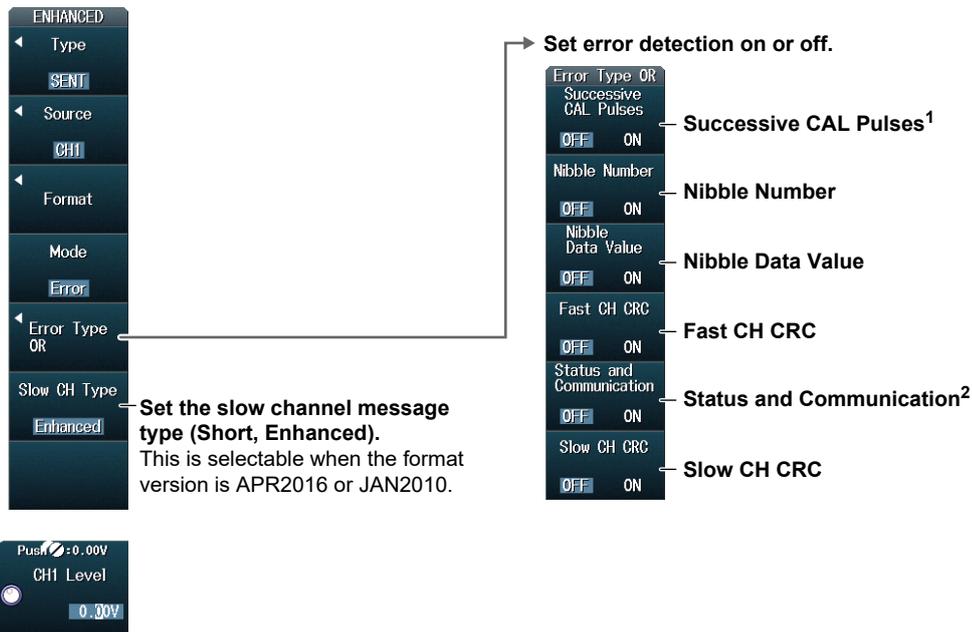
- Set the ID input format.
- Set the data comparison condition.
- Set the data pattern input format.
- Set the data pattern.

Setting ID and Data Reference Values a and b

Input format 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 **Mode** soft key and then the **Error** soft key to display the following menu.



1 Not selectable when Successive Calibration Pulses is set to OFF for Customize Error Factor in “Setting the Format (Format)” (page 2-36).

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 2-36).

The DLM4000 triggers when it detects various types of errors.

2.14 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

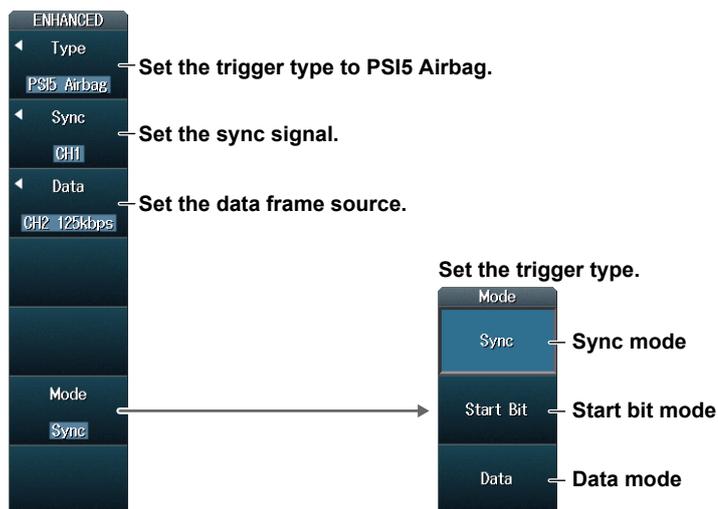
► [“PSI5 Airbag Trigger \[ENHANCED, option\]” in the Features Guide](#)

Auto Setup

The DLM4000 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 12.7.

ENHANCED_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.



Setting the Sync Signal (Sync)

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



Set the sync signal (CH1 to CH8, X).

* If you select X, sync signal will not be detected. Therefore, Trigger mode Sync will not be available.

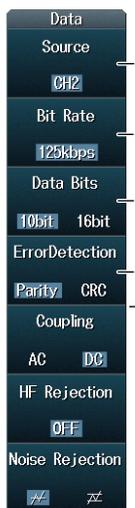
Set the trigger coupling, HF rejection, and noise rejection.
▶ section 2.3



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 CH8).

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

Set the data length (10bit, 16bit).

Set the error detection method (Parity, CRC).

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



Set the level used to detect data frame source states.

When the bit rate is set to User Define



Set the bit rate.

Set the level used to detect data frame source states.

Trigger Type (Mode)

Sync Mode

Press the **Mode** soft key and then the **Sync** soft key.
The DLM4000 triggers on the rising edge of sync pulses.

Start Bit Mode

Press the **Mode** soft key and then the **Start Bit** soft key.
The DLM4000 triggers on start bits.

Data Mode

Setting Trigger Conditions (Condition Setup)

Press the **Mode** soft key, the **Data** soft key, and then the **Condition Setup** soft key to display the following screen.

The screenshot shows the 'Data Condition Setup' menu with a left-hand navigation pane. The main area displays two comparison conditions. Annotations with arrows point to specific UI elements:

- When the Comparison Condition Is True:**
 - Condition:** True (highlighted)
 - Input Format:** Bin, Hex (highlighted)
 - Data:** (always selected)
 - Comparison condition:** When data length* is 10bit (highlighted)
 - Data pattern:** X X X (highlighted)
 - Comparison condition:** When data length* is 16bit (highlighted)
 - Data pattern:** X X X X X X X X (highlighted)
- When the Comparison Condition Is Data = a:**
 - Condition:** Data = a (highlighted)
 - Input Format:** Hex, Dec (highlighted)
 - Data:** (always selected)
 - Comparison condition:** Data = a (highlighted)
 - Input format of reference value a:** Hex, Dec (highlighted)
 - Reference value a:** 000 (highlighted)

Setting Reference Value a

Data length*	10bit		16bit	
	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.

2.15 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

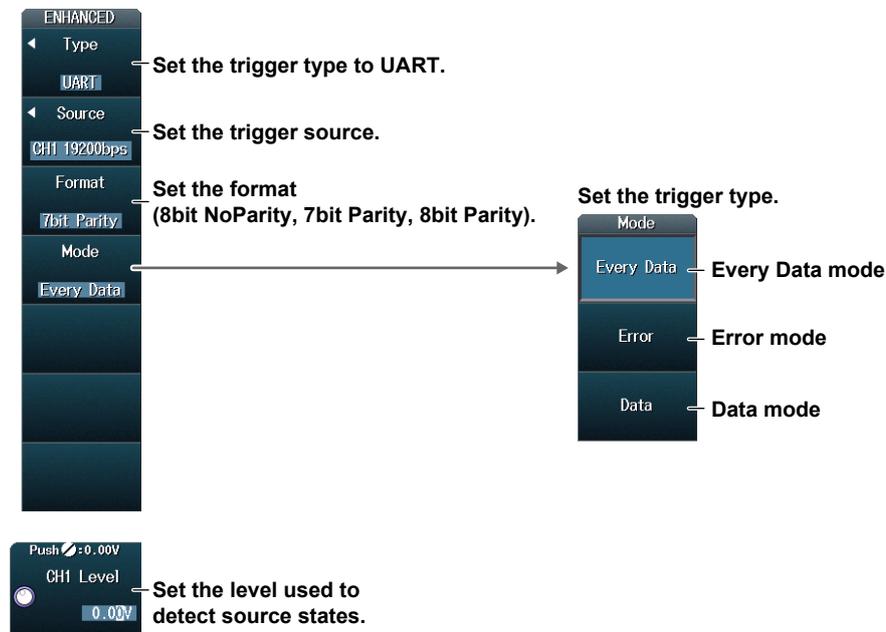
► [“UART Trigger \[ENHANCED, option\]” in the Features Guide](#)

Auto Setup

The DLM4000 can automatically set the trigger source level and bit rate from the received UART signal and trigger on them. For details, see section 12.8.

ENHANCED UART Menu

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



Setting the Trigger Source (Source)

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

When the Trigger Source Is a Channel from CH1 to CH8

Source
Source
CH1
Bit Rate
19200bps
Bit Order
LSB MSB
Polarity
01 01
Coupling
AC DC
HF Rejection
OFF
Noise Rejection

Set the trigger source (CH1 to CH8).

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

Set the bit order (LSB, MSB).

Set the polarity (01, 01).

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

Set the sample point.

When the Bit Rate Is Set to User Define
Bit Rate
User Define
Bit Order
LSB MSB
Polarity
01 01
Coupling
AC DC
HF Rejection
OFF
Noise Rejection

Set the bit rate.

Set the sample point.

Push 62.5%
Sample Point
62.5%

Push Toggle
Bit Rate
19200bps
Sample Point
62.5%

When the Trigger Source Is LOGIC(L) or LOGIC(A|B)

Source
Source
LOGIC(L)
Bit Rate
19200bps
Bit Order
LSB MSB
Polarity
01 01
Source Bit
L0

Set the trigger source (LOGIC(L) or LOGIC(A|B)).*

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

Set the bit order (LSB, MSB).

Set the polarity (01, 01).

Set the source bit (L0 to L7, A0 to A7, B0 to B7).*

Set the sample point.

When the Bit Rate Is Set to User Define
Bit Rate
User Define
Bit Order
LSB MSB
Polarity
01 01
Source Bit
L0

Set the bit rate.

Set the sample point.

Push 62.5%
Sample Point
62.5%

Push Source Bit
L0

Push Toggle
Bit Rate
19200bps
Sample Point
62.5%

* You can select CH8 or LOGIC(L), depending on which channel's corresponding key (CH8 or L) is illuminated.
LOGIC(A|B), A0 to A7, and B0 to B7 are available on models with the /L16 option.

Trigger Type (Mode)

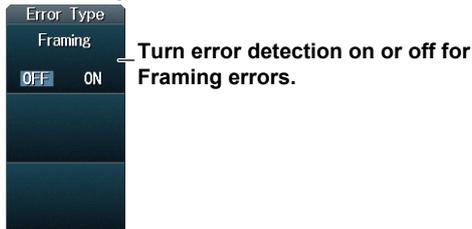
Every Data Mode

Press the **Mode** soft key and then the **Every Data** soft key.
The DLM4000 triggers on all data.

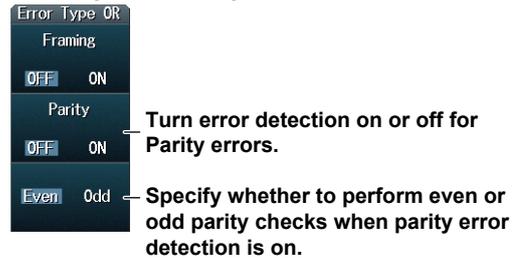
Error Mode

Press the **Mode** soft key, the **Error** soft key, and then the **Error Type** or **Error Type OR** soft key to display the following menu.

When the format is set to **8bit NoParity**



When the format is set to **7bit Parity or 8bit Parity**



* Format setting ► page 2-45

The DLM4000 triggers when it detects an error.

Data Mode

Setting Trigger Conditions (Condition Setup)

Press the **Mode** soft key, the **Data** soft key, and then the **Condition Setup** soft key to display the following screen.

The DLM4000 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.

2.15 Triggering on UART Signals (Option)

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.

2.16 Triggering on I²C Bus Signals (Option)

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

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

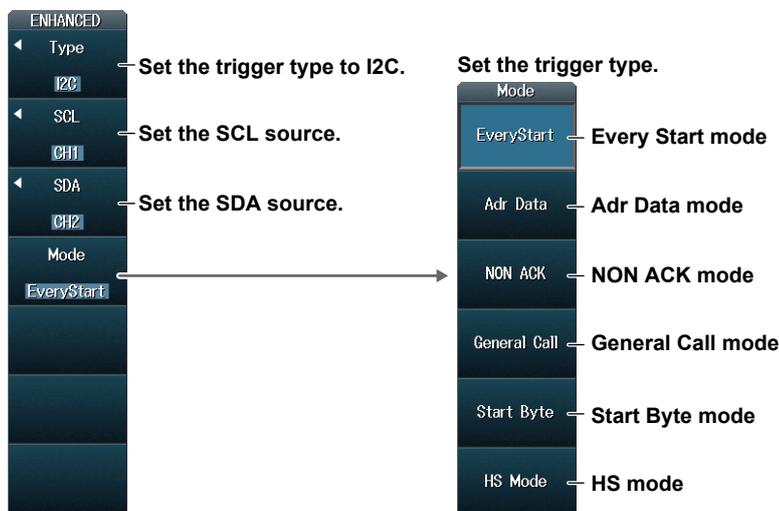
► “I²C Bus Trigger [ENHANCED, option]” in the Features Guide

Auto Setup

The DLM4000 can automatically set the source level from the received I²C bus signal and trigger on it. For details, see section 12.9.

ENHANCED I2C Menu

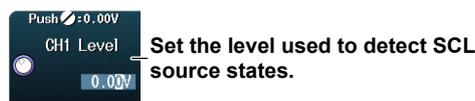
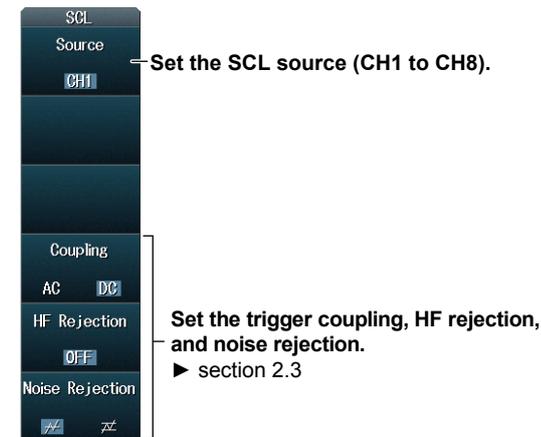
Press **ENHANCED** and then the **Type** soft key. From the setup menu that appears, select **I2C** to display the following menu.



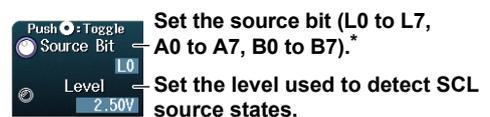
Setting the SCL Source (SCL)

Press the **SCL** soft key to display one of the menus shown below. The menu that is displayed varies depending on the specified source.

When the SCL Source Is a Channel from CH1 to CH8



When the SCL Source Is LOGIC(L) or LOGIC(A|B)*



* You can select CH8 or LOGIC(L), depending on which channel's corresponding key (CH8 or L) is illuminated. LOGIC(A|B), A0 to A7, and B0 to B7 are available on models with the /L16 option.

Setting the SDA source (SDA)

Press the **SDA** soft key to display one of the menus shown below. The menu that is displayed varies depending on the specified source.

When the SDA Source Is a Channel from CH1 to CH8



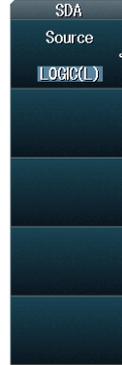
- Set the SDA source.
- When the SCL source is a channel from CH1 to CH4, set the SDA source to a channel from CH1 to CH4.
 - When the SCL source is a channel from CH5 to CH8 or LOGIC(L), set the SDA source to a channel from CH5 to CH8.

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



Set the level used to detect SDA source states.

When the SDA Source Is LOGIC(L)



- Set the SDA source (LOGIC(L)).
- This setting can only be selected when the SCL source is set to CH5 to CH7 or LOGIC(L).



- Set the source bit (L0 to L7).
- Set the level used to detect SDA source states.

* You can select CH8 or LOGIC(L), depending on which channel's corresponding key (CH8 or L) is illuminated.

When the SCL Source Is LOGIC(A|B)



The SDA source is fixed to LOGIC(A|B).



- Set the source bit (A0 to A7, B0 to B7).
- Set the level used to detect SDA source states.

* LOGIC(A|B) is available on models with the /L16 option.

Trigger Type (Mode)

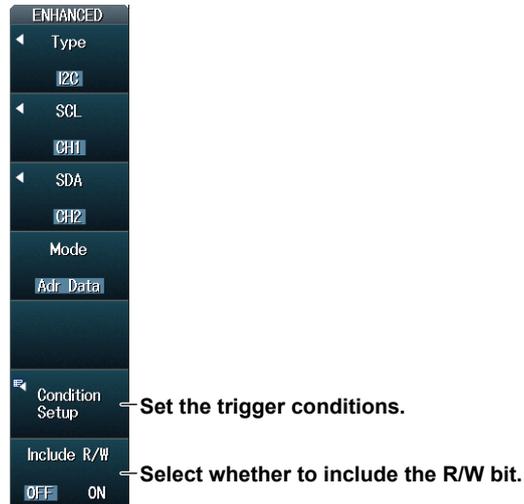
Every Start Mode

Press the **Mode** soft key and then the **Every Start** soft key.

The DLM4000 triggers when it detects a start condition.

Adr Data Mode

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



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.

2.16 Triggering on I2C Bus Signals (Option)

Setting Trigger Conditions (Condition Setup)

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

The DLM4000 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 not included
- When the R/W bit is included

Set the data length.

Set the comparison start position.

Set the data pattern input format.

Set the comparison condition.

Set the data pattern.

• When Address Type Is 7bit + Sub Adr

Start (always selected)

Set the address input format.

Set the address type (7bit + Sub Adr).

Set the address pattern.

- When the R/W bit is not included
- When the R/W bit is included

Set the data length.

Set the comparison start position.

Set the data pattern input format.

Set the comparison condition.

Set the data pattern.

• When Address Type Is 10bit Address

Start (always selected)

Set the address input format.

Set the address type (10bit Address).

Set the address pattern.

- When the R/W bit is not included
- When the R/W bit is included

Set the data length.

Set the comparison start position.

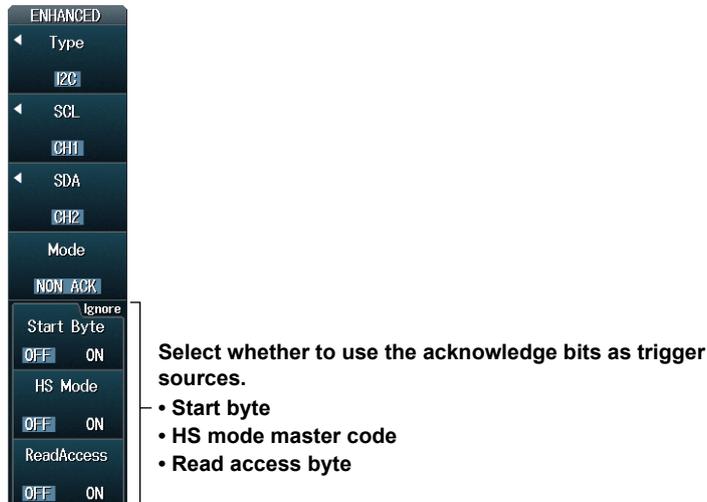
Set the data pattern input format.

Set the comparison condition.

Set the data pattern.

NON ACK Mode

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



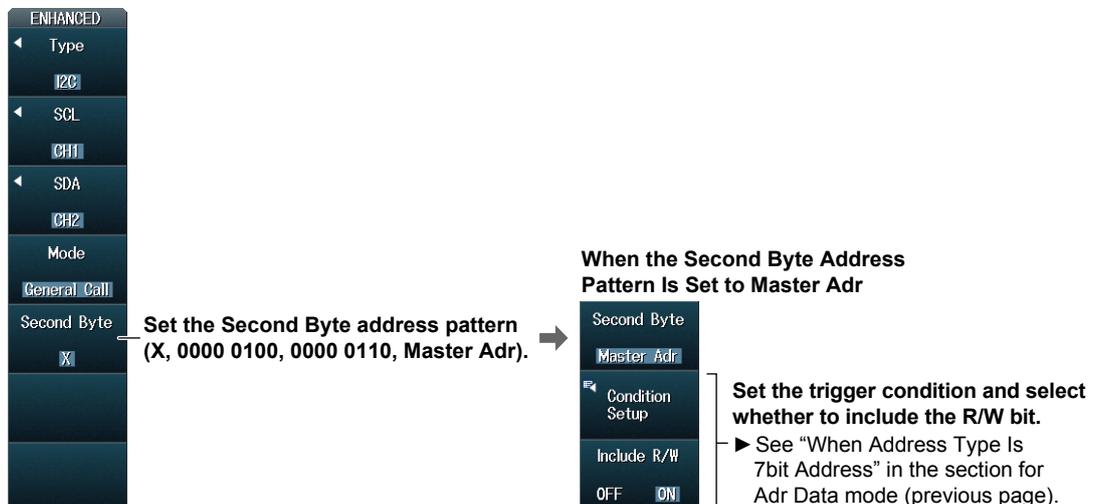
The DLM4000 triggers when the acknowledgement bit is Nack.

Selecting Whether to Use the Acknowledge Bits as Trigger Sources (Start Byte, HS Mode, ReadAccess)

You can select whether to use (OFF) or ignore (ON) the acknowledge bits that belong to the start byte (Start Byte), HS mode master code (HS Mode), and read access byte (Read Access).

General Call Mode

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



When Second Byte is set to Master Adr, the DLM4000 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 in the Condition Setup screen are used as trigger conditions.

Start Byte Mode

Press the **Mode** soft key and then the **Start Byte** soft key.

The DLM4000 triggers when it detects the start byte master code.

HS Mode

Press the **Mode** soft key and then the **HS Mode** soft key.

The DLM4000 triggers when it detects the high speed mode master code.

2.17 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 DLM4000 can automatically set the source level from the received SPI bus signal and trigger on it. For details, see section 12.10.

ENHANCED 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

The screenshot shows a vertical menu titled "ENHANCED" with the following options and descriptions:

- Type: SPI — Set the trigger type to SPI.
- Mode: 3 Wire 4 Wire — Set the wiring system (3 Wire).
- Clock: CH1 F — Set the clock source.
- Data1: CH2 — Set the Data1 source.
- CS(SS): CH4 L — Set the chip select source.
- Condition Setup — Set the trigger conditions.

When Wiring System Is 4 Wire

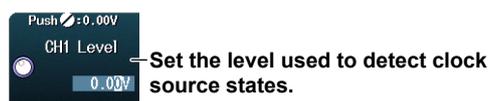
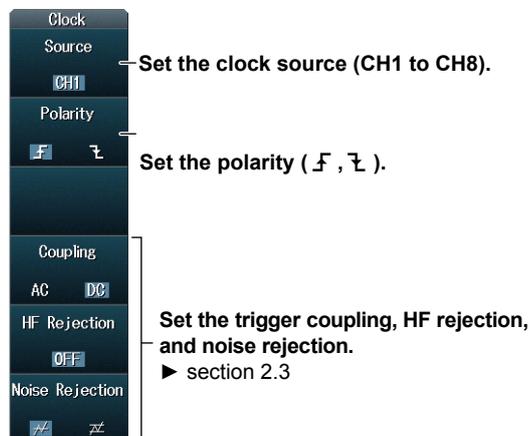
The screenshot shows a vertical menu titled "ENHANCED" with the following options and descriptions:

- Type: SPI — Set the trigger type to SPI.
- Mode: 3 Wire 4 Wire — Set the wiring system (4 Wire).
- Clock: CH1 F — Set the clock source.
- Data1: CH2 — Set the Data1 source.
- Data2: CH3 — Set the Data2 source.
- CS(SS): CH4 L — Set the chip select source.
- Condition Setup — Set the trigger conditions.

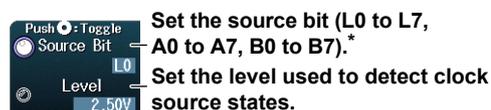
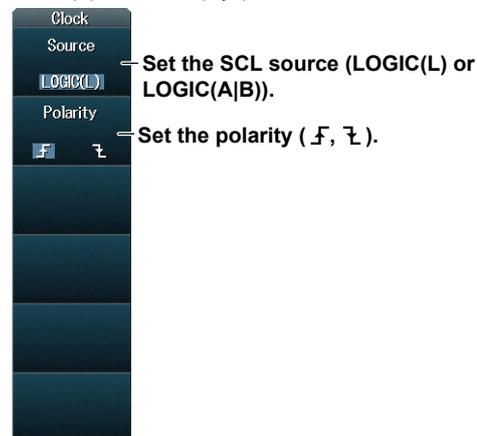
Setting the Clock Source (Clock)

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

When the Clock Source Is a Channel from CH1 to CH8 *



When the Clock Source Is LOGIC(L) or LOGIC(A|B) *

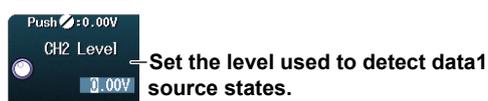
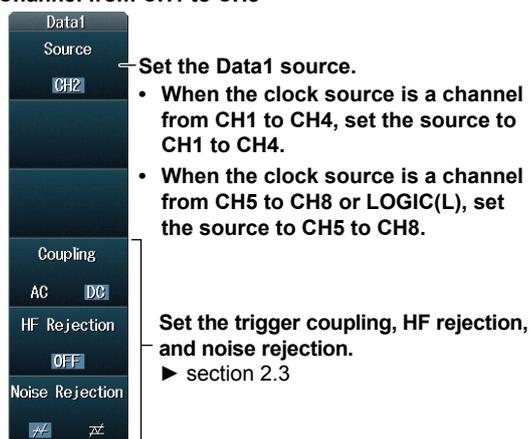


* You can select CH8 or LOGIC(L), depending on which channel's corresponding key (CH8 or L) is illuminated. LOGIC(A|B), A0 to A7, and B0 to B7 are available on models with the /L16 option.

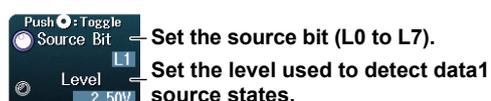
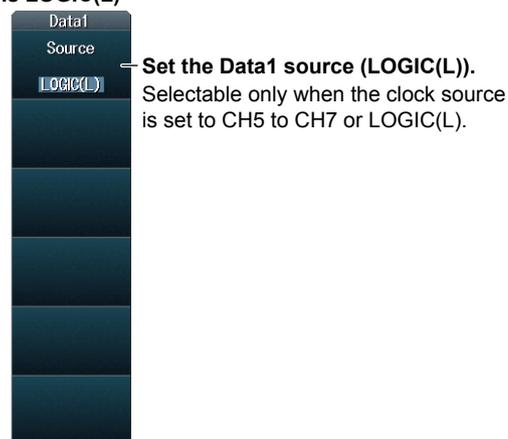
Setting the Data1 Source (Data1)

Press the **Data1** soft key to display one of the menus shown below. The menu that is displayed varies depending on the specified data source.

When the Data1 Source Is a Channel from CH1 to CH8



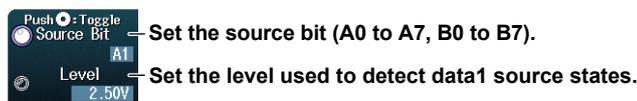
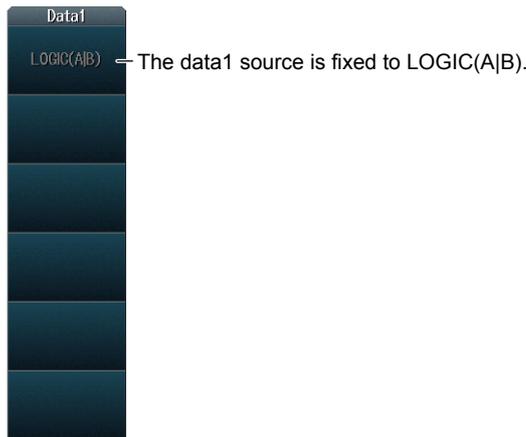
When the Data1 Source Is LOGIC(L)



* You can select CH8 or LOGIC(L), depending on which channel's corresponding key (CH8 or L) is illuminated.

2.17 Triggering on SPI Bus Signals (Option)

When the Clock Source Is LOGIC(A|B)



* LOGIC(A|B) is available on models with the /L16 option.

Setting the Data2 Source (Data2)

Press the **Data2** soft key to display the one of the same menus that appears when you set the Data1 source. The menu that is displayed varies depending on the specified data source.

When the wiring system is 4 Wire, you can set the Data2 source as indicated below.

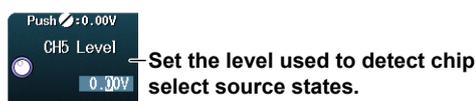
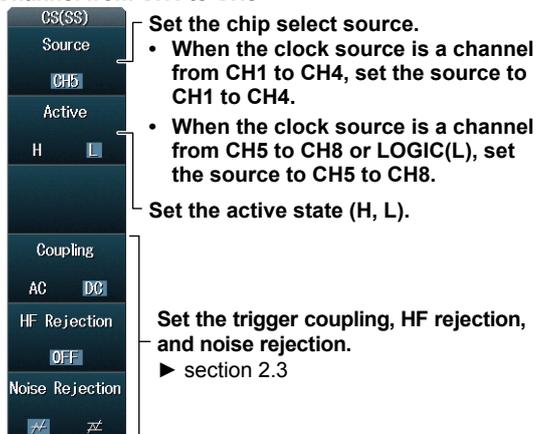
- When the clock source is a channel from CH1 to CH4: Set the source to CH1 to CH4.
- When the clock source is a channel from CH5 to CH8 or LOGIC(L): Set the source to CH5 to CH8 or LOGIC(L).
- When the clock source is LOGIC(A|B): Fixed to LOGIC(A|B).

* You can select CH8 or LOGIC(L), depending on which channel's corresponding key (CH8 or L) is illuminated. LOGIC(A|B) is available on models with the /L16 option.

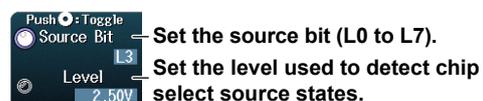
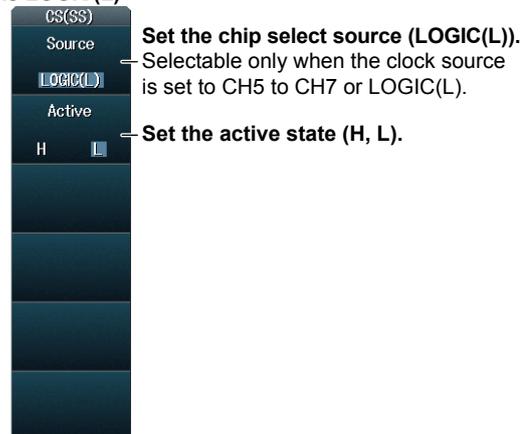
Setting the Chip Select Source (CS(SS))

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

When the Chip Select Source Is a Channel from CH1 to CH8

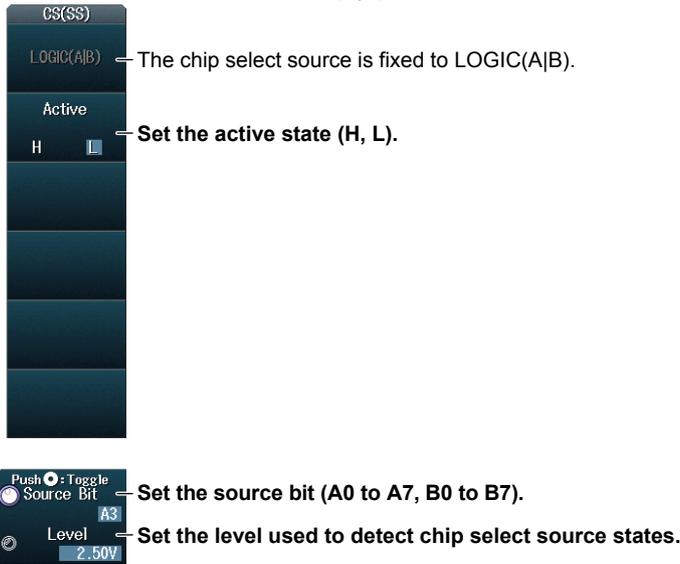


When the Chip Select Source Is LOGIC(L)



* You can select CH8 or LOGIC(L), depending on which channel's corresponding key (CH8 or L) is illuminated.

When the Clock Source Is LOGIC(A|B)



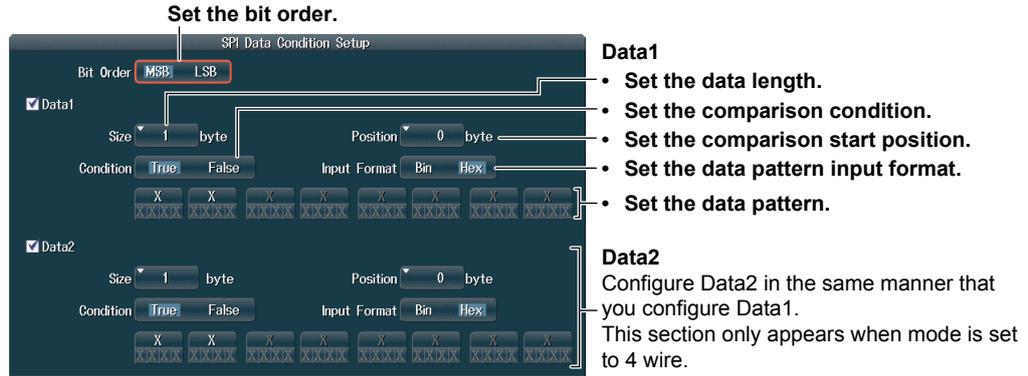
* LOGIC(A|B) is available on models with the /L16 option.

Setting Trigger Conditions (Condition Setup)

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

When Wiring System Is 4 Wire

Set the trigger conditions for Data1 and Data2.



When Wiring System Is 3 Wire

Only set the trigger condition for Data1.

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

ENHANCED User Define Menu

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

When the Clock Is Off

The image shows two screenshots of the ENHANCED User Define menu. The left screenshot shows the main menu with options: Type (User Define), Source (CH1 H), Clock (OFF ON), and Condition Setup. The right screenshot shows the Source menu with options: Source (CH1), Active (H L), Coupling (AC DC), HF Rejection (OFF), and Noise Rejection (two icons).

Annotations for the left screenshot:

- Set the trigger type to User Define. (points to Type)
- Turn the clock on or off (OFF). (points to Clock)
- Set the trigger conditions. (points to Condition Setup)

Annotations for the right screenshot:

- Set the data source. (points to Source)
- Set the data source (CH1 to CH8). (points to Source)
- Set the data source state to be recognized as 1 (H, L). (points to Active)
- Set the trigger coupling, HF rejection, and noise rejection. ► section 2.3 (points to Coupling, HF Rejection, and Noise Rejection)

Additional settings shown below the screenshots:

- Bit Rate: 1000.0kbps (Set the bit rate.)
- CH1 Level: 0.00V (Set the level used to detect data source states.)

Setting the Data Source (Source)

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.

The image shows the Data Setup screen with the following settings and annotations:

- Data Size: 8 bit (Set the data length.)
- Input Format: Bin Hex (Set the data pattern input format.)
- Data Pattern: A grid of 8 columns and 4 rows of 'X' characters (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

ENHANCED

- Type: **User Define** — Set the trigger type to User Define.
- Source: **CH1 H** — Set the data source (CH1 to CH8).
- Clock: **ON** — Turn the clock on or off (ON).
- Clock: **CH2 F** — Set the clock source.
- CS: **X** — Set the chip select source.
- Latch: **X** — Set the latch source.
- Condition Setup — Set the trigger conditions.

Press the **source** soft key and specify one of the channels from CH1 to CH8 to set that channel's 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.

Clock

- Source: **CH2** — Set the clock source.
 - When the data source is a channel from CH1 to CH4, set the source to CH1 to CH4.
 - When the data source is a channel from CH5 to CH8, set the source to CH5 to CH8.
- Polarity: **F** **L** — Set the timing for data source sampling (F, L).
- Coupling: **AC** **DC** — Set the trigger coupling, HF rejection, and noise rejection.
 - section 2.3
- HF Rejection: **OFF**
- Noise Rejection: **F** **L**
- CH2 Level: **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.

CS

Source
CH1

Active
L H

Coupling
AC DC

HF Rejection
OFF

Noise Rejection
/ /

Set the chip select source.

- When the data source is a channel from CH1 to CH4, set the source to CH1 to CH4 or X.
- When the data source is a channel from CH5 to CH8, set the source to CH5 to CH8 or X.

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

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

Push $\pm 0.00V$

CH1 Level
0.00V

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 DLM4000 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.

Latch

Source
CH1

Polarity
F Z

Coupling
AC DC

HF Rejection
OFF

Noise Rejection
/ /

Set the latch source.

- When the data source is a channel from CH1 to CH4, set the source to CH1 to CH4 or X.
- When the data source is a channel from CH5 to CH8, set the source to CH5 to CH8 or X.

Set the timing for data source pattern comparison (F, Z).

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

Push $\pm 0.00V$

CH1 Level
0.00V

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
- Definition
- Horizontal sync frequency
- Sync guard frequency

► “TV Trigger [ENHANCED]” in the Features Guide

ENHANCED TV Menu

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

The image shows two screenshots of the device's menu system. The left screenshot is the 'ENHANCED TV' menu, and the right is the 'Mode' menu. Arrows point from text labels to specific menu items.

ENHANCED TV Menu:

- Type** (TV) — Set the trigger type to TV.
- Mode** (NTSC) — Set the broadcasting system.
- Source** (CH1) — Set the source (CH1 to CH8).
- Polarity** (Pos Neg) — Set the polarity (Pos, Neg).
- Line** (One All) — Set the line number (One, All).
- Field** (1 2 X) — Set the field number (1, 2, X).^{1, 2}
- Frame Skip** (1 2 4 8) — Set the frame skip (1, 2, 4, 8).¹

Mode Menu:

- NTSC** — NTSC
- PAL** — PAL
- SDTV (480/60p)** — SDTV (480/60p)
- HDTV** (1080/60i) — HDTV
- UserdefTV** — UserdefTV

Additional Settings:

- Push Level** (0.5div) — Set the level used to detect source states.
- Line No.** (3) — Set the line number.¹

1 You can set this when the line number is set to One.

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

Broadcasting System (Mode)

NTSC

Press the **Mode** soft key and then the **NTSC** soft key.

The DLM4000 triggers using the specified field and line of the NTSC signal as trigger conditions.

PAL

Press the **Mode** soft key and then the **PAL** soft key.

The DLM4000 triggers using the specified field and line of the PAL signal as trigger conditions.

SDTV (480/60p)

Press the **Mode** soft key and then the **SDTV(480/60p)** soft key.

The DLM4000 triggers using the specified line of the SDTV signal as trigger conditions.

2.19 Triggering on a TV Trigger

HDTV

Press the **Mode** soft key and then the **HDTV** soft key to display the following menu.

The DLM4000 triggers using the specified field and line of the HDTV signal as trigger conditions.



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

UserdefTV

Press the **Mode** soft key and then the **UserdefTV** soft key to display the following menu.

The DLM4000 triggers using the user-defined field and line as trigger conditions.



Set the broadcasting system to UserdefTV.

Set the definition (SD, HD).

Set the line number (One, All).

Set the field number (1, 2, X).¹

Set the frame skip (1, 2, 4, 8).¹

Set the source.



Set the source (CH1 to CH8).

Set the polarity (Pos, Neg).

Set the HF rejection (OFF, 300 kHz).



Set the level used to detect source states.

Set the line number.¹



Set the horizontal sync frequency.

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

¹ You can set this when the line number is set to One.

2.20 Triggering on Combination Triggers (B TRIG)

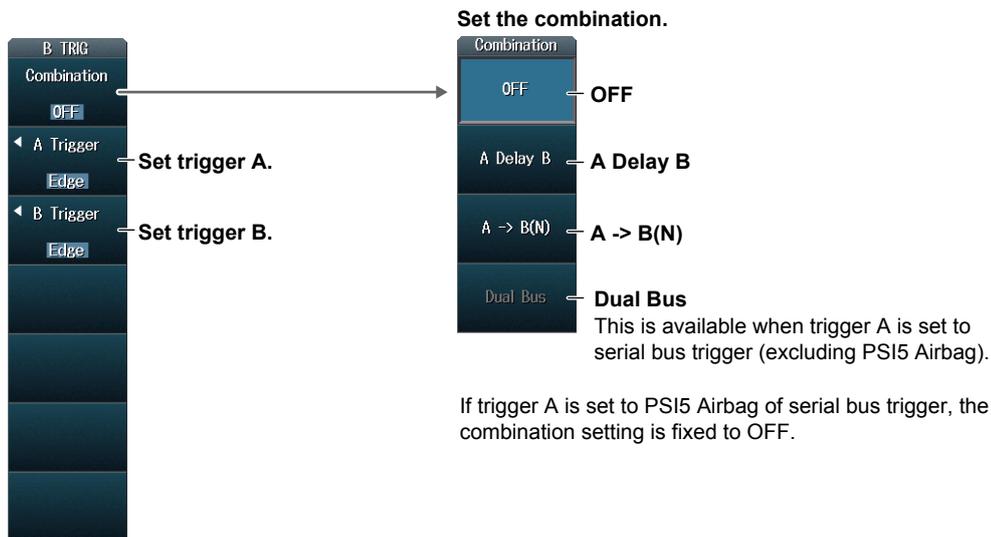
This section explains the following settings (which are used when triggering on a combination trigger).

- 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.



Setting the Combination (Combination)

OFF

Press the **Combination** soft key and then the **OFF** soft key.
The DLM4000 triggers when the trigger A conditions are met.

A Delay B

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



After the trigger A conditions are met and the specified amount of time (the delay time) elapses, the DLM4000 triggers when the trigger B conditions are met.

2.20 Triggering on Combination Triggers (B TRIG)

A -> B(N)

Press the **Combination** soft key and then 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 DLM4000 triggers when the trigger B conditions are met N times.

Dual Bus

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



Set trigger B.

If you specify a serial bus trigger (excluding 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 is changed to serial bus trigger.

Of the serial bus triggers that can be used and are displayed on the menu, condition B will change to the top most serial bus trigger.

The DLM4000 triggers when the serial bus trigger A or B conditions are met.

Note

You can select Dual Bus when condition A is a serial bus trigger (excluding PSI5 Airbag).

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.



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



← **Set 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
Edge	Section 2.3
Edge qualified	Section 2.5
State	Section 2.6
FlexRay	Section 2.9
CAN	Section 2.10
CAN FD	Section 2.11
LIN	Section 2.12
SENT	Section 2.13
UART	Section 2.15
I2C	Section 2.16
SPI	Section 2.17
User-defined serial bus	Section 2.18

2.21 Forcing the DLM4000 to Trigger (FORCE TRIG)

▶ [“Trigger Type \(Type\)” in the Features Guide](#)

Press **SHIFT+B TRIG** (FORCE TRIG).

2.22 Setting the Action-On-Trigger Function

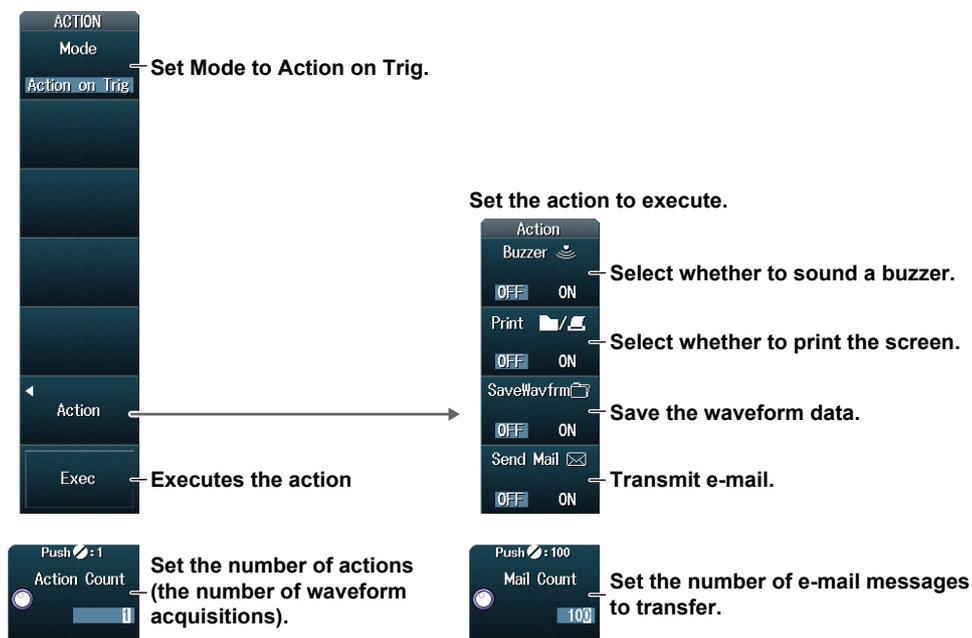
This section explains the following settings (which are used when executing the action-on-trigger function).

- 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.



Executing Actions (Exec)

After specifying the action mode, the action to execute, and the number of actions, press the **Exec** soft key. The DLM4000 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 16.5
- When the action to execute is e-mail transmission, the DLM4000 sends the number of messages specified by either Action Count or Mail Count, whichever is lower.

2.23 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 parameters

► “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.

The image shows the ACTION menu and its sub-menus with the following annotations:

- Mode**: Set the action mode (Go/Nogo AND, Go/Nogo OR).
- 1, 2, 3, 4**: Select a reference condition from 1 to 4.
- Action**: Set the action to execute. (Refer to section 2.22)
- Exec**: Executes the action.
- Condition1**: Set the reference standard (IN, OUT, X).
- Trace**: Set the source waveform.
- Mode**: Set the reference range type.
- Range**: Set the GO/NO-GO determination source window.
- Upper/Lower**: 0.50div, -0.50div
- Left/Right**: 3.00div, -2.50div
- Action Count**: Set the number of actions (the number of waveform acquisitions).
- Nogo Count**: Set the number of no-go results.

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 DLM4000 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 16.5
- When the action to execute is e-mail transmission, the DLM4000 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(L), LOGIC(A|B),* XY1 to XY4, FFT1, or FFT2
- When the reference condition is 2 or 4 and the source waveform is Math1 to Math4

Source Waveform	Reference Range Type			
	RectZone	WaveZone	PolygonZone	Parameter
CH1 to CH8	Yes	Yes	Yes	Yes
LOGIC(L) and LOGIC(A|B)*	No	No	No	Yes
Math1 to Math4				
Reference condition 1 and 3	Yes	Yes	Yes	Yes
Reference condition 2 and 4	No	No	No	Yes
XY1 to XY4	Yes	No	Yes	Yes
FFT1 and FFT2	No	No	No	Yes

* LOGIC(A|B) is available on models with the /L16 option.

Note

Using the CH8 Terminal and LOGIC(L) Port

When you perform GO/NO-GO determination, you cannot use the CH8 terminal and LOGIC(L) port as the source at the same time. Specify the source that you want to use in advance by pressing either the CH8 key or the L key.

Rectangular Zone (RectZone)

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

Condition1
Condition — **Reference standard.** The rectangular zone appears when this is set to IN or OUT.

IN OUT %

Trace — **Set the source waveform (CH1 to CH8, Math1 to Math4,* XY1 to XY4).**
* Math1 to Math4 can be specified when the reference condition is 1 or 3.

Mode — **Set the reference range type (RectZone).**

Range — **Set the GO/NO-GO determination source window (Main, Zoom1, or Zoom2).**
Set this when the source waveform is CH1 to CH8 or Math1 to Math4.

Upper/Lower — **Set the vertical range.**

Left/Right — **Set the horizontal range.**

Push Toggle
Upper — **Configure the range of the rectangular zone.**
0.50div — **Set the top side.**
Lower — **Set the bottom side.**
-0.50div

Push Toggle
Left — **Configure the range of the rectangular zone.**
-3.00div — **Set the left side.**
Right — **Set the right side.**
-2.50div

Waveform Zone (WaveZone)

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

Condition1
Condition
IN OUT % — **Reference standard.** The waveform zone appears when this is set to IN or OUT.

Trace — **Set the source waveform (CH1 to CH8, Math1 to Math4*).**
* Math1 to Math4 can be specified when the reference condition is 1 or 3.

Mode — **Set the reference range type (WaveZone).**

Time Range — **Set the GO/NO-GO determination source window (Main, Zoom1, or Zoom2).**

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

Edit 1 — **Edit the waveform zone.**

Set the GO/NO-GO determination area.

Push = Toggle
T Range1 — **Set the left side.**
-5.00div
T Range2 — **Set the right side.**
5.00div

Editing a Waveform Zone (Edit1 to 4)

1. Press the **Zone No.** soft key, and select the number, from 1 to 4, of the waveform zone that you want to edit.
The soft key for editing the waveform zone will change (to Edit 1, 2, 3, or 4) according to the selected number.
2. Press the soft key for editing the waveform zone (**Edit 1, 2, 3, or 4**).
The waveform zone editing menu for the number that you selected will be displayed.

Editing the Whole Waveform

3. Press the **Edit** soft key and select Whole to display the following menu.

Edit 1
Edit
Whole Part — **Set the editing range (Whole).**

Upper/Lower — **Set the vertical range.**
0.00div
0.00div

Left/Right — **Set the horizontal range.**
0.00div
0.00div

Trace — **Change the base waveform (CH1 to CH8, Math1 to Math4).**

Exec — **Restart editing.**

Store — **Confirm the changes to the waveform zone.**

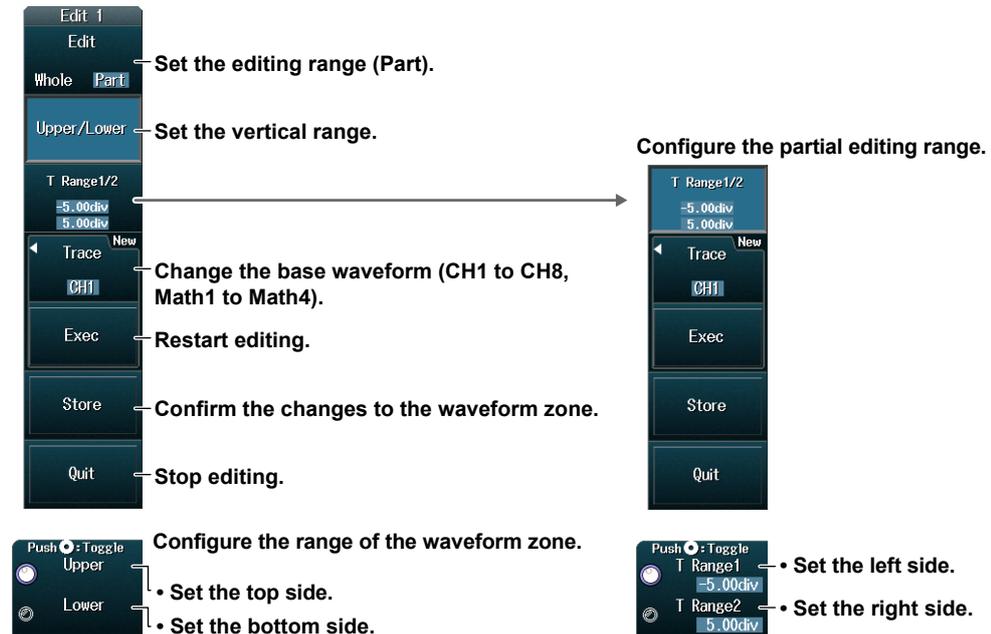
Quit — **Stop editing.**

Configure the range of the waveform zone.
Push = Toggle
Upper — **Set the top side.**
0.00div
Lower — **Set the bottom side.**
0.00div

Configure the range of the waveform zone.
Push = Toggle
Left — **Set the left side.**
0.00div
Right — **Set the right side.**
0.00div

Editing a Part of the Waveform

3. Press the **Edit** soft key and select Part to display the following menu.



- **Change 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.

- **Restart editing.**

To restart the editing of the waveform zones, press this soft key.

- **Confirm the changes to the waveform zone.**

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

- **Stop 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.

Polygonal Zone (PolygonZone)

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

	<p>Reference standard. The polygonal zone appears when this is set to IN or OUT.</p> <p>Set the source waveform (CH1 to CH8, Math1 to Math4,* XY1 to XY4). * Math1 to Math4 can be specified when the reference condition is 1 or 3.</p> <p>Set the reference range type (PolygonZone).</p> <p>Set the GO/NO-GO determination source window (Main, Zoom1, or Zoom2). Set this when the source waveform is CH1 to CH8 or Math1 to Math4.</p> <p>Set the polygonal zone to edit (1 to 4). GO/NO-GO determination is performed using the polygonal zone that you specify here.</p>
--	--

	<p>Configure the position of the polygonal zone.</p> <ul style="list-style-type: none"> • Set the vertical position. • Set the 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 17.7) and loading the polygonal image into the specified zone number (Zone No. 1 to 4), configure the polygonal zone GO/NO-GO determination.

Setting a Reference Range Using Waveform Parameters (Parameter)

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

When CH1 to CH8 or Math1 to Math4 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 (excluding measurement of the delay between waveforms). For information on setting automated measurement of waveform parameters, see section 9.1.

Condition1
Condition
IN OUT X

Trace
CH1
Mode
Parameter
Item
Max

Set the source waveform (CH1 to CH8, Math1 to Math4).

Set the reference range type (Parameter).

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

Item Setup

- Max
- Min
- P-P
- High
- Low
- Amplitude
- Rms
- Mean
- Sdev
- +Over
- Over
- Pulse Count
- Edge Count
- V1
- V2
- ΔT
- IntegTV+
- IntegTV
- Freq
- Period
- Avg Freq
- Avg Period
- Rise
- Fall
- Width
- Width
- Burst
- Duty
- Delay

Configure the GO/NO-GO determination range.

Upper limit
Lower limit

Enter

Enters the selected measurement items

When LOGIC(L) or LOGIC(A|B) 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.

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

For information on setting automated measurement of waveform parameters, see section 9.1.

Condition1
Condition
IN OUT X

Trace
LOGIC(L)
Mode
Parameter
Source Bit
L0
Upper/Lower
0.00000
0.00000
Item
Freq

Set the source waveform (LOGIC(L) or LOGIC(A|B)).*

The reference range type is fixed to Parameter.

Set the source bit.

Configure the GO/NO-GO determination range.

Upper limit
Lower limit

Set the source bit (L0 to L7, A0 to A7, B0 to B7).*

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

Item Setup

- Freq
- Period
- Avg Freq
- Duty
- Pulse Count
- Delay

Enter

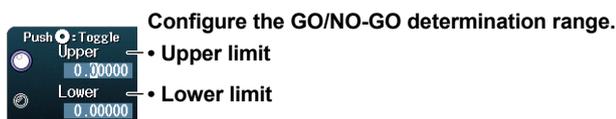
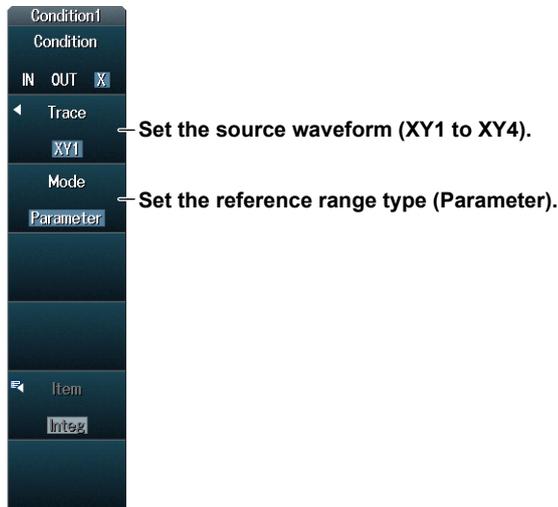
Enters the selected measurement items

* You can select CH8 or LOGIC(L), depending on which channel's corresponding key (CH8 or L) is illuminated. LOGIC(A|B), A0 to A7, and B0 to B7 are available on models with the /L16 option.

2.23 Performing GO/NO-GO Determination

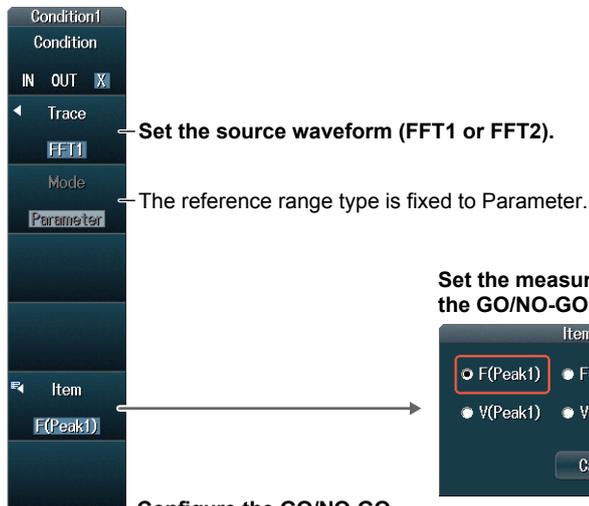
When XY1 to XY4 Is the Source Waveform

The measurement item to use in the GO/NO-GO determination is the area of XY1 to XY4. For information on setting how the XY waveform is displayed and how its area is determined, see chapter 5 of this manual and appendix 1 of the Features Guide, IM DLM4038-01EN.



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



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.

The ACQUIRE menu is shown with the following options and their functions:

- Record Length**: Set the record length. (Current value: 125kPoints)
- Mode**: Set the acquisition mode. (Current value: Normal)
- Trigger Mode**: Set the trigger mode. (Current value: Auto)
- Hi Resolution**: Turns high resolution mode on and off. (Current value: OFF)
- Interleave**: Turns interleave mode on and off. (Current value: OFF)
- Sampling Mode**: Set the sampling mode. (Current value: Interpolation)
- ACQ Count**: Set the number of waveforms to acquire, the attenuation constant, and the number of times to average. (Current value: Infinite)

The top of the screen displays the following parameters:

- Sampling mode**: Normal
- Acquisition mode**: IntP
- Sample rate**: 62.5GS/s
- Record length**: 1.25 M

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.

3.2 Starting and Stopping Waveform Acquisition

► “Waveform Acquisition (RUN/STOP)” and
“Acquiring the Waveform Once (SINGLE)”
in the Features Guide

Starting and Stopping Waveform Acquisition (RUN/STOP)

1. Press **RUN/STOP**.
 - The **RUN/STOP** key illuminates, and waveform acquisition starts. The acquired waveforms are displayed.
 - If you set the record length to a value that allows only one waveform to be acquired, pressing **RUN/STOP** will produce the same result as pressing **SINGLE**.
2. Press **RUN/STOP** again.

The **RUN/STOP** key light turns off, and waveform acquisition stops.

Acquiring a Waveform Once (SINGLE)

1. Press **SINGLE**.
 - The **SINGLE** key illuminates, and waveform acquisition starts. The acquired waveform is displayed.
 - The DLM4000 switches to Single mode and acquires a waveform.
 - When the DLM4000 triggers, it acquires and displays only one waveform and then stops waveform acquisition. The **SINGLE** key light turns off.
 - To stop waveform acquisition, press **RUN/STOP**.

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 arrangement
- Color
- Intensity

▶ “Display” in the Features Guide

DISPLAY Menu

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

The screenshot shows the DISPLAY menu with the following options and their functions:

- Format** — Set the display format (Auto, Single, Dual, Triad, Quad, Hexa, Octal).
- Dot Connect** — Set the display interpolation (Sine, Line, Pulse, or OFF).
- Graticule** — Set the graticule.
- Scale Value** — Turns the scale value display on and off.
- Mapping** — Set the waveform arrangement.
- Color** — Set the display colors.
- Accumulate** — (No description provided in the image)
- Intensity** — Set the intensity.

Setting the Graticule (Graticule)

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

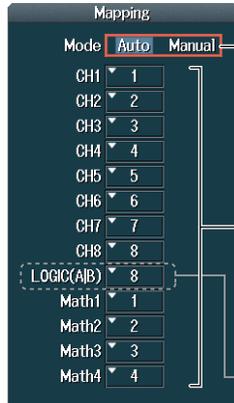
The screenshot shows the Graticule menu with the following options and their functions:

- Dot Grid** — Display the grid with dotted lines.
- Line Grid** — Display the grid with solid lines.
- Frame** — Display the grid frame.
- Cross Hair** — Display the grid with a cross hair.
- Fine Grid** — Select ON to display the fine grid. Select OFF to not display the fine grid.

Setting the Waveform Arrangement (Mapping)

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

When the CH8 Key is Lit

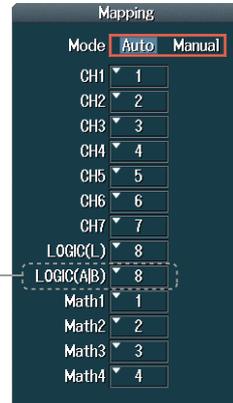


Set the allocation method (Auto, Manual).

If the allocation method is set to Manual, assign each channel's waveform to the divided screens (1 to 8).

/L16 option

When the L Key is Lit



Setting the Display Color (Color)

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

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

This menu appears on models with the SENT or PSI5 option.

Set the grid intensity.

Set the marker intensity.

Set the cursor intensity.

Set the zoom box intensity.

Set the waveform display color.

• When the CH8 Key is Lit

Set the color of each trend.

• When the L Key is Lit

Set the display color of each waveform.

/L16 option

Set the serial bus trend color.

4.2 Using the Accumulate Feature

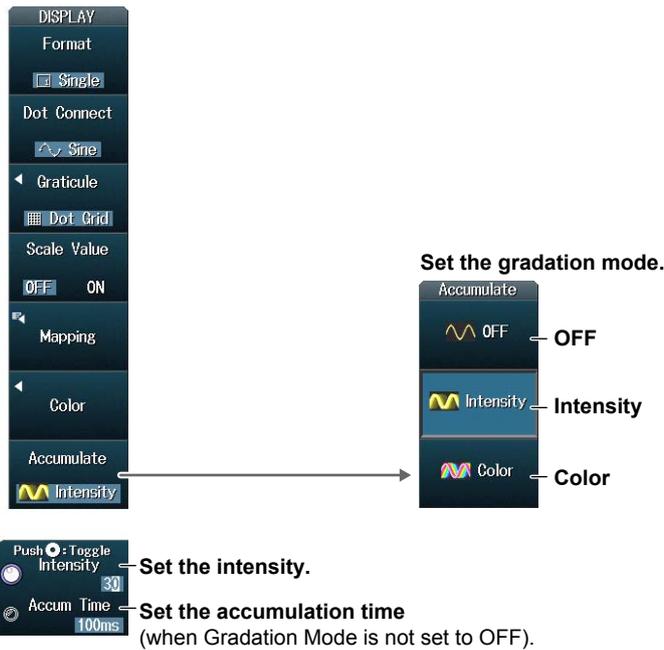
This section explains the following settings (which are used when using the accumulate feature).

- Gradation mode (accumulate display)
- Intensity level
- Accumulation time

► [“Accumulate \(Accumulate\)” in the Features Guide](#)

DISPLAY Menu

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



Setting the Gradation Mode (Accumulate)

OFF: Does not accumulate waveforms.

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.

4.3 Using the Snapshot and Clear Trace Features

► “Snapshot (SNAP SHOT)” and
“Clear Trace (CLEAR TRACE)”
in the Features Guide

Snapshot (SNAP SHOT)

1. 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.

Note

When the color data setting is ON(Rev.) on the PRINT File menu, if you print the snapshot waveforms or save them to a file, the waveforms may not be discernible.

Clear Trace (CLEAR TRACE)

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

4.4 Adjusting the Backlight

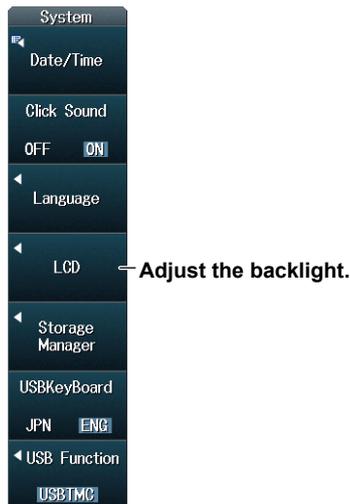
This section explains the following settings (which are used when adjusting the backlight).

- Turning off the backlight
- Automatically turning off the backlight
- Adjusting the brightness

► “System Configuration (System Configuration)” in the Features Guide

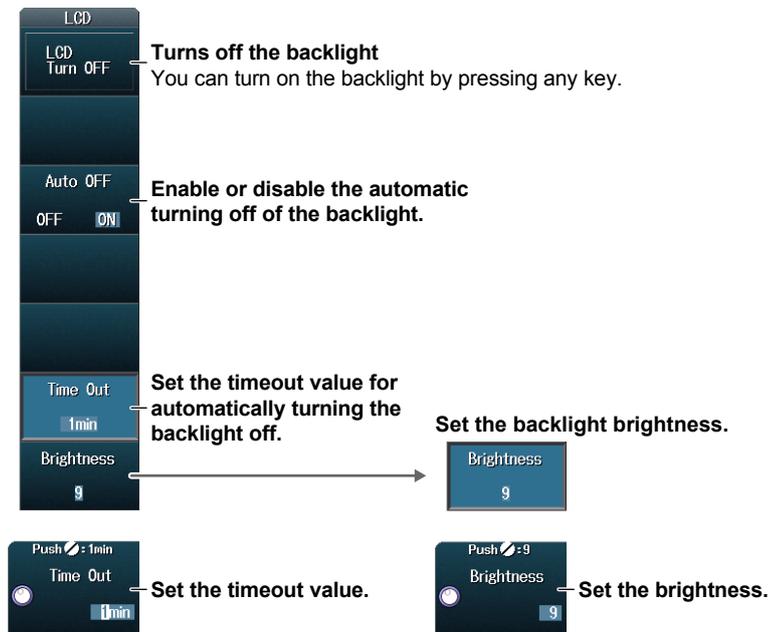
UTILITY System Configuration Menu

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



Adjusting the Backlight (LCD)

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



5.1 Displaying XY Waveforms

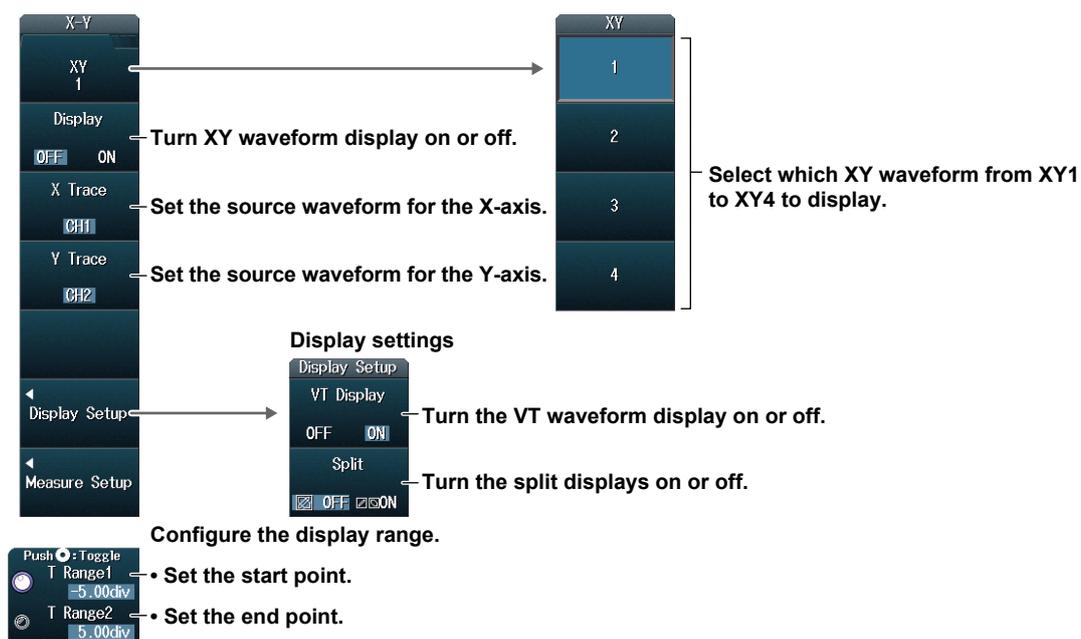
This section explains the following settings (which are used when displaying XY waveforms).

- 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

X-Y Menu

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



Setting the X-Axis and Y-Axis Source Waveforms (X Trace/Y Trace)

The source waveforms that you can assign to the X-axis and Y-axis of XY waveforms are as follows:

XY Waveforms	X-Axis and Y-Axis Source Waveforms
XY1 and XY2	CH1 to CH4, Math1, Math2
XY3 and XY4	CH5 to CH8, Math3, Math4

5.2 Performing Cursor Measurements and Area Calculations

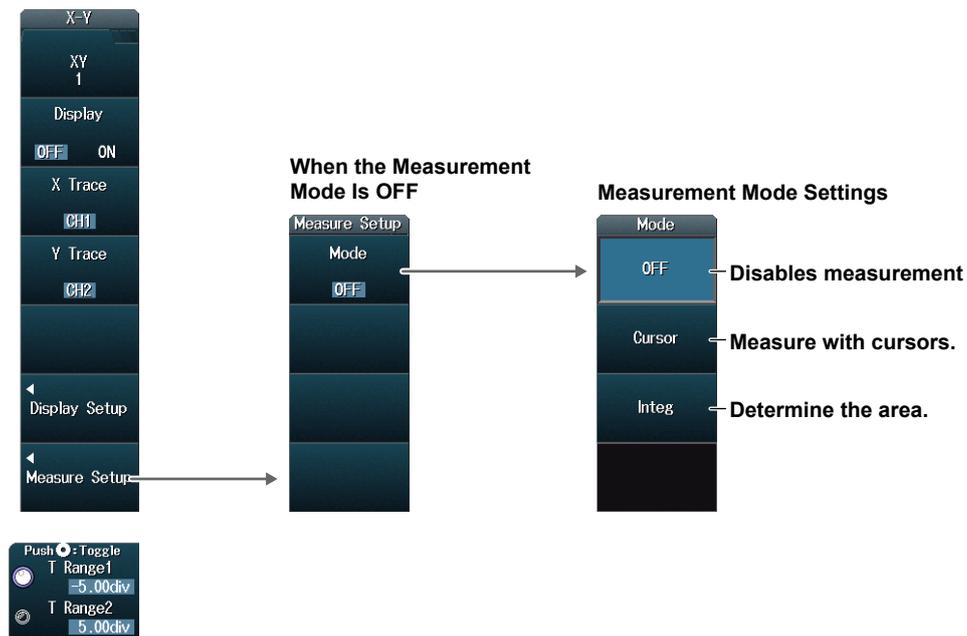
This section explains the following settings (which are used when performing cursor measurements on and determining the area of the displayed XY waveform).

- Measurement mode
- Cursor measurement
- Area determination method

► “Measurement (Measure Setup)” in the Features Guide

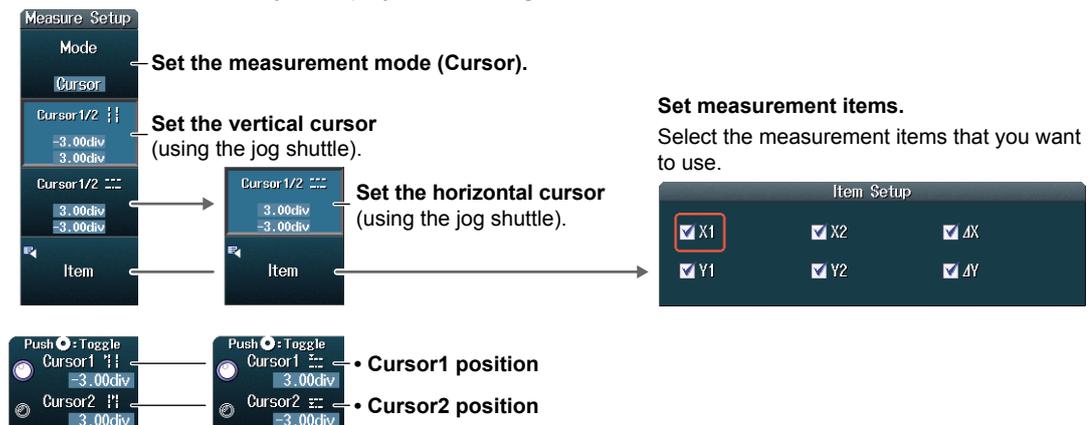
X-Y Measure Setup Menu

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



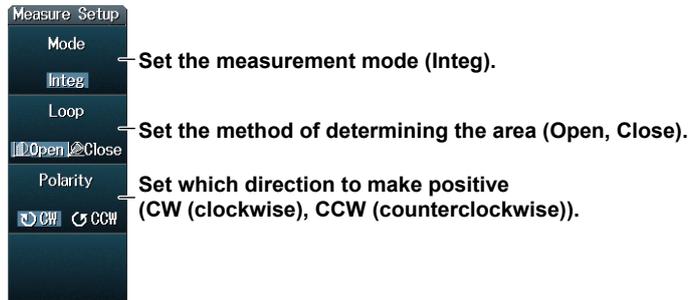
Performing Cursor Measurements (Cursor)

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



Performing Area Calculations (Integ)

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



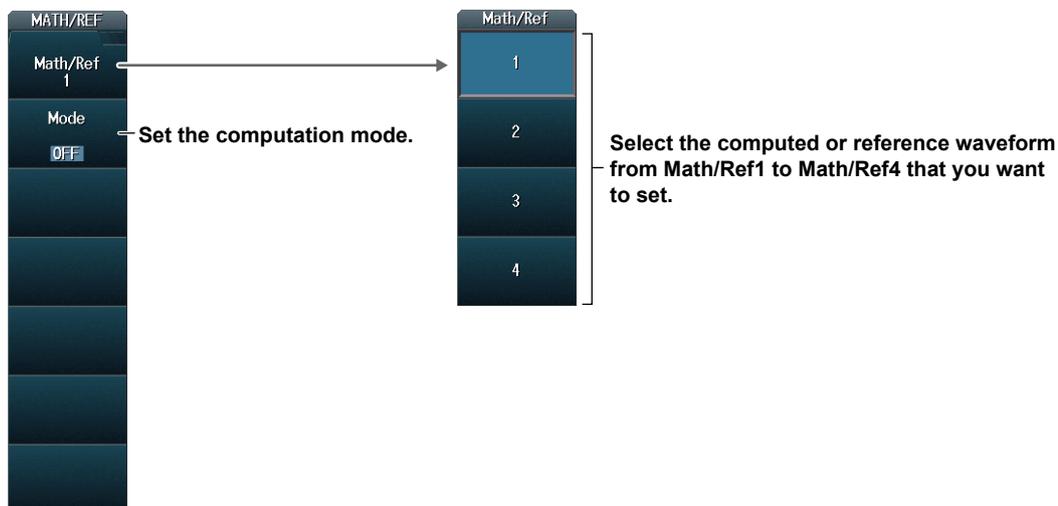
6.1 Setting the Computation Mode

This section explains how to set the computation mode.

► “Computation Mode (Mode)” in the Features Guide

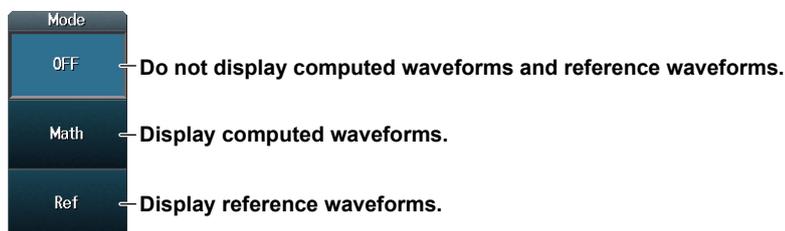
MATH/REF Menu

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



Setting the Computation Mode (Mode)

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



Note

- When the state display of logic signal LOGIC(L) is on, Math/Ref4 cannot be used. ► section 1.2
- When the trigger mode is set to Single, the DLM4000 will not display computed waveforms (MATH waveforms) while it is acquiring waveforms. The DLM4000 will display computed waveforms after it triggers and the roll mode display stops.
- The DLM4000 will not display computed waveforms that have been generated through user-defined computation while it is acquiring waveforms. The DLM4000 will display the computed waveforms after it stops acquiring waveforms.

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.

Set Mode to Math.

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

Set the computation source waveform (see the table below).

Specify the computed waveform from among Math1 to Math4 that you want to configure.

Setting the Computation Source Waveform

The computation source waveforms that you can set for Source1 and Source2 are listed below.

Computed Waveforms That Display Computation Results	Source1 or Source2
Math1 (Math/Ref1)	CH1 to CH4
Math2 (Math/Ref2)	CH1 to CH4 or Math1
Math3 (Math/Ref3)	CH5 to CH8
Math4 (Math/Ref4)	CH5 to CH8 or Math3

6.3 Performing Filter Functions

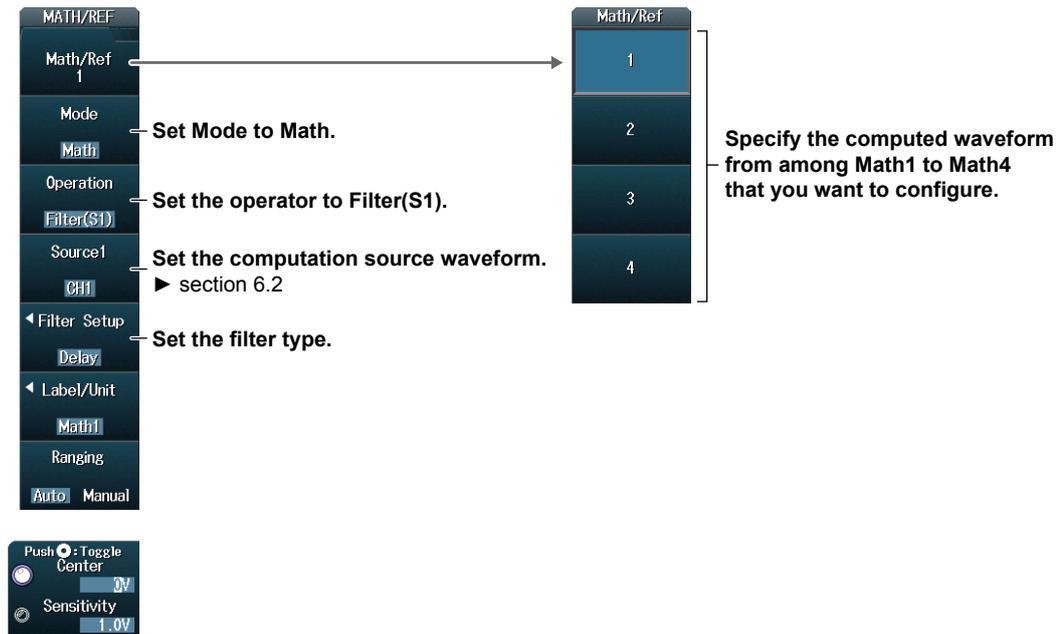
This section explains the following settings (which are used when performing the phase shift and moving average filter functions and when applying an IIR filter to the waveform).

- Operators
- Computation source waveforms
- Filter type

► “Operators (Operation)” in the Features Guide

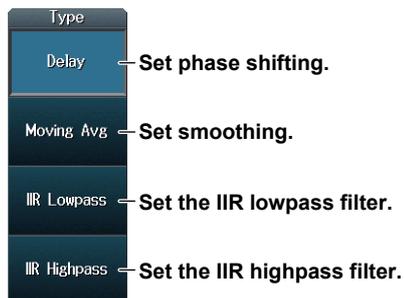
MATH/REF Menu

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



Setting the Filter Type (Type)

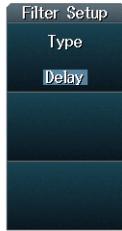
Press the **Filter Setup** soft key, then the **Type** soft key to display the following menu.



6.3 Performing Filter Functions

Setting Phase Shifting (Delay)

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



Set the delay value.

Setting Smoothing (Moving Avg)

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



Set the number of weighted points.

Setting 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

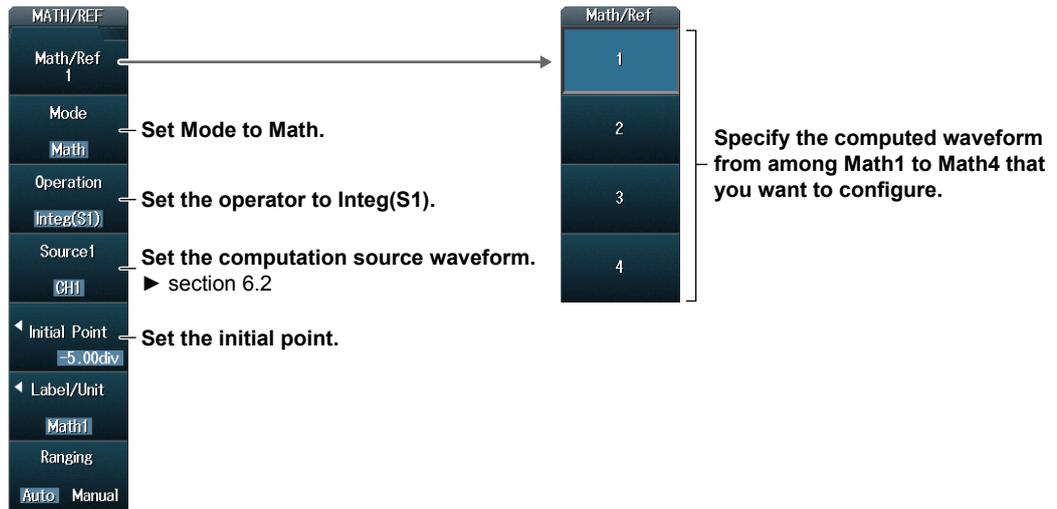
This section explains the following settings (which are used when performing integration).

- Operators
- Computation source waveforms
- Initial point

► “Operators (Operation)” in the Features Guide

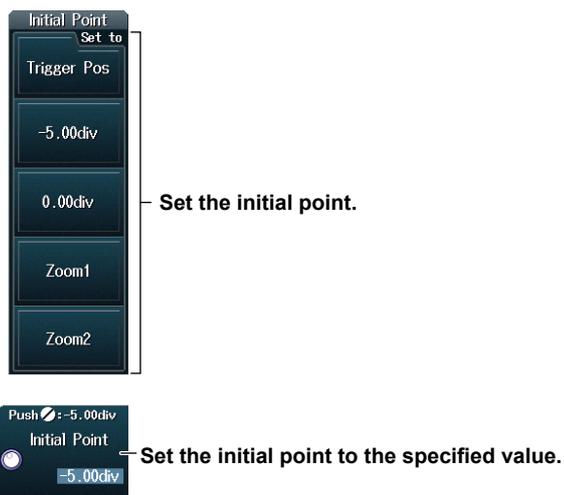
MATH/REF Menu

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



Setting the Initial Point (Initial Point)

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



6.5 Performing Count Computations

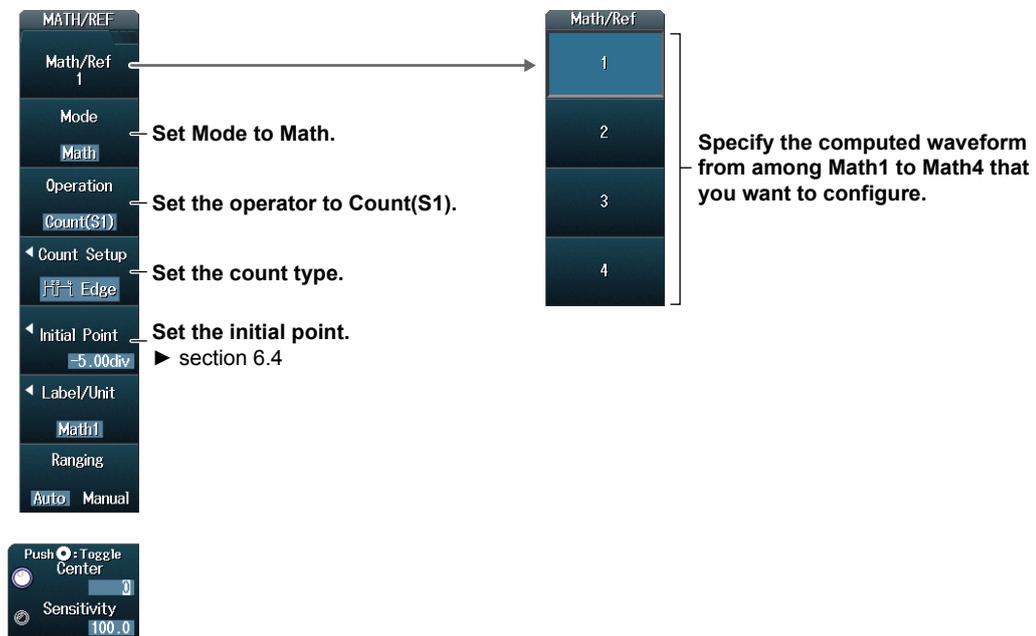
This section explains the following settings (which are used when performing edge count or rotary count).

- 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

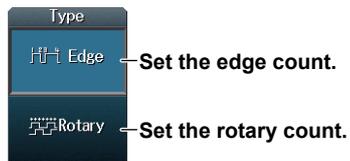
MATH/REF Menu

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



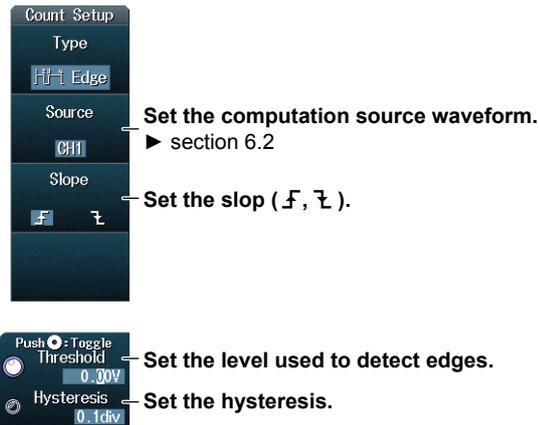
Setting the Count Type (Type)

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



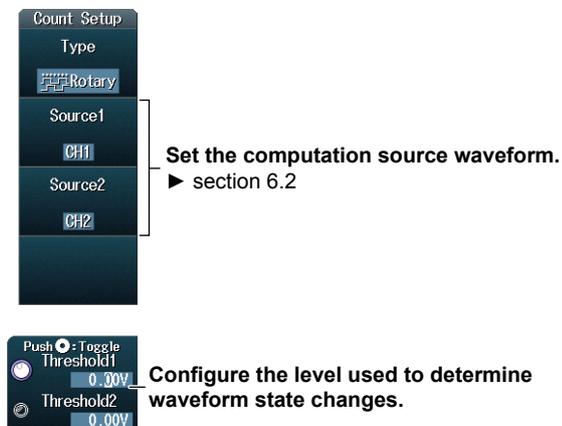
Setting the Edge Count (Edge)

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



Setting the Rotary Count (Rotary)

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



6.6 Setting Labels, Units, and Scaling

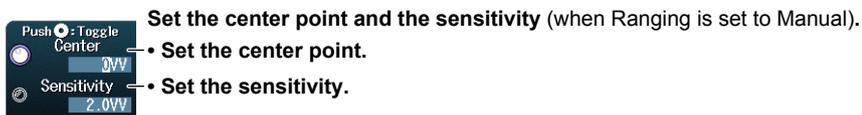
This section explains the following settings (which are used with labels, units, and scaling).

- Label
- Unit
- Scaling

► “Setting Labels and Units (Label/Unit)” and “Scaling (Ranging)” in the Features Guide

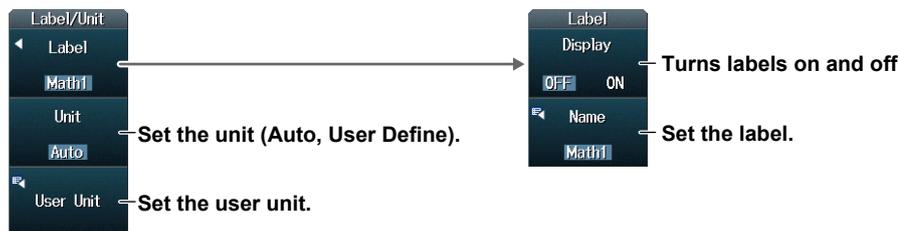
MATH/REF Menu

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



Setting Labels and Units (Label/Unit)

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



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

► “Reference Waveforms” in the Features Guide

MATH/REF Menu

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

Diagram illustrating the MATH/REF menu flow:

- MATH/REF Menu:**
 - Math/Ref 1
 - Mode: **Ref** (Set Mode to Ref.)
 - Load from (Load a reference waveform. (See the table below.))
 - Label/Unit: **Ref1** (Set labels.)
- Reference Waveform Selection Menu:**
 - 1
 - 2
 - 3
 - 4

Select the reference waveform from Ref1 to Ref4 that you want to set.
- Position Menu:**
 - Position: **0.00div** (Set the vertical position.)

Loading the Reference Waveform (Load from)

Specify one of the following waveform channels to acquire the reference waveform from.

Reference Waveform	Waveform Channel
Ref1 (Math/Ref1)	CH1 to CH4
Ref2 (Math/Ref2)	CH1 to CH4 or Math1
Ref3 (Math/Ref3)	CH5 to CH8
Ref4 (Math/Ref4)	CH5 to CH8 or Math3

Setting Labels (Label/Unit)

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

Diagram illustrating the Label/Unit menu flow:

- Label/Unit Menu:**
 - Label
 - Ref1
 - User Unit
- Label Menu:**
 - Display: **ON** (Turns labels on and off)
 - Name: **Ref1** (Set the label.)

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 ranging
- Scaling

► “User-Defined Computation (User Define, Option)” in the Features Guide

MATH/REF Menu

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

MATH/REF
 Math/Ref
 Mode — Set Mode to Math.
 Operation — Set the operator to User Define.
 Expression — Set the expressions.
 Setup — Set the computation conditions.
 Label/Unit — Set the label and unit.
 Auto Ranging — Set auto ranging.

Math/Ref
 1
 2
 3
 4

Specify the computed waveform from among Math1 to Math4 that you want to configure.

Push Center — Configure the scaling.
 Sensitivity

Setting Expressions (Expression)

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

Example: Computed waveform Math4

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

Define an expression by combining computation source waveforms and operators.

Math 4

Measure
 M1 M2 M3
 C1 C5 Bus
 C2 C6 Bus2
 C3 C7 Bus3
 C4 C8

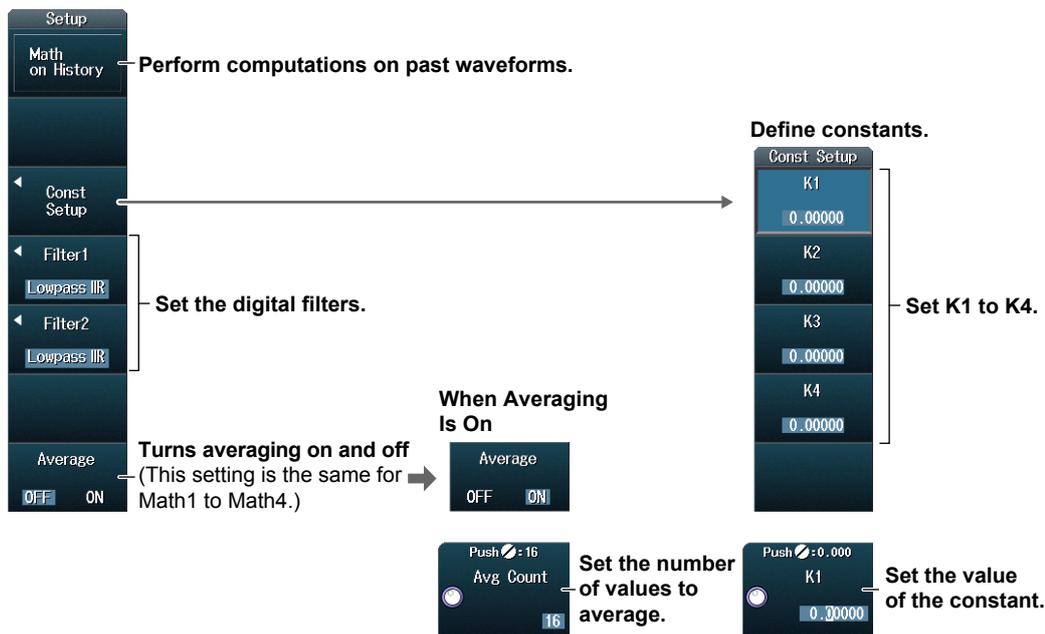
FILT1 FILT2 PH DA K1 K2 K3 K4 Enter
 MEAN HLBT T () , PI e fs 1/fs
 PWHH PWLL INTEG SIN COS TAN 7 8 9 /
 PWHL PWLH DIFF ASIN ACOS ATAN 4 5 6 *
 PWXX FV BIN EXP LN LOG 1 2 3 -
 DUTYH DUTYL DELAY ABS P2 SQRT 0 . Exp +

) — Inserts a right parenthesis
 ← — Moves the cursor to the left
 → — Moves the cursor to the right
 Delete — Deletes the character at the cursor position
 BS — Deletes the previous character
 Clear — Deletes all the characters you have entered
 Enter — Enters the expression

- Computed waveform Math3 (M1 M2)
- Computed waveform Math2 (M1)
- M1 to M3 are not displayed for computed waveform Math1.

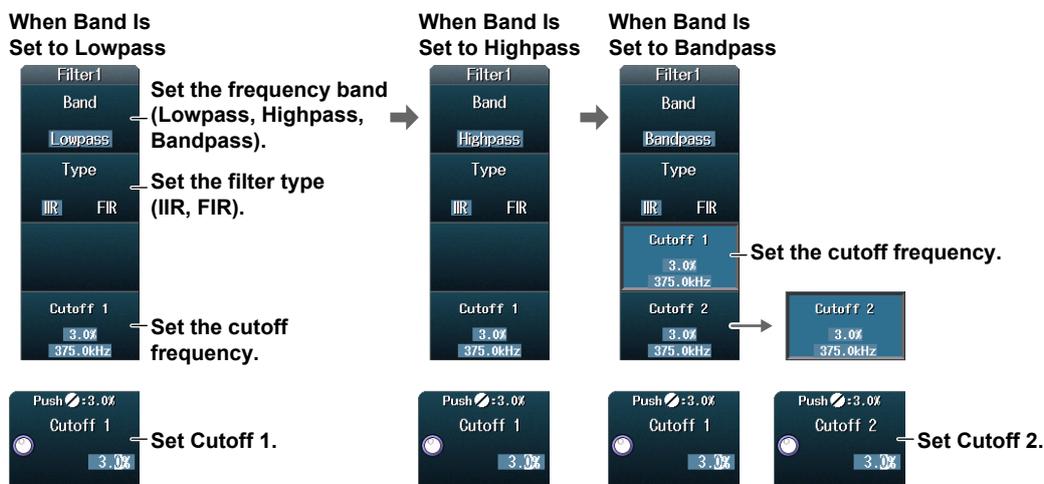
Setting Computation Conditions (Setup)

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



Setting Digital Filters (Filter1 and Filter2)

Press the **Filter1** or **Filter2** soft key to display the following menu.



* Cutoff 2 is only set when 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
- 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 CH8, Math1 to Math4).

Configure the FFT conditions.

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

Set the vertical and horizontal scale values.

Configure FFT waveform measurement. ► section 7.2

Set the number of FFT points.

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-, CH-).¹

Set the spectrum sub type (MAG, LOGMAG, PHASE, REAL, IMAG).^{1, 2}

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

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

Set the analysis source waveform (CH1 to CH8, Math1 to Math4).³

Set the unit.

Set the unit type (Auto, User Define).

Set the user-defined unit using up to 4 characters.

1 This is available on models 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 be specified on models with the user-defined computation option when Type is set to CS-, TF-, or CH-.

Setting the Vertical and Horizontal Scale Values (Display Setup)

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

The diagram illustrates the process of setting vertical and horizontal scale values through the **Display Setup** menu. It consists of three main screenshots showing different menu states and their corresponding settings.

Initial Display Setup Menu:

- Vert. Scale:** Set the vertical scale values (Auto, Manual). Options: **Auto**, **Manual**. Values: **-40.000dBV**, **20.0dBV**.
- Center/Scale:** Manually set the vertical scale values (using the jog shuttle).
- Horiz. Scale:** Set the horizontal scale values (Auto, Center/Span, Left/Right). Options: **Auto**, **Center/Span**, **Left/Right**. Values: **312.5kHz**, **625.0kHz**.
- VT Display:** Turn the VT waveform display on or off. Options: **OFF**, **ON**.

When Horiz. Scale Is Set to Center/Span:

- Horiz. Scale:** Manually set the center point and span. Options: **Center/Span**. Values: **62.5kHz**, **125.0kHz**.

When Horiz. Scale Is Set to Left/Right:

- Horiz. Scale:** Manually set the left and right sides of the axis. Options: **Left/Right**. Values: **0.0kHz**, **625.0kHz**.

Vertical Scale Detail:

- Push [] : Toggle**
- Center** (radio button selected) → Center of the vertical axis
- 40.000dBV** → Value per div
- Sensitivity** (radio button selected)
- 20.0dBV**

Horizontal Scale Detail (Center/Span):

- Push [] : Toggle**
- Center** (radio button selected) → Center point
- 62.5kHz** → Span
- Span** (radio button selected)
- 125.0kHz**

Horizontal Scale Detail (Left/Right):

- Push [] : Toggle**
- Left** (radio button selected) → Left side
- 0.0kHz** → Right side
- Right** (radio button selected)
- 625.0kHz**

7.2 Measuring FFT Waveforms

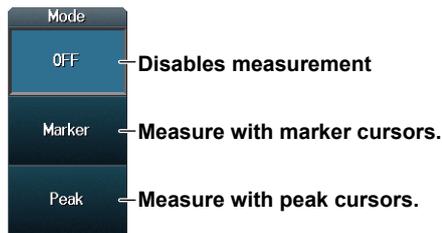
This section explains the following settings (which are used when measuring FFT waveforms).

- Cursor type
- Marker cursor measurements
- Peak cursor measurements

► “Cursor Measurement (Measure Setup)” in the Features Guide

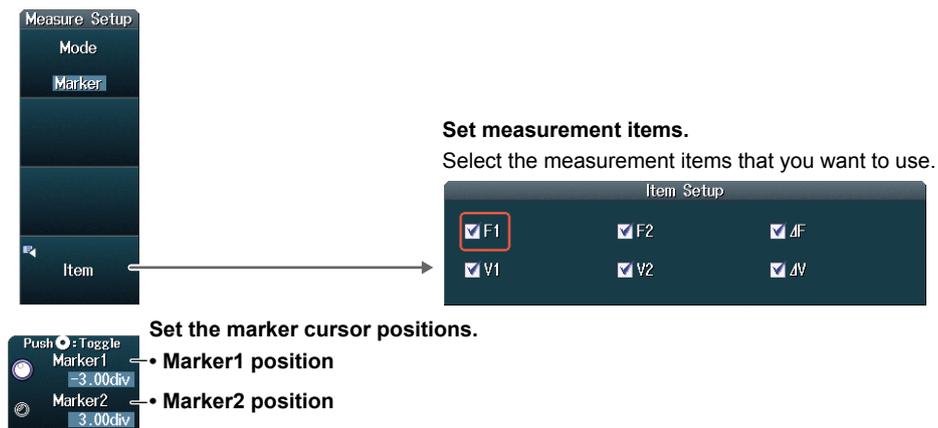
Setting the Cursor Type (Mode)

Press **SHIFT+MATH/REF** (FFT), the **Measure Setup** soft key, and then the **Mode** soft key to display the following menu.



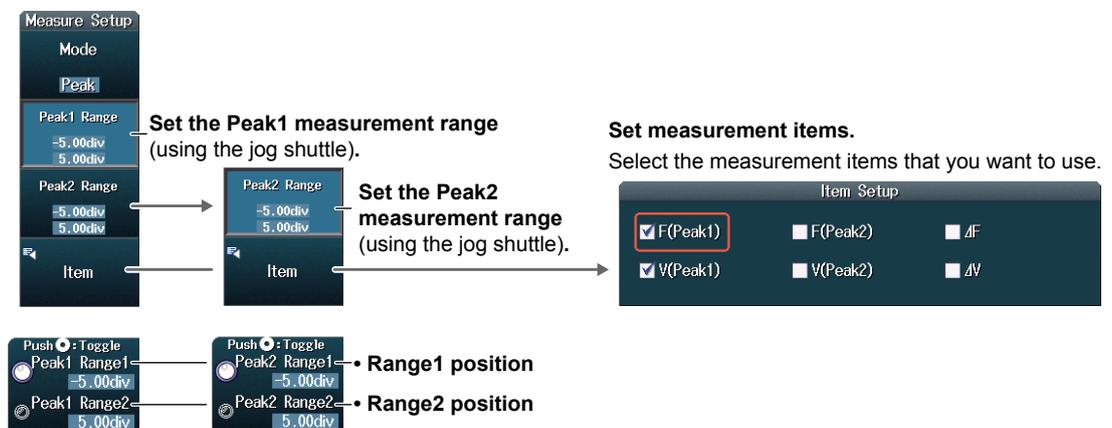
Measuring with Marker Cursors (Marker)

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



Measuring with Peak Cursors (Peak)

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



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.

* You can select CH8 or LOGIC(L), depending on which channel's corresponding key (CH8 or L) is illuminated. Specify the channel that you want to measure in advance by pressing either the CH8 key or the L key. LOGIC(A|B) is available on models with the /L16 option.

Cursor Jumping (Cursor Jump)

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

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

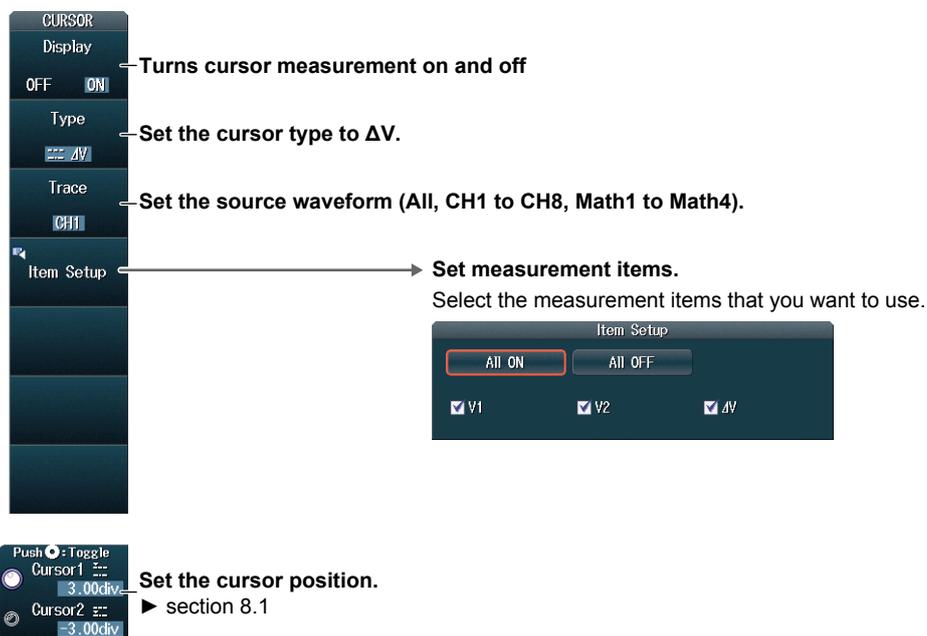
This section explains the following settings (which are used when performing ΔV cursor measurements).

- Cursor measurement
- Cursor type
- Source waveform
- Measurement items
- Cursor position

► “ ΔV Cursors (ΔV)” in the Features Guide

CURSOR Menu

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



The image shows the CURSOR menu with the following options and descriptions:

- Display** (OFF ON) — Turns cursor measurement on and off
- Type** (ΔV) — Set the cursor type to ΔV .
- Trace** (CH1) — Set the source waveform (All, CH1 to CH8, Math1 to Math4).
- Item Setup** — Set measurement items. Select the measurement items that you want to use.

The Item Setup sub-menu is shown with the following options:

- All ON (highlighted)
- All OFF
- V1
- V2
- ΔV

Below the main menu, the cursor position settings are shown:

- Push \odot = Toggle
- Cursor1 \equiv 3.00div
- Cursor2 \equiv 3.00div

Set the cursor position. ► section 8.1

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.

The CURSOR menu is shown with the following options and annotations:

- Display**: OFF ON. Turns cursor measurement on and off.
- Type**: ΔT & ΔV . Set the cursor type to ΔT & ΔV .
- Trace**: CH1. Set the source waveform (All, CH1 to CH8, Math1 to Math4).
- Item Setup**: Selects the measurement items to use.
- V Cursor 1/2**: 3.00div, -3.00div. Set the ΔV cursor positions (using the jog shuttle).
- T Cursor 1/2**: -4.00div, 4.00div. Set the ΔT cursor positions (using the jog shuttle).
- T Cursor Jump**: Make cursor ΔT jump. ► section 8.1

The **Item Setup** sub-menu is shown with the following options:

- All ON (highlighted) / All OFF
- T1, T2, ΔT , 1/ ΔT
- V1, V2, ΔV

Annotations for the bottom section:

- Cursor1 position**: Set the cursor position. (Cursor1: 3.00div)
- Cursor2 position**: Set the cursor position. (Cursor2: -3.00div)

8.4 Marker Cursor Measurements (Marker)

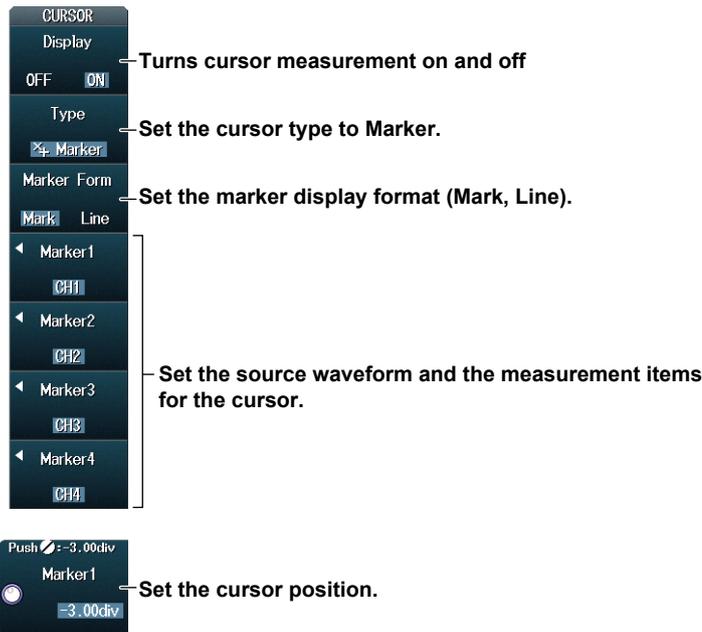
This section explains the following settings (which are used when measuring with marker cursors).

- Cursor measurement
- Cursor type
- Marker display format
- The waveform to measure using the cursors
- Measurement items
- Cursor jumping
- Cursor position

► [“Marker Cursors \(Marker\)” in the Features Guide](#)

CURSOR Menu

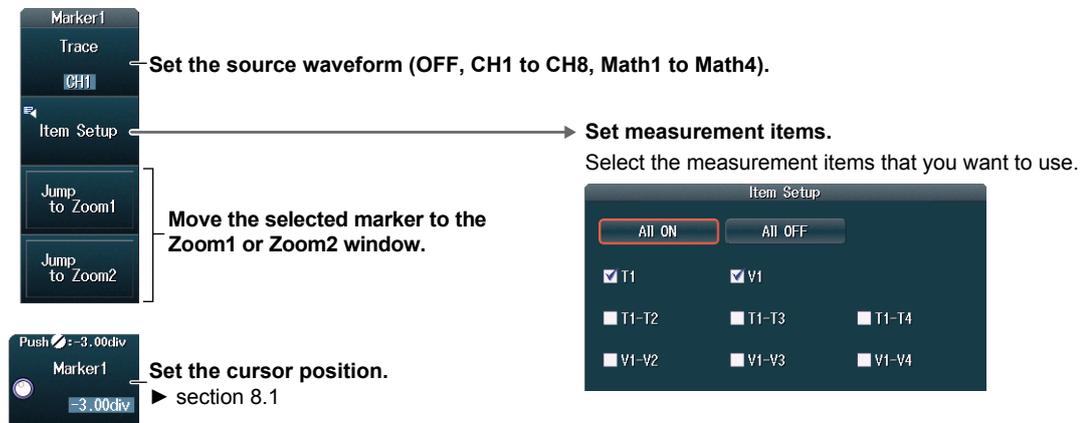
Press **CURSOR** to display the following menu.



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.

Example: When you press the Marker1 soft 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.

The CURSOR menu is shown with the following options and annotations:

- Display**: OFF ON. Turns cursor measurement on and off.
- Type**: Degree. Set the cursor type to Degree.
- Trace**: CH1. Set the source waveform (All, CH1 to CH8, LOGIC(L),* LOGIC(A|B),* Math1 to Math4).
- Item Setup**: Set measurement items. Select the measurement items that you want to use.
- Reference Setup**: Set the reference.
- Cursor Jump**: Cursor jumping ► section 8.1

The **Item Setup** sub-menu is shown with the following options:

- All ON
- All OFF
- D1
- D2
- D4
- V1
- V2

The cursor position settings are shown with the following options:

- Push = Toggle
- Cursor1: -4.00div. Set the cursor position. ► section 8.1
- Cursor2: 4.00div

* You can select CH8 or LOGIC(L), depending on which channel's corresponding key (CH8 or L) is illuminated. Specify the channel that you want to measure in advance by pressing either the CH8 key or the L key. LOGIC(A|B) is available on models with the /L16 option.

Setting the Reference (Reference Setup)

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

The Reference Setup menu is shown with the following options and annotations:

- Ref Value**: 360. Set the reference angle (using the jog shuttle).
- Unit**: deg. Set the unit.
- Ref Cursor**: -2.00div, 2.00div. Set the reference cursor (using the jog shuttle).

The Reference Setup sub-menu is shown with the following options:

- Push = 360
- Ref Value: 360. Set the reference angle.
- Push = Toggle
- Ref Cursor1: -2.00div. Ref Cursor1: zero point
- Ref Cursor2: 2.00div. 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.

The screenshot shows the MEASURE menu with the following options and their functions:

- Mode**: Turns automated measurement on and off. The menu shows 'OFF' and 'ON' with 'ON' selected.
- Item Setup**: Set the source waveform and measurement items.
- Indicator**: Set the measurement location indicator. The menu shows 'OFF'.
- Ref Levels**: Set the reference levels for time measurements.
- Statistics**: Process statistics on automatically measured values. ▶ section 9.2. The menu shows 'OFF'.
- Enhanced**: Measure enhanced parameters. ▶ section 9.3.
- Time Range**: Set the measurement source window. The menu shows 'Main'.

Below the main menu, there is a sub-menu for configuring the time range:

- Push []: Toggle**
- T Range1**: =5.00div
- T Range2**: 5.00div

▶ **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 **CH8**, **LOGIC(L)**, **LOGIC(A)**, **LOGIC(B)**, or **Math1** to **Math4**, to display the following menu.

- * You can select CH8 or LOGIC(L), depending on which channel's corresponding key (CH8 or L) is illuminated. Specify the channel that you want to measure in advance by pressing either the CH8 key or the L key.
LOGIC(A) and LOGIC(B) are available on models with the /L16 option.

When the Measurement Source Waveform Is CH1 to CH8 or Math1 to Math4

Clears the check boxes of all the measurement items

Measure Item

All OFF Copy To All Trace Cycle Mode OFF

Max Min P-P High Low
Amplitude Rms Mean Sdev
+Over -Over Pulse Count Edge Count
V1 V2 ΔT IntegTY+ IntegTY
Freq Period Avg Freq Avg Period Burst
Rise Fall +Width -Width Duty
Delay Delay Setup

Trace
CH1
CH2
CH3
CH4
CH5-CH8/LOGIC
Math1-Math4

Configure the measurement of delay between waveforms.

Set the reference (CH1 to CH8, Math1 to Math4, TrigPos).

Set the polarity of the edge to be detected (\uparrow , \downarrow).

Set which counted edge to use as a detected point.

Delay Setup (CH1)

Reference CH8
Polarity \uparrow
Count 1
Unit Time Degree

• When Reference is set to TrigPos.

Delay Setup (CH1)

Reference TrigPos
Polarity \uparrow
Count 1
Unit Time Degree

Set the unit (Time, Degree).

When the Measurement Source Waveform Is LOGIC(L)

Clears the check boxes of all the measurement items

Select the measurement items that you want to use.

Press the LOGIC(L) soft key.

Configure the measurement of delay between waveforms.

Set the reference (CH1 to CH7, LOGIC(L), LOGIC(A|B),* Math1 to Math4, TrigPos).

Set the polarity of the edge to be detected (F , 1).

Set which counted edge to use as a detected point.

Set the unit (Time, Degree).

• When Reference is set to LOGIC(L).

Set the reference bit (L0 to L7).

• When Reference is set to TrigPos.

• When Reference is set to LOGIC(A|B).*

Set the reference bit (A0 to A7, B0 to B7).

* LOGIC(A|B) is available on models with the /L16 option.

9.1 Automatically Measuring Waveform Parameters

When the Measurement Source Waveform Is LOGIC(A) or LOGIC(B) (Option)

Example: When the measurement source waveform is LOGIC(A)

Clears the check boxes of all the measurement items

Select the measurement items that you want to use.

Press the LOGIC(A) or LOGIC(B) soft key.

Configure the measurement of delay between waveforms.

Set the reference (CH1 to CH8 or LOGIC(L),* LOGIC(A|B), Math1 to Math4, TrigPos).

Set the polarity of the edge to be detected (\uparrow , \downarrow).

Set which counted edge to use as a detected point.

Set the unit (Time, Degree).

• When Reference is set to LOGIC(L).*

Set the reference bit (L0 to L7).

• When Reference is set to LOGIC(A|B).

Set the reference bit (A0 to A7, B0 to B7).

• When Reference is set to TrigPos.

* You can select CH8 or LOGIC(L), depending on which channel's corresponding key (CH8 or L) is illuminated. Specify the channel that you want to measure in advance by pressing either the CH8 key or the L key.

Setting the Measurement Location Indicator (Indicator)

1. Press the **Indicator** soft key.

You can set Indicator to OFF (the measurement location indicator is not displayed) or display a setup menu with the items whose check boxes you have selected in "Setting the Source Waveform and the Measurement Items (Item Setup)."

* The measurement locations of the following items can be indicated.

Max, Min, P-P, High, Low, Amplitude, Rms, Mean, +Over, -Over, V1, V2, Avg Freq, Avg, Period, Burst, Freq, Period, +Width, -Width, Duty, Rise, Fall, and Delay

2. Use the **jog shuttle** or the **SET** key to select the item whose measurement location you want to indicate.

The measurement location of the item you specify is indicated by a cursor.

Setting the Reference Levels for Time Measurements (Ref Levels)

Press the **Ref Levels** soft key to display the following screen.

Set the unit for the distal, mesial, and proximal reference levels (% or Unit).

Set the distal value (using the jog shuttle).

Set the mesial value (using the jog shuttle).

Set the proximal value (using the jog shuttle).

Set the mode for determining high and low levels (Auto, Max-Min, Histogram).

	Mode	Distal	Mesial	Proximal	High Low
CH1	Unit	90%	50%	10%	Auto
CH2	Unit	90%	50%	10%	Auto
CH3	Unit	90%	50%	10%	Auto
CH4	Unit	90%	50%	10%	Auto
CH5	Unit	90%	50%	10%	Auto
CH6	Unit	90%	50%	10%	Auto
CH7	Unit	90%	50%	10%	Auto
CH8	Unit	90%	50%	10%	Auto
Math1	Unit	90%	50%	10%	Auto
Math2	Unit	90%	50%	10%	Auto
Math3	Unit	90%	50%	10%	Auto
Math4	Unit	90%	50%	10%	Auto

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.

9.2 Processing Statistics on Automatically Measured Values

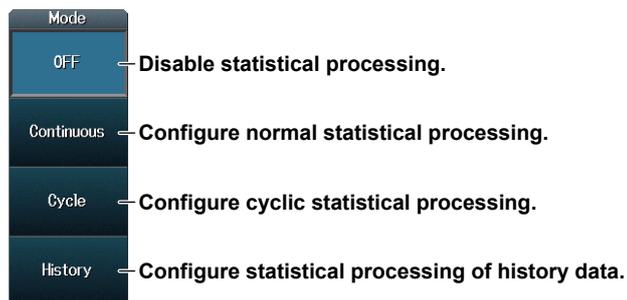
This section explains the following settings (which are used when processing statistics on automatically measured waveform parameters).

- Statistical processing mode
- Normal statistical processing
- Cyclic statistical processing
- Statistical processing of history data

► [“Statistics \(Statistics\)” in the Features Guide](#)

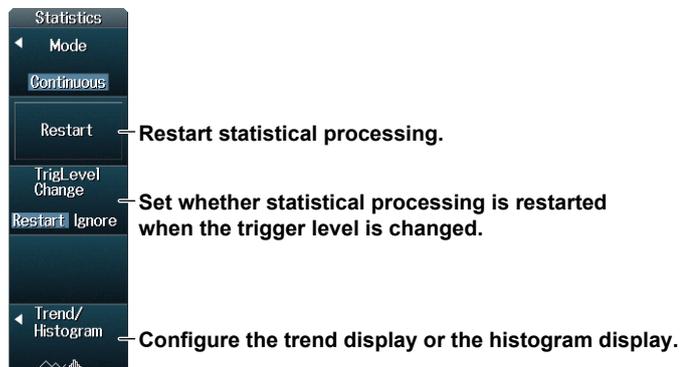
MEASURE Statistics Menu

Press **MEASURE**, the **Statistics** soft key, and then the **Mode** soft key to display the following menu.



Setting Normal Statistical Processing (Continuous)

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



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.

Setting 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.

Switches the graph display on and off

Set the displayed graph to Trend.

Set the measurement items to display trends for.

Execute auto scaling.

Set the vertical scale values.

Set the horizontal scale value.

Switches the VT waveform display window on and off

Turns cursor measurement on and off

Set the cursor positions.

Set the horizontal scale value or the vertical scale values.

• Histogram Display

Select whether to set Histogram1 or Histogram2.

Switches the graph display on and off

Set the displayed graph to Histogram.

Set the measurement items to display histograms for.

Switches the VT waveform display window on and off

Configure parameter or cursor measurements.

Set the measurement mode.

Set the items for measuring waveform parameters. Select the measurement items that you want to use.

Set the cursor positions.

Setting Cyclic Statistical Processing (Cycle)

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

Statistics

- Mode
- Cycle**
- Exec — Execute statistical processing.
- Cycle Trace — Set the source waveform used to determine the period (Own, CH1 to CH8, LOGIC(L),* LOGIC(A|B),* Math1 to Math4).
- CH1
- List — Configure the list display.
- Trend/Histogram — Configure the trend display or the histogram display.
 - ▶ the trend and histogram menus for normal statistical processing on the previous page

* You can select CH8 or LOGIC(L), depending on which channel's corresponding key (CH8 or L) is illuminated. Specify the channel that you want to measure in advance by pressing either the CH8 key or the L key. LOGIC(A|B) is available on models with the /L16 option.

Setting 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 move the SET key left and right or up and down to move the highlighted position and scroll through the displayed items.

Set the search mode (OFF, Statistics Max, Statistics Min, Data ≤ b, a ≤ Data, or a ≤ Data ≤ b).

Jumps to and highlights the specified destination

Select the sort method (Forward or Reverse).

Set the value of a and b (only when Search Mode is set to Data ≤ b, a ≤ Data, or a ≤ Data ≤ b).

	Min(C2)	P-P(C2)	High(C2)	Low(C2)
1	-0.71mV	10.87mV	10.09mV	-0.12mV
2	-0.84mV	11.00mV	10.09mV	-0.14mV
3	-1.17mV	11.33mV	10.09mV	-0.10mV
4	-1.03mV	11.19mV	10.09mV	-0.12mV
5	-0.75mV	10.91mV	10.09mV	-0.05mV
6	-0.92mV	11.08mV	10.09mV	-0.09mV
7	-1.01mV	11.17mV	10.09mV	-0.05mV
8	-0.75mV	10.91mV	10.09mV	-0.04mV
9	-0.91mV	11.07mV	10.09mV	-0.82mV
10	-0.60mV	10.76mV	10.09mV	0.01mV
11	-0.56mV	10.73mV	10.09mV	-0.04mV
12	-0.74mV	10.89mV	10.09mV	-0.05mV
13	-1.63mV	11.79mV	10.09mV	-0.02mV
14	-0.88mV	11.04mV	10.09mV	-0.01mV
15	-0.73mV	10.89mV	10.09mV	-0.05mV
16	-0.97mV	11.13mV	10.09mV	-0.01mV
17	-0.82mV	10.97mV	10.09mV	-0.01mV
18	-1.02mV	11.18mV	10.09mV	-0.07mV
19	-0.89mV	11.05mV	10.09mV	-0.04mV
20	-0.78mV	10.93mV	10.09mV	-0.05mV
21	-0.70mV	10.85mV	10.09mV	-0.05mV
22	-0.81mV	10.97mV	10.09mV	-0.07mV
23	-0.72mV	10.88mV	10.09mV	-0.02mV
24	-0.61mV	10.77mV	10.09mV	-0.07mV
25	-0.85mV	11.01mV	10.09mV	-0.05mV
26	-0.68mV	10.84mV	10.09mV	-0.05mV
27	-0.72mV	10.88mV	10.09mV	-0.05mV
28	-0.79mV	10.95mV	10.09mV	-0.09mV
29	-1.48mV	11.64mV	10.09mV	-0.04mV

Note

You can highlight a measured value and then press SET to zoom in on the corresponding waveform position.

Setting Statistical Processing of History Data (History)

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



The screenshot shows a vertical menu titled "Statistics" with the following options: "Mode", "History", "Exec", "List", and "Trend/Histogram". The "History" option is highlighted. To the right of the menu, there are three annotations with arrows pointing to the "Exec", "List", and "Trend/Histogram" options.

- Exec** ← Execute statistical processing.
- List** ← Configure the list display.
 - ▶ the list display for cyclic statistical processing on the previous page
- Trend/Histogram** ← Configure the trend display or the histogram display.
 - ▶ the trend and histogram menus for normal statistical processing on page 9-7

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 Area2.

Set up a calculation that uses automated measurement values.

Select the expressions to use.

Enter the name using up to 8 characters.

Enter the unit using up to 4 characters.

Calc	Name	Expression	Unit
<input type="checkbox"/> Calc 1	Calc1	Max(C1)	
<input type="checkbox"/> Calc 2	Calc2	Min(C2)	
<input type="checkbox"/> Calc 3	Calc3	High(M1)	
<input type="checkbox"/> Calc 4	Calc4	Low(M2)	

Set the measurement source window.
► section 9.1

Configure the time range.
► section 9.1

Set the expressions.

Define an expression by combining computation source waveforms and operators.

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

Setting Area2 (Item Setup (Area2))

Press the **Item Setup (Area2)** soft key to display a screen for setting the Area2 source waveform and measurement items. The screen is the same as the Item Setup screen shown in section 9.1.

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.

ZOOM1

- Display — Turn zooming on or off.
- OFF ON
- Format — Set the display format (Main, Single, Dual, Triad, Quad, Hexa, Octal).
- Main — Set the main window display (OFF, ON(20%), ON(50%)).
- ON(50%)
- Auto Scroll — Configure auto scrolling.
- Trace — Turn zoom source waveforms on or off (All, CH1 to CH8, LOGIC(L),* LOGIC(A|B),* Math1 to Math4).
* You can select CH8 or LOGIC(L), depending on which channel's corresponding key (CH8 or L) is illuminated. Specify the channel that you want to measure in advance by pressing either the CH8 key or the L key. LOGIC(A|B) is available on models with the /L16 option.
- Vertical Zoom — Set the vertical zoom. ► section 10.2

Push = 0.00div

Z1 Position

0.00div

— Set the zoom position.

Setting Auto Scrolling (Auto Scroll)

Press the **Auto Scroll** soft key to display the following menu.

Auto Scroll

- Speed — Set the scroll speed (x1, x2, x5, x10, x20, x50).
- Down — Decreases the speed by one level
- Up — Increases the speed by one level
- Auto Scroll — Configure auto scrolling.
- ◀ — Zooms in on the left edge of the Main window
- ◀ — Scrolls left
- — Stops auto scrolling
- ▶ — Scrolls right
- ▶ — Zooms in on the right edge of the Main window

Push = Toggle

Z1 Position

0.00div

Speed

x5

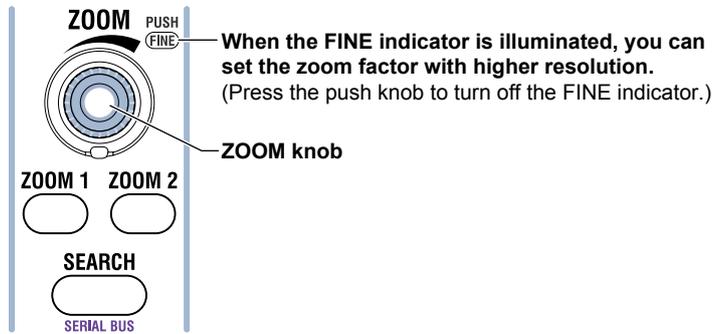
— Set the scroll speed.

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 (ZOOM1 or ZOOM2) is illuminated more brightly.

If you push the ZOOM knob, the FINE indicator illuminates, and you can set the zoom factor with higher resolution.



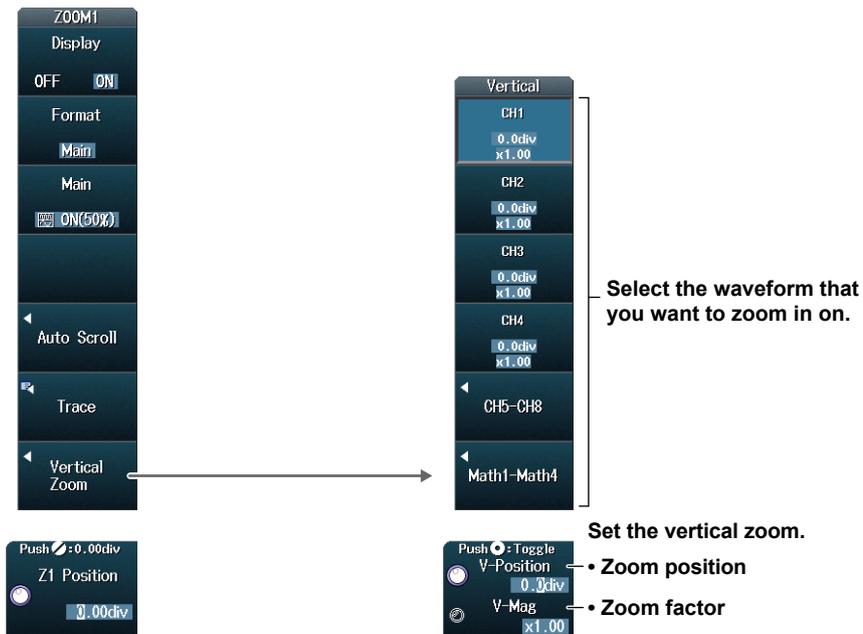
10.2 Zooming in on or out from Waveforms in the Vertical Direction

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.



Note

You can reset the zoom position and factor by pressing **RESET**.

11.1 Searching for Edges

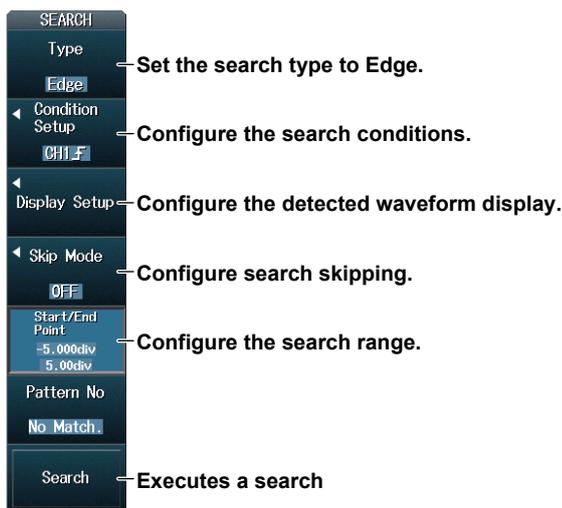
This section explains the following settings (which are used when searching for edges).

- 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.



When You Press the Start/End Point Soft Key



Setting Search Conditions (Condition Setup)

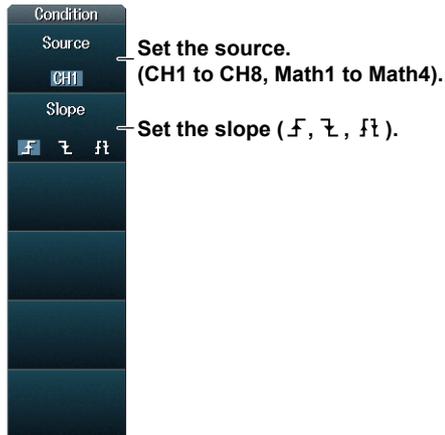
Note

Using the CH8 Terminal and LOGIC(L) Port

When you execute a search, you cannot use the CH8 terminal and LOGIC(L) port as the source at the same time. Specify the source that you want to use in advance by pressing either the CH8 key or the L key.

Press the **Condition Setup** soft key to display one of the menus shown below. The menu that is displayed varies depending on the specified source.

When the Source is CH1 to CH8 or Math1 to Math4



Set the source.
(CH1 to CH8, Math1 to Math4).

Set the slope (F, L, ft).

Set the level used to detect source states.

Set the hysteresis.

When the Source Is LOGIC(L) or LOGIC(A|B)*



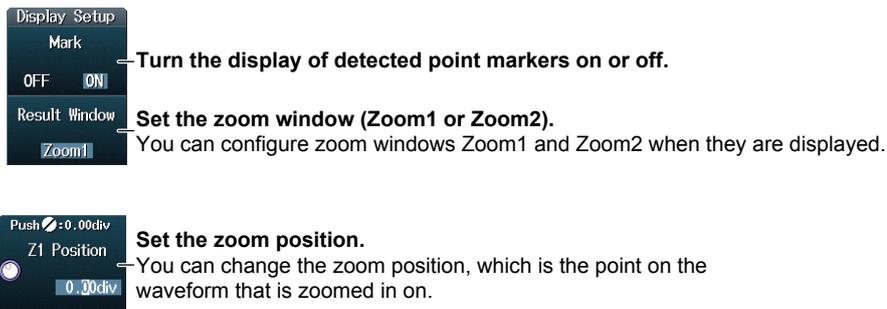
Set the source (LOGIC(L), LOGIC(A|B)).

Set the source bit (L0 to L7, A0 to A7, B0 to B7).*

* LOGIC(A|B), A0 to A7, and B0 to B7 are available on models with the /L16 option.

Setting 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).
You can configure zoom windows Zoom1 and Zoom2 when they are displayed.

Set the zoom position.
You can change the zoom position, which is the point on the waveform that is zoomed in on.

Turning the Display of Detected Point Markers On or Off

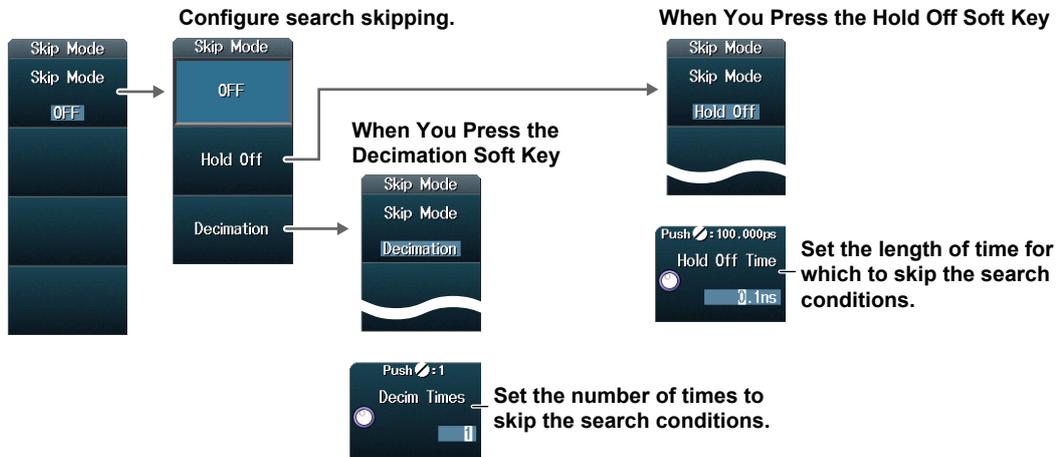
You can display marks at the top of the main and zoom windows to clearly show the detected position on the waveform (the detected point mark). Marks that match detected point numbers are highlighted.

Configuring Search Skipping (Skip Mode)

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

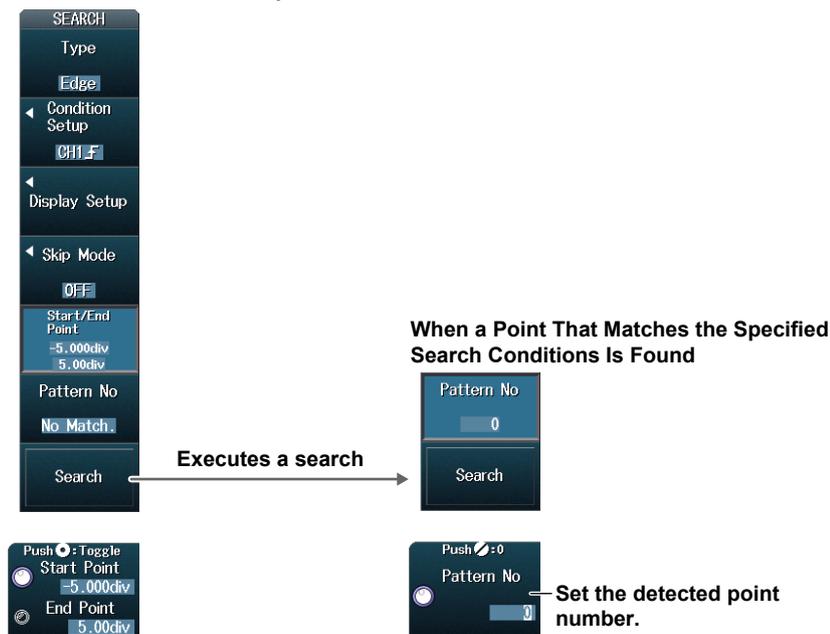
After a search condition is met, you can skip the detection of search conditions for the specified amount of time or the specified number of counts.

(You can specify this setting when the search type is set to Edge or Pulse Width.)



Executing a Search (Search)

Press the **Search** soft key to execute the search.



Executing Searches

1. Set the search conditions.
2. Press the **Search** soft key.

The DLM4000 searches for the search conditions. If the DLM4000 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 Number

You can set the detected point number and display the waveform for the detected point on the zoom window.

11.2 Using Conditions to Limit Edge Searches

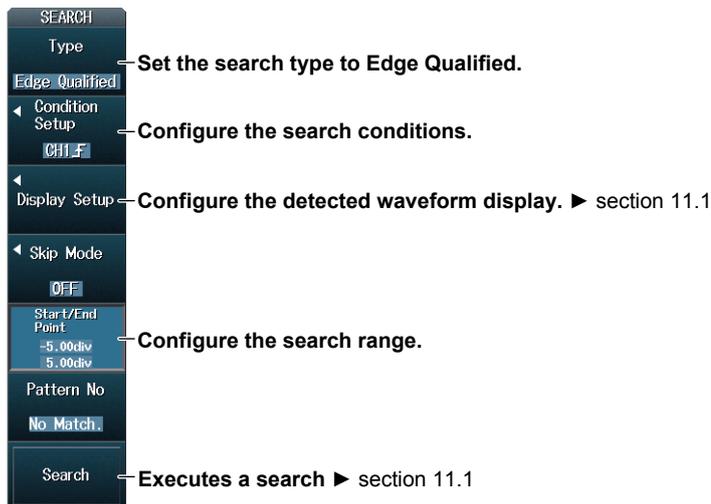
This section explains the following settings (which are used when using conditions to limit edge searches).

- 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

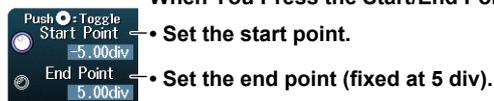
► “Search Type (Type),”
“Search Range (Start/End Point),” and
“Search Conditions (Condition Setup)”
in the Features Guide

SEARCH Edge Qualified Menu

Press **SEARCH**, the **Type** soft key, and then the **Edge Qualified** soft key to display the following menu.



When You Press the Start/End Point Soft Key



Setting Search Conditions (Condition Setup)

Note

Using the CH8 Terminal and LOGIC(L) Port

When you execute a search, you cannot use the CH8 terminal and LOGIC(L) port as the source at the same time. Specify the source that you want to use in advance by pressing either the CH8 key or the L key.

Press the **Condition Setup** soft key to display one of the menus shown below. The menu that is displayed varies depending on the specified source.

When the Source is CH1 to CH8 or Math1 to Math4

Condition

Source **CH1** — Set the source (CH1 to CH8, Math1 to Math4).

Slope **F** **L** — Set the slope (F, L).

Qualification — Set the qualifications.

Logic **AND** **OR** — Set the logic combination (AND, OR).

Condition **True** **False** — Set the search requirement (True, False).

Level/Hys — Set the hysteresis and the level used to detect the state for each signal.

When the Source Is LOGIC(L) or LOGIC(A|B)*

Condition

Source **LOGIC(L)** — Set the source (LOGIC(L), LOGIC(A|B)).

Slope **F** **L**

Qualification

Logic **AND** **OR**

Condition **True** **False**

Level/Hys

Source Bit **L0** — Set the source bit (L0 to L7, A0 to A7, B0 to B7).*

* LOGIC(A|B), A0 to A7, and B0 to B7 are available on models with the /L16 option.

Setting the Qualifications (Qualification)

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

Example: When the source is CH1

Signal set to be the source

Set the qualifications (H, L, X) for signals other than the source.

Qualification

CH1	F	L	X
CH2	H	L	X
CH3	H	L	X
CH4	H	L	X
CH5	H	L	X
CH6	H	L	X
CH7	H	L	X
CH8	H	L	X
A7	H	L	X
A6	H	L	X
A5	H	L	X
A4	H	L	X
A3	H	L	X
A2	H	L	X
A1	H	L	X
A0	H	L	X
Math1	H	L	X
Math2	H	L	X
Math3	H	L	X
Math4	H	L	X

L7 H L X

L6 H L X

L5 H L X

L4 H L X

L3 H L X

L2 H L X

L1 H L X

L0 H L X

B7 H L X

B6 H L X

B5 H L X

B4 H L X

B3 H L X

B2 H L X

B1 H L X

B0 H L X

CH8 and L0 to L7 cannot be enabled simultaneously. Specify the source that you want to use in advance by pressing either the CH8 key or the L key.

/L16 option

11.2 Using Conditions to Limit Edge Searches

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 screen.

Set the level used to detect the state of each signal.

Set the hysteresis.

	Level	Hysteresis
CH1	0.00V	0.6div
CH2	0.00V	0.6div
CH3	0.00V	0.6div
CH4	0.00V	0.6div
CH5	0.00V	0.6div
CH6	0.00V	0.6div
CH7	0.00V	0.6div
CH8	0.00V	0.6div
Math1	0.00VV	0.6div
Math2	0.00VV	0.6div
Math3	0.00VV	0.6div
Math4	0.00VV	0.6div

11.3 Searching for State Conditions

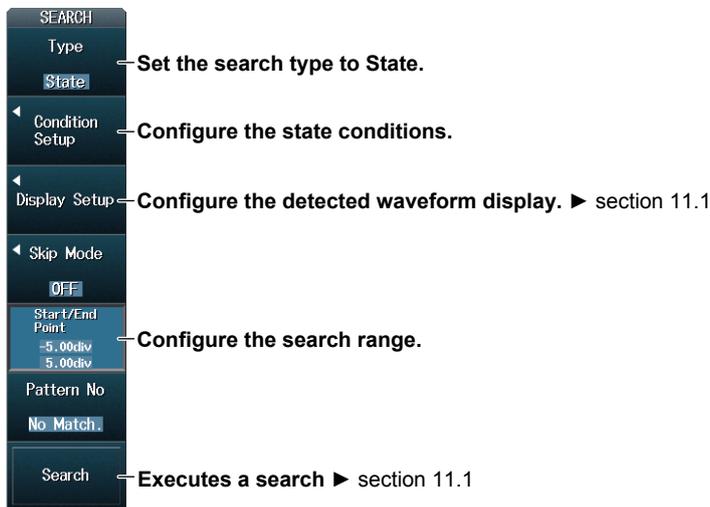
This section explains the following settings (which are used when searching for state conditions).

- Search type
- Search range
Search start and end points
- State condition
Clock source, pattern, logic combination, search requirements, the level used to detect signal states, and hysteresis

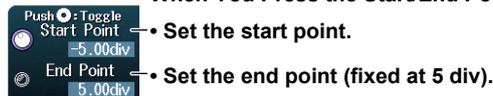
► “Search Type (Type),”
“Search Range (Start/End Point),” and
“Search Conditions (Condition Setup)”
in the Features Guide

SEARCH State Menu

Press **SEARCH**, the **Type** soft key, and then the **State** soft key to display the following menu.



When You Press the Start/End Point Soft Key



Setting State Conditions (Condition Setup)

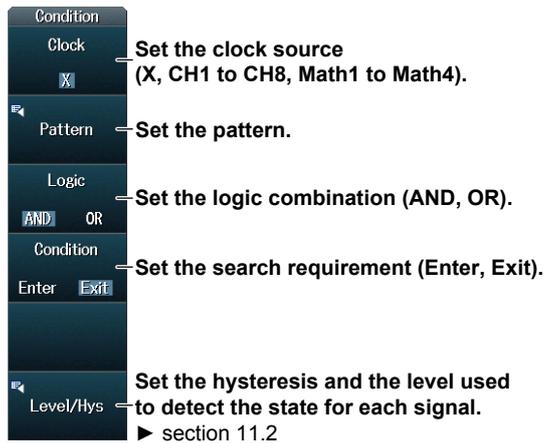
Note

Using the CH8 Terminal and LOGIC(L) Port

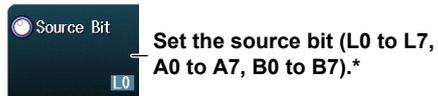
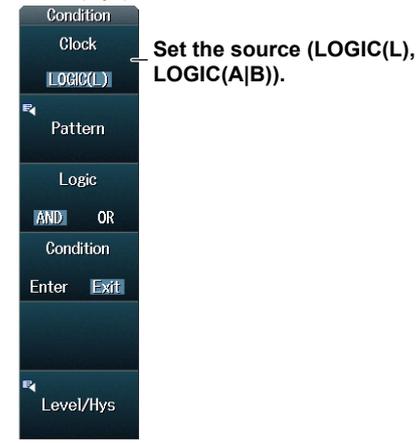
When you execute a search, you cannot use the CH8 terminal and LOGIC(L) port as the source at the same time. Specify the source that you want to use in advance by pressing either the CH8 key or the L key.

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

When the Clock Source is X, CH1 to CH8, or Math1 to Math4



When the Clock Source is LOGIC(L) or LOGIC(A|B)*



* LOGIC(A|B), A0 to A7, and B0 to B7 are available on models with the /L16 option.

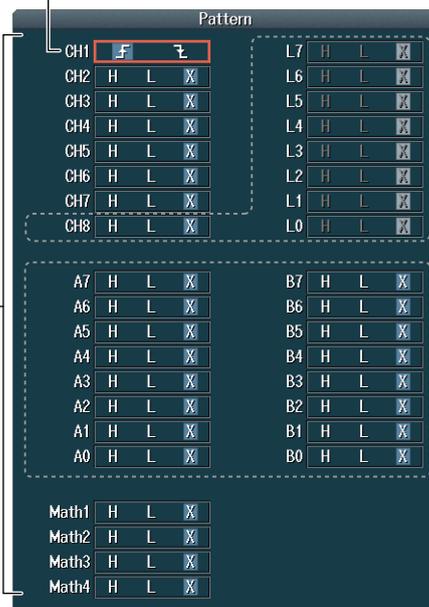
Setting the Pattern (Pattern)

Press the **Pattern** soft key to display one of the screens shown below. The screen that is displayed varies depending on the specified clock source.

Example: When the clock source is CH1

Set the slope for the clock source signal (F, \bar{L}).

Set the pattern (H, L, X) for signals other than the clock source.



CH8 and L0 to L7 cannot be enabled simultaneously. Specify the source that you want to use in advance by pressing either the CH8 key or the L key.

/L16 option

- **When There is No Clock Source (When the Clock Source is X)**

You can set the pattern for all the signal states for CH1 to CH7, CH8 or L0 to L7, A0 to A7, B0 to B7, and Math1 to Math4.

* A0 to A7 and B0 to B7 are available on models with the /L16 options.

11.4 Searching for Pulse Width

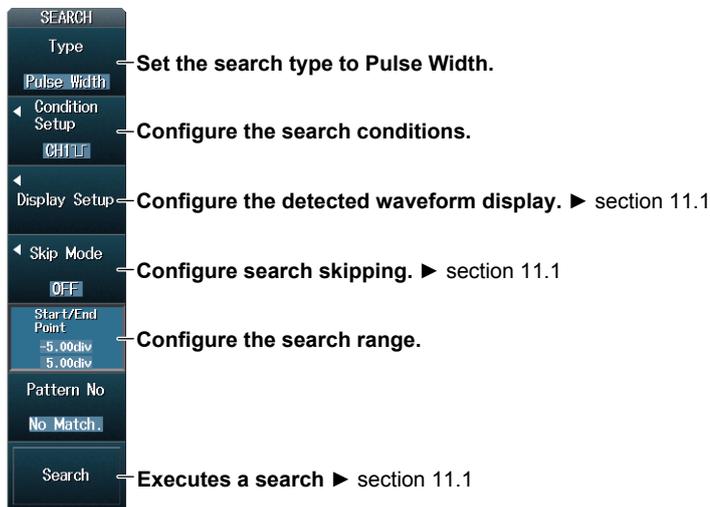
This section explains the following settings (which are used when searching for pulse width).

- 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.



When You Press the Start/End Point Soft Key



Setting Search Conditions (Condition Setup)

Note

Using the CH8 Terminal and LOGIC(L) Port

When you execute a search, you cannot use the CH8 terminal and LOGIC(L) port as the source at the same time. Specify the source that you want to use in advance by pressing either the CH8 key or the L key.

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

When the Source is CH1 to CH8 or Math1 to Math4

Set the source (CH1 to CH8, Math1 to Math4).

Set the polarity (,).

Set the time width mode.

Set the reference time.

Set the level used to detect the state of each signal and the hysteresis.

Level used to detect each signal state

Hysteresis

Reference time

When the Clock Source is LOGIC(L) or LOGIC(A|B)*

Set the source (LOGIC(L), LOGIC(A|B)).

Set the polarity (,).

Set the time width mode.

Set the source bit.

Set the reference time.

Set the level used to detect the state of each signal and the hysteresis.

Set the source bit (L0 to L7, A0 to A7, B0 to B7).*

Reference time

* LOGIC(A|B), A0 to A7, and B0 to B7 are available on models with the /L16 option.

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 reference time Time1.
- Less than: The pulse width must be shorter than reference time 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.
- TimeOut: The pulse width must be longer than reference time Time1.

Setting the Reference Times (Time1 and Time2)

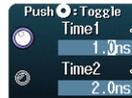
Press the **Time** soft key to display one of the menus shown below. The menu that is displayed varies depending on the set time width mode.

When the Time Width Mode Is More than, Less than, or TimeOut



← Set reference time Time1.

When the Time Width Mode is Between or OutOfRange



← Set reference time Time1.

← Set reference time Time2.

11.5 Searching for State Width

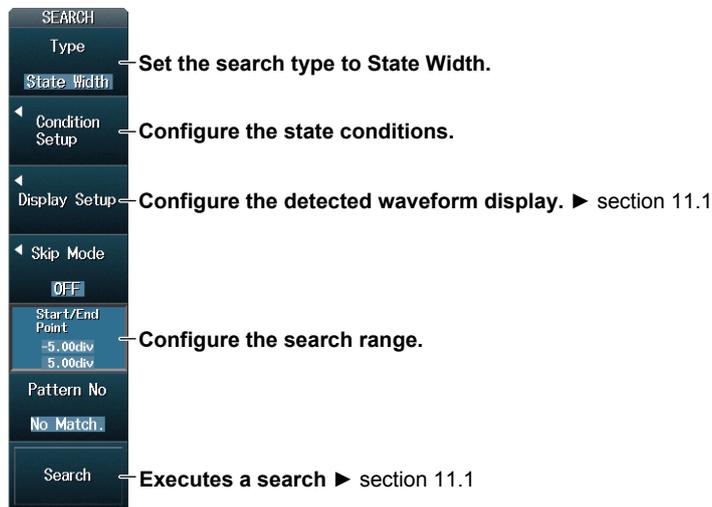
This section explains the following settings (which are used when searching for state width).

- Search type
- Search range
Search start and end points
- State condition
Clock source, pattern, logic combination, search requirements, time width mode, reference times, the level used to detect signal states, and hysteresis

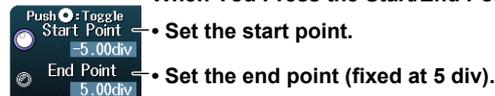
► “Search Type (Type),”
“Search Range (Start/End Point),” and
“Search Conditions (Condition Setup)”
in the Features Guide

SEARCH State Width Menu

Press **SEARCH**, the **Type** soft key, and then the **State Width** soft key to display the following menu.



When You Press the Start/End Point Soft Key



Setting State Conditions (Condition Setup)

Note

Using the CH8 Terminal and LOGIC(L) Port

When you execute a search, you cannot use the CH8 terminal and LOGIC(L) port as the source at the same time. Specify the source that you want to use in advance by pressing either the CH8 key or the L key.

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

When the Clock Source Is LOGIC(L) or LOGIC(A|B)*

Condition Setup Menu:

- Clock:** Set the clock source (X, CH1 to CH8/LOGIC(L), LOGIC(A|B), Math1 to Math4).
- Pattern:** Set the pattern.
- Logic:** Set the logic combination (AND, OR).
- Condition:** Set the search requirement (True, False).
- Mode:** Set the time width mode.
- Level/Hys:** Set the hysteresis and the level used to detect the state for each signal. ▶ section 11.2

Reference Time: Set the reference time.

Source Bit: Set the source bit (L0 to L7, A0 to A7, B0 to B7).*

* LOGIC(A|B), A0 to A7, and B0 to B7 are available on models with the /L16 option.

Setting the Pattern (Pattern)

Press the **Pattern** soft key to display one of the screens shown below. The screen that is displayed varies depending on the specified clock source.

Example: When the clock source is CH1

Set the slope for the clock source signal (F, L).

Set the pattern (H, L, X) for signals other than the clock source.

Pattern Menu:

- CH1: F, L
- CH2: H, L, X
- CH3: H, L, X
- CH4: H, L, X
- CH5: H, L, X
- CH6: H, L, X
- CH7: H, L, X
- CH8: H, L, X
- A7: H, L, X
- A6: H, L, X
- A5: H, L, X
- A4: H, L, X
- A3: H, L, X
- A2: H, L, X
- A1: H, L, X
- A0: H, L, X
- B7: H, L, X
- B6: H, L, X
- B5: H, L, X
- B4: H, L, X
- B3: H, L, X
- B2: H, L, X
- B1: H, L, X
- B0: H, L, X
- Math1: H, L, X
- Math2: H, L, X
- Math3: H, L, X
- Math4: H, L, X

CH8 and L0 to L7 cannot be enabled simultaneously. Specify the source that you want to use in advance by pressing either the CH8 key or the L key.

/L16 option

- **When There is No Clock Source (When the Clock Source is X)**

You can set the pattern for all the signal states for CH1 to CH7, CH8 or L0 to L7, A0 to A7, B0 to B7, and Math1 to Math4.

* A0 to A7 and B0 to B7 are available on models with the /L16 options.

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:** A point is detected when the period during which the state condition is met or not met is longer than reference time Time1 and the condition changes.
- Less than:** A point is detected when the period during which the state condition is met or not met is shorter than reference time Time1 and the condition changes.
- Between:** A point is detected 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:** A point is detected 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.
- TimeOut:** A point is detected when the period during which the state condition is met or not met is longer than reference time 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 TimeOut



Set reference time Time1.

When the Time Width Mode is Between or OutOfRange



Set reference time Time1.

Set reference time Time2.

12.1 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
 - Auto setup, source, bit rate, bus channel, sample point, the level used to detect the source state, and hysteresis
- Decode 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

SEARCH FlexRay Menu

Press **SHIFT+SEARCH** (SERIAL BUS) and then the **Type** soft key. From the setup menu that appears, select **FlexRay** to display the following menu.

SERIAL BUS

- Serial Bus 1
- Display **OFF ON** — Turns on or off the serial bus signal analysis and search displays.
- Type **FlexRay** — Set the serial bus signal type to FlexRay.
- Setup **CH1 5Mbps** — Set the serial bus.
- Search — Configure the search.
- Decode **Hex** — Set the decode display (Hex, Bin).
- List — Configure the list display.

Serial Bus

- 1
- 2
- 3
- 4

Select which serial bus to set (Serial Bus1 to Serial Bus4).

Push **Toggle** List No. **0** — Set the analysis number.

Z1 Position **0.00div** — Set the zoom position. This sets the zoom position for the window selected during zoom window configuration (described later).

Setting the Serial Bus (Setup)

Note

Using the CH8 Terminal and LOGIC(L) Port

If you perform an analysis or execute a search when using the LOGIC(L) port for input, you cannot specify CH8 as the source. Press the CH8 key in advance to enable input from the CH8 terminal.

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

During Auto Setup

Executes auto setup → Abort ← Stop auto setup.

Source: CH1 — Set the source (CH1 to CH8, Math1 to Math4).

Bit Rate: 5Mbps — Set the bit rate (2.5 Mbps, 5 Mbps, 10 Mbps).

Channel: A B — Set the bus channel (A, B).

Sample Point: 4 5 6 — Set the sample point (4, 5, 6).

Level: 0.30V — Set the level used to detect source states.

Hysteresis: 0.6div — Set the hysteresis.

Manual Setup

Auto Setup (Auto Setup)

1. Set the source.
Auto setup cannot be performed when the source is set to Math1 to Math4.
2. Press the **Auto Setup** soft key.
The DLM4000 will automatically configure the serial bus settings.
The DLM4000 automatically configures the bit rate, bus channel, sample point, level, and hysteresis and triggers on the start of frame (SOF) of the FlexRay bus signal.
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.

The auto setup feature will not work properly on some input signals.

Manual Setup

After running auto setup, you can change the following settings and display decoded results.

- Source
- Bit rate
- Bus channel
- Sample point
- Level used to detect source states
- Hysteresis

Setting the List Display (List)

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

Turns zoom linking on or off

Set the list size and the display position (Full Screen, Half(Upper), Half(Lower)).

Lists the analysis results

Set the analysis number.

Analysis number	Time(ms)	S/D	IND	ID	Len	CC	Data	Information
-4	-0.205008	S	0011	1	4	3	01 01 01 01 01 01 01 01	FES Error
-3	-0.153808	S	0011	2	4	3	02 02 02 02 02 02 02 02	
-2	-0.102608	S	0010	3	4	3	03 03 03 03 03 03 03 03	
-1	-0.051408	S	1111	4	4	3	01 02 03 04 05 06 07 08	
0	-0.000216	S	0000	5	4	3	00 00 00 00 00 00 00 00	
1	0.050984	D	1111	6	5	3	C8 C9 CA CB CC CD CE CF D0 D1	
2	0.102192	D	1111	7	2	3	FF FF FF FF	
3	0.153384	D	1111	8	6	3	01 01 01 01 02 02 02 02 03 03 03 03	
4	0.204592	S	0011	1	4	4	01 01 01 01 01 01 01 01	CRC Error
5	0.255792	S	0011	2	4	4	02 02 02 02 02 02 02 02	
6	0.306992	S	0010	3	4	4	03 03 03 03 03 03 03 03	
7	0.358192	S	1111	4	4	4	01 02 03 04 05 06 07 08	

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 to display the following menu.

The image shows a vertical menu titled "Search" with several options: "Field Jump", "Result Window", "Mode", and "Search".

- Field Jump**: Jump to the specified field (ID, Payload Length, Header CRC, Cycle Count, CRC).
- Result Window**: Set the zoom window (Zoom1 or Zoom2). The "Zoom1" option is highlighted.
- Mode**: Set the search type (Frame Start, Error, ID/Data). The "Frame Start" option is highlighted. A right-pointing arrow indicates to see section 2.9.
- Search**: Executes a search. An arrow points to the right, indicating the result.

Below the menu, two screenshots show the results of a search:

- The first screenshot shows "Pattern No" as "No Match" and "Z1 Position" as "0.00div".
- The second screenshot shows "Pattern No" as "0" and "Z1 Position" as "-4.78div".

Annotations for the second screenshot:

- Pattern No 0**: Set the detected point number.
- Z1 Position -4.78div**: 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).

Setting the Zoom Window

You can configure zoom windows Zoom1 and Zoom2 when they are displayed. Zoom1 is automatically displayed during the auto 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 details, see section 2.9.

Executing Searches

1. Set the search type.
2. Press the **Search** soft key.

The DLM4000 searches for the search conditions. If the DLM4000 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 Number

You can set the detected point number and display the waveform for the 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 Bus Signals (Option)

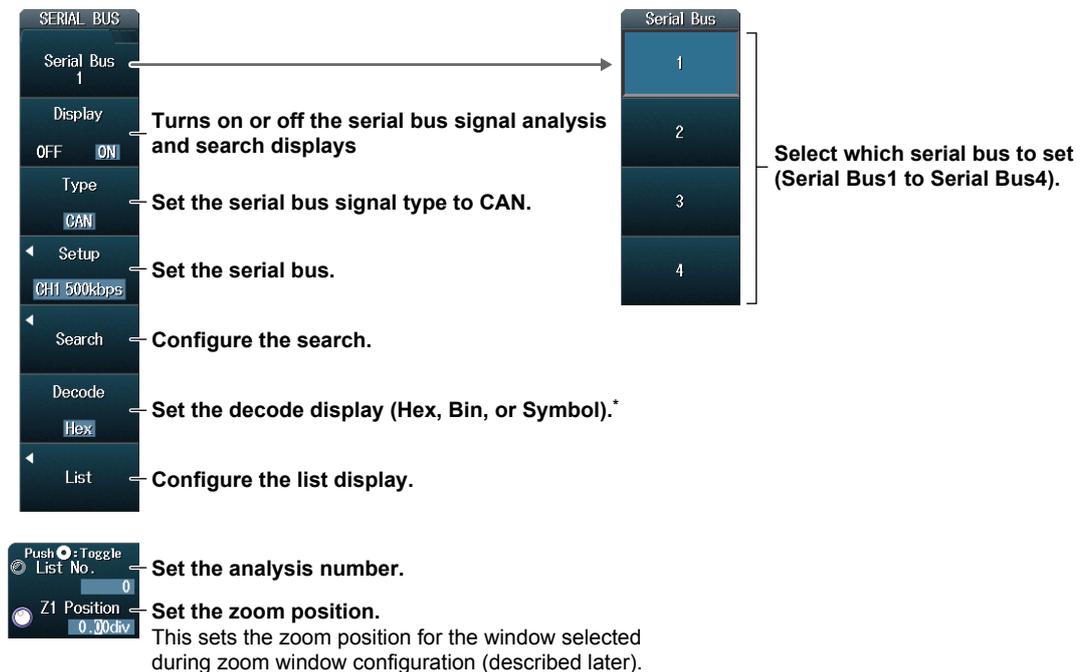
This section explains the following settings (which are used when analyzing or searching CAN bus signals).

- 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
- Decode 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 CAN Bus Signals (Option)” in the Features Guide

SEARCH CAN Menu

Press **SHIFT+SEARCH** (SERIAL BUS) and then the **Type** soft key. From the setup menu that appears, select **CAN** to display the following menu.



SERIAL BUS

- Serial Bus 1
- Display **OFF ON** — Turns on or off the serial bus signal analysis and search displays
- Type **CAN** — Set the serial bus signal type to CAN.
- Setup **CH1 500kbps** — Set the serial bus.
- Search — Configure the search.
- Decode **Hex** — Set the decode display (Hex, Bin, or Symbol).*
- List — Configure the list display.

Serial Bus

- 1
- 2
- 3
- 4

Select which serial bus to set (Serial Bus1 to Serial Bus4).

Push []: Toggle

- List No. 0 — Set the analysis number.
- Z1 Position 0.00div — Set the zoom position. This sets the zoom position for the window selected during zoom window configuration (described later).

* You can select display CANdB symbols if you load the physical value/symbol definition file (.sbl).

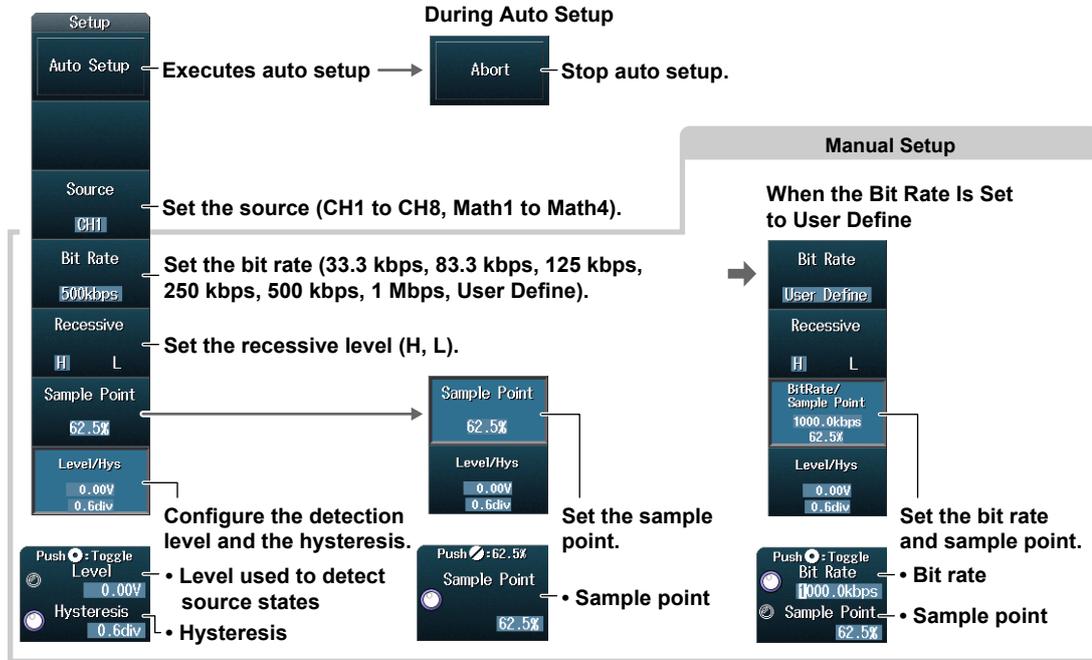
Setting the Serial Bus (Setup)

Note

Using the CH8 Terminal and LOGIC(L) Port

If you perform an analysis or execute a search when using the LOGIC(L) port for input, you cannot specify CH8 as the source. Press the CH8 key in advance to enable input from the CH8 terminal.

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



Auto Setup (Auto Setup)

- Set the source.
Auto setup cannot be performed when the source is set to Math1 to Math4.
- Press the **Auto Setup** soft key.
The DLM4000 will automatically configure the serial bus settings.
The DLM4000 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.

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.

The auto setup feature will not work properly on some input signals.

Manual Setup

After running auto setup, you can change the following settings and display decoded results.

- Source
- Bit rate
- Recessive level
- Sample point
- Level used to detect source states
- Hysteresis

Setting the List Display (List)

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

The image shows a vertical menu titled 'List' with the following options: 'Zoom Link' (OFF/ON), 'List Size' (Half(Upper)), and 'Show List'. Below the menu is a 'List No.' field with a value of 0. To the right, a 'Serial Bus' analysis window displays a table of CAN bus data.

Zoom Link — Turns zoom linking on or off

List Size — Set the list size and the display position (Full Screen, Half(Upper), Half(Lower)).

Show List — Lists the analysis results

List No. — Set the analysis number.

No.	Time(us)	Frame	ID	DLC	Data	CRB	Ask	Information
-6	-13.788	Error						
-5	-11.564	Data	00A	2	01 02	4A24	Y	
-4	-9.062	Data	012	1	FE	2263	Y	
-3	-6.612	Data	100	3	FF 01 A4	6C6E	Y	
-2	-4.028	Data	00A	2	01 02	4A24	Y	
-1	-1.516	Data	012	1	FE	2263	Y	
0	0.924	Data	100	3	FF 01 A4	6C6E	Y	
1	3.508	Data	00A	2	01 02	4A24	Y	
2	6.020	Data	012	1	FE	2263	Y	
3	8.460	Data	100	3	FF 01 A4	6C6E	Y	
4	11.044	Data	00A	2	01 02	4A24	Y	
5	13.556	Data	012	1	FE	2263	Y	

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 to display the following menu.

The image shows a vertical menu titled "Search" with several options. Arrows point from text labels to these options:

- Field Jump**: Jump to the specified field (SOF, ID, Control Field, Data Field, CRC, ACK).
- Result Window**: Set the zoom window (Zoom1 or Zoom2).
- Zoom1**: (part of the Result Window setting)
- Mode**: Set the search type (SOF, Error, or ID/Data).
▶ section 2.10
- SOF**: (part of the Mode setting)
- Search**: Executes a search. This appears when a point that matches the specified search conditions is found.

Below the menu, two smaller screenshots show the results of the search:

- The first shows "Pattern No" as "No Match" and "Z1 Position" as "0.00div".
- The second shows "Pattern No" as "0" and "Z1 Position" as "-4.78div".

Jumping to the Specified Field

Jumps to the field in the data frame that corresponds to the specified detected point number (Pattern No).

Setting the Zoom Window

You can configure zoom windows Zoom1 and Zoom2 when they are displayed. Zoom1 is automatically displayed during the auto 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 2.10.

Executing Searches

1. Set the search type.
2. Press the **Search** soft key.

The DLM4000 searches for the search conditions. If the DLM4000 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 Number

You can set the detected point number and display the waveform for the 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 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 the source state, and hysteresis

- Decode display
- List display
- 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 CAN FD Bus Signals \(Option\)”](#) in the Features Guide

SEARCH CAN FD Menu

Press **SHIFT+SEARCH** (SERIAL BUS) and then the **Type** soft key. From the setup menu that appears, select **CAN FD** to display the following menu.

SERIAL BUS

- Serial Bus 1
- Display **OFF ON** — Turns on or off the serial bus signal analysis and search displays.
- Type **CAN FD** — Set the type to CAN FD. (If the CAN FD standard is set to non-ISO, “(non-ISO)” is displayed.)¹
- Setup CH1 500kbps / 1Mbps — Set the serial bus.
- Search — Configure the search.
- Decode **Hex** — Set the decode display (Hex, Bin, or Symbol).²
- List — Configure the list display.

Serial Bus

- 1
- 2
- 3
- 4

Select which serial bus to set (Serial Bus1 to Serial Bus4).

Push []: Toggle List No. — Set the analysis number.

Z1 Position 0.00div — 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 12-10.

2 You can select display CANdB symbols if you load the physical value/symbol definition file (.sbl).

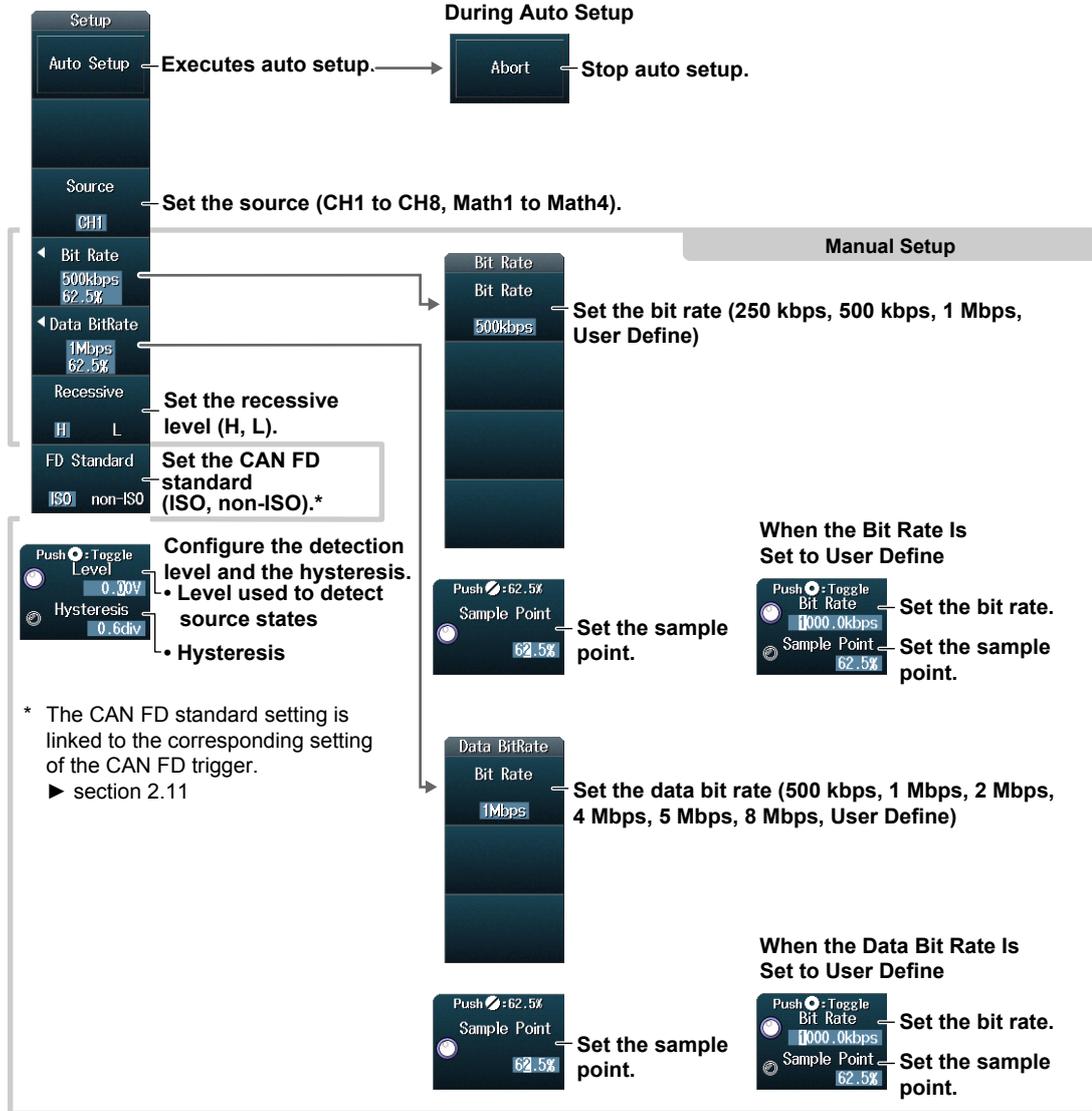
Setting the Serial Bus (Setup)

Note

Using the CH8 Terminal and LOGIC(L) Port

If you perform an analysis or execute a search when using the LOGIC(L) port for input, you cannot specify CH8 as the source. Press the CH8 key in advance to enable input from the CH8 terminal.

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



Auto Setup (Auto Setup)

1. Set the source.
Auto setup cannot be performed when the source is set to Math1 to Math4.
2. Press the **Auto Setup** soft key.
The DLM4000 will automatically configure the serial bus settings.
The DLM4000 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.
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.

The auto setup feature will not work properly on some input signals.

Manual Setup

After running auto setup, you can change the following settings and display decoded results.

- Source
- Bit rate
- Data bit rate
- Recessive level
- CAN FD standard
- Sample point
- Level used to detect source states
- Hysteresis

Setting the List Display

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

Analysis number When the CAN FD standard is set to ISO

Serial Bus										
Time(ms)	Frame	ID	DLC	Data	SC	CRC	Ack	Information		
-2	-0.613261	FD Data	103	F	63 62 61 60 59 58 57 56	C	11C48C	Y		
					55 54 53 52 51 50 49 48					
					47 46 45 44 43 42 41 40					
					39 38 37 36 35 34 33 32					
					31 30 29 28 27 26 25 24					
					23 22 21 20 19 18 17 16					
					15 14 13 12 11 10 09 08					
					07 06 05 04 03 02 01 00					
-1	-0.357254	FD Data	104	1	08	6	00312	Y		
0	-0.001243	Data	000	8	00 00 00 00 00 00 00 00		145E	Y	Analysis number	
1	0.336763	Data	7FF	8	FF FF FF FF FF FF FF FF		4C89	Y		
2	0.672774	Data	555	8	55 AA C3 0F AA 55 3C F0		4485	Y		

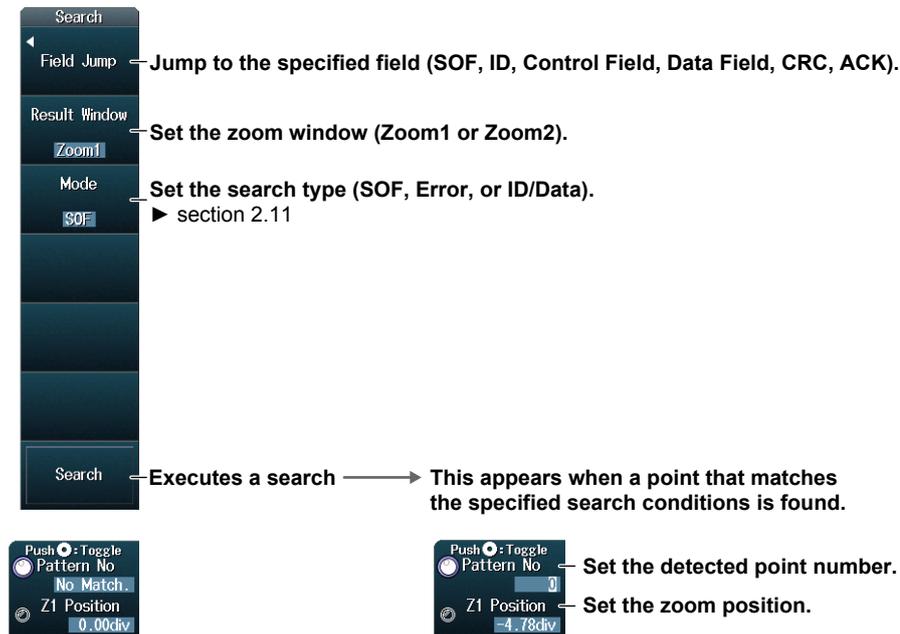
When the CAN FD standard is set to non-ISO

Serial Bus										
Time(ms)	Frame	ID	DLC	Data	CRC	Ack	Information			
-6	-3.685344	FD Data	1FFFFFFF	C	FF FF FF FF FF FF FF FF		0FB6FA	Y		
					FF FF FF FF FF FF FF FF					
					FF FF FF FF FF FF FF FF					
					FF FF FF FF FF FF FF FF					
-5	-3.031328	Data	00A	2	01 02		4A24	Y		
-4	-2.397312	Data	012	1	FE		2263	Y		
-3	-1.781296	Data	100	3	FF 01 A4		6D6E	Y		
-2	-1.129280	FD Data	555	4	55 AA C3 0F		1F19B	Y		
-1	-0.565264	FD Data	2AA	4	AA 55 3C F0		18164	Y		
0	-0.001248	FD Data	000	4	00 00 00 00		0F0EC	Y		
1	0.566768	FD Data	7FF	4	FF FF FF FF		1B279	Y		
2	1.134784	FD Data	15555555	4	55 AA C3 0F		02DC7	Y		
3	1.736800	FD Data	0AAAAAAA	4	AA 55 3C F0		0DDEA	Y		

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 to display the following menu.



Jumping to the Specified Field

Jumps to the field in the data frame that corresponds to the specified detected point number (Pattern No).

Setting the Zoom Window

You can configure zoom windows Zoom1 and Zoom2 when they are displayed. Zoom1 is automatically displayed during the auto 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 2.11.

Executing Searches

1. Set the search type.
2. Press the **Search** soft key.

The DLM4000 searches for the search conditions. If the DLM4000 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 Number

You can set the detected point number and display the waveform for the 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 LIN Bus Signals (Option)

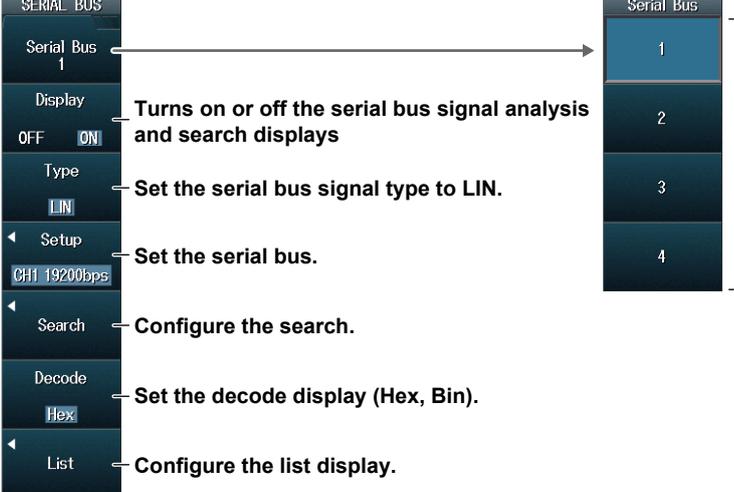
This section explains the following settings (which are used when analyzing or searching LIN bus signals).

- 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
- Decode 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 LIN Bus Signals \(Option\)”](#) in the Features Guide

SEARCH LIN Menu

Press **SHIFT+SEARCH** (SERIAL BUS) and then the **Type** soft key. From the setup menu that appears, select **LIN** to display the following menu.



The image shows two screenshots of the device's menu system. The left screenshot is the 'SERIAL BUS' menu, and the right screenshot is the 'Serial Bus' sub-menu. Arrows indicate the flow from the 'Type' option in the first menu to the sub-menu, and from the 'Serial Bus' option to the 'List' option. A bracket on the right side of the sub-menu indicates that options 1 through 4 correspond to Serial Bus 1 through Serial Bus 4.

SERIAL BUS

- Serial Bus 1
- Display
 - Turns on or off the serial bus signal analysis and search displays
- Type
 - Set the serial bus signal type to LIN.
- Setup
 - Set the serial bus.
- Search
 - Configure the search.
- Decode
 - Set the decode display (Hex, Bin).
- List
 - Configure the list display.

Serial Bus

- 1
- 2
- 3
- 4

Select which serial bus to set (Serial Bus1 to Serial Bus4).

Push [Enter] Toggle

- List No. 0
 - Set the analysis number.
- Z1 Position 0.00div
 - Set the zoom position.
 - This sets the zoom position for the window selected during zoom window configuration (described later).

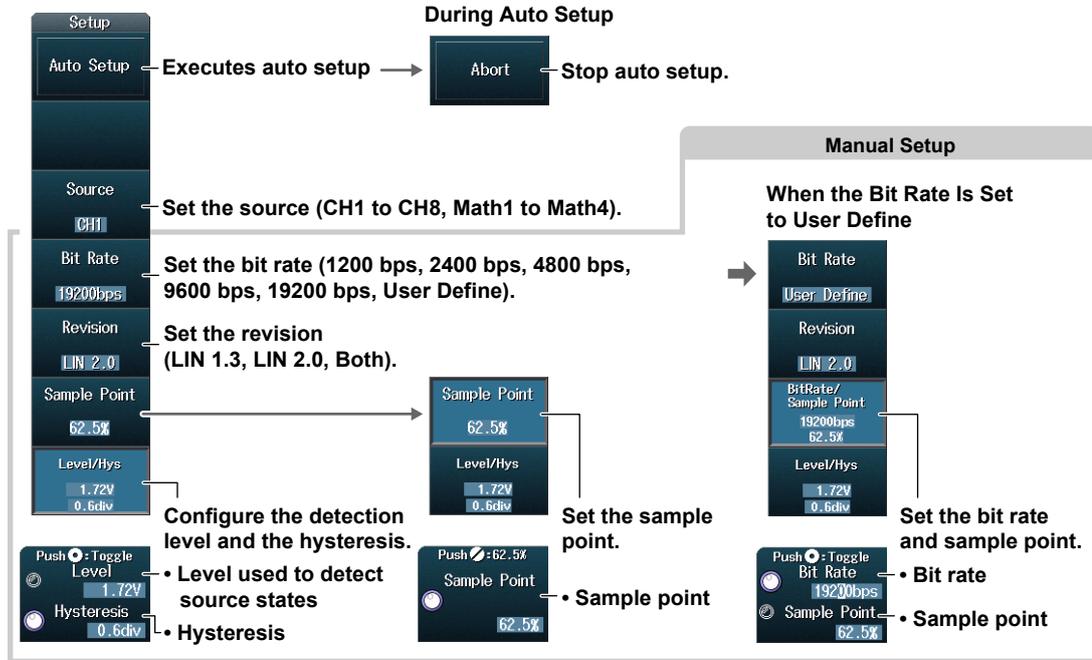
Setting the Serial Bus (Setup)

Note

Using the CH8 Terminal and LOGIC(L) Port

If you perform an analysis or execute a search when using the LOGIC(L) port for input, you cannot specify CH8 as the source. Press the CH8 key in advance to enable input from the CH8 terminal.

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



Auto Setup (Auto Setup)

1. Set the source.
Auto setup cannot be performed when the source is set to Math1 to Math4.
2. Press the **Auto Setup** soft key.
The DLM4000 will automatically configure the serial bus settings.
The DLM4000 automatically configures the bit rate, revision, sample point, level, and hysteresis and triggers on the LIN bus signal's Break Synch.
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.

The auto setup feature will not work properly on some input signals.

Manual Setup

After running auto setup, you can change the following settings and display decoded results.

- Source
- Bit rate
- Revision
- Sample point
- Level used to detect source states
- Hysteresis

Setting the List Display (List)

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

The **List** menu is shown with the following options:

- Zoom Link**: OFF ON (Turns zoom linking on or off)
- List Size**: Half(Upper) (Set the list size and the display position (Full Screen, Half(Upper), Half(Lower))).
- Show List**: Lists the analysis results

Below the menu, the **List No.** is set to 0 (Set the analysis number).

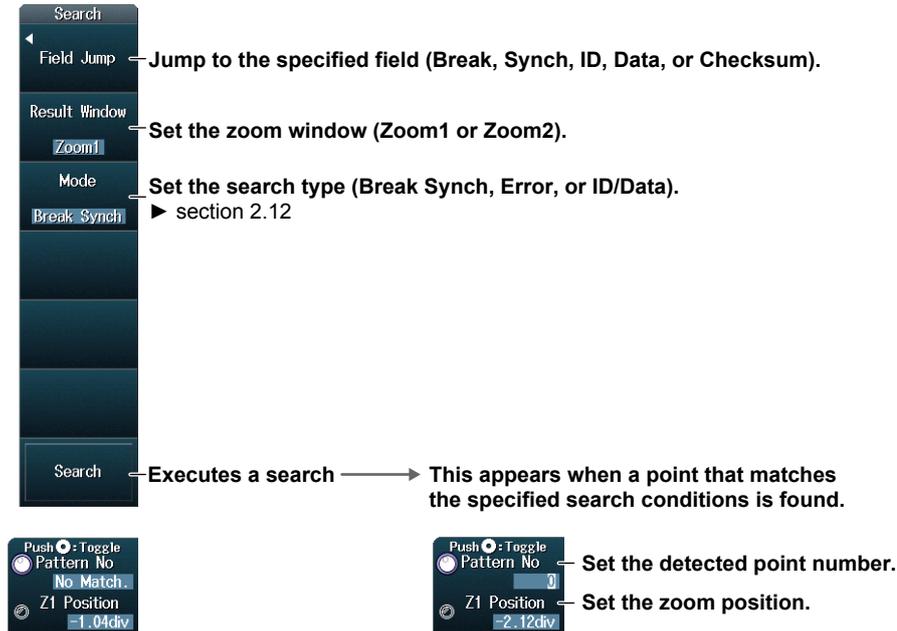
The resulting analysis results table is shown below:

No.	Time(ms)	ID	ID-Field	Data	Checksum	Information
-5	-158.412	26	A6	00 00		FF
-4	-127.164	30	F0	C8 0A		2D
-3	-95.916	26	A6	00 00		FF
-2	-64.668	30	F0	C8 0A		29
-1	-33.420	26	A6	00 00		FF
0	-2.172	30	F0	CF 0A	26	
1	29.076	26	A6	00 00		FF
2	60.324	30	F0	D3 0A		22
3	91.572	26	A6	00 00		FF
4	122.820	30	F0	D7 0A		1E
5	154.068	26	A6	00 00		FF
6	185.316	30	F0	DA 0A		1B

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 to display the following menu.



Jumping to the Specified Field

Jumps to the field in the frame that corresponds to the specified detected point number (Pattern No).

Setting the Zoom Window

You can configure zoom windows Zoom1 and Zoom2 when they are displayed. Zoom1 is automatically displayed during the auto 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 2.12.

Executing Searches

1. Set the search type.
2. Press the **Search** soft key.

The DLM4000 searches for the search conditions. If the DLM4000 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 Number

You can set the detected point number and display the waveform for the 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 CXPI Bus Signals (Option)

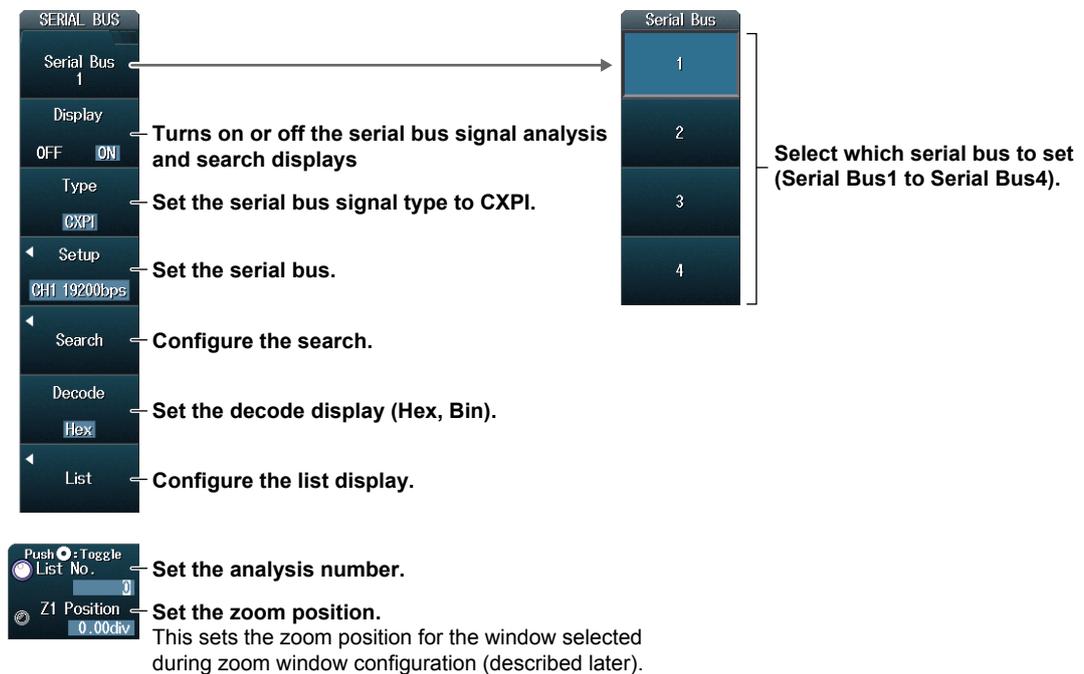
This section explains the following settings (which are used when analyzing or searching CXPI bus signals):

- 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

SEARCH CXPI Menu

Press **SHIFT+SEARCH** (SERIAL BUS) and then the **Type** soft key. From the setup menu that appears, select **CXPI** to display the following menu.



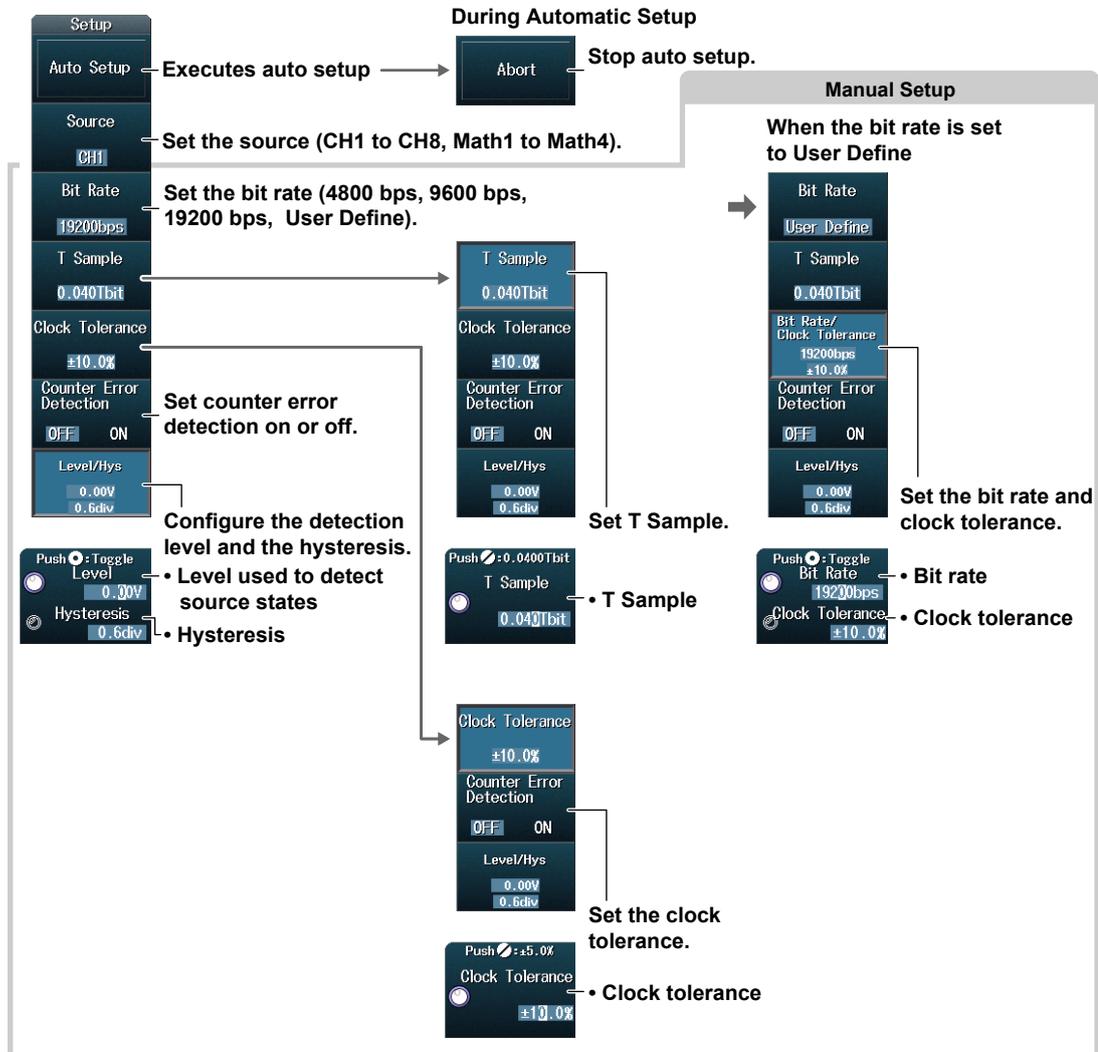
Setting the Serial Bus (Setup)

Note

Using the CH8 terminal and LOGIC (L) Port

If you perform an analysis or execute a search when using the LOGIC (L) port for input, you cannot specify CH8 as the source. Press the CH8 key in advance to enable input from the CH8 terminal.

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



Auto Setup (Auto Setup)

1. Set the source.
Auto setup cannot be performed when the source is set to Math1 to Math4.
2. Press the **Auto Setup** soft key.
The DLM4000 will automatically configure the serial bus settings.
The DLM4000 automatically configures the bit rate, level, and hysteresis and triggers on the start of frame (SOF) of the CXPI bus signal.
While the serial bus is being configured, Auto Setup changes to Abort. If you want to stop, press the **Abort** soft key.

The auto setup feature will not work properly on some input signals.

Manual Setup

After running auto setup, you can change the following settings and display decoded results.

- Source
- Bit rate
- T Sample
- Clock tolerance
- Counter error detection
- Level used to detect source states
- Hysteresis

Setting the List Display (List)

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

The **List** menu contains the following options:

- Zoom Link**: Turns zoom linking on or off (OFF/ON).
- List Size**: Set the list size and the display position (Full Screen, Half(Upper), Half(Lower)).
- Show List**: Lists the analysis results.

Below the menu is a **Push 0** button and a **List No.** field with a value of 0. This is used to set the analysis number.

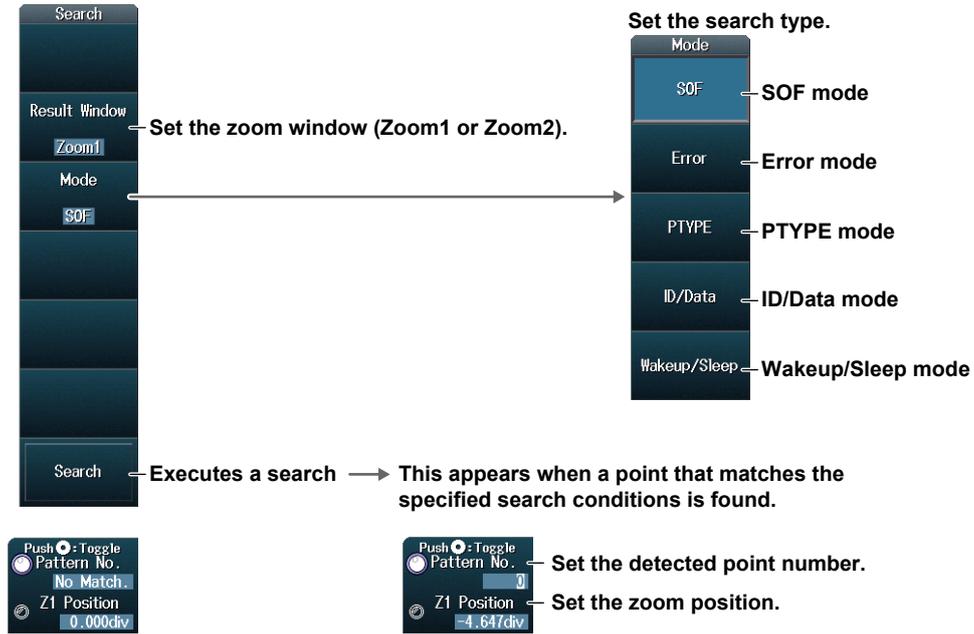
The resulting **Analysis number** table is shown below:

Analysis number	Time(ms)	ID	DLC	W/S	CT	Data	CRS	Information
-3	-52.4732	03	L16	00	0	00 11 22 33 44 55 66 77 88 99 AA BB	2830	
-2	-32.4704	04	12	00	0	40 41 42 43 44 45 46 47 48 49 4A 4B	00	
-1	-12.4676	05	12	00	0	50 51 52 53 54 55 56 57 58 59 5A 5B	E0	
0	-0.4654	P20	2	00	0	01 FF	61	
1	7.5356	06	12	00	1	60 61 62 63 64 65 66 67 68 69 6A 6B	7D	ID-Parity Error
2	27.5384	07	12	00	1	70 71 72 73 74 75 76 77 78 79 7A 7B	4D	CRC Error
3	47.5412	08						Data Length Error
4	67.5440	09	12	00	0	90 91 92 93 94 95 96 97 98 99 9A 9B	F4	Framing Error
5	87.5468	0A	12	00	1	A0 A1 A2 A3 A4 A5 A6 A7 A8 A9 AA AB	96	IBS Error
6	107.5496	0B	12	00	1	B0 B1 B2 B3 B4 B5 B6 B7 B8 B9 BA BB		
7	127.5524	0C						

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 to display the following menu.



Setting the Zoom Window

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

SOF (Start of Frame) Mode

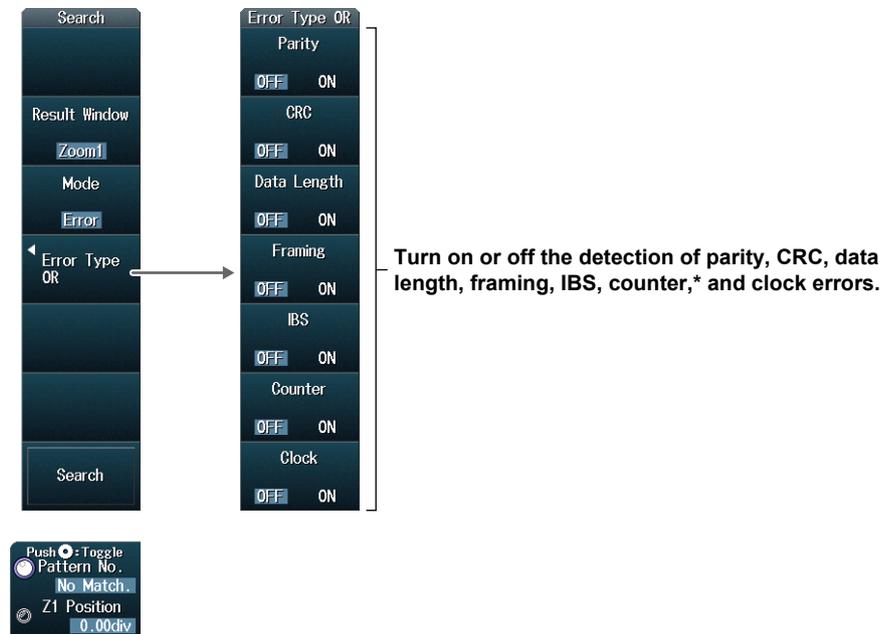
Press the **Mode** soft key and then the **SOF** soft key.

The DLM4000 searches for the start position of CXPI bus signal frames.

Error Mode

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

The DLM4000 searches for various errors.



* Not displayed when the counter error detection is set to off.

PTYPE Mode

Press the **Mode** soft key and then the **PTYPE** soft key.

The DLM4000 searches for the PTYPE of the CXPI bus signal.

12.5 Analyzing and Searching CXPI Bus Signals (Option)

ID/Data Mode

Setting Search Conditions (Condition Setup)

Press the **Mode** soft key, the **ID/Data** soft key, and then the **Condition Setup** soft key to display the following screen.

The DLM4000 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.

Search

Result Window

Zoom

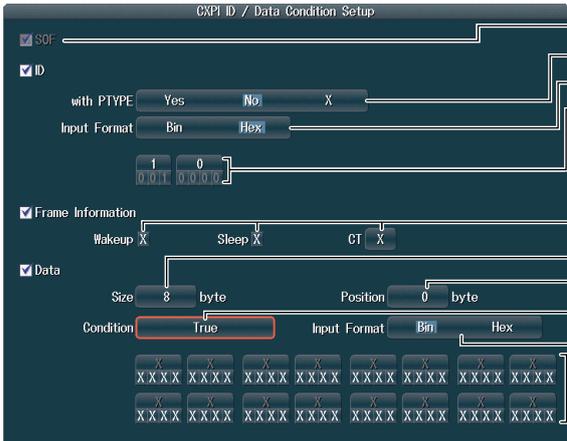
Mode

ID/Data

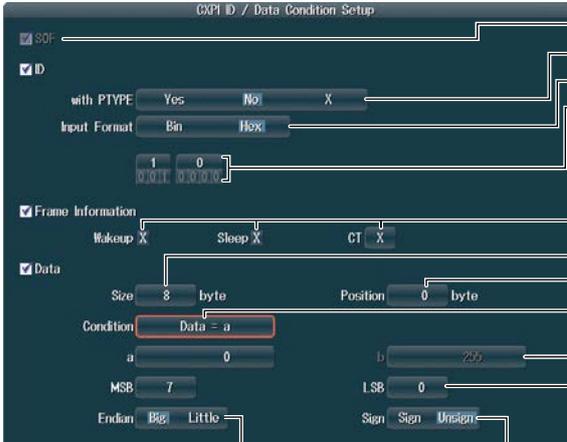
Condition Setup

Search

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



SOE (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.

SOE (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.

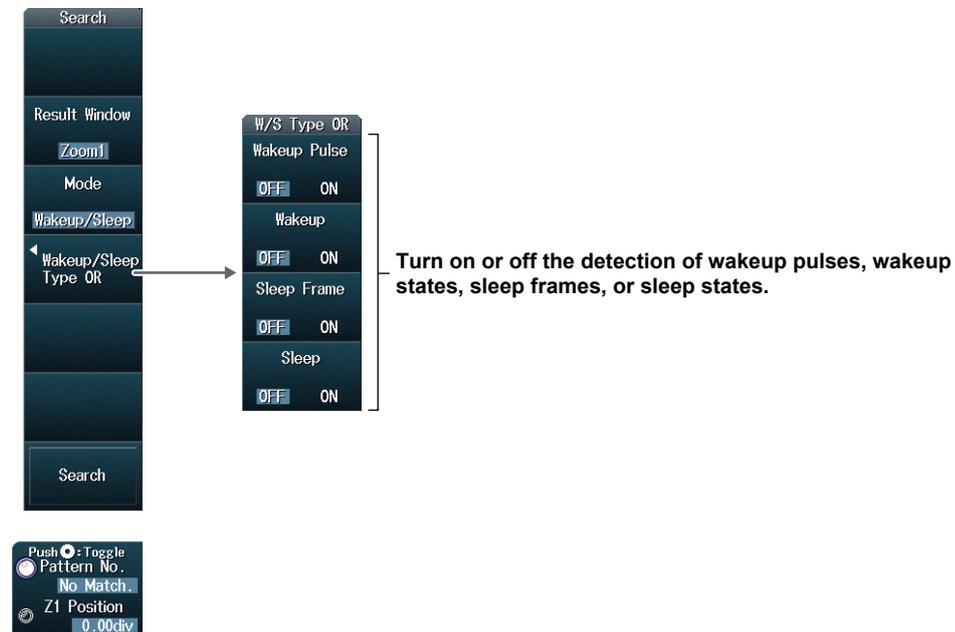
Set whether to use a signed (Sign) or unsigned (Unsign) data format.

Set the byte order.

Wakeup/Sleep Mode

Press the **Mode** soft key, the **Wakeup/Sleep** soft key, and then the **Wakeup/Sleep Type OR** soft key to display the following menu.

The DLM4000 searches for wakeup pulses, wakeup states, sleep frames, or sleep states.



Executing Searches

1. Set the search type.
2. Press the **Search** soft key.

The DLM4000 searches for the search conditions. If the DLM4000 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

You can set the detected point number and display the waveform for the 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 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
 - Auto setup, source, format, display channel, fast channel data type, slow channel message type, the level used to detect the source state, and hysteresis
- Decode 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

SEARCH SENT Menu

Press **SHIFT+SEARCH** (SERIAL BUS) and then the **Type** soft key. From the setup menu that appears, select **SENT** to display the following menu.

The image shows a sequence of menu screens from a device. The first screen is titled 'SERIAL BUS' and has several options: 'Serial Bus 1', 'Display' (OFF/ON), 'Type' (SENT), 'Setup' (CH1 3.00us), 'Search', 'Decode' (Hex), and 'List/Trend'. Arrows point from these options to descriptive text. An arrow from 'Serial Bus 1' points to a second screen titled 'Serial Bus' with options 1, 2, 3, and 4. A bracket on the right of this screen is labeled 'Select which serial bus to set (Serial Bus1 to Serial Bus4)'. Below the first screen, there are two more menu screens. The first is 'Push [] : Toggle List No.' with a value of 0. The second is 'Z1 Position' with a value of 0.00div. Arrows point from these screens to descriptive text.

SERIAL BUS

- Serial Bus 1 → Turns on or off the serial bus signal analysis and search displays
- Display OFF ON
- Type SENT → Set the serial bus signal type to SENT.
- Setup CH1 3.00us → Set the serial bus.
- Search → Configure the search.
- Decode Hex → Set the decode display (Hex or Bin).
- List/Trend → Configure the list display and trend display.

Serial Bus

1, 2, 3, 4 → Select which serial bus to set (Serial Bus1 to Serial Bus4).

Push [] : Toggle List No.

0 → Set the analysis number.

Z1 Position

0.00div → Set the zoom position. This sets the zoom position for the window selected during zoom window configuration (described later).

Setting the Serial Bus (Setup)

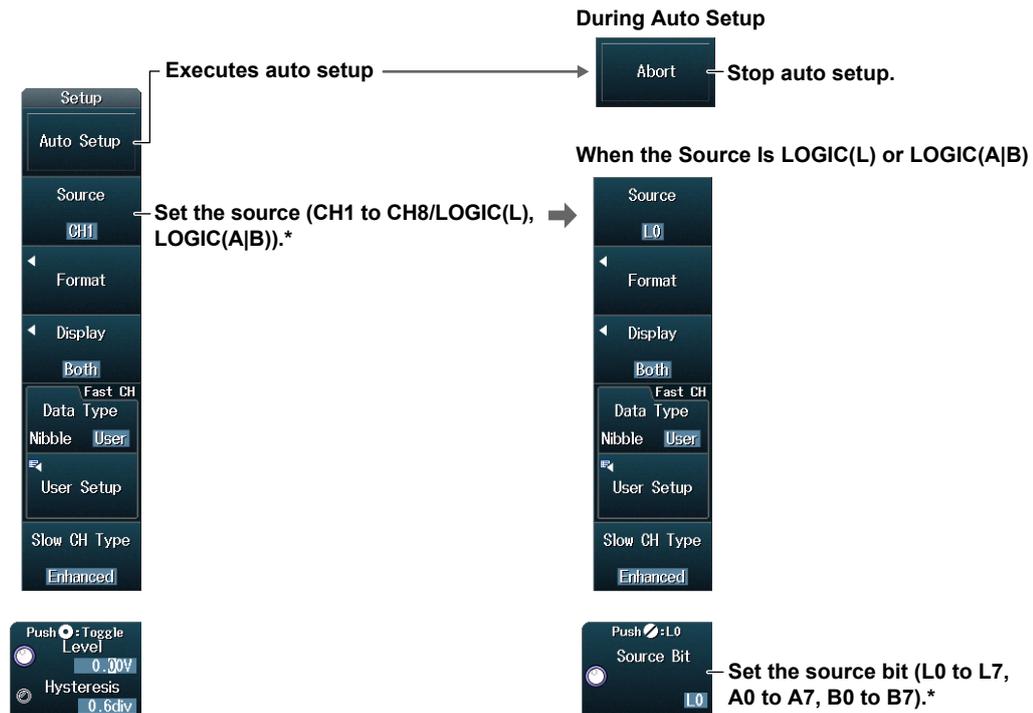
Note

Using the CH8 Terminal and LOGIC(L) Port

When you perform an analysis or execute a search, you cannot use the CH8 terminal and LOGIC(L) port as the source at the same time. Specify the source that you want to use in advance by pressing either the CH8 key or the L key.

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

Auto Setup (Auto Setup)



* You can select CH8 or LOGIC(L), depending on which channel's corresponding key (CH8 or L) is illuminated. LOGIC(A|B), A0 to A7, and B0 to B7 are available on models with the /L16 option.

1. Set the source. If you select LOGIC(L) or LOGIC(A|B), set the source bit (L0 to L7, A0 to A7, B0 to B7).

You cannot use auto setup under the following circumstances.

- When the source is set to Math1 to Math4
- When state display is applied to a LOGIC bit that is set as the source

2. Press the **Auto Setup** soft key.

The DLM4000 will automatically configure the serial bus settings.

The auto setup feature automatically configures the format, level, and hysteresis and then triggers at the end of S&C of the fast channel.

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.

The auto setup feature will not work properly on some input signals.

Manual Setup

After running auto setup, you can change the following settings and display decoded results.

- Source
- Format
- Display channel
- Fast channel data type
- Fast channel user data type
- Slow channel message type
- Level used to detect source states
- Hysteresis

When the Source Is LOGIC(L) or LOGIC(A|B)

Set the source (CH1 to CH8/LOGIC(L), LOGIC(A|B)).¹

Set the format. ▶ section 2.13

Set the display channel (Both, Fast CH, Slow CH).

Set the fast channel data type (Nibble, User).

Set the slow channel message type (Short, Enhanced) (only when the version is JAN2010). ▶ section 2.13

Set the level used to detect source states.

Set the hysteresis.

Set the source bit (L0 to L7, A0 to A7, B0 to B7).¹

When the fast channel data type is User

Set the user data type(Verion is set to JAN2010 or FEB2008 and older).

Data	Size	Order
<input checked="" type="checkbox"/> Data1	12	Big Little
<input checked="" type="checkbox"/> Data2	12	Big Little
<input type="checkbox"/> Data3	0	Big Little
<input type="checkbox"/> Data4	0	Big Little

Set the nibble byte order (Big, Little).
Set the data size (0 to 24).²

Set the user data type(Verion is set to APR2016).

Multiplexing

Data	Size	Order
<input checked="" type="checkbox"/> Data1(FC)	4	Big Little
<input checked="" type="checkbox"/> Data2	12	Big Little
<input type="checkbox"/> Data3	0	Big Little
<input type="checkbox"/> Data4	0	Big Little

Check the check box when the SENT signal is multiplexing.³

Select the check boxes for the items that you want to use as comparison conditions.

- 1 You can select CH8 or LOGIC(L), depending on which channel's corresponding key (CH8 or L) is illuminated. LOGIC(A|B), A0 to A7, and B0 to B7 are available on models with the /L16 option.
- 2 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.
- 3 When Multiplexing is checked, the data size of Data 1 is fixed to 4 bits to correspond to FC.

Setting the Format (Format)

This is the same as setting the format for the trigger type. For details, see section 2.13.

Configuring the List Display and Trend Display (List/Trend)

Press the **List/Trend** soft key to display the following menu.

Zoom Link — Turns zoom linking on or off

List Size — Set the list size and the display position (Full Screen, Half(Upper), Half(Lower)).

Show List — Lists the analysis results

Trend — Configure the trend display.

List No. — Set the analysis number.

Showing the List of Analysis Results (Show List)

Press the **Show List** soft key to display the following screen.

Analysis number

No.	Time(ms)	Sync(us)	Tick(us)	S&C	Data	CRC	Length(tick)	Information	ShowCH
-3	-3.13038	168.08	3.00	0100	7 C 5 D E 8	C	283.98		
-2	-2.27805	168.08	3.00	1100	7 C 5 D F 8	E	284.00		
-1	-1.42563	168.06	3.00	1100	7 C 5 E 0 8	4	284.01		
0	0.57326	168.08	3.00	0000	7 C 5 E 1 8	6	283.99		<END>
1	0.27910	168.10	3.00	1000	7 C 5 E 2 8	0	284.00		<START>
2	1.13160	168.10	3.00	1000	7 C 5 E 3 8	2	283.98		ID=01
3	1.98403	168.08	3.00	1100	7 C 5 E 4 8	C	284.00		Data=F53
4	2.83645	168.10	3.00	1100	7 C 5 E 5 8	E	283.99		CRC=0F
5	3.68891	168.08	3.00	1100	7 C 5 E 6 8	8	283.99		Info=
6	4.54128	168.08	3.00	1100	7 C 5 E 7 8	A	283.97		
7	5.39360	168.06	3.00	0100	7 C 5 E 8 8	9	284.00		
8	6.24592	168.06	3.00	0100	7 C 5 E 9 8	B	283.99		

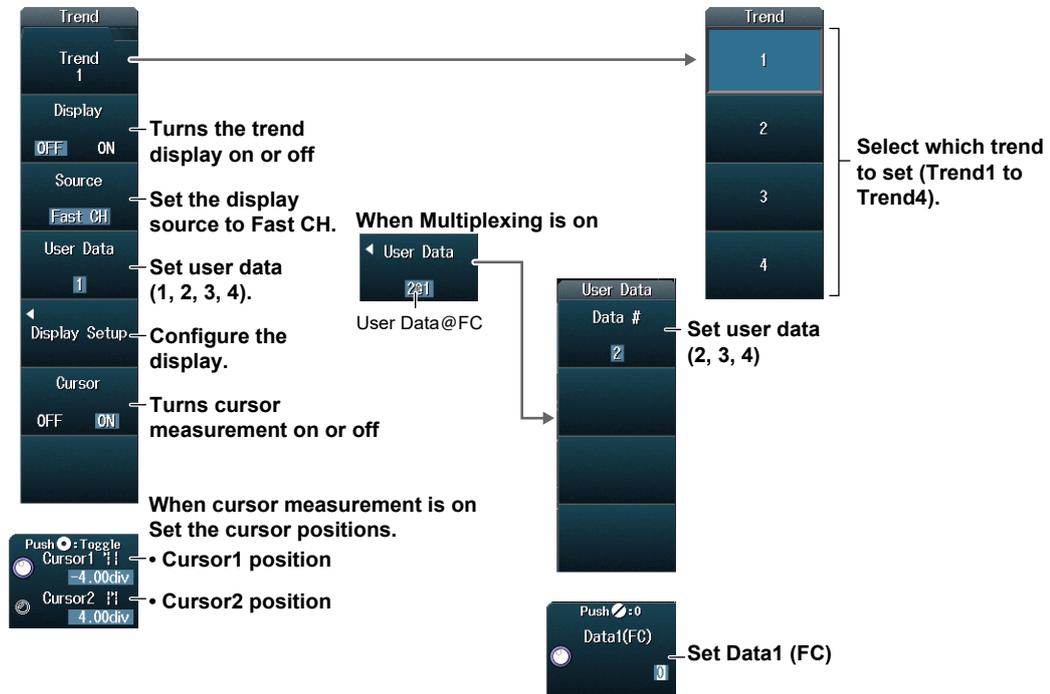
List No. — Set the analysis number (using the jog shuttle).

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).

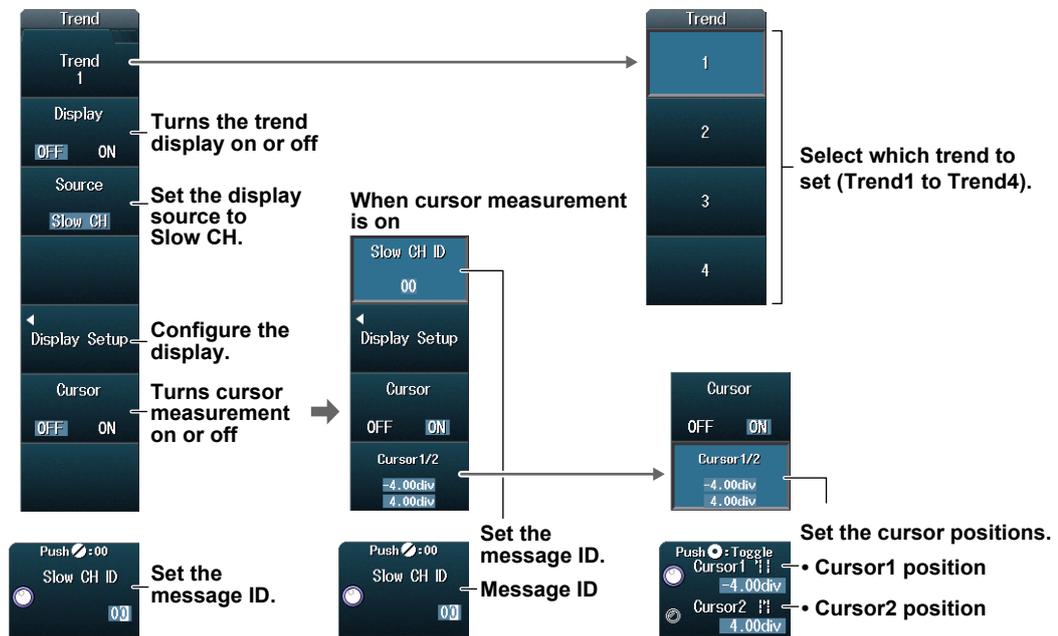
Configuring the Trend Display (Trend)

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

When the Source Is Set to Fast Channel



When the Source Is Set to Slow Channel



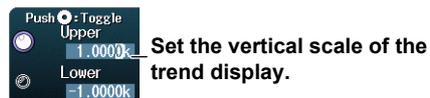
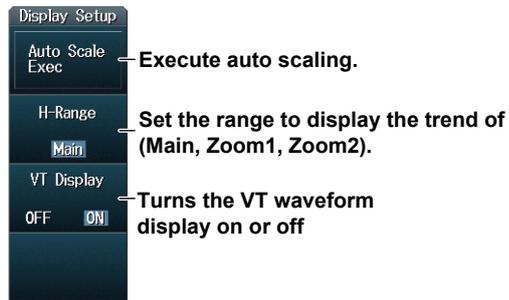
Setting the Message ID (Slow CH ID)

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 12-24) and the version in "Setting the Serial Bus (Setup)" (pages 12-25 and 12-26), 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.



Executing auto 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.

The screenshot shows a vertical menu titled "Search". The menu items are: "Result Window" (with "Zoom1" selected), "Mode" (with "Every Fast CH" selected), and "Search".

- Result Window**: Set the zoom window (Zoom1 or Zoom2).
- Mode**: Set the search type (Every Fast CH, Fast CH S&C, Fast CH Data, Every Slow CH, Slow CH ID/Data, Error).
▶ section 2.13
- Search**: Executes a search. This appears when a point that matches the specified search conditions is found.

Below the main menu, two smaller screenshots show the results of a search:

- Left screenshot**: Shows "No Match" and "Z1 Position 0.00div".
- Right screenshot**: Shows "Pattern No 0" and "Z1 Position =2.12div".

Setting the Zoom Window

You can configure zoom windows Zoom1 and Zoom2 when they are displayed. Zoom1 is automatically displayed during the auto 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 Fast CH, Fast CH S&C, Fast CH Data, Every Slow CH, Slow CH ID/Data, or Error. For details, see section 2.13. However, if the search mode is Slow CH ID/Data, set ID/data reference values a and b in the format (Hex or Dec) specified in decode display in "SEARCH SENT Menu" (page 12-24). The search condition setup screen (Condition Setup) of Slow CH ID/Data mode does not have the "ID and data input format setting (Input Format)" item in section 2.13 that is available on the trigger condition setup screen.

Executing Searches

1. Set the search type.
2. Press the **Search** soft key.

The DLM4000 searches for the search conditions. If the DLM4000 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 Number

You can set the detected point number and display the waveform for the 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 PSI5 Airbag Signals (Option)

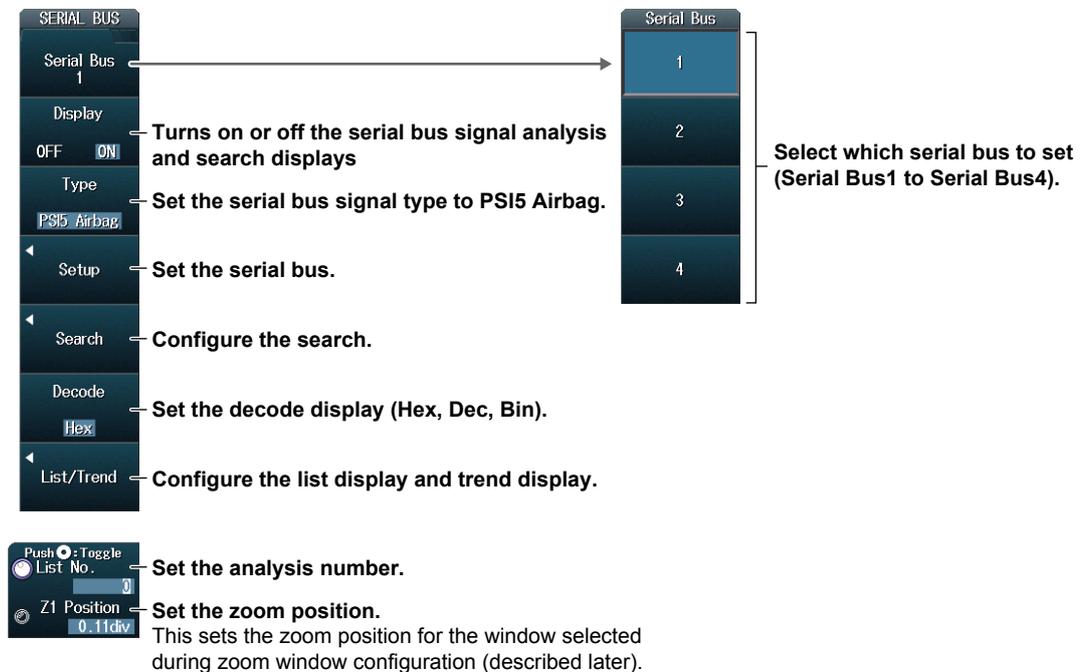
This section explains the following settings (which are used when analyzing or searching PSI5 Airbag signals):

- 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

► “Analyzing and Searching Serial Bus Signals” and “Analyzing and Searching PSI5 Airbag Signals (Option)” in the Features Guide

SEARCH PSI5 Airbag Menu

Press **SHIFT+SEARCH** (SERIAL BUS) and then the **Type** soft key. From the setup menu that appears, select PSI5 Airbag to display the following menu.



SERIAL BUS

- Serial Bus ↑
- Display OFF ON → Turns on or off the serial bus signal analysis and search displays
- Type PSI5 Airbag → Set the serial bus signal type to PSI5 Airbag.
- Setup ← Set the serial bus.
- Search ← Configure the search.
- Decode Hex → Set the decode display (Hex, Dec, Bin).
- List/Trend ← Configure the list display and trend display.

Serial Bus

- 1
- 2
- 3
- 4

Select which serial bus to set (Serial Bus1 to Serial Bus4).

Push Toggle

List No. 0 → Set the analysis number.

Z1 Position 0.11 div → Set the zoom position. This sets the zoom position for the window selected during zoom window configuration (described later).

Setting the Serial Bus (Setup)

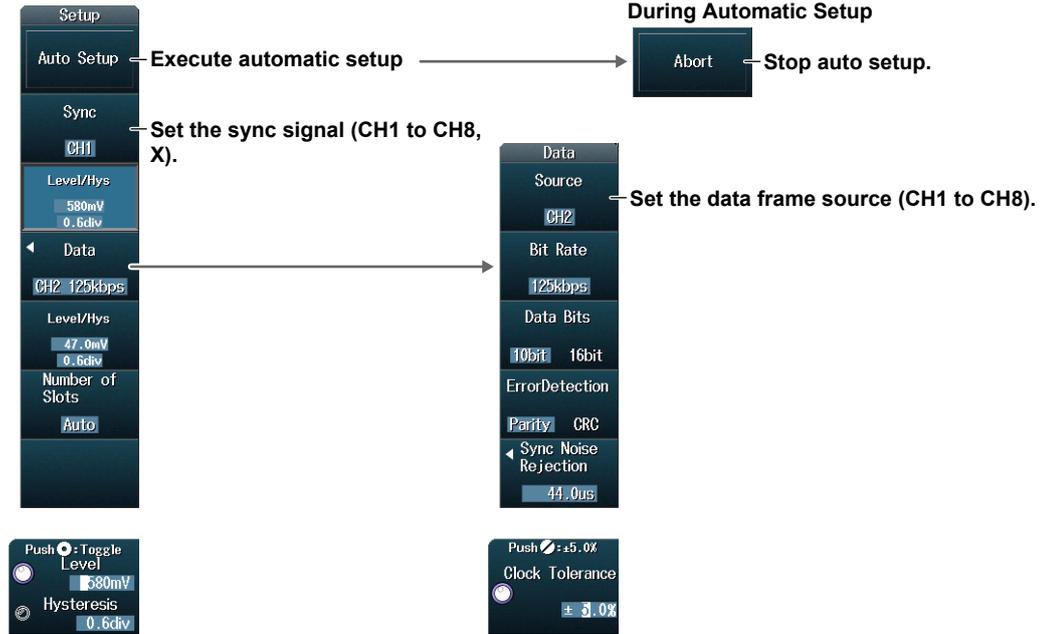
Note

Handling of the CH8 terminal and LOGIC (L) Port

If you perform an analysis or execute a search when using the LOGIC (L) port for input, you cannot specify CH8 as the source. Press the CH8 key in advance to enable input from the CH8 terminal.

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

Auto Setup (Auto Setup)



1. Set the sync signal.
 - Auto setup cannot be performed when the source is set to Math1 to Math4.
 - When X is specified, sync signal is not detected. Therefore, sync noise rejection is set to OFF.
2. Set the data frame source.

Auto setup cannot be performed when the source is set to Math1 to Math4.
3. Press the **Auto Setup** soft key.

The DLM4000 will automatically configure the serial bus settings.
 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 CH8, the DLM4000 triggers on the rising edge of the sync pulse.
 - When the sync signal source is X, the DLM4000 triggers on the start bit of data frames.

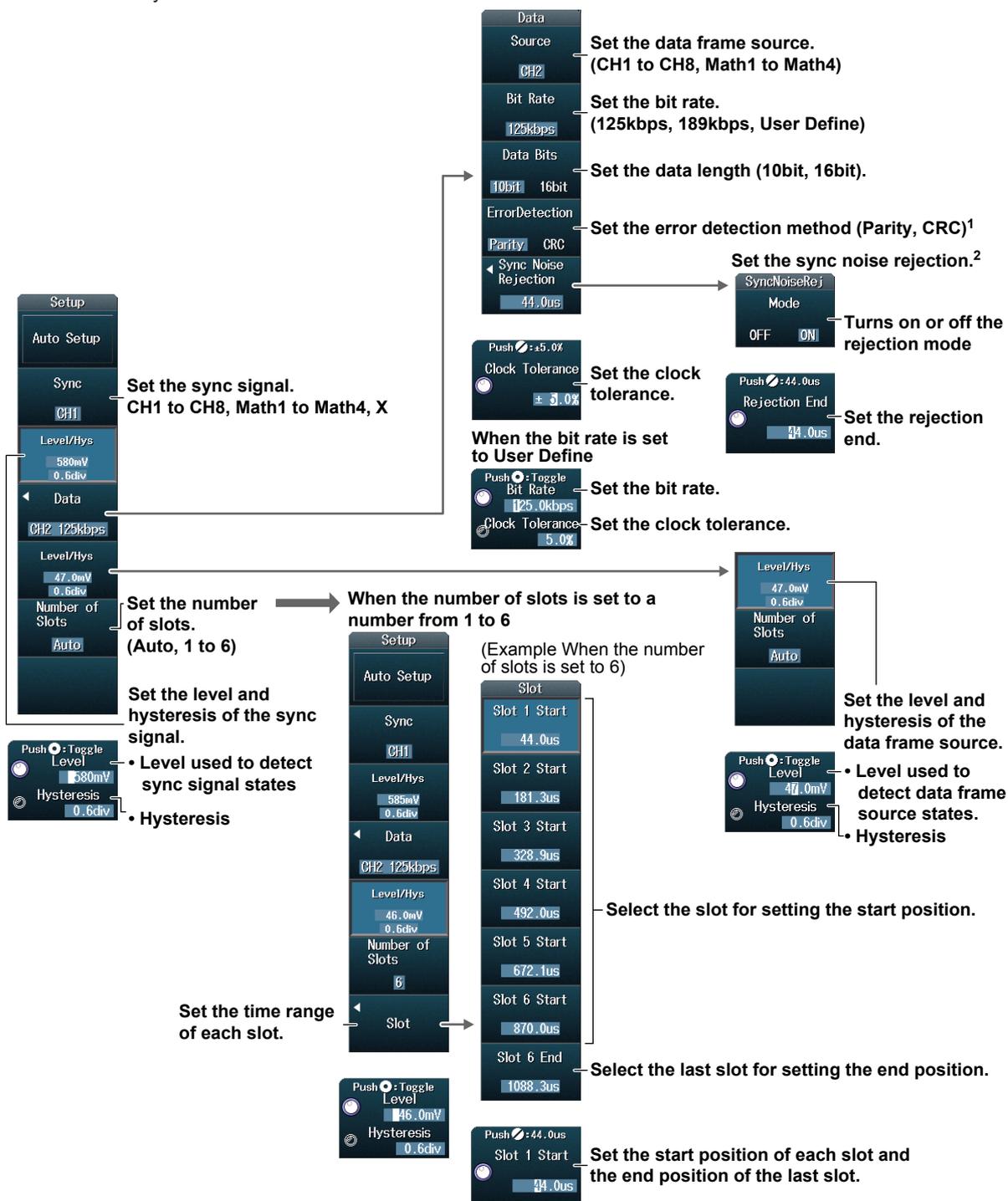
While the serial bus is being configured, Auto Setup changes to Abort. If you want to stop, press the **Abort** soft key.

The auto setup feature will not work properly on some input signals.

Manual Setup

After running auto setup, you can change the following settings and display decoded results.

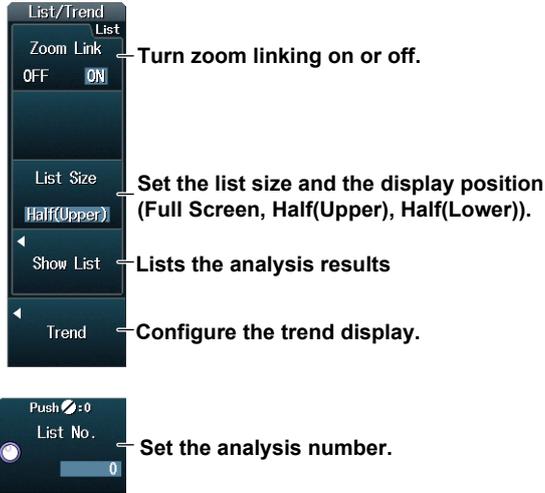
- Sync signal source
CH1 to CH8, Math1 to Math4
- Data frame source
Bit rate, data length, error detection method, sync noise rejection, clock tolerance
- Number of slots
Set the time range of each slot (when the number of slots is set to a number from 1 to 6)
- Level used to detect source states
- Hysteresis



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.

Configuring the List Display and Trend Display (List/Trend)

Press the **List/Trend** soft key to display the following menu.

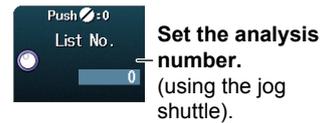


Showing the List of Analysis Results (Show List)

Press the **Show List** soft key to display the following screen.

Analysis number

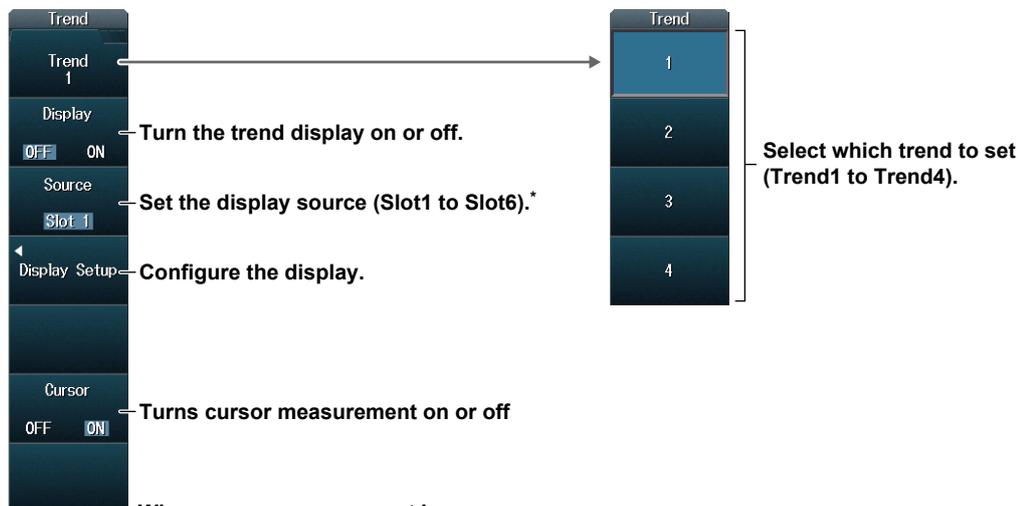
No.	Time(ms)	from Sync(us)	Slot No.	Data	Parity/CRC	Information
-2	-0.301012	197.71	2	006	0	
-1	-0.145404	353.32	3	301	1	
0	0.000024	498.74	Sync			
1	0.058088	58.06	1	380	1	
2	0.197752	197.73	2	000	0	
3	0.353368	353.34	3	301	1	
4	0.498816	498.79	Sync			
5	0.556884	58.07	381	0		Frame Error,Clock Error
6	0.696552	197.74	1	3FA	0	
7	0.852200	353.38	2	301	1	
8	0.997620	498.80	Sync			
9	1.055684	58.06	1	382	0	



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).

Configuring the Trend Display (Trend)

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



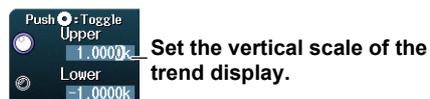
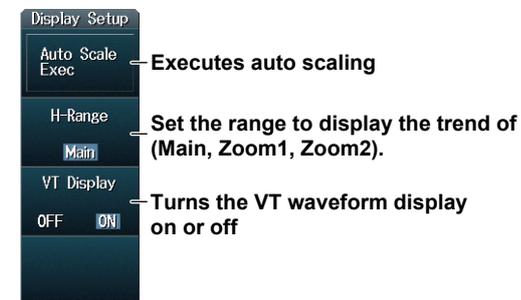
When cursor measurement is on
Set the cursor positions.



* The selectable range of display source varies depending on the number-of-slots setting on the Setup menu (page 12-33).

Configuring the Display (Display Setup)

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



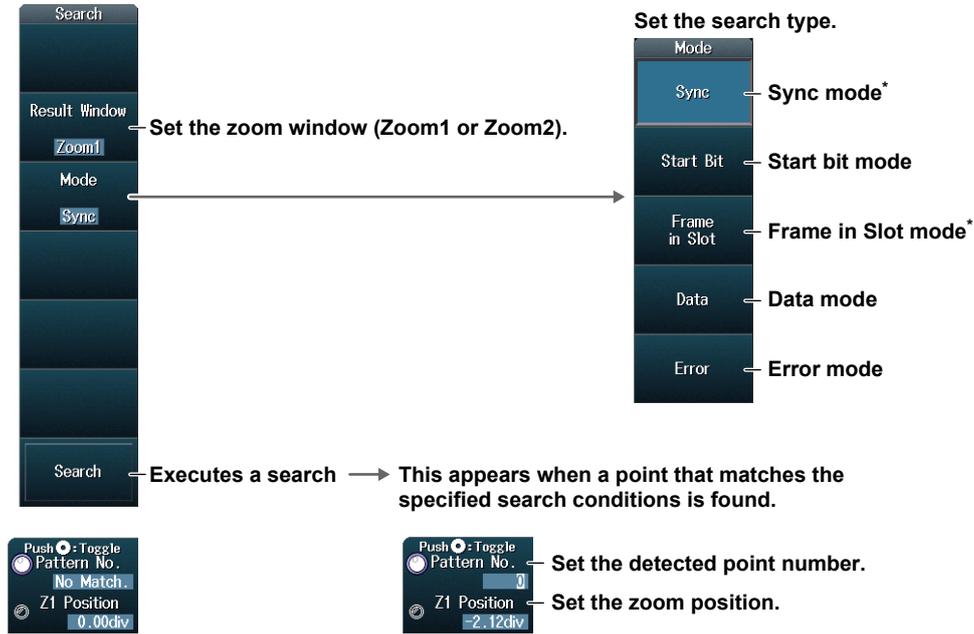
Executing Automatic Scaling

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.



* These modes will not be available if the sync signal source (page 12-33) is set X.

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

Sync Mode

Press the **Mode** soft key and then the **Sync** soft key.

The DLM4000 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

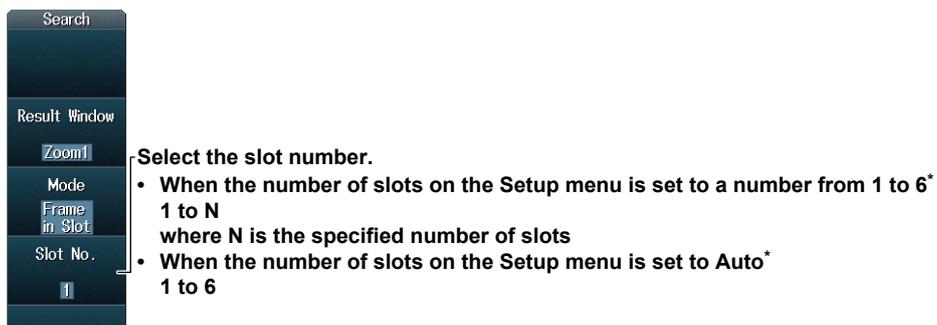
Press the **Mode** soft key and then the **Start Bit** soft key.

The DLM4000 searches for the start bit of data frames.

Frame in Slot Mode

Press the **Mode** soft key and then the **Frame in Slot** soft key to display the following menu.

The DLM4000 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.



* See “Manual Setup” on page 12-33.

Data Mode

Press the **Mode** soft key, the **Data** soft key, and then the **Condition Setup** soft key to display the following screen.

The DLM4000 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.
- 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

- 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.

* See "Manual Setup" on page 12-33.

• **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 page 12-33.

• **Setting Reference Values a and b**

Data length*	10bit		16bit	
	Hex, Bin	Dec	Hex, Bin	Dec
Selectable range	200 to 1FF	-512 to 511	8000 to 7FFF	-32768 to 32767

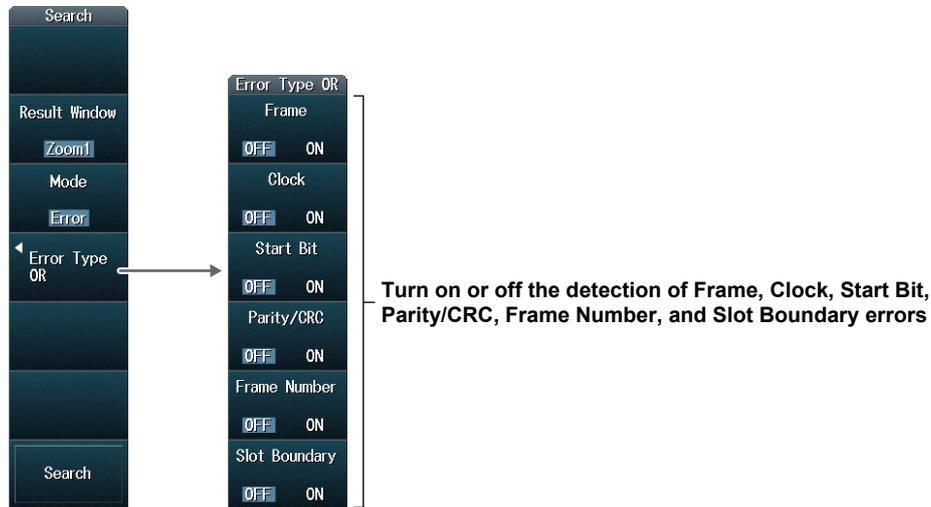
* See "Manual Setup" on page 12-33.

12.7 Analyzing and Searching PSI5 Airbag Signals (Option)

Error Mode

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

The DLM4000 searches for various errors that are set to ON.



Executing Searches

1. Set the search type.
2. Press the **Search** soft key.

The DLM4000 searches for the search conditions. If the DLM4000 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 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
- Decode display
- List display
 - List size, 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

SEARCH UART Menu

Press **SHIFT+SEARCH** (SERIAL BUS) and then the **Type** soft key. From the setup menu that appears, select **UART** to display the following menu.

SERIAL BUS

- Serial Bus 1
- Display **OFF ON** — Turns on or off the serial bus signal analysis and search displays
- Type **UART** — Set the serial bus signal type to UART.
- Setup **CH1 19200bps** — Set the serial bus.
- Search — Configure the search.
- Decode **Hex** — Set the decode display (Hex, Bin, ASCII).
- List — Configure the list display.

Serial Bus

- 1
- 2
- 3
- 4

Select which serial bus to set (Serial Bus1 to Serial Bus4).

When Grouping Is Set to OFF

- Push **Toggle** Data No. — Set the data number
- Z1 Position — Set the zoom position.

When Grouping Is Set to ON

- Push **Toggle** List No. — Set the analysis number.
- Z1 Position — Set the zoom position. This sets the zoom position for the window selected during zoom window configuration (described later).

* For details on turning grouping on and off, see “Setting the List Display (List)” (described later).

Setting the Serial Bus (Setup)

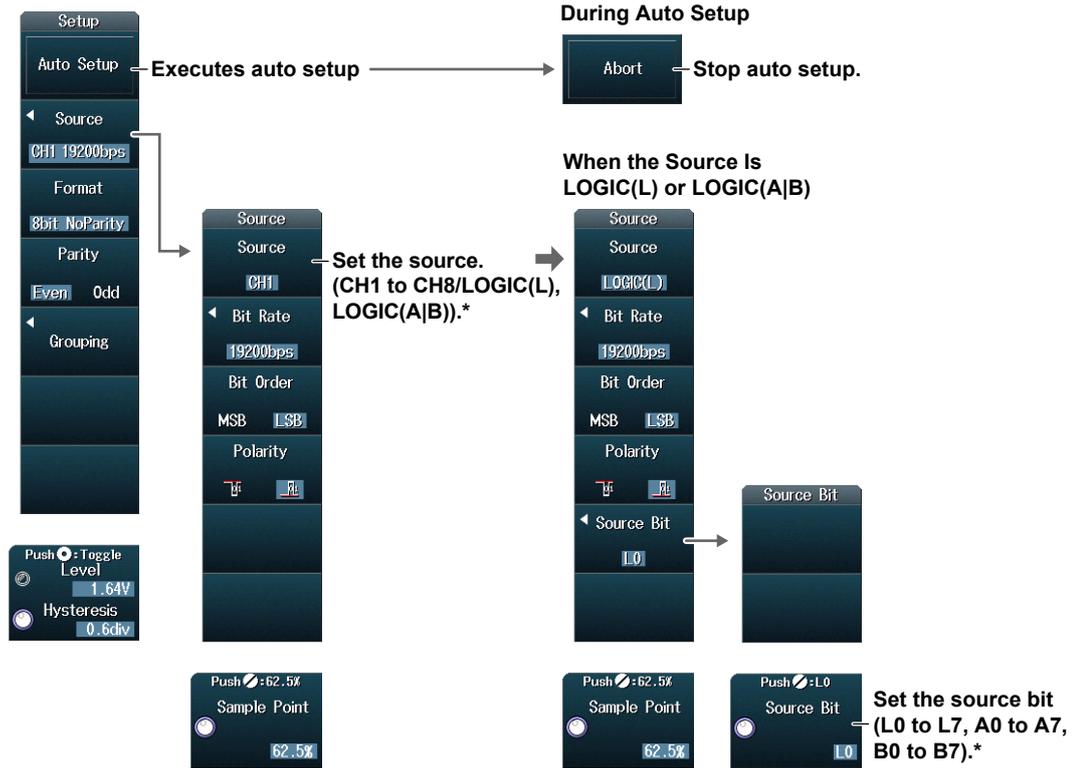
Note

Using the CH8 Terminal and LOGIC(L) Port

When you perform an analysis or execute a search, you cannot use the CH8 terminal and LOGIC(L) port as the source at the same time. Specify the source that you want to use in advance by pressing either the CH8 key or the L key.

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

Auto Setup (Auto Setup)



* You can select CH8 or LOGIC(L), depending on which channel's corresponding key (CH8 or L) is illuminated. LOGIC(A|B), A0 to A7, and B0 to B7 are available on models with the /L16 option.

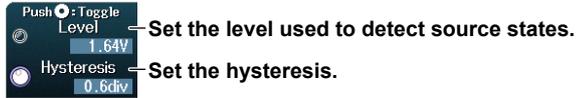
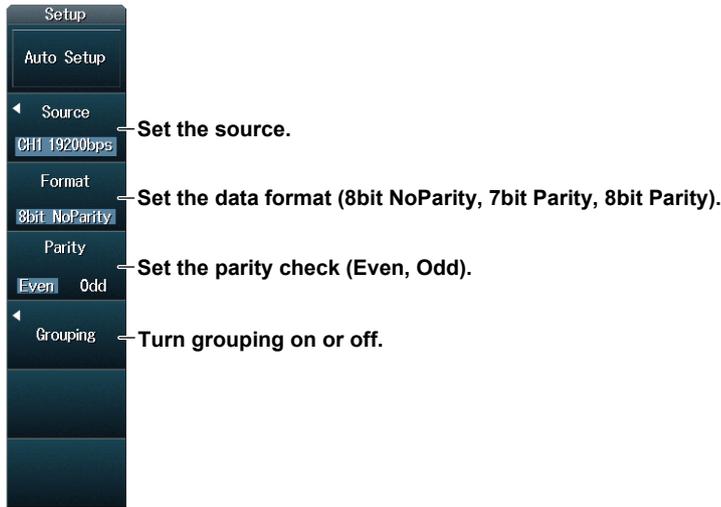
1. Press the **Source** soft key.
The source setup menu is displayed.
2. Set the source. If you select LOGIC(L) or LOGIC(A|B), set the source bit (L0 to L7, A0 to A7, B0 to B7).
You cannot use auto setup under the following circumstances.
 - When the source is set to Math1 to Math4
 - When state display is applied to a LOGIC bit that is set as the source
3. Press **ESC** to return to the bus setup menu.
4. Press the **Auto Setup** soft key.
The DLM4000 will automatically configure the serial bus settings.
The DLM4000 automatically configures the bit rate, sample point, level, and hysteresis and then triggers on the UART signal's Stop Bit.
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.

The auto setup feature will not work properly on some input signals.

Manual Setup

After running auto setup, you can change the following settings and display decoded results.

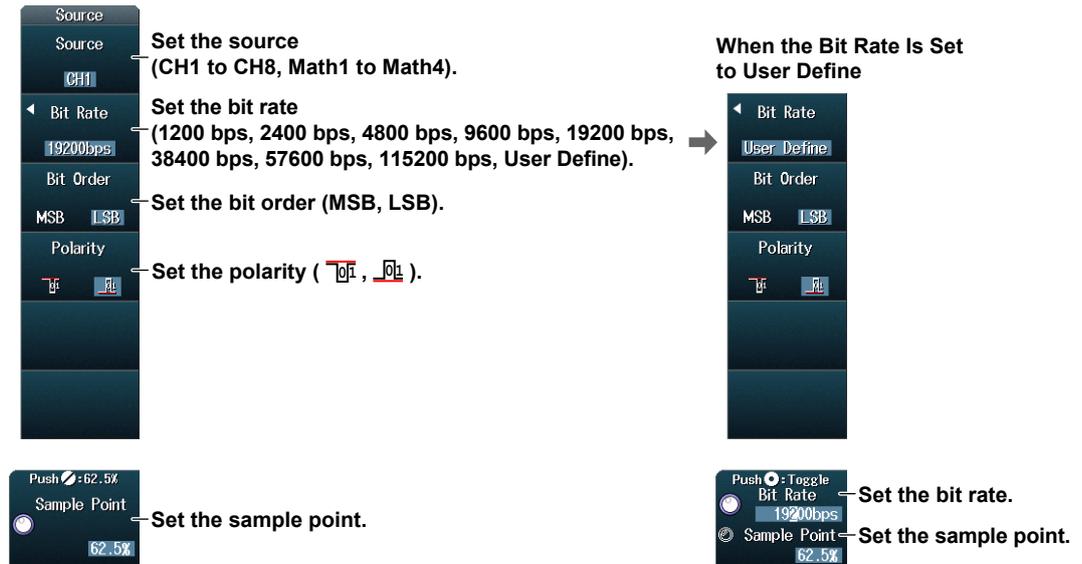
- Source
- Format
- Parity
- Grouping
- Level used to detect source states
- Hysteresis



Setting the Source (Source)

Press the **Source** soft key to display one of the menus shown below. The menu that is displayed varies depending on the specified source.

- **When the Source is CH1 to CH8 or Math1 to Math4**



12.8 Analyzing and Searching UART Signals (Option)

- When the Source Is LOGIC(L) or LOGIC(A|B)

Source

- Source: LOGIC(L) — Set the source (LOGIC(L), LOGIC(A|B)).*
- Bit Rate: 19200bps — Set the bit rate (1200 bps, 2400 bps, 4800 bps, 9600 bps, 19200 bps, 38400 bps, 57600 bps, 115200 bps, User Define).
- Bit Order: MSB LSB — Set the bit order (MSB, LSB).
- Polarity: — Set the polarity (,).
- Source Bit: L0

When the Bit Rate Is Set to User Define

- Bit Rate: User Define
- Bit Order: MSB LSB
- Polarity: —
- Source Bit: L0

Source Bit

- Source Bit: L0

Sample Point

- Sample Point: 62.5%

Source Bit

- Source Bit: L0

Toggle Bit Rate

- Bit Rate: 19200bps — Set the bit rate.
- Sample Point: 62.5% — Set the sample point.

* You can select CH8 or LOGIC(L), depending on which channel's corresponding key (CH8 or L) is illuminated. LOGIC(A|B), A0 to A7, and B0 to B7 are available on models with the /L16 option.

Setting the Grouping (Grouping)

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

Grouping

- Grouping: OFF ON — Turn grouping on or off.

Byte Space

- Byte Space: 0.521ms — Set the byte space.

Setting the List Display (List)

Press the **List** soft key on the SEARCH UART menu to display the following menu.

When Grouping Is Set to OFF

Turns zoom linking on or off

Set the grouping (set this to OFF).

Set the list size and the display position (Full Screen, Half(Upper), Half(Lower)).

Lists the analysis results

Data from the leftmost side of the waveform display

The data that corresponds to the selected data number is highlighted.

Addr	Hex	ASCII
00000000	A5 CA 14 23 D1 22 44 09 12 A5 4B 96 2D	...
00000010	D1 A3 46 0C 99 33 E7 4E 9C 39 F3 E7 CF	...
00000020	71 63 C6 8D 1B 36 EC D8 30 E1 42 84 88	...
00000030	8B 17 2E D0 3A F5 EB D7 AF DE 30 7B F6	...
00000040	6F 5F BE FC 78 F0 E1 C3 06 8D 9A B4 69	...
00000050	9A 35 EB 56 2D DB 36 ED 5A 35 6A D4 28	...
00000060	82 84 89 93 27 4E 1D BB F6 6C 59 B2 E4	...
00000070	C9 93 A6 CC 18 30 E0 C0 81 03 87 8E 1D	...
00000080	D2 24 48 11 A3 47 8E 9C B8 71 62 44 88	...
00000090	00 81 82 05 8B 96 AC D8 B1 63 47 0F 1E	...
000000a0	E8 50 21 C3 87 0F 9F 3F FF FF 7E FC F9	...
000000b0	90 21 C2 05 0A 14 A9 53 27 0F 9F BE 7D	...
000000c0	55 AA 55 2B D7 2E DC B8 F0 60 41 03 06	...

When A Framing Error Is Detected: 2D* An * is appended to the data number.

When a Parity Error Is Detected: 05x An x is appended to the data number.

When Both a Framing Error and a Parity Error Are Detected: The * used for marking framing errors is appended to the data number.

When Grouping Is Set to ON

Turns zoom linking on or off

Set the grouping (set this to ON).

Set the list size and the display position (Full Screen, Half(Upper), Half(Lower)).

Lists the analysis results

If multiple errors are detected in one piece of data, the DLM4000 only displays the framing error indication. Framing Error or Parity Error

No.	Time(µs)	Data(HEX)	Data(ASCII)	Information
-5	-15.243	7E	..	..
-4	-13.670	FC F9 F2 E4	..	..
-3	-10.379	48 90 21 42	H.B	..
-2	-7.088	05 0A 14 A9	..	..
-1	-3.795	53 27 CF 9F	S'.	..
0	-0.504	BE 7D FA F5	J..	..
1	2.787	6A 56 2A 95	JHU	..
2	6.080	2B D7 2E 9C	..	..
3	9.371	B8 F0 60 41	..	..
4	12.662	03 06 0C 18	..	..
5	15.955	B1 E2 D5 0A	..	..
6	19.246	95 2B D6 AC	..	..

This is the detailed list of analysis results that is displayed when you press SET. All data for the specified analysis number is displayed.

Addr	Hex	ASCII
00000000	BE 7D FA F5	...

When You Press SET

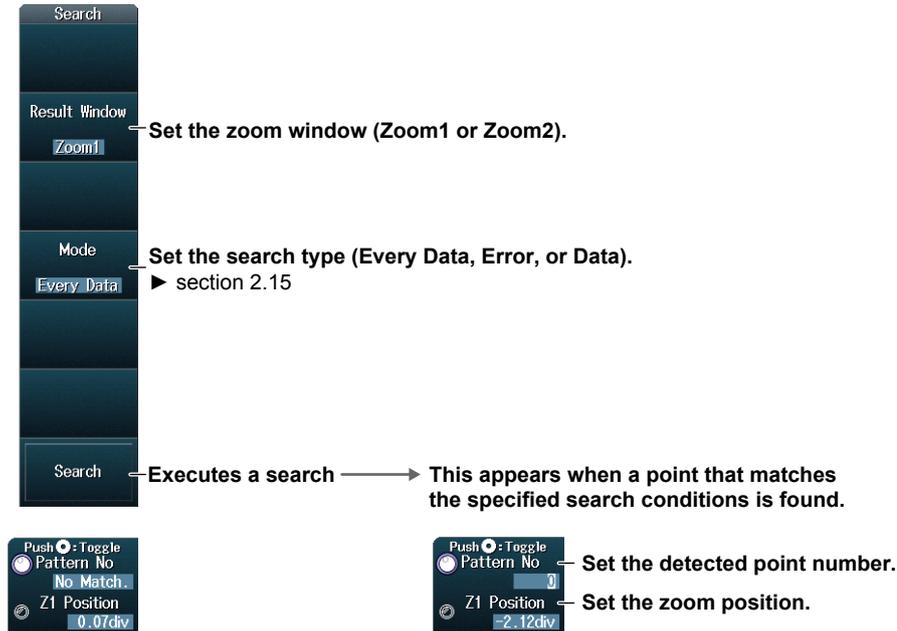
Set the data number.

- The data that corresponds to the selected data number is highlighted.
- In the list that appears when you press SET, the same marks are appended to the data numbers when an error is detected as when grouping is 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).

Search Setup (Search)

Press the **Search** soft key on the SEARCH UART menu to display the following menu.



Setting the Zoom Window

You can configure zoom windows Zoom1 and Zoom2 when they are displayed. Zoom1 is automatically displayed during the auto 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 2.15.

Executing Searches

1. Set the search type.
2. Press the **Search** soft key.

The DLM4000 searches for the search conditions. If the DLM4000 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 Number

You can set the detected point number and display the waveform for the 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 I²C Bus Signals (Option)

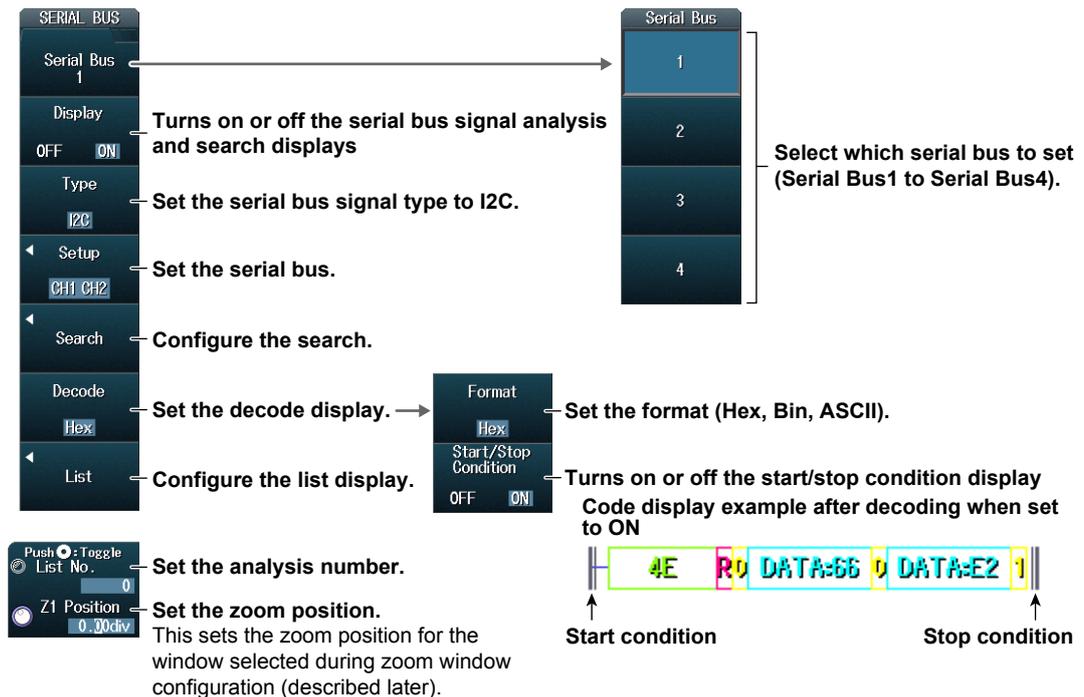
This section explains the following settings (which are used when analyzing or searching I²C bus signals).

- 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
- Decode display
- List display
 - List size, display position, detailed display, 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 I²C Bus Signals (Option)” in the Features Guide

SEARCH I2C Menu

Press **SHIFT+SEARCH** (SERIAL BUS) and then the **Type** soft key. From the setup menu that appears, select **I2C** to display the following menu.



Setting the Serial Bus (Setup)

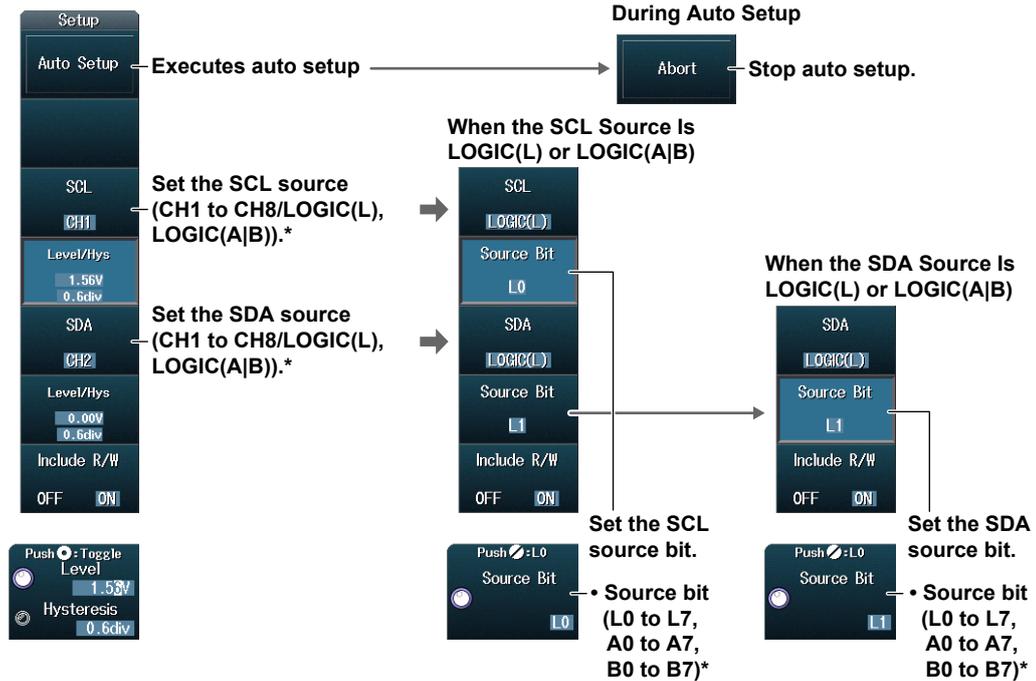
Note

Using the CH8 Terminal and LOGIC(L) Port

When you perform an analysis or execute a search, you cannot use the CH8 terminal and LOGIC(L) port as the source at the same time. Specify the source that you want to use in advance by pressing either the CH8 key or the L key.

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

Auto Setup (Auto Setup)



1. Set the SCL and SDA sources.

The range within which the SDA source can be set changes depending on the SCL source as indicated below.

SCL Source	SDA Source
CH1 to CH4	CH1 to CH4
CH5 to CH8/LOGIC(L)*	CH5 to CH8/LOGIC(L)*
LOGIC(A|B)*	LOGIC(A|B)*

If you select LOGIC(L) or LOGIC(A|B), set the source bit (L0 to L7, A0 to A7, B0 to B7).*

* You can select CH8 or LOGIC(L), depending on which channel's corresponding key (CH8 or L) is illuminated. LOGIC(A|B), A0 to A7, and B0 to B7 are available on models with the /L16 option.

You cannot use auto setup under the following circumstances.

- When the SCL or SDA source is set to Math1 to Math4
- When state display is applied to a LOGIC bit that is set as the SCL or SDA source

2. Press the **Auto Setup** soft key.

The DLM4000 will automatically configure the serial bus settings.

The DLM4000 automatically configures the level and hysteresis and triggers on the start condition of the I²C bus signal.

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.

The auto setup feature will not work properly on some input signals.

Manual Setup

After running auto setup, you can change the following settings and display decoded results.

- SCL source
- SDA source
- Level used to detect source states
- Hysteresis

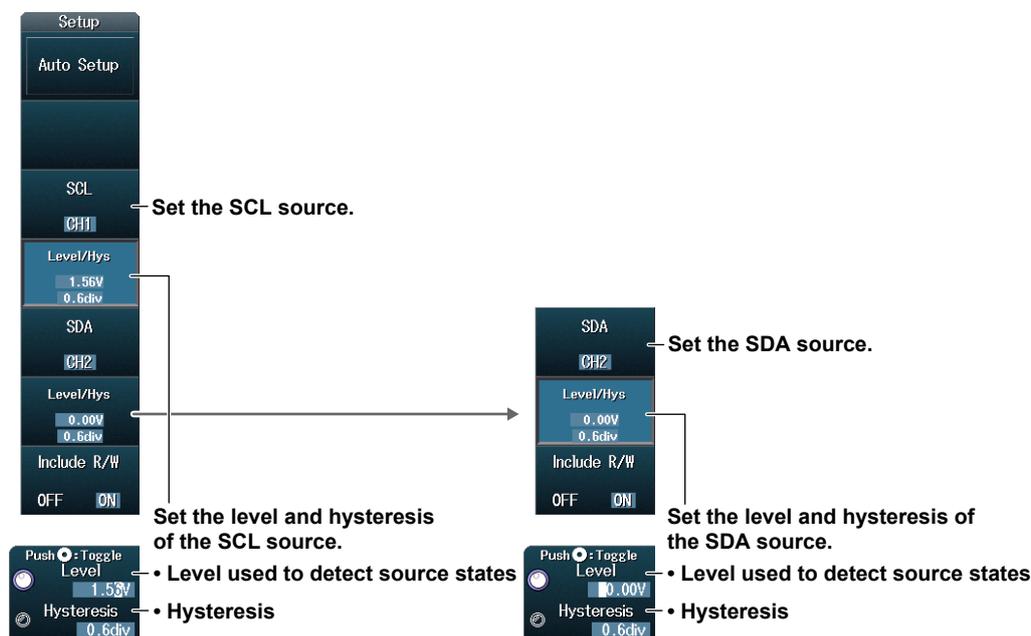
Setting the SCL Source and the SDA Source (SCL, SDA)

The range within which the SDA source can be set changes depending on the SCL source as indicated below.

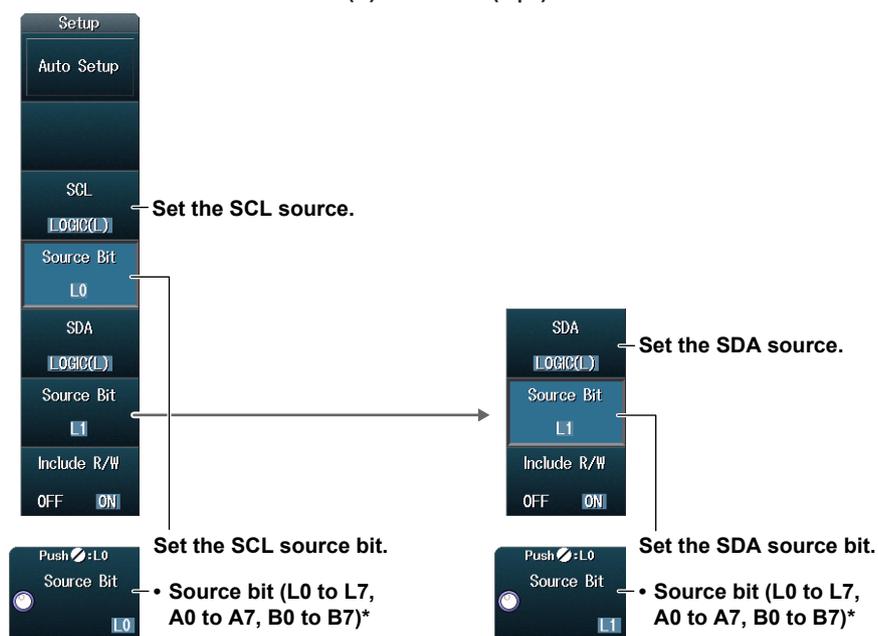
SCL source	SDA source
CH1 to CH4, Math1, or Math2	CH1 to CH4, Math1, or Math2
CH5 to CH8/LOGIC(L),* Math3, or Math4	CH5 to CH8/LOGIC(L),* Math3, or Math4
LOGIC(A|B)*	LOGIC(A|B)*

* You can select CH8 or LOGIC(L), depending on which channel's corresponding key (CH8 or L) is illuminated. LOGIC(A|B) is available on models with the /L16 option.

• When the Source is CH1 to CH8 or Math1 to Math4



• When the Source Is LOGIC(L) or LOGIC(A|B)



* A0 to A7 and B0 to B7 are available on models with the /L16 options.

R/W Bit Inclusion (Include R/W)

Specify whether to include the R/W bit (ON) or omit it (OFF) when setting or displaying the address. This setting affects the display and configuration of the address pattern in the following situations.

- When the search type is Adr Data or General Call (when Second Byte is Master Adr) and the search conditions are being set (Address in the Condition Setup screen)
- When the decode display is visible
- When the 1st and 2nd address boxes on the list display are visible



Select whether to include 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.

Setting the List Display (List)

Press the **List** soft key on the SEARCH I2C menu to display the following menu.

Turns zoom linking on or off

Set the list size and the display position (Full Screen, Half(Upper), Half(Lower)).

Lists the analysis results

Analysis number

No.	Time(us)	1st	2nd	R/W	Data	Information
-4	-0.0495304	0s		R	06s 07s 08s 09s 0As	10-bit
-3	-0.0293856	0s	01s	W		10-bit
-2	-0.0245360	0s		R	06s 07s 08s 09s 0As	10-bit
-1	-0.0043928	0s	01s	W		10-bit
0	0.0004568	0s		R	06s 07s 08s 09s 0As	10-bit
1	0.0206016	0s	01s	W		10-bit
2	0.0254744	0s		R	06s 07s 08s 09s 0As	10-bit
3	0.0456176	0s	01s	W		10-bit

Set the analysis number.

When You Press SET

Set the data number.

This is the detailed list of analysis results that is displayed when you press SET.

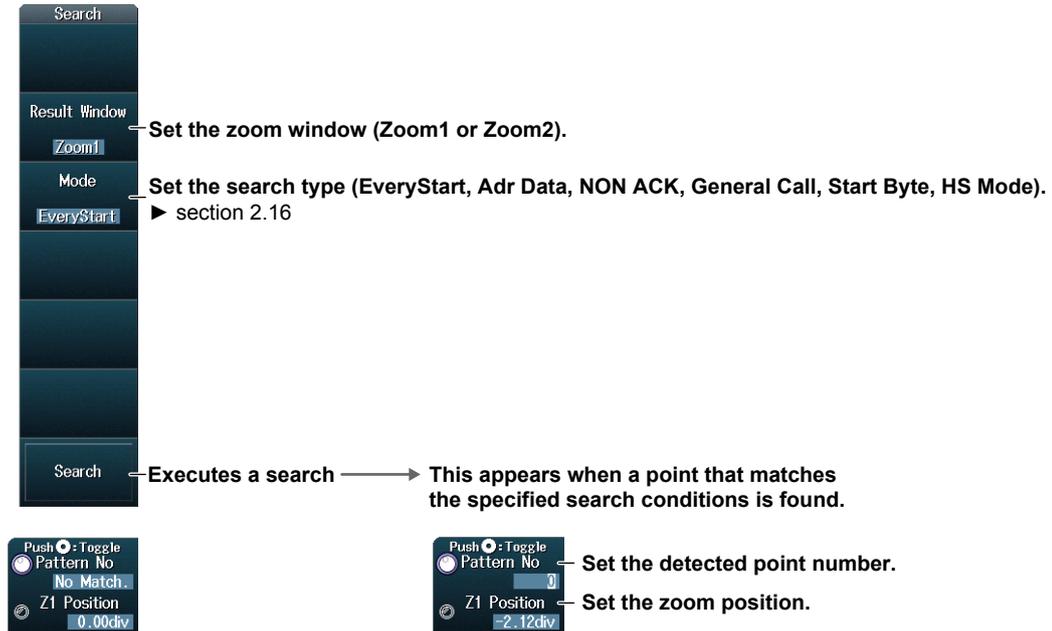
All data for the specified analysis number is displayed.

The data that corresponds to the selected data number is highlighted.

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 I2C menu to display the following menu.



Setting the Zoom Window

You can configure zoom windows Zoom1 and Zoom2 when they are displayed. Zoom1 is automatically displayed during the auto 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 2.16.

Executing Searches

1. Set the search type.
2. Press the **Search** soft key.

The DLM4000 searches for the search conditions. If the DLM4000 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 Number

You can set the detected point number and display the waveform for the 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 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
- Decode display
- List display
 - List size, display position, detailed display, 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

SEARCH SPI Menu

Press **SHIFT+SEARCH** (SERIAL BUS) and then the **Type** soft key. From the setup menu that appears, select **SPI** to display the following menu.

The diagram illustrates the menu structure for searching SPI bus signals. It shows three sequential menu screens:

- Screen 1 (SERIAL BUS):** Contains options for Serial Bus 1, Display (OFF/ON), Type (SPI), Setup, Search, Decode (Hex), and List.
 - Display:** Turns on or off the serial bus signal analysis and search displays.
 - Type:** Set the serial bus signal type to SPI.
 - Setup:** Set the serial bus.
 - Search:** Configure the search.
 - Decode:** Set the decode display (Hex, Bin, ASCII).
 - List:** Configure the list display.
- Screen 2 (Serial Bus):** A list of options numbered 1 through 4. A bracket indicates that the user should select which serial bus to set (Serial Bus1 to Serial Bus4).
- Screen 3:** Contains options for Push: Toggle, List No. (0), and Z1 Position (0.00div).
 - List No.:** Set the analysis number.
 - Z1 Position:** Set the zoom position. This sets the zoom position for the window selected during zoom window configuration (described later).

Setting the Serial Bus (Setup)

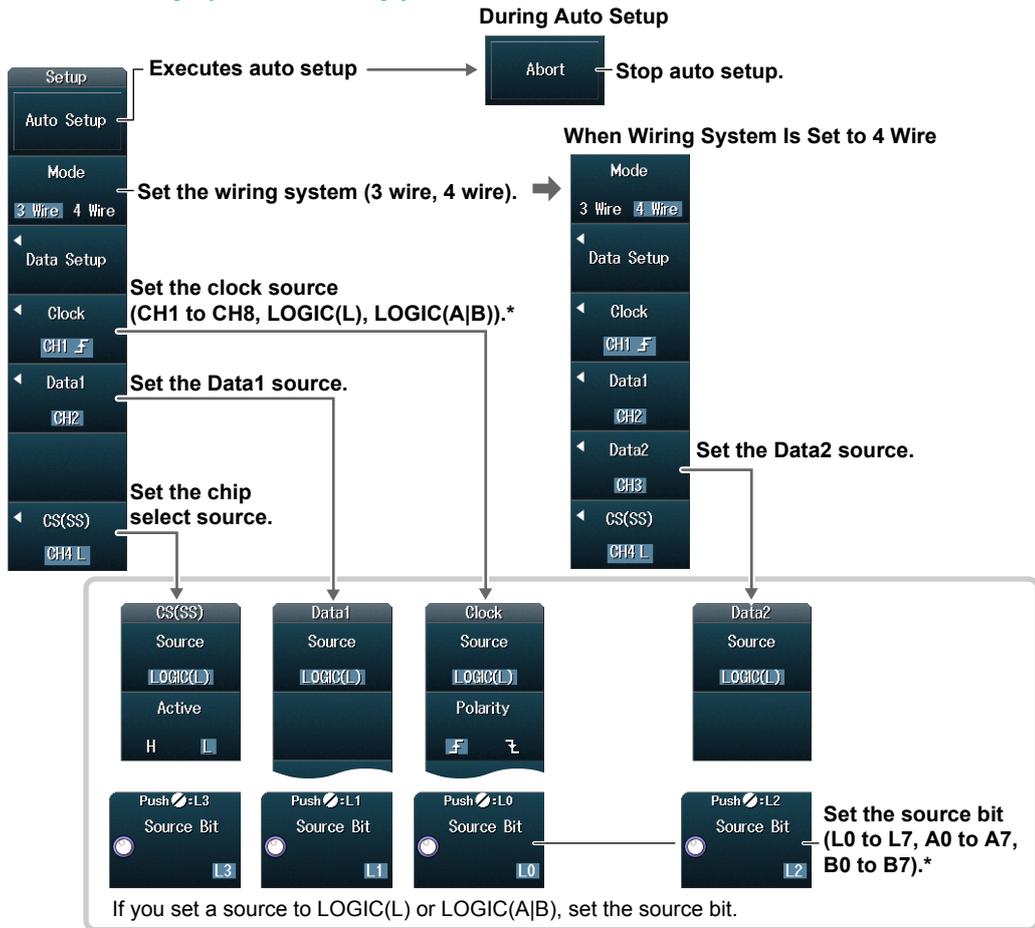
Note

Using the CH8 Terminal and LOGIC(L) Port

When you perform an analysis or execute a search, you cannot use the CH8 terminal and LOGIC(L) port as the source at the same time. Specify the source that you want to use in advance by pressing either the CH8 key or the L key.

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

Auto Setup (Auto Setup)



1. Set the wiring system and the clock, data, and chip select sources.

Ranges within Which the Data1, Data2, and Chip Select Sources Can Be Set

- When the clock source is a channel from CH1 to CH4: Set the sources to CH1 to CH4.
- When the clock source is a channel from CH5 to CH8 or LOGIC(L): Set the sources to CH5 to CH8 or LOGIC(L).
- When the clock source is LOGIC(A|B): LOGIC(A|B).

* LOGIC(A|B), A0 to A7, and B0 to B7 are available on models with the /L16 option.

You cannot use auto setup under the following circumstances.

- When the clock, Data1, Data2, or chip select source is set to Math1 to Math4
- When state display is applied to any of the LOGIC bits set as the clock, Data1, Data2, or chip select source
- When the chip select source is set to X (don't care)

2. Press the **Auto Setup** soft key.

The DLM4000 will automatically configure the serial bus settings. The DLM4000 automatically configures the level and hysteresis and then triggers on the SPI signal's first data byte.

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.

The auto setup feature will not work properly on some input signals.

Manual Setup

After running auto setup, you can change the following settings and display decoded results.

- Wiring system
- Clock source
- Data1 and 2 sources
- Chip select source
- Level used to detect source states
- Hysteresis
- Polarity

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.

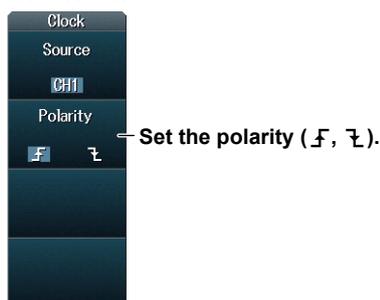
The range within which the Data1, Data2, and chip select sources can be set changes depending on the clock source as indicated below.

	When the Clock Source Setting Is		
	CH1 to CH4, Math1, or Math2	CH5 to CH8/LOGIC(L),* Math3, or Math4	LOGIC(A|B)*
Data1 and Data2	CH1 to CH4, Math1, or Math2	CH5 to CH8/LOGIC(L),* Math3, or Math4	LOGIC(A|B)*
Chip select	CH1 to CH4, Math1, Math2, or X (no source)	CH5 to CH8/LOGIC(L),* Math3, Math4, or X (no source)	LOGIC(A|B)*

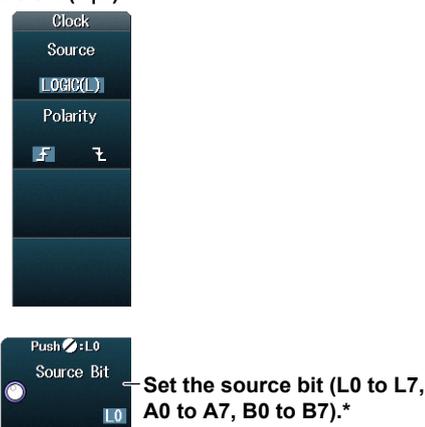
* You can select CH8 or LOGIC(L), depending on which channel's corresponding key (CH8 or L) is illuminated. LOGIC(A|B) is available on models with the /L16 option.

Setting the Clock Source (Clock)

When the Source is CH1 to CH8 or Math1 to Math4



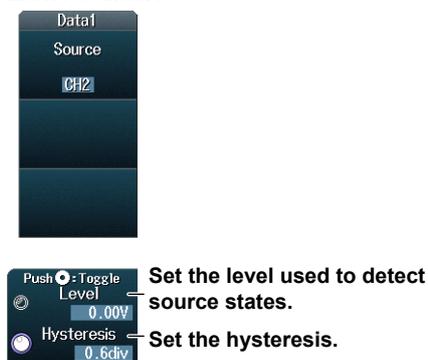
When the Source Is LOGIC(L) or LOGIC(A|B)



Setting the Data1 and Data2 Sources (Data1 and Data2)

This section explains how to set the Data1 source. The Data2 source can be set in the same way. Set the Data2 source when the wiring system is 4 Wire.

When the Source is CH1 to CH8 or Math1 to Math4



When the Source Is LOGIC(L) or LOGIC(A|B)



* A0 to A7 and B0 to B7 are available on models with the /L16 options.

Setting the Chip Select Source (CS(SS))

When the Source is CH1 to CH8 or Math1 to Math4



Set the active state (H, L).

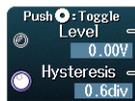
When the Source Is LOGIC(L) or LOGIC(A|B)



When the Chip Selector Source Is X (No source)



Turn grouping on or off.



Set the level used to detect source states.
Set the hysteresis.



Set the source bit (L0 to L7, A0 to A7, B0 to B7).*



Set the idle time.

* A0 to A7 and B0 to B7 are available on models with the /L16 options.

Setting the Data Format (Data Setup)

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

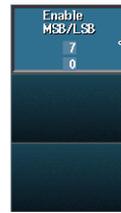


Set the bit order (MSB, LSB).

Set the field size.



Field size



Set the enabled bit range.

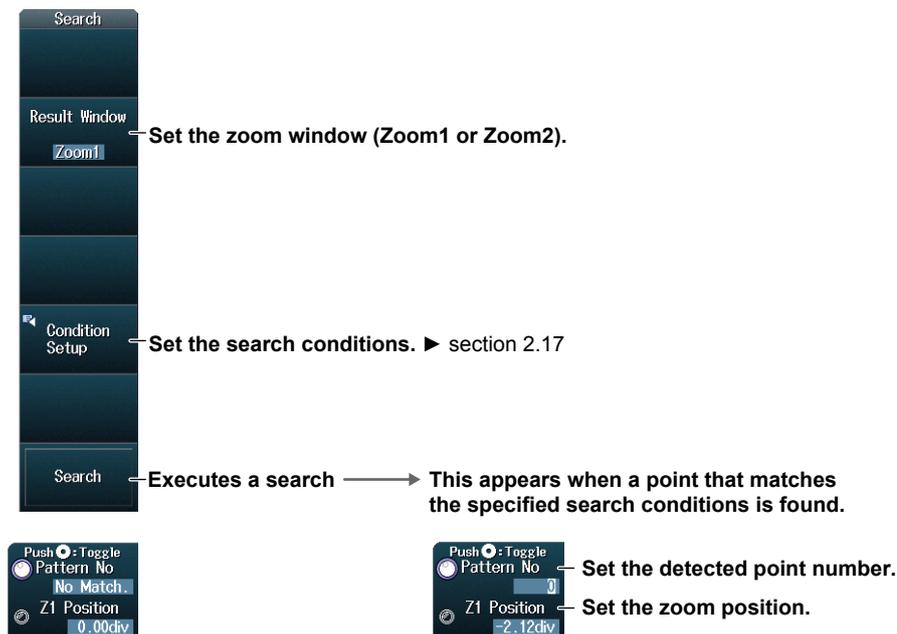


MSB

LSB

Search Setup (Search)

Press the **Search** soft key on the SEARCH SPI menu to display the following menu.



Setting the Zoom Window

You can configure zoom windows Zoom1 and Zoom2 when they are displayed. Zoom1 is automatically displayed during the auto setup of the analysis settings.

Setting Search Conditions

You can set search conditions in the same way that you set trigger conditions. For details, see section 2.17.

Executing Searches

1. Set the search conditions.
2. Press the **Search** soft key.

The DLM4000 searches for the search conditions. If the DLM4000 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 Number

You can set the detected point number and display the waveform for the 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

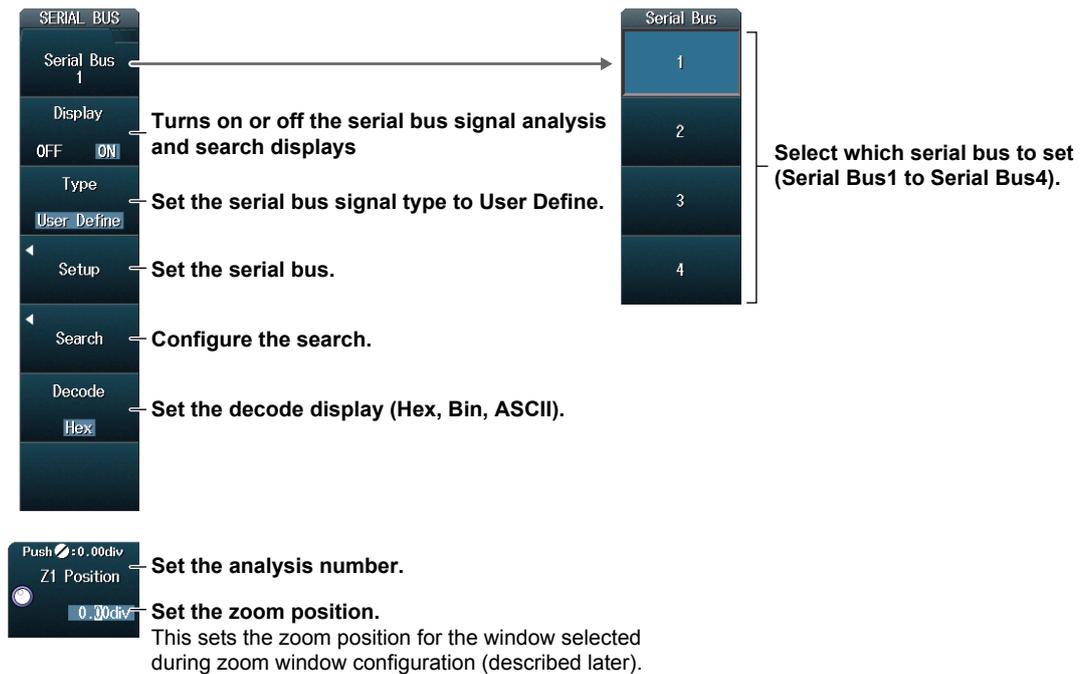
- Decode display and decoding start point
- Zoom position
- Search

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

SEARCH User Define Menu

Press **SHIFT+SEARCH** (SERIAL BUS) and then the **Type** soft key. From the setup menu that appears, select **User Define** to display the following menu.



Setting the Serial Bus (Setup)

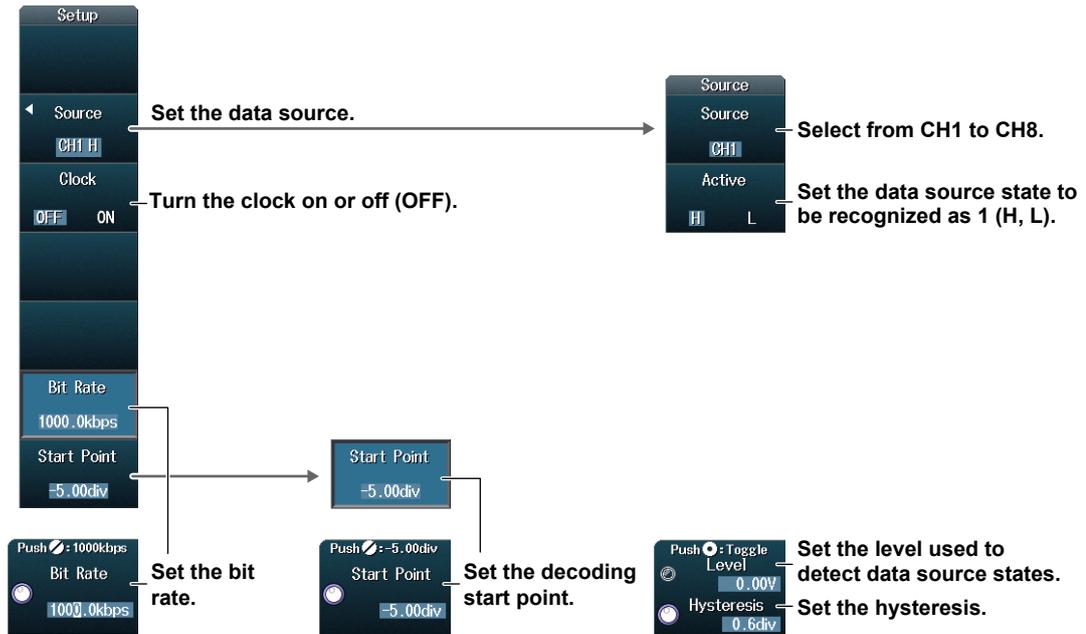
Note

Using the CH8 Terminal and LOGIC(L) Port

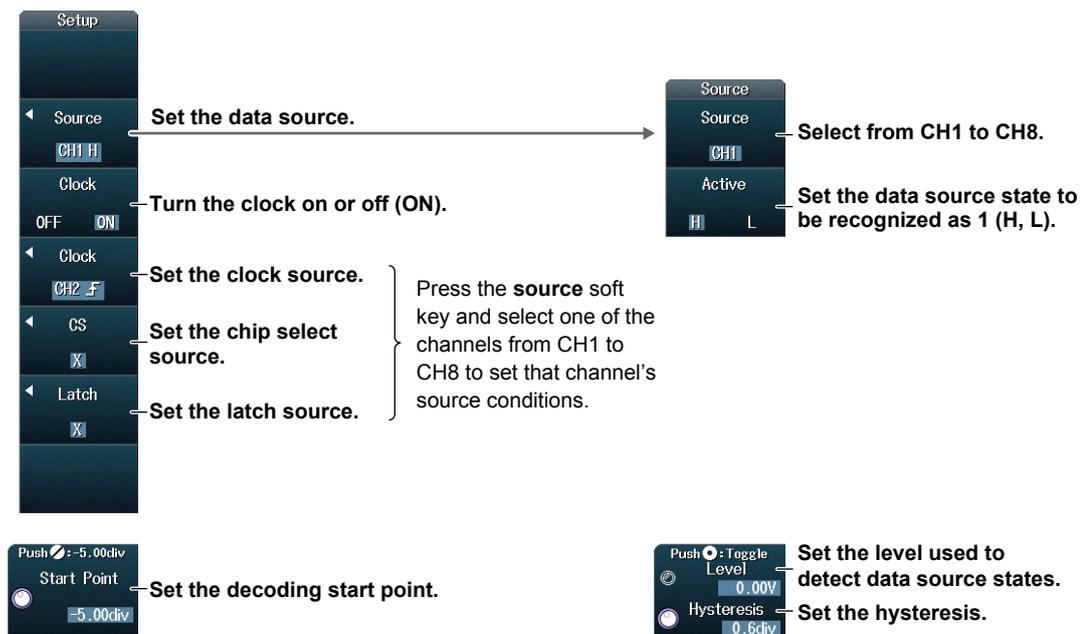
If you perform an analysis or execute a search when using the LOGIC(L) port for input, you cannot specify CH8 as the source. Press the CH8 key in advance to enable input from the CH8 terminal.

Press the **Setup** soft key to display one of the menus shown below. The menu that is displayed varies depending on whether the clock is on or off.

When the Clock Is Off



When the Clock Is On



Setting the Clock Source (Clock)

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

Clock

Source
CH2

Polarity
F

Annotations:
 - **Set the clock source.**
 • When the data source is a channel from CH1 to CH4, set the source to CH1 to CH4.
 • When the data source is a channel from CH5 to CH8, set the source to CH5 to CH8.
 - **Set the timing for data source sampling (F, \bar{L}).**

Push Toggle
Level
0.00V

Hysteresis
0.6div

Annotations:
 - **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.

CS

Source
CH3

Active
H

Annotations:
 - **Set the chip select source.**
 • When the data source is a channel from CH1 to CH4, set the source to CH1 to CH4 or X.
 • When the data source is a channel from CH5 to CH8, set the source to CH5 to CH8 or X.
 - **Set the chip select source state to be recognized as the data source (L, H).**

Push Toggle
Level
0.00V

Hysteresis
0.6div

Annotations:
 - **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 DLM4000 tests the data source.

Setting the Latch Source (Latch)

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

Latch

Source
CH4

Polarity
F

Annotations:
 - **Set the latch source.**
 • When the data source is a channel from CH1 to CH4, set the source to CH1 to CH4 or X.
 • When the data source is a channel from CH5 to CH8, set the source to CH5 to CH8 or X.
 - **Set the timing for data source pattern comparison (F, \bar{L}).**

Push Toggle
Level
0.00V

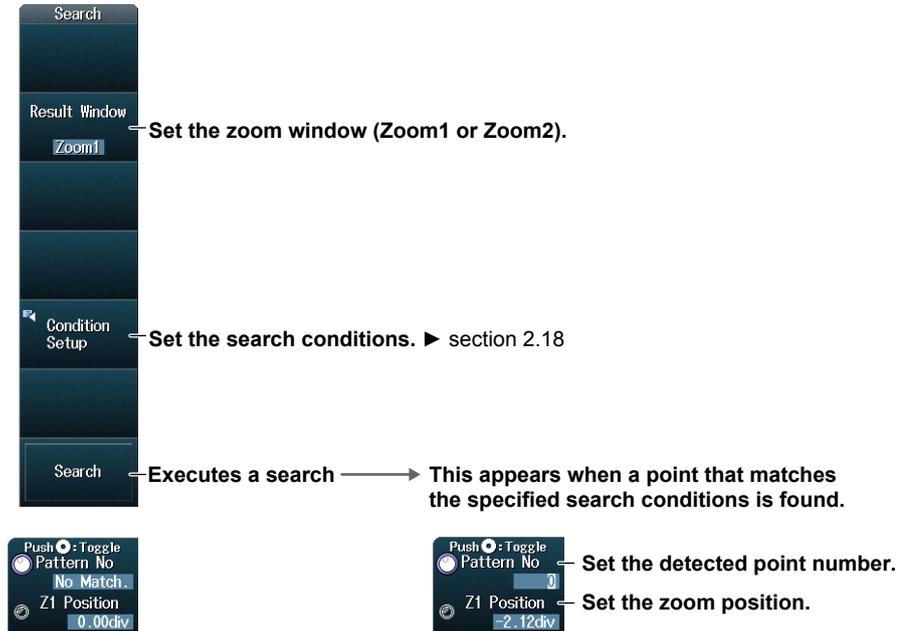
Hysteresis
0.6div

Annotations:
 - **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.



Setting the Zoom Window

You can configure zoom windows Zoom1 and Zoom2 when they are displayed.

Setting Search Conditions

You can set search conditions in the same way that you set trigger conditions. For details, see section 2.18.

Executing Searches

1. Set the search conditions.
2. Press the **Search** soft key.

The DLM4000 searches for the search conditions. If the DLM4000 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 Number

You can set the detected point number and display the waveform for the 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.

12.12 Displaying Multiple Lists

This section explains how to list the decoded results of multiple serial bus signals simultaneously.

► “Analyzing and Searching Serial Bus Signals” and “List Setup” in the Features Guide

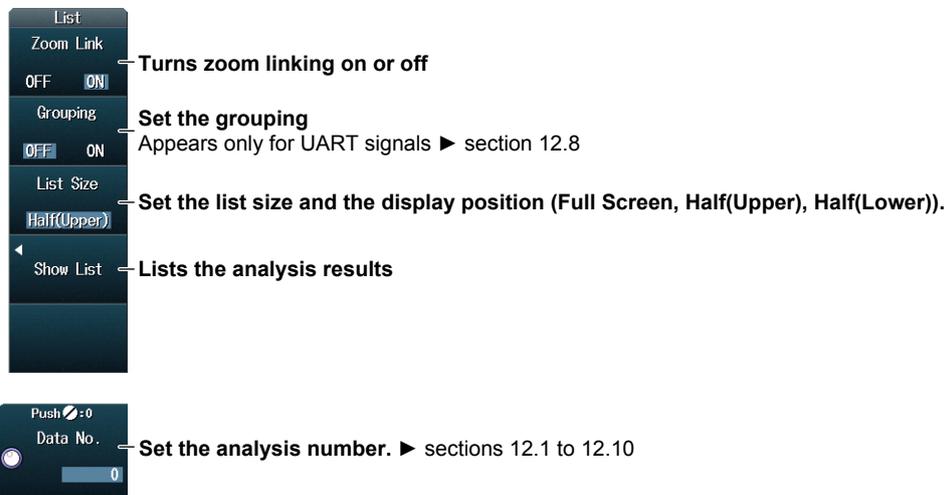
Serial Bus Signal Setup

1. Assign serial bus signals that you want to list simultaneously to **Serial Bus1 to Serial Bus4**.
► sections 12.1 to 12.10

Setting the List Display (List)

2. On the Serial Bus menu whose analysis and search displays (Display) are on, press the **List** soft key.

The following menu appears.



Listing the Analysis Results (Show List)

3. Press the **Show List** key.
Serial buses whose analysis and search displays (Display) are on are displayed simultaneously.

Example: When List Size is set to Half(Upper), and the serial bus signal types are set as follows
Serial Bus1(S1): UART, Serial Bus2(S2): I2C, Serial Bus3(S3): SPI, Serial Bus4(S4): SPI

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.

Change the list you want to use.

- Moves to the left list.
- Moves to the right list.
- Expands the list you want to use or returns to the original screen.

13.1 Displaying Waveform Histograms

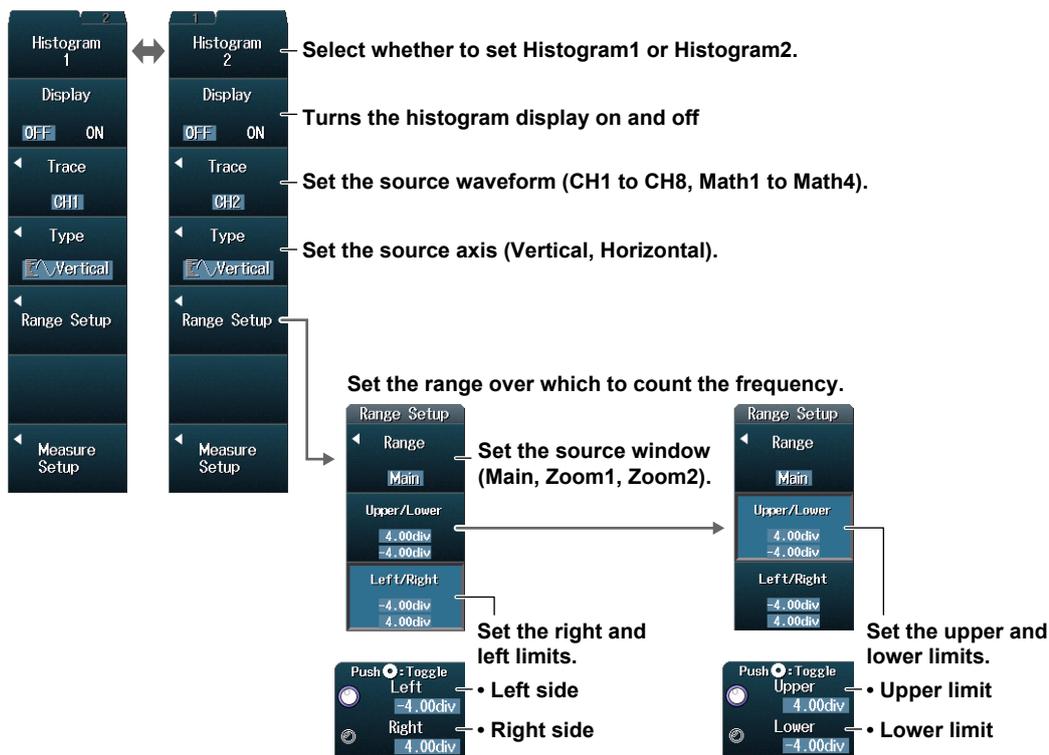
This section explains the following settings (which are used when displaying a histogram of the frequency of data occurrence in a specified area).

- Histogram display
- 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.



13.2 Measuring Histogram Parameters

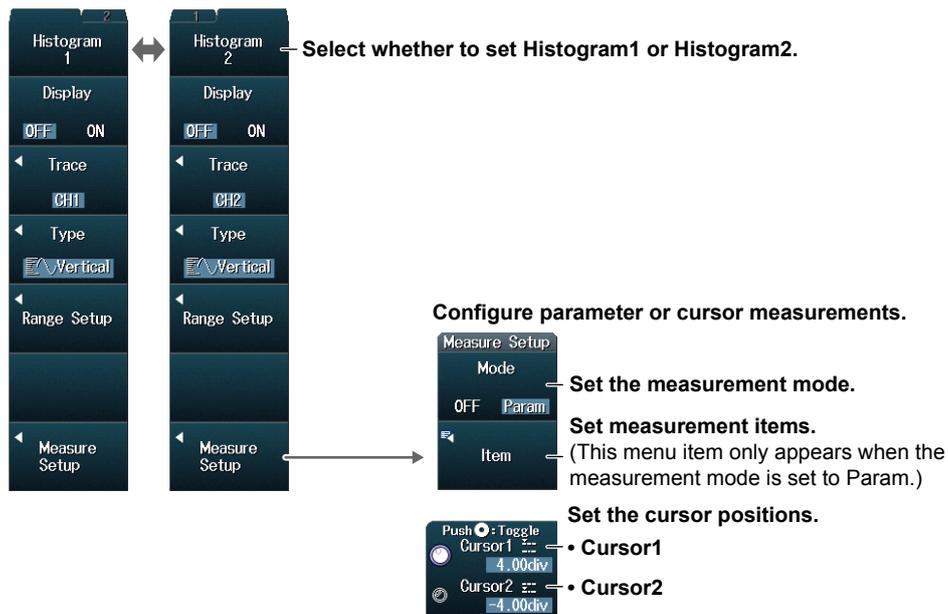
This section explains the following settings (which are used when measuring histogram parameters).

- 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.



Select whether to set Histogram1 or Histogram2.

Configure parameter or cursor measurements.

Measure Setup

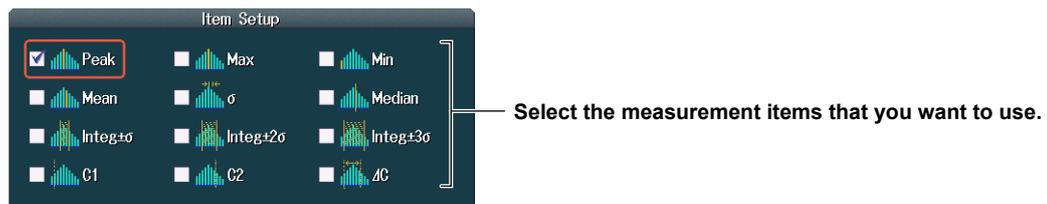
- Mode — Set the measurement mode.
- OFF Param — Set measurement items. (This menu item only appears when the measurement mode is set to Param.)
- Item

Set the cursor positions.

- Cursor1 — 4.00div
- Cursor2 — -4.00div

Setting Measurement Items (Item)

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



Select the measurement items that you want to use.

- Peak
- Mean
- Integ+ σ
- C1
- Max
- σ
- Integ+2 σ
- C2
- Min
- Median
- Integ+3 σ
- 4C

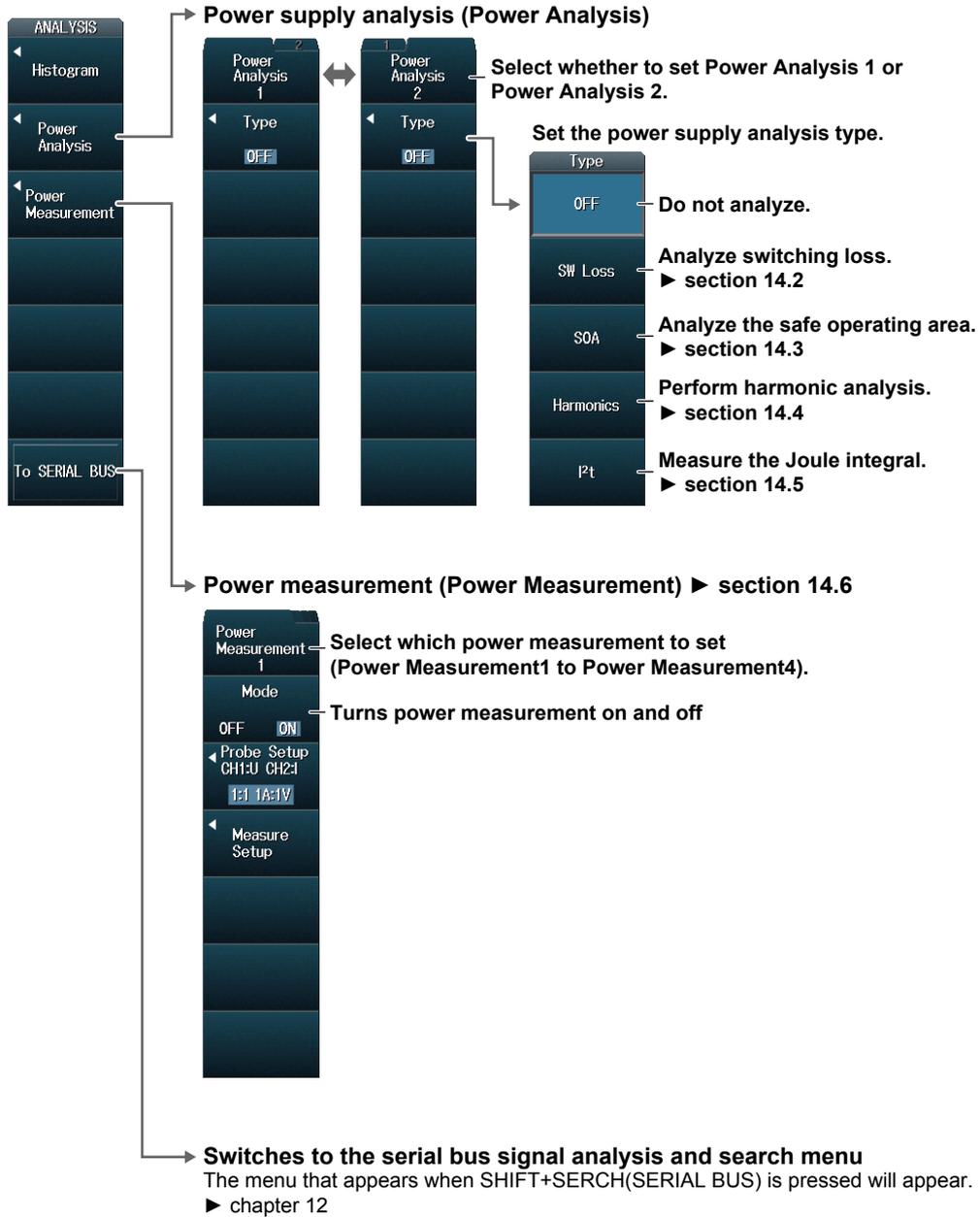
14.1 Setting the Power Supply Analysis Type or Power Measurement

This section explains how to set the power supply analysis type and power measurement.

▶ [“Overview of the Power Supply Analysis Feature” in the Features Guide](#)

ANALYSIS Menu

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



Note

Power supply analysis and power measurement cannot be executed simultaneously. If any of the power measurement items, Power Measurement1 to Power Measurement4, 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.

Power Analysis 1 ↔ **Power Analysis 2** — Select whether to set Power Analysis1 or Power Analysis2.

Type — Set Type to SW Loss.

Probe Setup — Configure the probe.

Measure Setup — Set the measurement conditions.

Math1 / **Math2** — Shows and hides the power trace.

Power (OFF/ON) — Shows and hides the power trace.

Ranging (Auto/Manual) — Set the scaling (Auto, Manual).
 ► section 6.6

Push = Toggle Center (0.00W) — Set the center point and the sensitivity (when Ranging is set to Manual).

Sensitivity (2.000W) — Set the sensitivity.

Configuring the Probe (Probe Setup)

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

Probe Setup — Set the input channel (CH1:CH2, CH3:CH4).

Probe CH1/CH2 — Set the probe attenuation and voltage-to-current conversion ratio (using the jog shuttle).

Deskw CH1/CH2 — Set each channel's deskw value (using the jog shuttle).

Ref Trace — Set the reference trace.

Auto Deskew — Executes auto deskewing.

Push = Toggle Deskw CH1 (0.00ns) — Set each channel's deskw value.

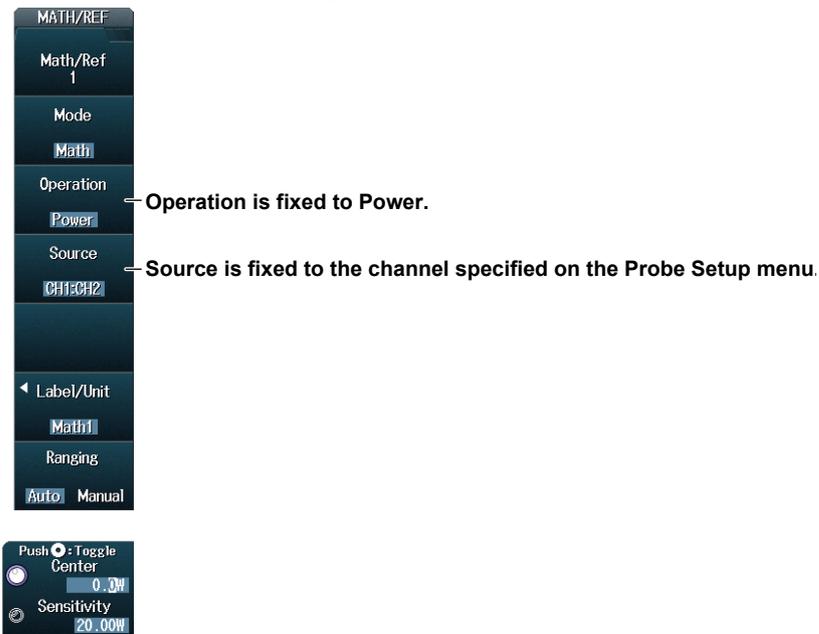
Push = Toggle Deskw CH2 (0.00ns) — Set each channel's deskw value.

Probe CH1/CH2 (1A:1V) — Set the probe attenuation and voltage-to-current conversion ratio.

Probe CH2:1 (1A:1V) — Set the probe attenuation and voltage-to-current conversion ratio.

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 30 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.



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.

When Cycle Mode Is Set to ON

- Turns cycle mode on and off
- Set the device (MOSFET, BJT/IGBT, OFF).
- Set the reference levels for voltage channels. ▶ section 9.1
- Set measurement items. Select the measurement items that you want to use.
- Set the measurement source window. ▶ section 9.1
- Configure the time range.
- Set the watt hour unit (Wh, J).

When Device Is Set to MOSFET or BJT/IGBT

- Configure the RDS or Vce value.

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 Analyzing the Safe Operating Area

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.

Power Analysis 1 ↔ **Power Analysis 2** — Select whether to set Power Analysis1 or Power Analysis2.

Type: SOA — Set Type to SOA.

Probe Setup CH1:U CH2:I — Configure the probe. ► section 14.2

VT Display OFF ON — Switches the VT waveform display window on and off

Cursor ON — Configure the cursor display.

Cursor Display OFF ON — Turns the cursor display on and off

Cursor1/2 || — Set the vertical cursor position.

Cursor1/2 --- — Set the horizontal cursor position.

Configure the time range.

T Range1 — T Range1

T Range2 — T Range2

Cursor1 — Cursor1

Cursor2 — Cursor2

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 Analyzing Harmonics

This section explains the following settings (which are used when performing harmonic analysis).

- Probe
- Applicable class
- Harmonic grouping
- Scale
- List storage and display
- List size and display position
- Analysis start point
- EUT's power supply voltage

► “Harmonic Analysis (Harmonics)” in the Features Guide

ANALYSIS Power Analysis Menu

Press **ANALYSIS** and then the **Power Analysis** soft key to display the following menu.

Power Analysis 1 ↔ **Power Analysis 2** — Select whether to set Power Analysis1 or Power Analysis2.

Type — Set Type to Harmonics.

Probe Setup CH1:U CH2:I CH3:U CH4:I — Configure the probe. ► section 14.2

Class Setup — Set the applicable class.

Grouping — Set the harmonic grouping (OFF, Type1, Type2).

Display Setup — Configure list storage and display settings.

List — Set the analysis start point and power supply voltage.

Display Settings

Display Setup

Scale — Set the scale (Linear, Log).

VT Display — Switches the VT waveform display window on and off

Push = Toggle Start Point -5.00div — Analysis start point

System Volt 230V — Power supply voltage

Configuring the Applicable Class (Class Setup)

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

Class Setup

Class — Set the applicable class.

When the Applicable Class Is C

Class — Obtains the EUT's power factor.*

Get λ

Over 25 watt — Set whether the active power exceeds 25 W (True) or not (False).

Push = Toggle Fund Current 1.000A — Set the EUT's fundamental current.

λ 0.800 — Set the power factor.*

When the Applicable Class Is D

Class — Set the EUT's active power.

Power 100.0

* You can select this when the active power exceeds 25 W (Over 25 Watt is set to True).

Note

While λ (the power factor) is being obtained, 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.

List Storage and Display (List)

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

Set the save destination and file name. > section 17.2

Saves the list

Set the list size and the display position (Full Screen, Half(Upper), Half(Lower)).

Lists the analysis results

Analysis number

Set the analysis number.

Order	Measure(A)	Limit(A)	Info
1	-----	-----	-----
2	-----	0.340	-----
3	-----	-----	-----
4	-----	0.190	-----
5	-----	-----	-----
6	-----	0.100	-----
7	-----	-----	-----
8	-----	0.050	-----
9	-----	-----	-----
10	-----	0.035	-----
11	-----	-----	-----
12	-----	0.030	-----

• When the Applicable Class Is C

Set the analysis number.

Order	Measure(A)	Limit(A)	Measure(C)	Limit(C)	Info
1	-----	-----	(New)	-----	-----
2	-----	0.020	-----	2.000	-----
3	-----	0.240	-----	30.000	-----
4	-----	-----	-----	-----	-----
5	-----	0.100	-----	10.000	-----
6	-----	-----	-----	-----	-----
7	-----	0.070	-----	7.000	-----
8	-----	-----	-----	-----	-----
9	-----	0.050	-----	5.000	-----
10	-----	-----	-----	-----	-----
11	-----	0.030	-----	3.000	-----
12	-----	-----	-----	-----	-----

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
- Scaling

► “Joule Integral (I^2t)” in the Features Guide

ANALYSIS Power Analysis Menu

Press **ANALYSIS** and then the **Power Analysis** soft key to display the following menu.

Power Analysis 1 ↔ **Power Analysis 2** — Select whether to set Power Analysis1 or Power Analysis2.

Type — Set Type to I^2t .

Probe Setup CH1:U CH2:I — Configure the probe. ► section 14.2

Measure Setup — Set the measurement conditions.

Math1 I^2t OFF ON — Shows and hides the Joule integral waveform

Auto Ranging — Set auto ranging.

Center 0.00EU — Configure the center point and the sensitivity.

Sensitivity 1.000EU — Sensitivity

Setting Measurement Conditions (Measure Setup)

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

Item OFF I^2t — Turns Joule integral on and off

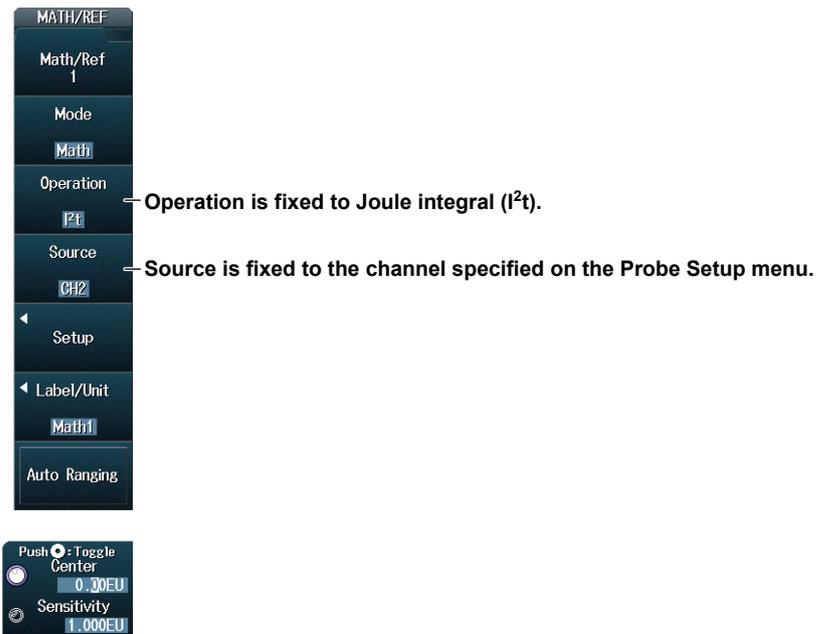
Time Range Zoom1 — Set the measurement source window. ► section 9.1

T Range1 5.00div — Set the area to be measured.

T Range2 5.00div

Note

- If you set the power supply analysis type to I^2t , 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 30 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 $I^2t(\text{Math1})$ or $I^2t(\text{Math2})$ on, the Joule integral waveform is displayed on the screen. If you then press MATH/REF key, the following menu is displayed.



If you turn $I^2t(\text{Math1})$ or $I^2t(\text{Math2})$ 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.

Turns power measurement on and off

Configure the probe.

Set the measurement conditions.

Select which power measurement to set (Power Measurement1 to Power Measurement4).

The voltage and current input channels are fixed as follows:

Power Measurement	Voltage Input Channel	Current Input Channel
Power Measurement1	CH1	CH2
Power Measurement2	CH3	CH4
Power Measurement3	CH5	CH6
Power Measurement4	CH7	CH8

Note

- For input channels that are assigned to power measurement and whose mode is set to ON, the following standard waveform parameters cannot be set. Because the measurement items of power measurement are the same as the following standard waveform parameters, the power measurement values are used in place of waveform parameters.
Max, Min, P-P, Rms, Mean, Sdev, Avg Freq
- If any of the power measurements is set to ON, cycle mode of the standard waveform parameters is set to OFF.

Configuring the Probe (Probe Setup)

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

Set each channel's deskew value (using the jog shuttle).

Set the reference trace.

Executes auto deskewing

Set each channel's deskew value.

Set the probe attenuation and voltage-to-current conversion ratio (using the jog shuttle).

Set the probe attenuation and voltage-to-current conversion ratio.

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.

Set the measurement source window.
▶ section 9.1

Configure the time range.
▶ section 9.1

Set up a calculation that uses automated measurement values.

Select the expressions to use.

Enter the name using up to 8 characters.

Enter the unit using up to 4 characters.

Calc	Name	Expression	Unit
<input type="checkbox"/> Calc 1	Calc1	Max(C1)	
<input type="checkbox"/> Calc 2	Calc2	Min(C2)	
<input type="checkbox"/> Calc 3	Calc3	High(M1)	
<input type="checkbox"/> Calc 4	Calc4	Low(M2)	

Set the expressions.

Define an expression by combining computation source waveforms and operators.

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

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

Select the measurement items that you want to use.

- Measurement items of voltage input channels CH1, CH3, CH5, and CH7

Set the unit (Wh, J).

- Measurement items of current input channels CH2, CH4, CH6, and CH8

Setting the Reference Levels for Time Measurements (Ref Levels)

Press the **Ref Levels** soft key. Depending on the power measurement that is selected (Power Measurement1 to Power Measurement4), the following screen appears.

Set the unit for the distal, mesial, and proximal reference levels (% or Unit).

Set the distal value (using the jog shuttle).

Set the mesial value (using the jog shuttle).

Set the proximal value (using the jog shuttle).

Set the mode for determining high and low levels (Auto, Max-Min, Histogram).

Power Measurement1

	Mode	Distal	Mesial	Proximal	High Low
CH1	% Unit	90%	50%	10%	Auto
CH2	% Unit	90%	50%	10%	Auto

Power Measurement2

Ref Levels					
	Mode	Distal	Mesial	Proximal	High Low
CH3	% Unit	90%	50%	10%	Auto
CH4	% Unit	90%	50%	10%	Auto

Power Measurement3

Ref Levels					
	Mode	Distal	Mesial	Proximal	High Low
CH5	% Unit	90%	50%	10%	Auto
CH6	% Unit	90%	50%	10%	Auto

Power Measurement4

Ref Levels					
	Mode	Distal	Mesial	Proximal	High Low
CH7	% Unit	90%	50%	10%	Auto
CH8	% Unit	90%	50%	10%	Auto

Setting the Measurement Location Indicator (Indicator)

1. Press the **Indicator** soft key.
You can set Indicator to OFF (the measurement location indicator is not displayed) or display a setup menu with the items whose check boxes you have selected in "Setting the Measurement Items (Item Setup)."
2. Use the **jog shuttle** or the **SET** key to select the item whose measurement location you want to indicate.
The measurement location of the item you specify is indicated by a cursor.

15.1 Displaying History Waveforms

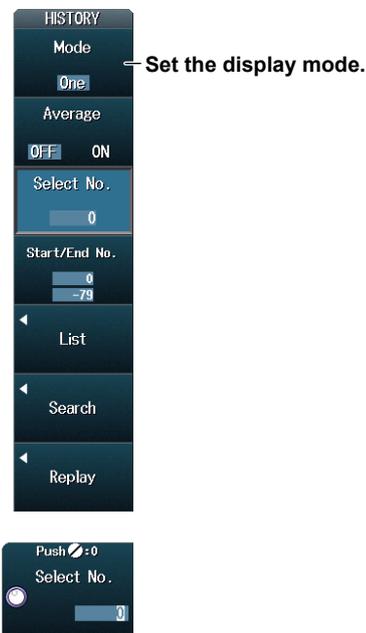
This section explains the following settings (which are used when displaying history waveforms held in the acquisition memory).

- 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** ($\sqrt{\text{CN}}$) to display the following menu.



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 are displayed in an intermediate color.¹
- 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

The image shows the HISTORY menu for display modes One and All. The main menu includes: Mode (One), Average (OFF/ON), Select No. (0), Start/End No. (0/-79), List, Search, and Replay. Annotations indicate: 'Set the display mode (One, All)', 'Turns averaging on and off', 'Set the display range (using the jog shuttle)*', 'Show the list of timestamps.', and 'Replay*'. Below are two sub-menus: 'Configure the display range' with Start No. and End No. fields, and 'Set the highlight display*' with a Select No. field.

* The Select No. and Start/End No. soft keys and the Replay soft key menu appear when averaging is off.

When the Display Mode Is Set to Accumulate

The image shows the HISTORY menu for the Accumulate display mode. The main menu includes: Mode (Accumulate), Grade (Intensity), and other options. Annotations indicate: 'Set the display mode (Accumulate)' and 'Set the gradation mode (Intensity, Color)'. Below is a sub-menu 'Configure the display range' with Start No. and End No. fields.

Displaying a List of Timestamps (List)

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

No.	Trig'd Time	Delta							
			s	ms	us	ns	ps	s	ms	us	ns	ps
0	12:58:02.625 283 600	0.010 014 640							
-1	12:58:02.615 268 960	0.017 286 400							
-2	12:58:02.597 982 560	0.010 014 800							
-3	12:58:02.587 967 760	0.017 288 880							
-4	12:58:02.570 678 880	0.010 014 800							
-5	12:58:02.560 664 080	0.017 286 400							
-6	12:58:02.543 377 680	0.010 014 640							
-7	12:58:02.533 363 040	0.017 276 160							
-8	12:58:02.516 086 880	0.010 014 800							
-9	12:58:02.506 072 080	0.054 321 920							
-10	12:58:02.451 750 160	0.010 014 640							
-11	12:58:02.441 735 520	0.017 276 160							
-12	12:58:02.424 459 360	0.010 014 800							
-13	12:58:02.414 444 560	0.017 282 560							
-14	12:58:02.397 162 000	0.010 014 640							
-15	12:58:02.387 147 360	0.017 276 240							
-16	12:58:02.369 871 120	0.010 014 640							
-17	12:58:02.359 856 480	0.017 281 280							
-18	12:58:02.342 575 200	0.010 014 800							
-19	12:58:02.332 560 400	0.017 276 080							
-20	12:58:02.315 284 320	0.010 014 800							
-21	12:58:02.305 269 520	0.017 277 440							
-22	12:58:02.287 992 080	0.010 014 640							
-23	12:58:02.277 977 440	0.017 276 240							
-24	12:58:02.260 701 200	0.010 014 640							
-25	12:58:02.250 686 560	0.017 276 160							
-26	12:58:02.233 410 400	0.010 014 800							
-27	12:58:02.223 395 600	0.017 282 560							
-28	12:58:02.206 113 040	0.010 014 720							

Delta Min	Jump to the record number whose data contains the triggers with the least time between them.
Delta Max	Jump to the record number whose data contains the triggers with the most time between them.
Oldest	Jump to the oldest record number.
Latest	Jump to the latest record number.

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 DLM4000 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.



The screenshot shows a vertical menu titled "Replay". The menu items are: "Speed", "Down", "Up", "Record No.", "Oldest", a left arrow, a square, a right arrow, and "Latest".

- Speed** — Set the replay speed (x1/60, x1/30, x1/10, x1/3, x1, x3, x10).
- Down** — Decreases the speed by one level
- Up** — Increases the speed by one level
- Record No.** — Set the record number.
- Oldest** — Displays the oldest history waveform
- Left Arrow** — Replays waveforms toward older waveforms
- Square** — Stops the replay
- Right Arrow** — Replays waveforms toward newer waveforms
- Latest** — Displays the latest history waveform



The screenshot shows two sub-menus. The first is titled "Record No." and has a "Push" button and a "Select" button. The second is titled "Speed" and has a "Toggle" button and a "Speed" button.

- Record No.** — Record number to start replaying
- Speed** — Replay speed

15.2 Searching History Waveforms

This section explains the following settings (which are used when searching history waveforms).

- Search condition
- Reference condition numbers 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** ($\sqrt{\text{H}}$) to display the following menu.

The image shows two screenshots of the oscilloscope's menu system. The left screenshot is the **HISTORY** menu, and the right screenshot is the **Search** menu. Annotations with arrows point to specific options in both menus.

HISTORY Menu:

- Mode:** Set the display mode to One or All. (Option: One)
- Average:** OFF ON
- Select No.:** 0
- Start/End No.:** 0, -79
- List:** (Left arrow)
- Search:** Search history waveforms. (Right arrow)
- Replay:** (Left arrow)

Search Menu:

- Condition:** Set the search condition (Simple, AND, OR). (Option: Simple)
- Trace:** CH1
- Range:** Main
- Upper/Lower:** 0.50div, -0.50div
- Left/Right:** =3.00div, =2.50div
- Exec:** Executes the search
- Reset:** Finishes the search

Below the main screenshots are two smaller screenshots of the **Push** menu:

- Push -0:** Select No. 0
- Push Toggle:** Upper 0.50div, Lower =0.50div

Setting the Search Condition and Searching When the Search Condition Is Set to Simple

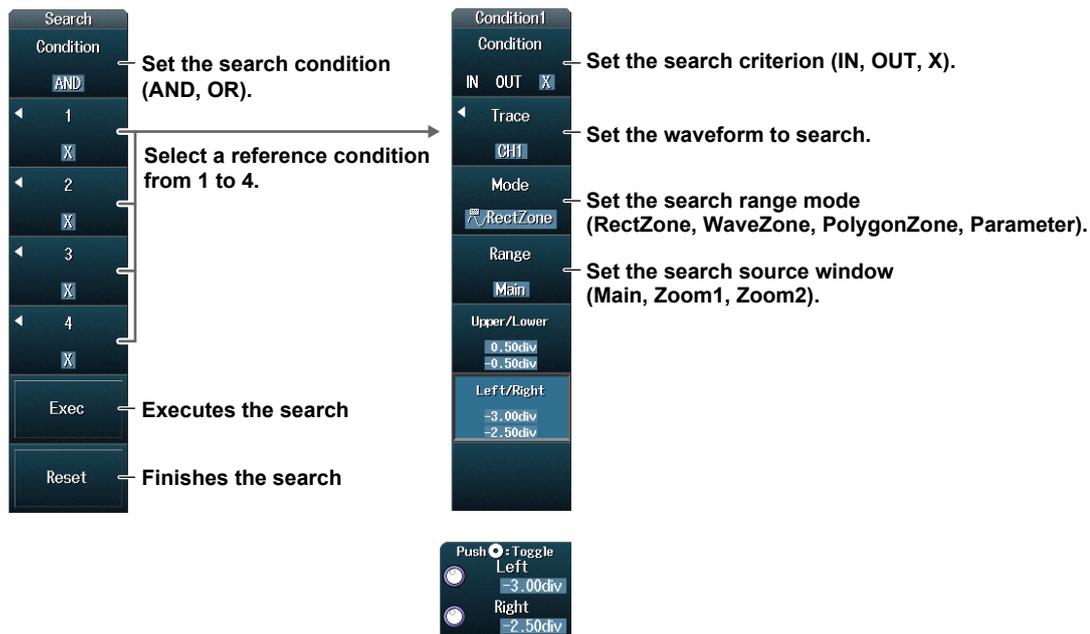
The image shows a detailed view of the **Search** menu with annotations explaining each option.

- Condition:** Set the search condition (Simple). (Option: Simple)
- Trace:** Set the waveform to search (CH1 to CH8, Math1 to Math4, XY1 to XY4). (Option: CH1)
- Range:** Set the search source window (Main, Zoom1, Zoom2). (Option: Main)
- Upper/Lower:** Set the search range (rectangular zone). (Options: 0.50div, -0.50div)
- Left/Right:** You can set the search range mode in the same manner that you set the reference range type for GO/NO-GO determination. See section 2.23, and read all instances of “determination” as “search.” (Options: =3.00div, =2.50div)
- Exec:** Executes the search
- Reset:** Finishes the search

Below the main screenshot is a smaller screenshot of the **Push** menu:

- Push Toggle:** Upper 0.50div, Lower =0.50div

When the Search Condition Is Set to AND or OR



Setting the Waveform to Search (Trace)

You can select the waveform to search from the settings below.

CH1 to CH8/LOGIC(L), LOGIC(A|B), Math1 to Math4, XY1 to XY4, FFT1, or FFT2

* You can select CH8 or LOGIC(L), depending on which channel's corresponding key (CH8 or L) is illuminated. Specify the channel that you want to search through in advance by pressing either the CH8 key or the L key.

LOGIC(A|B) is available on models with the /L16 option.

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 to XY4, you cannot set the search range mode to WaveZone.
- When you set the waveform to search to LOGIC(L), LOGIC(A|B), 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. See section 2.23, and read all instances of "determination" as "search."

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 DLM4000 series. The DLM4000 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.
- Do not use glue containing organic solvents, such as alcohol or ether, to paste recorded paper. 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 or smudge 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

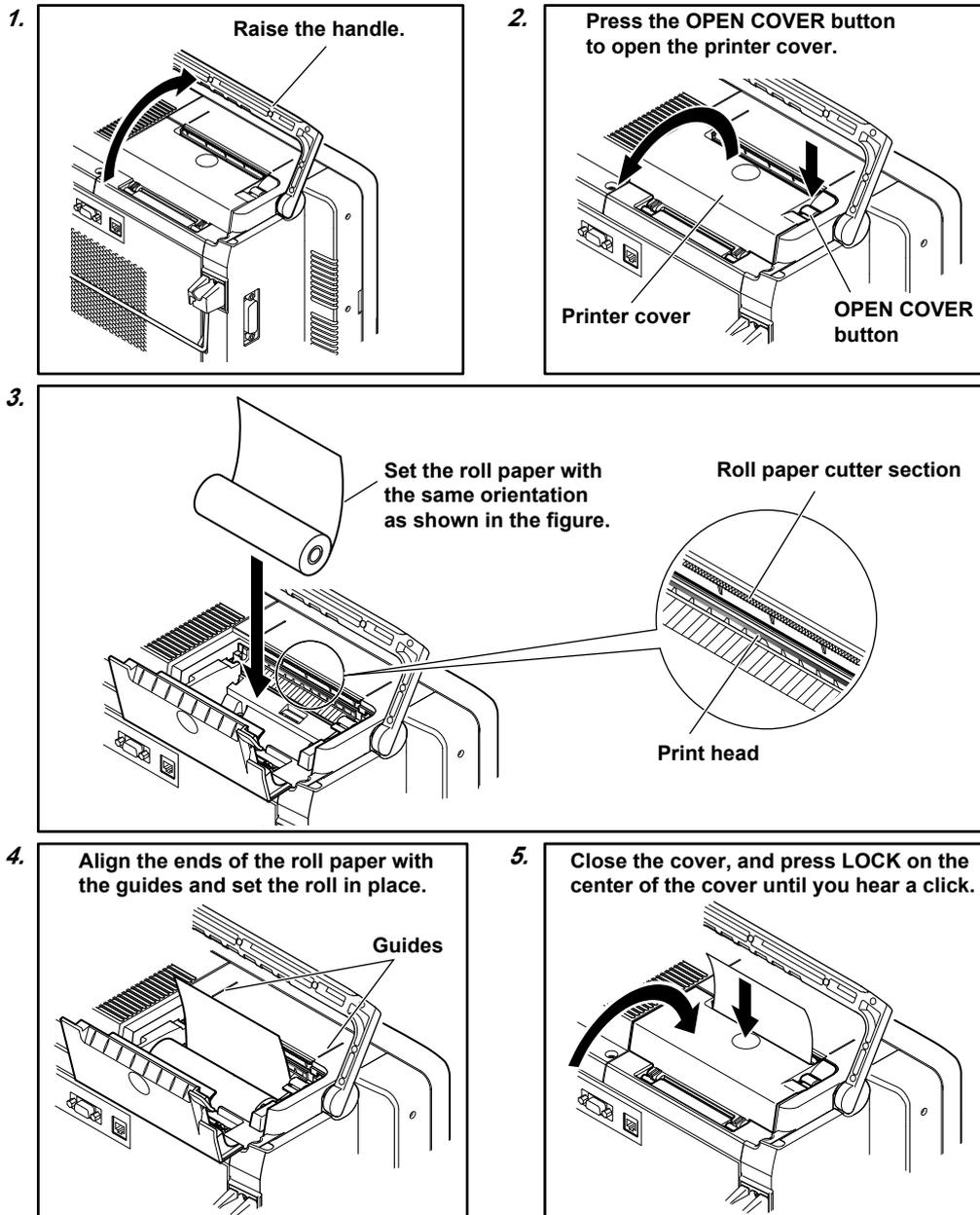
- Do not touch the print head. If you do, you may burn yourself.
- Do not touch the roll paper cutter section at the end of the printer cover. Doing so may cause injury.

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.



16.2 Printing on the Built-in Printer (Option)

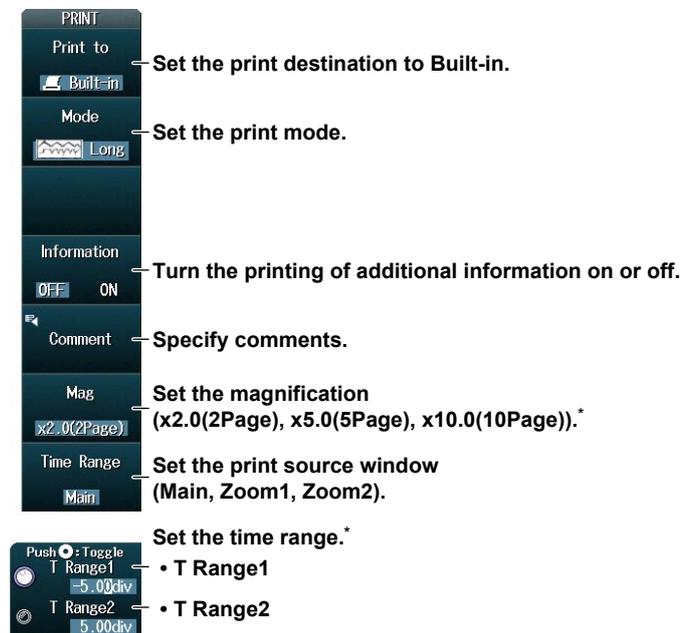
This section explains the following settings (which are used when printing on the optional built-in printer).

- Print destination
- Print mode
- Additional information
- Comments
- Magnification
- Time range

► [“Printing on the Built-in Printer \(Built-in\)” in the Features Guide](#)

PRINT Built-in Menu

Press **SHIFT+PRINT** (MENU), the **Print to** soft key, and then the **Built-in** soft key to display the following menu.



* This is displayed when the print mode is set to Long.

Setting the Print Mode (Mode)

Hardcopy: The entire DLM4000 screen is printed.

Normal: The waveform area of the DLM4000 screen is printed. The menu is not printed.

Long: As in Normal mode, the entire DLM4000 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 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.



Setting the Print Mode (Mode)

Hardcopy: The entire DLM4000 screen is printed.

Normal: The waveform area of the DLM4000 screen is printed. The menu is not printed.

Note

You must configure the network printer in advance by following the instructions in section 18.7.

16.4 Saving Screen Captures to Files

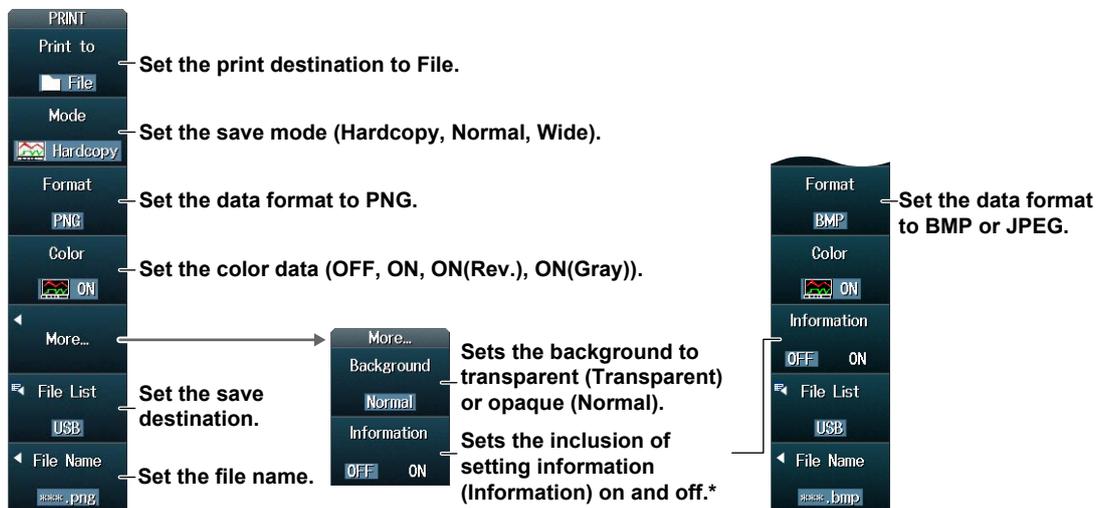
This section explains the following settings (which are used when saving screen captures to files).

- Output destination
- Save mode
- Data format
- Color data
- Background transparency (transparent or opaque)
- Save destination
- File name

► [“Saving Screen Captures to Files \(File\)” in the Features Guide](#)

PRINT File Menu

Press **SHIFT+PRINT** (MENU), the **Print** to soft key, and then the **File** soft key to display the following menu.



* 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 DLM4000 screen is saved.

Normal: The waveform area of the DLM4000 screen is saved. The menu is not saved.

Wide: As in Normal mode, the entire DLM4000 screen is saved, but the time axis is magnified from 2 to 10 times.

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.

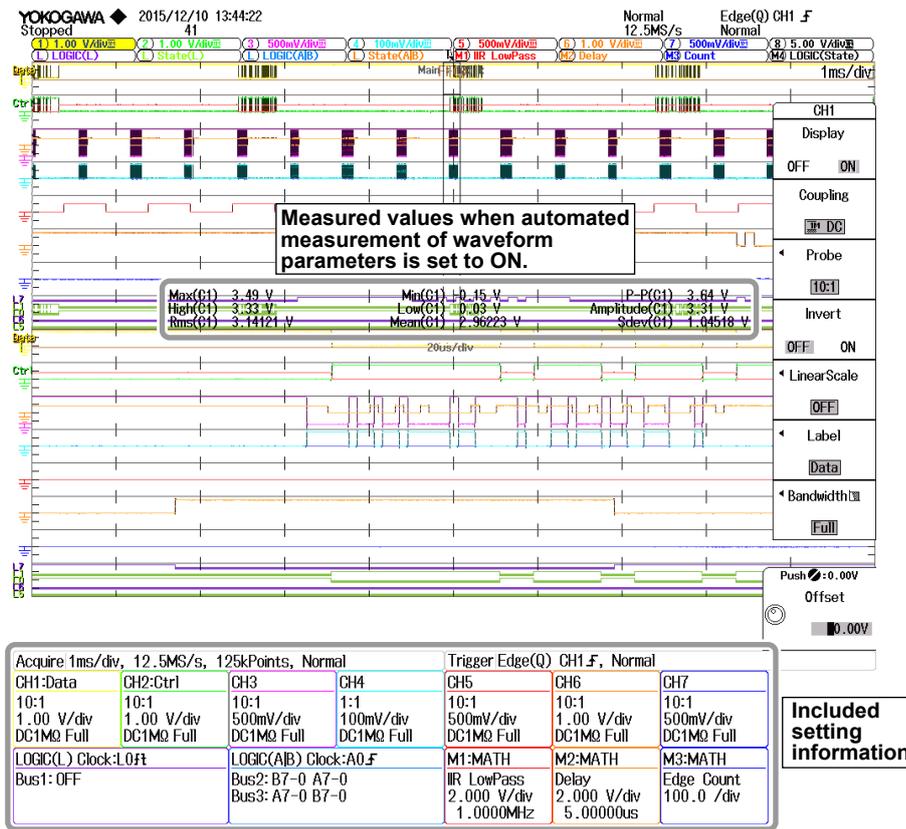
Assigning File Names (File Name)

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



16.5 Printing and Saving Screen Capture Data to Multiple Output Destinations at the Same Time

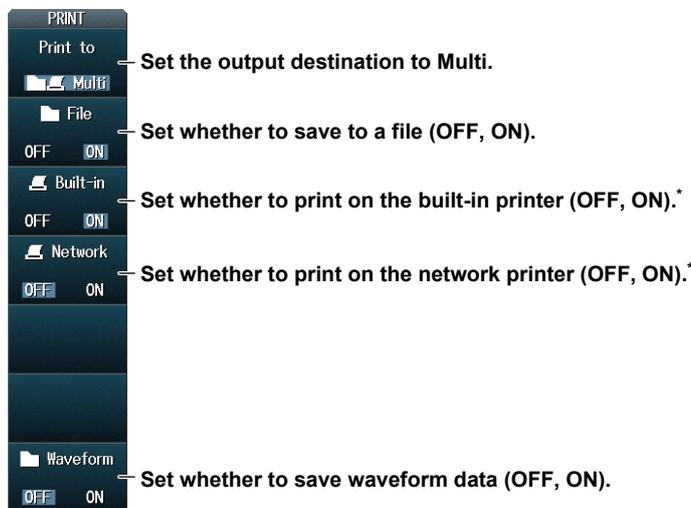
This section explains the following settings (which are used when printing and saving screen capture data and waveform data to multiple output destinations at the same time).

- Output destination
- Saving screen captures to files
- Printing screen captures on the built-in printer (option)
- Printing screen captures on a 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.



* Option

The DLM4000 outputs screen capture data 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 16.4
- Printing screen captures on the built-in printer (option)
 - section 16.2
- Printing screen captures on a network printer (option)
 - section 16.3
- 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

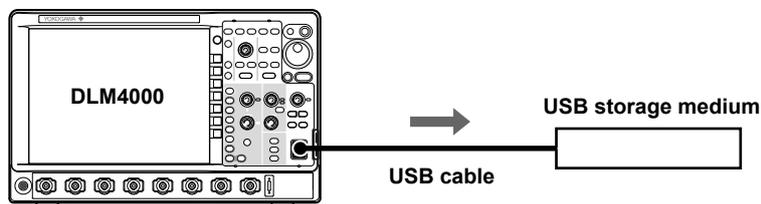
ATTENTION

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 DLM4000 USB port, connect the USB cable directly as shown in the figure below. You can connect or disconnect a USB cable at any time regardless of whether the DLM4000 is on or off (hot-plugging is supported). Connect the type A connector of the USB cable to the DLM4000, and connect the type B connector to the USB storage medium. If you connect a USB storage device when the power switch is on, the device becomes available for use after the DLM4000 identifies it.



Note

- Connect the USB storage medium directly, not through a USB hub.
- Only connect compatible USB keyboards, mouse devices, and storage devices to the USB ports for peripherals.
- If you turn on the DLM4000 when there are USB devices connected to the USB ports for peripherals, the USB devices or the DLM4000 may not operate properly. In such cases, turn off the DLM4000, disconnect the USB devices, turn the DLM4000 back on, and then reconnect the USB devices. After turning off the power, wait at least 10 seconds before you turn it back on.
- 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 DLM4000 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 version 1.1.
- The supported formats of USB storage media are FAT32 and FAT16.
- The DLM4000 can identify up to four storage media. If the connected medium is partitioned, the DLM4000 treats each partition as a separate storage medium. As such, the DLM4000 can handle up to four partitions. On models with the /C8 option, if the USB storage media format is FAT32, the DLM4000 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

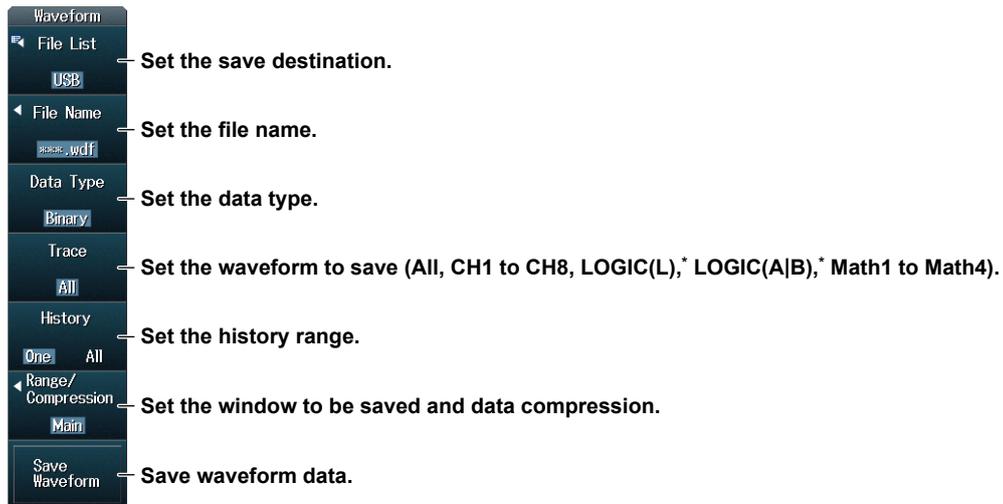
This section explains the following settings (which are used when saving waveform data).

- 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

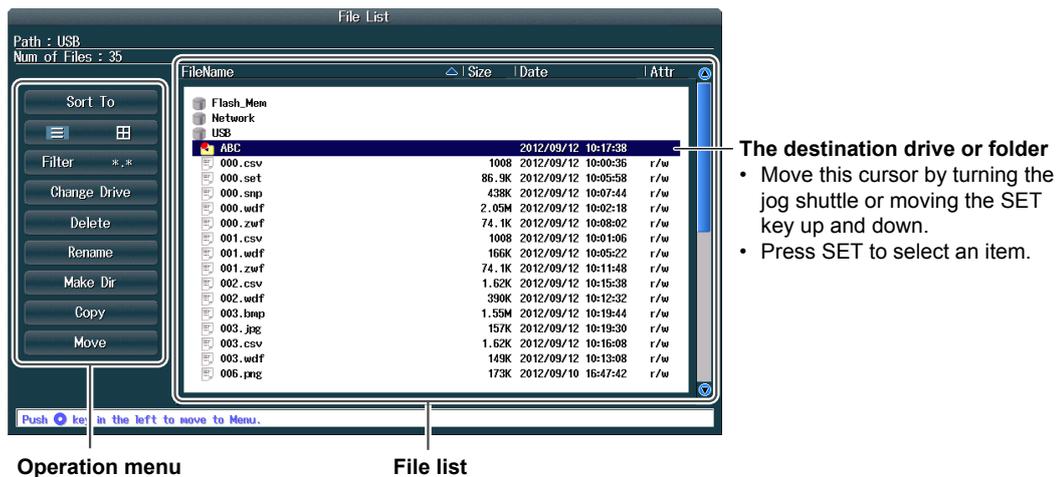
Press **FILE** and then the **Waveform(Save)** soft key to display the following menu.



* You can select CH8 or LOGIC(L), depending on which channel's corresponding key (CH8 or L) is illuminated. Specify the channel that you want to measure in advance by pressing either the CH8 key or the L key. LOGIC(A|B) is available on models with the /L16 option.

Setting the Save Destination (File List)

Press the **File List** soft key to display the following screen.



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.

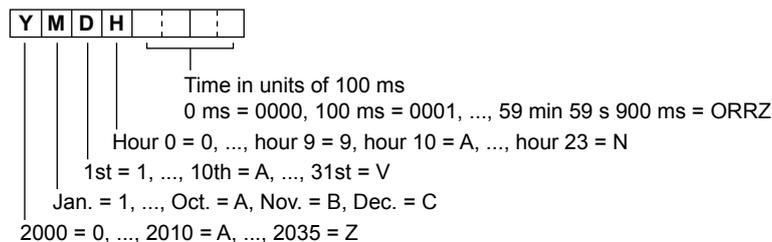
Assigning File Names (File Name)

Press the **File Name** soft key to display the following menu.

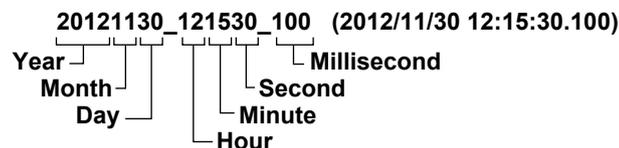


Setting Auto Naming (Auto Naming)

- 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 DLM4000 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 DLM4000 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 for the File Name setting is ignored.



- 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.



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).

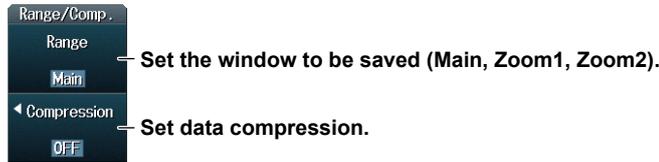
Display Mode (Mode) on the HISTORY Menu		One	All	Accumulate
Type of data to be saved (Data Type)	Binary	One or All selectable	One or All selectable	Fixed to All
	ASCII	Fixed to One	Fixed to One	Fixed to One
	ASCII with TimeInfo.	Fixed to One	Fixed to One	Fixed to One

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.

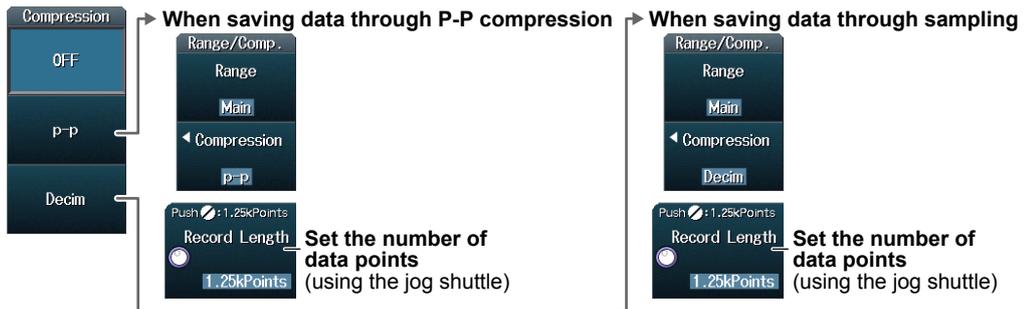
Setting the Window to Be Saved and Data Compression (Range/Compression)

Press the **Range/Compression** soft key to display the following menu.



Setting Data Compression (Compression)

When the window to be saved is set to Main, press the **Compression** soft key to display the following menu.



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 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 DLM4000.

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 DLM4000.

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 DLM4000.

17.3 Saving Setup Data

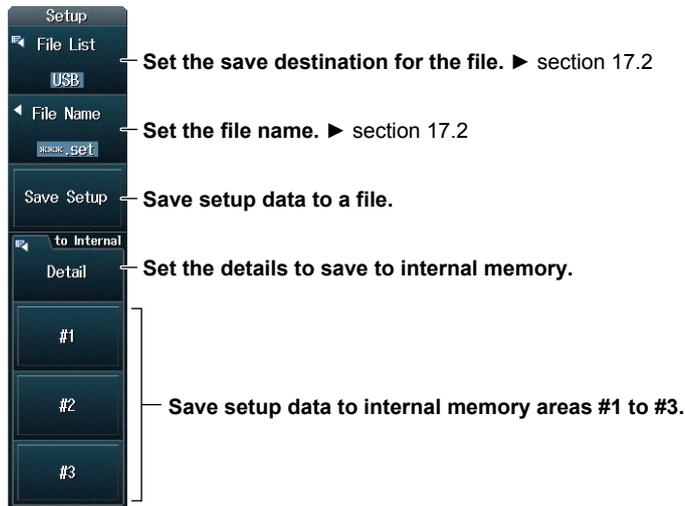
This section explains the following settings (which are used when saving setup data). You can save setup data to a file or to three different internal memory locations.

- 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.



Saving Setup Data (Save Setup)

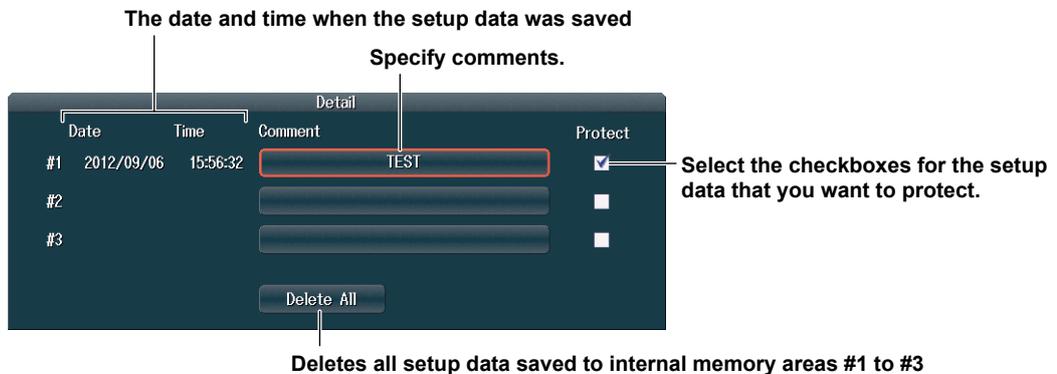
Save setup data to a file with a .set extension.

Saving Setup Data (to Internal; from #1 to #3)

Save setup data to internal memory areas #1 to #3.

Setting Internal Memory Details (to Internal; Detail)

Press the **Detail (to Internal)** soft key to display the following screen.



17.4 Saving Other Types of Data

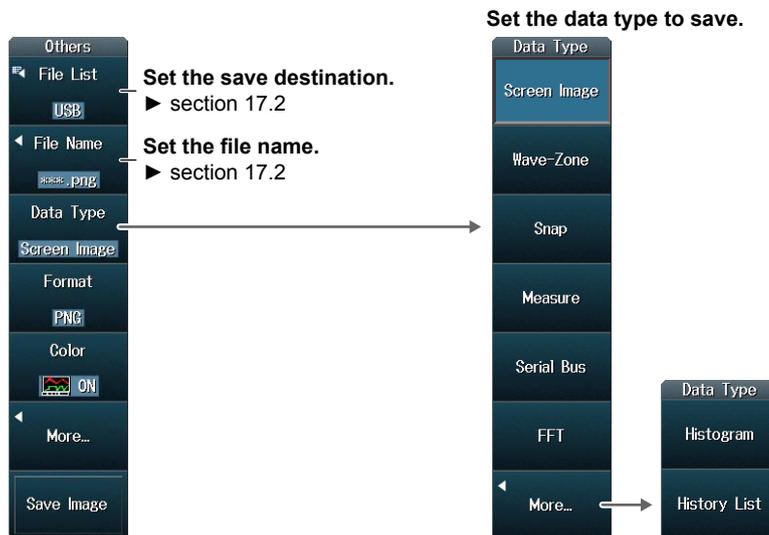
This section explains the following settings (which are used when saving screen captures, waveform zone data, snapshot waveform data, automated measurement values of waveform parameters, serial bus analysis results, FFT results, histogram data, and the list of timestamps).

- 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.



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 16.4.
 - 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 Serial Bus1, Serial Bus2, Serial Bus3, or Serial Bus4 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.

- Histogram: Save the waveform or waveform parameter histogram specified by Histogram 1 or Histogram 2 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

The screenshot shows the 'Others' menu with the following items and annotations:

- File List
- USB
- File Name
- back.png
- Data Type: **Screen Image** (Set Data Type to Screen Image.)
- Format: **PNG** (Set the data format to PNG.)
- Color: **ON** (Set the color data (OFF, ON, ON(Rev.), ON(Gray)).)
- More... (Sets the background to transparent (Transparent) or opaque (Normal).)
- Save Image (Save the screen capture.)

The 'More...' submenu is shown with the following items and annotations:

- Background: **Normal** (Sets the background to transparent (Transparent) or opaque (Normal).)
- Information: **OFF** (Sets the inclusion of setting information (Information) on and off.)

Another 'More...' submenu is shown with the following items and annotations:

- Format: **BMP** (Set the data format to BMP or JPEG.)
- Color: **ON**
- Information: **OFF**
- Save Image

When Data Type Is Wave-Zone

The screenshot shows the 'Others' menu with the following items and annotations:

- File List
- USB
- File Name
- back.zwf
- Data Type: **Wave-Zone** (Set Data Type to Wave-Zone.)
- Zone No.: **#1** (Set the waveform zone to save (#1 to #4).)
- Save Zone (Save the waveform zone.)

17.4 Saving Other Types of Data

When Data Type Is Snap

Others

- File List
- USB
- File Name
- Data Type: Snap
- Save Snap

Set Data Type to Snap.

Save a snapshot waveform.

When Data Type Is Measure

Others

- File List
- USB
- File Name
- Data Type: Measure
- Save Measure

Set Data Type to Measure.

Saves the automated measurement values of waveform parameters

When Data Type Is Serial Bus (When saving signals other than SENT)

Others

- File List
- USB
- File Name
- Data Type: Serial Bus
- Serial Bus: 1
- History: One
- Save Serial Bus

Set Data Type to Serial Bus.

Set the history range (One, All) ▶ section 17.2

Save the serial bus analysis results.

Select which serial bus to save (Serial Bus 1 to Serial Bus 4).

When Data Type Is Serial Bus (When saving SENT signals)

Others

- File List
- USB
- File Name
- Data Type: Serial Bus
- Serial Bus: 1
- Type: List
- History: One
- Save Serial Bus

Set Data Type to Serial Bus.

Select which serial bus to save (Serial Bus 1 to Serial Bus 4).

When the display type is set to Trend Waveform

Type

- Trend Waveform
- Setup
- Save Serial Bus

Set the display type (List, Trend Waveform).

Set the history range (One, All) ▶ section 17.2

Save the serial bus analysis results.

Setup

- Trend: 1
- TimeInfo.: ON
- Compression: OFF

Select the trend data to save (Trend1 to Trend4).

Turns the inclusion of time information on and off

Set data compression (OFF, p-p, Decim). ▶ section 17.2

When Data Type Is FFT

Others

File List

USB

File Name

BACK, CSV

Data Type

FFT

FFT1

FFT2

Freq Info.

OFF ON

Save FFT

Set Data Type to FFT.

Set the FFT to use (FFT1 or FFT2).

Turns the inclusion of frequency information on and off.

Save the FFT results.

When Data Type Is Histogram

Others

File List

USB

File Name

BACK, CSV

Data Type

Histogram

Histogram 1

Histogram 2

Save Histogram

Set Data Type to Histogram.

Set the histogram to use (Histogram 1 or Histogram 2).

Save the histogram data.

When Data Type is History List

Others

File List

USB

File Name

BACK, CSV

Data Type

History List

Save History List

Set Data Type to History List.

Save the list of timestamps.

17.5 Loading Waveform Data

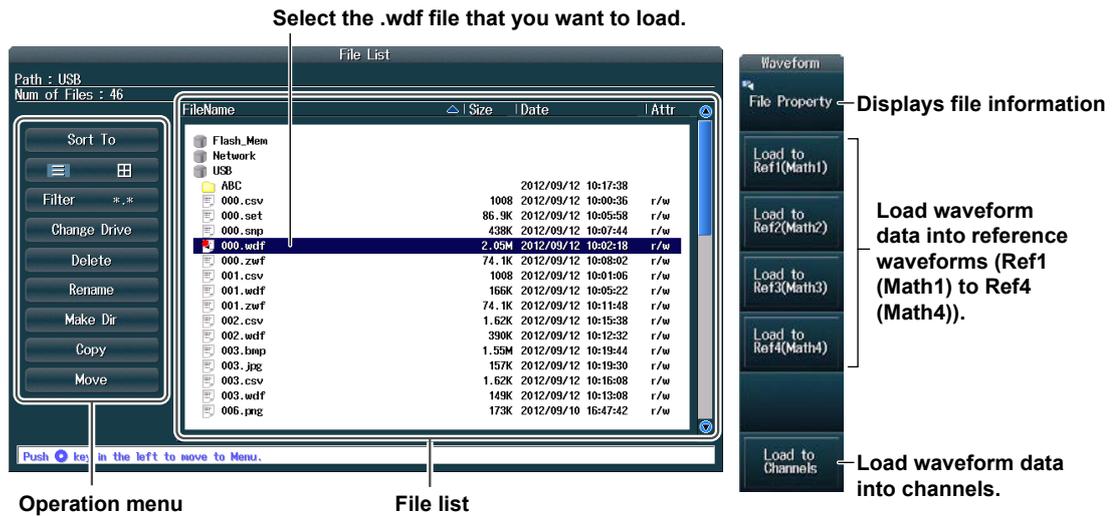
This section explains the following settings (which are used when loading waveform data).

- Displaying file information
- Loading waveform data into reference waveforms
- Loading waveform data into channels

► “Loading Data (Load)” in the Features Guide

FILE Waveform (Load) Menu

Press **FILE** and then the **Waveform(Load)** soft key to display the following menu.



Selecting Files

Select the file to load from the file list. ► section 17.8

Loading Waveform Data into Reference Waveforms (Load to Ref1(Math1) to Load to Ref4(Math4))

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. You can display reference waveforms by specifying Ref in a mode from Math/Ref1 to Math/Ref4.

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 (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 Data (Load)” in the Features Guide

FILE Setup (Load) Menu

Press **FILE** and then the **Setup(Load)** soft key to display the following menu.

Select the .set file that you want to load.

The screenshot shows the FILE Setup (Load) menu. On the left is the 'Operation menu' with options: Sort To, Filter, Change Drive, Delete, Rename, Make Dir, Copy, and Move. The main area is the 'File list' showing a table of files. The file '000.set' is selected. On the right is the 'Setup' menu with options: File Property, Load Setup File, from internal, and Detail. Below 'from internal' are three buttons labeled #1, #2, and #3.

File Name	Size	Date	Attr
Flash_Menu			
Network			
USB			
000.csv	100B	2012/09/12 10:00:36	r/w
000.set	86.9K	2012/09/12 10:05:58	r/w
000.smp	438K	2012/09/12 10:07:44	r/w
000.wdf	2.05M	2012/09/12 10:02:18	r/w
000.zwdf	74.1K	2012/09/12 10:08:02	r/w
001.csv	100B	2012/09/12 10:01:06	r/w
001.wdf	166K	2012/09/12 10:05:22	r/w
001.zwdf	74.1K	2012/09/12 10:11:48	r/w
002.csv	1.62K	2012/09/12 10:15:38	r/w
002.wdf	390K	2012/09/12 10:12:32	r/w
003.tmp	1.55M	2012/09/12 10:19:44	r/w
003.png	1.62K	2012/09/12 10:16:08	r/w
003.csv	157K	2012/09/12 10:19:30	r/w
003.wdf	149K	2012/09/12 10:13:08	r/w
004.png	178K	2012/09/18 13:03:02	r/w
005.png	152K	2012/09/18 13:03:14	r/w

Operation menu

File list

Setup

File Property — Displays file information

Load Setup File — Load the setup data file.

from internal — Configure the details to load from internal memory. ► section 17.3

Detail

#1 — Load setup data from internal memory areas #1 to #3.

#2

#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 Internal; from #1 to #3)

Load setup data from internal memory areas #1 to #3.

17.7 Loading Other Types of Data

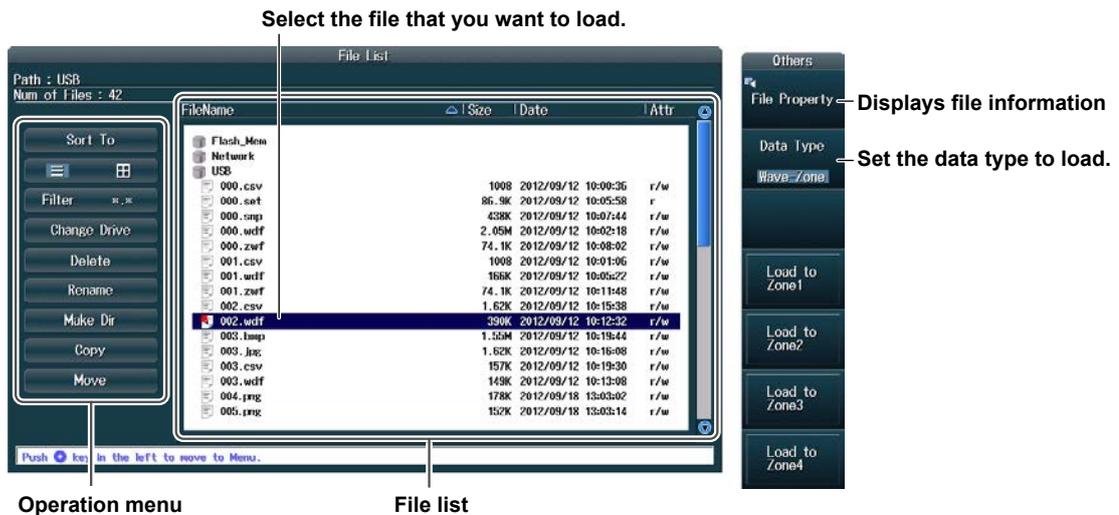
This section explains the following settings (which are used when loading waveform zones, polygonal zones, snapshot waveforms, or serial bus waveform symbol data).

- Displaying file information
- Data type to load
- Loading data

► “Loading Data (Load)” in the Features Guide

FILE Others (Load) Menu

Press **FILE** and then the **Others (Load)** soft key to display the following menu.



Selecting Files

Select the file to load from the file list. ► section 17.8

Setting the Data Type to Load (Data Type)

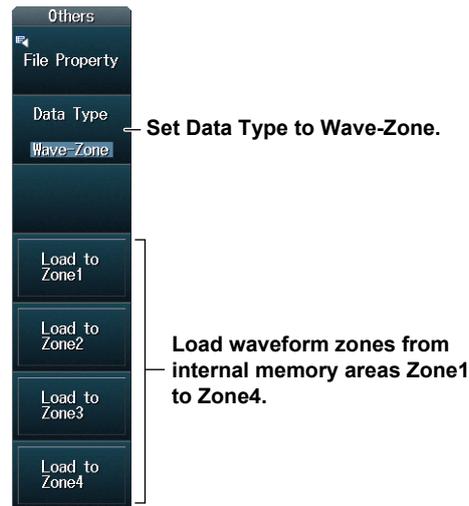
Wave-Zone: Load waveform zone files that have .zwf extensions that you created on the DLM4000 into internal memory areas Zone1 to Zone4.

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.

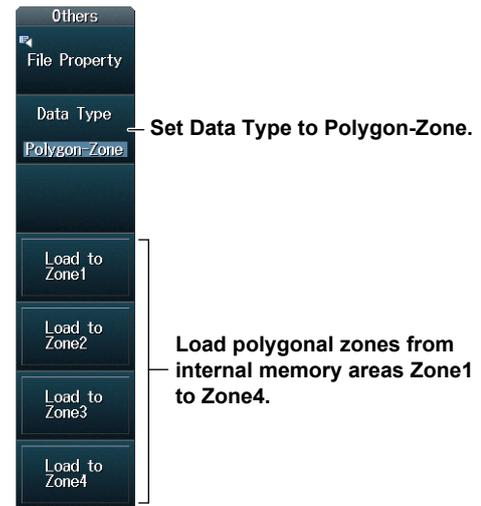
Snap: Load snapshot waveform files that have .snp extensions that you have saved.

Symbol: Load physical value/symbol definition files that have .sbl extensions that you have edited using the Symbol Editor tool.

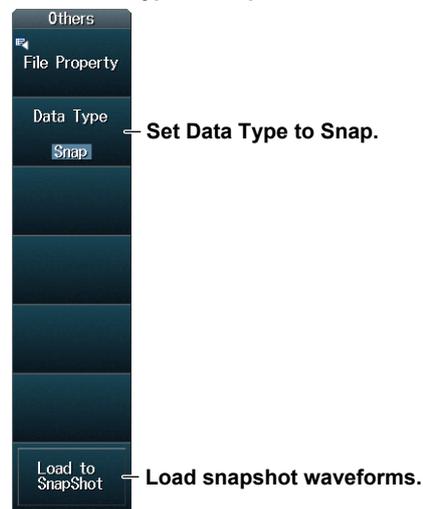
When Data Type Is Wave-Zone



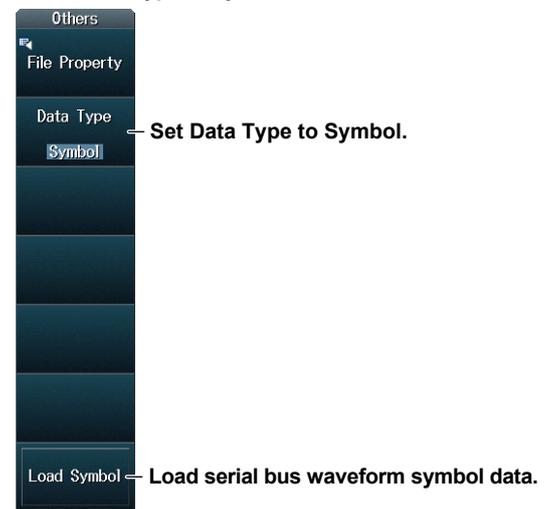
When Data Type Is Polygon-Zone



When Data Type Is Snap



When Data Type Is Symbol



17.8 Performing 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).

File list

- Sorting the file list
- Display format
- Selecting the type of file to list
- Changing storage media
- Deleting files and folders
- Renaming files and folders
- Creating folders (directories)

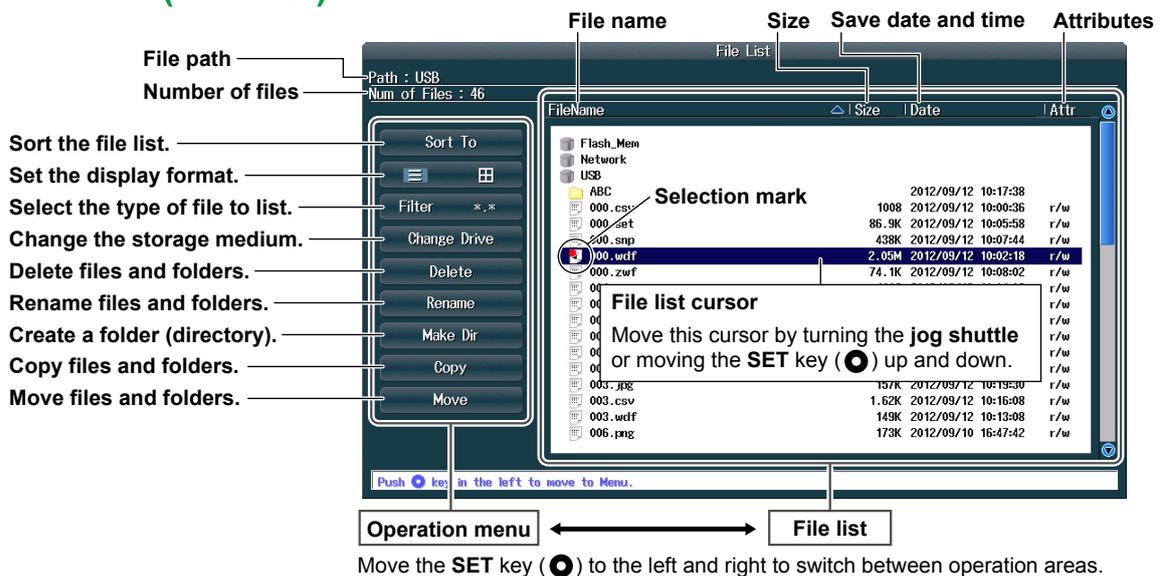
- Copying files and folders
- Moving files and folders
- Displaying file information

FILE Utility menu

- File protection
- Selecting files (All Set/All Reset and Set/Reset)

► “File Operations (Utility)” in the Features Guide

File List (File List)



Selecting What to Operate

When Operating a File or Folder

1. Move the cursor to the file or folder that you want to select.
A red selection mark (●) is displayed next to the file or folder.

When Operating Multiple Files and Folders

1. Move the cursor to a file or folder that you want to select.
 2. Press **SET** (●) or the **Set/Reset** soft key.
A blue selection mark (■) is displayed next to the file or folder.
 - To select multiple files, use **SET** or the **Set/Reset** soft key.
 - To select multiple folders, use the **Set/Reset** soft key.
When the cursor is highlighting a folder, pressing **SET** will open or close the folder.
 3. Repeat steps 1 and 2 to select all the files and folders you want.
- * To select all files and folders in the list, press the **All Set** soft key.

Selecting a Setup Menu Item

1. Turn the **jog shuttle** or move the **SET** (●) key up and down to move the cursor to the menu item you want to use.
2. Press **SET** (●).
The screen for the selected item 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.

FileName	Size	Date	Attr
Flash_Mem			
Network			
USB			
ABC		2012/09/12 10:17:38	
000.csv	1008	2012/09/12 10:00:36	r/w
000.set	86.9K	2012/09/12 10:05:58	r/w
000.snp	438K	2012/09/12 10:07:44	r/w
000.wdf	2.05M	2012/09/12 10:02:18	r/w
000.zwf	74.1K	2012/09/12 10:08:02	r/w
001.csv	1008	2012/09/12 10:01:06	r/w
001.wdf	166K	2012/09/12 10:05:22	r/w
001.zwf	74.1K	2012/09/12 10:11:48	r/w
002.csv	1.62K	2012/09/12 10:15:38	r/w
002.wdf	390K	2012/09/12 10:12:32	r/w
003.bmp	1.55M	2012/09/12 10:19:44	r/w
003.jpg	157K	2012/09/12 10:19:30	r/w
003.csv	1.62K	2012/09/12 10:16:08	r/w
003.wdf	149K	2012/09/12 10:13:08	r/w
006.png	173K	2012/09/10 16:47:42	r/w

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

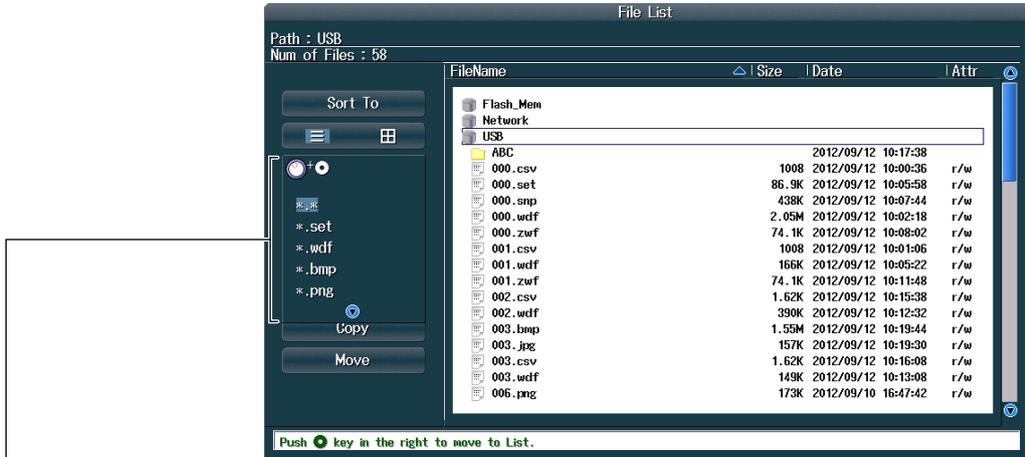
FileName	Size	Date	Attr
Flash_Mem			
Network			
USB			
ABC		2012/09/12 10:17:38	
000.csv	1008	2012/09/12 10:00:36	r/w
000.set	86.9K	2012/09/12 10:05:58	r/w
000.snp	438K	2012/09/12 10:07:44	r/w
000.wdf	2.05M	2012/09/12 10:02:18	r/w
000.zwf	74.1K	2012/09/12 10:08:02	r/w
001.csv	1008	2012/09/12 10:01:06	r/w
001.wdf	166K	2012/09/12 10:05:22	r/w
001.zwf	74.1K	2012/09/12 10:11:48	r/w
002.csv	1.62K	2012/09/12 10:15:38	r/w
002.wdf	390K	2012/09/12 10:12:32	r/w
003.bmp	1.55M	2012/09/12 10:19:44	r/w
003.jpg	157K	2012/09/12 10:19:30	r/w
003.csv	1.62K	2012/09/12 10:16:08	r/w
003.wdf	149K	2012/09/12 10:13:08	r/w
006.png	173K	2012/09/10 16:47:42	r/w

Thumbnail Display (田)

Thumbnail Display (田)

Selecting the Type of File to List (File Filter)

Select **Filter** on the operation menu to display the following screen.

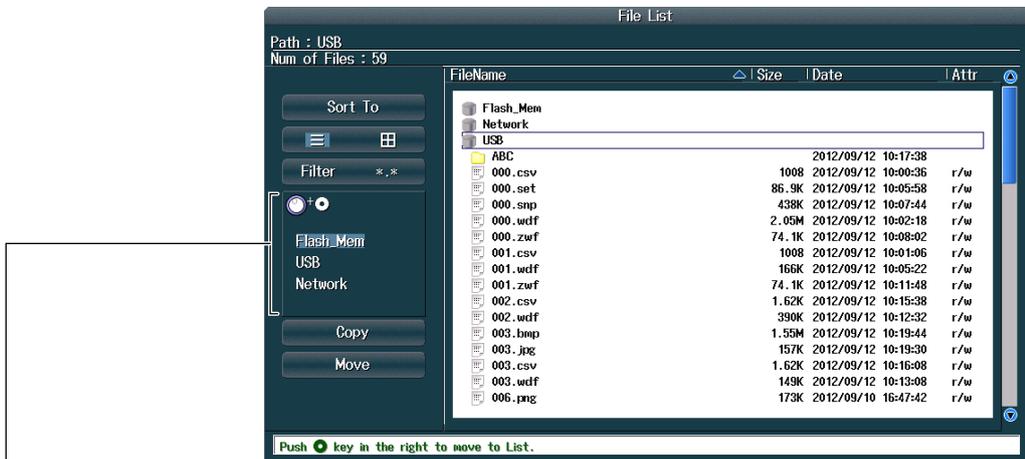


Select the type of file to list.

- *.*: 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.



Select a storage medium.

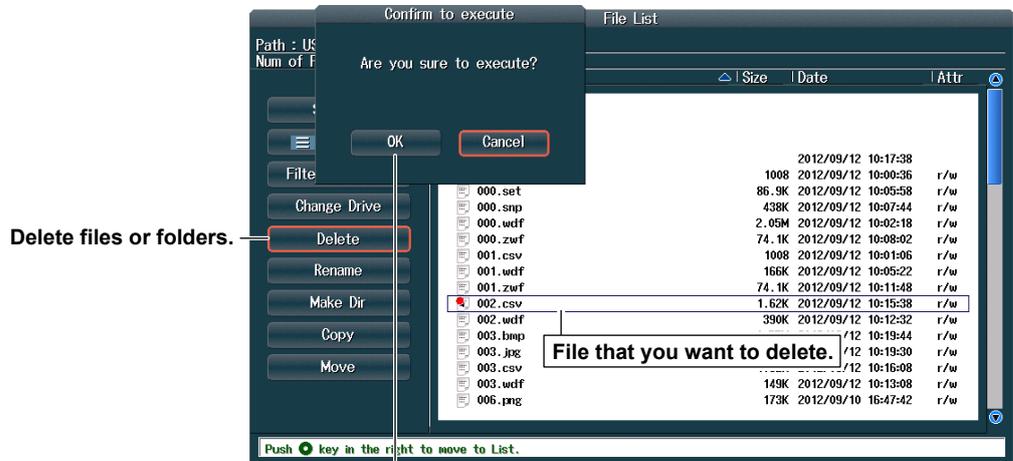
- Flash_Mem: Internal memory
- USB: The first USB storage medium that the DLM4000 detected
- USB1: The second USB storage medium that the DLM4000 detected
- Network: Network drive

Note

You can also change the storage medium by highlighting the storage medium (drive) you want to change to in the file list and pressing SET.

Deleting Files and Folders (Delete)

1. Select the file or folder that you want to delete from the file list.
2. Select **Delete** on the operation menu to display the following screen.



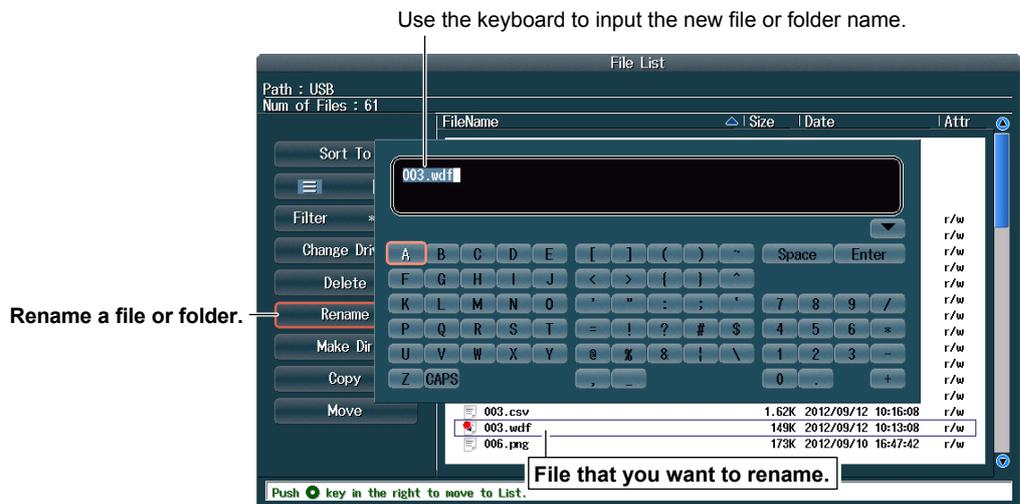
Confirms the deletion of the selected files and folders

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)

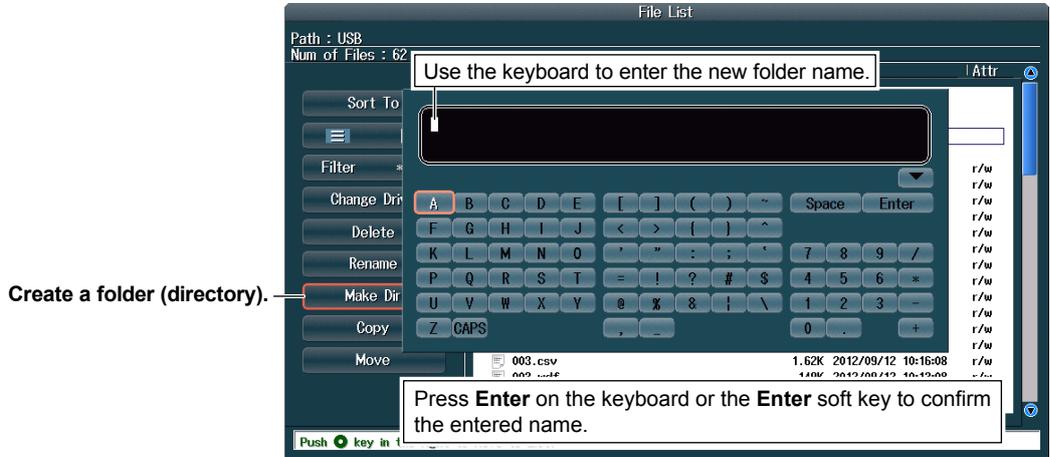
1. Select the file or folder that you want to rename from the file list.
2. Select **Rename** on the operation menu to display the following screen.



Press **Enter** on the keyboard or the **Enter** soft key to confirm the entered name.

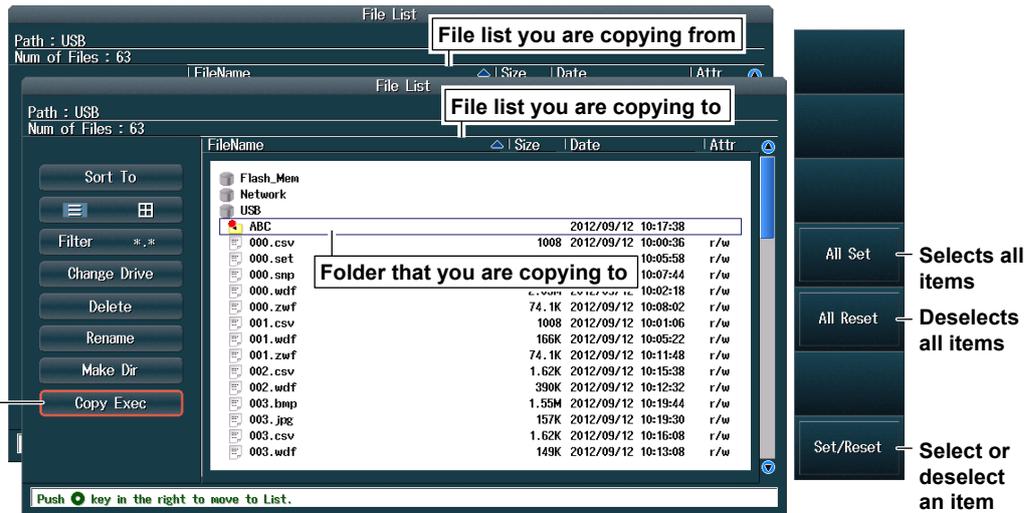
Making Folders (Make Dir)

1. Select the drive or folder that you want to make the new folder in from the file list.
2. Select **Make Dir** on the operation menu to display the following screen.



Copying Files and Folders (Copy)

1. Select the file that you want to copy from the file list.
2. Select **Copy** on the operation menu to display the following screen.



Copies the selected files and folders

3. Select the drive or folder on the file list that you are copying to.
4. Select **Copy Exec** on the operation menu to display the following screen.

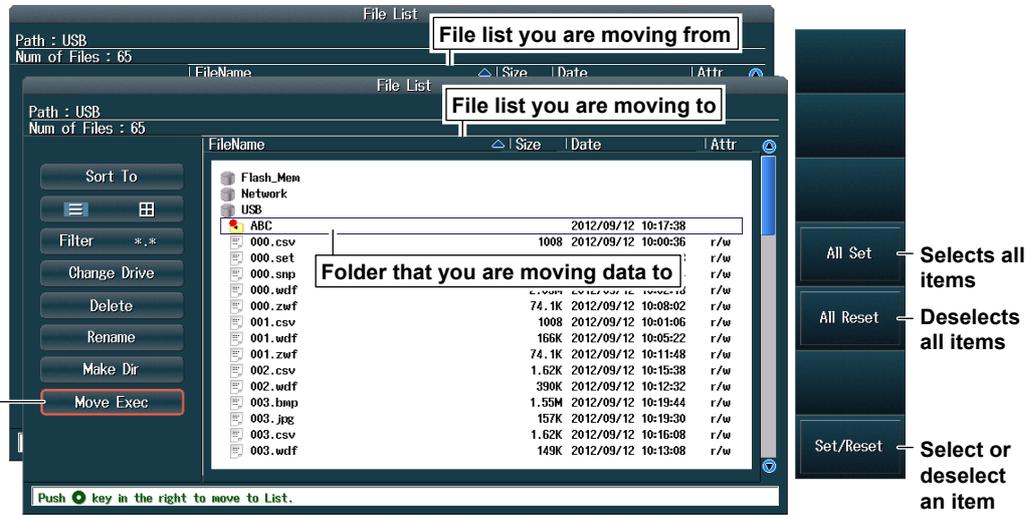


Note

- You can copy multiple files at the same time by selecting them with the Set/Reset soft key or 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)

1. Select the file that you want to move from the file list.
2. Select **Move** on the operation menu to display the following screen.



Moves the selected files and folders

3. Select the drive and folder on the file list that you are moving to.
4. Select **Move Exec** on the operation menu to display the following screen.

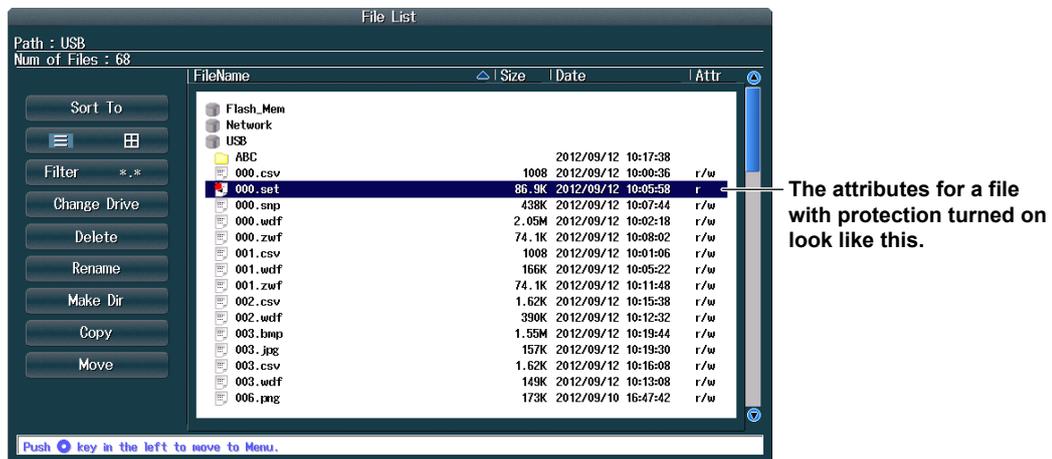
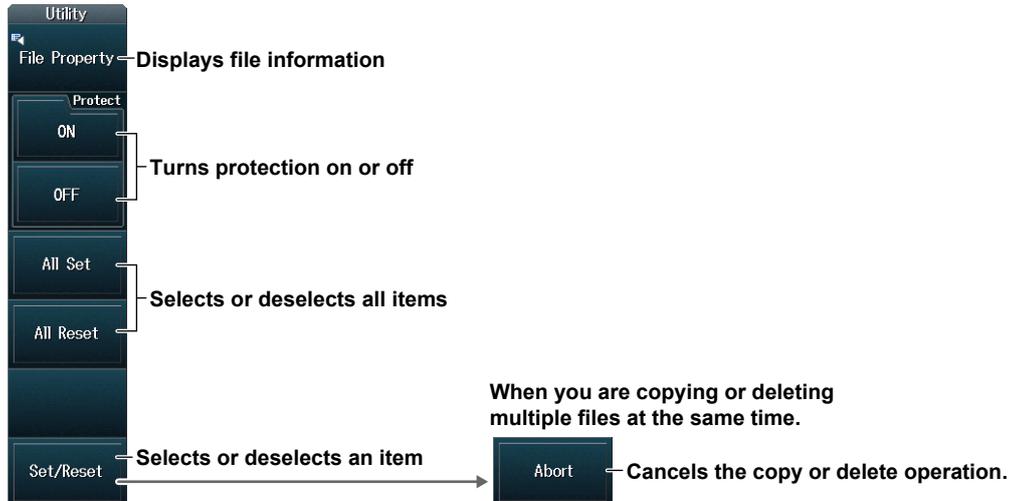


Note

- You can move multiple files at the same time by selecting them with the Set/Reset soft key or the jog shuttle and the SET key.
- You can perform file operations on the file list that you are moving data to as well.

FILE Utility Menu

Press **FILE** and then the **Utility** soft key to display the following menu.



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 displayed files and folders. Blue selection marks (👉/👈) are displayed next to the selected files and folders.

All Reset: Unselect all displayed files and folders.

Set/Reset

Select or deselect displayed files and folders that are highlighted. This is the same function as when you press the SET key. Blue selection marks (👉/👈) are displayed next to the selected files and folders.

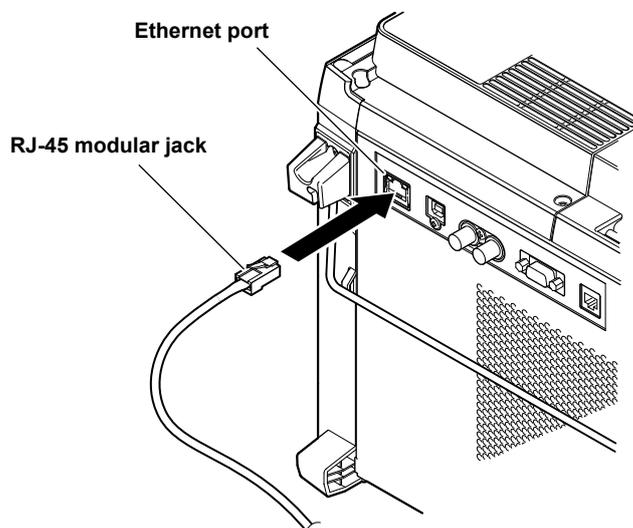
18.1 Connecting the DLM4000 to a Network

This section explains how to connect the DLM4000 to a network.

Ethernet Interface Specifications

There is a 1000BASE-T port located on the rear panel of the DLM4000.

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), SNMP, LPR (Net Print), DHCP, and DNS
Connector type	RJ-45



Items Required to Connect the DLM4000 to a Network

Cable

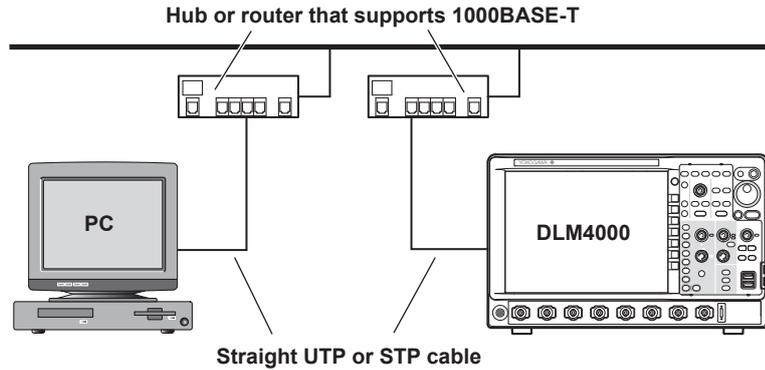
Use one of the following types of network cable that conforms to the transfer speed of your network.

- A UTP (Unshielded Twisted-Pair) cable
- An STP (Shielded Twisted-Pair) cable

Connection Procedure

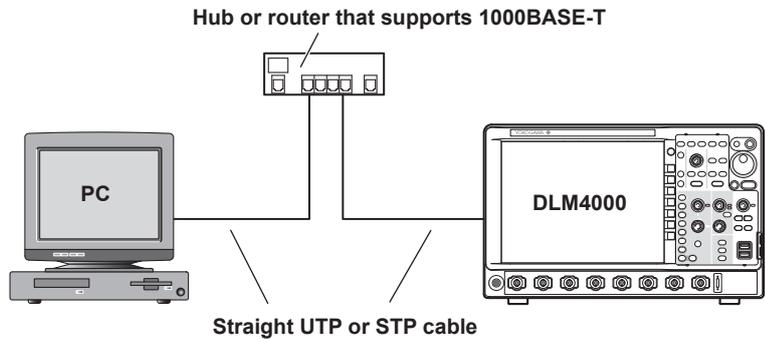
To Connect to a PC over a Network

1. Turn off the DLM4000.
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 DLM4000.



To Connect to a PC through a Hub or Router

1. Turn off the DLM4000 and the PC.
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 DLM4000.



Note

- Use a hub or router that conforms to the transfer speed of your network.
 - When you connect a PC to the DLM4000 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 DLM4000 to a PC directly. Direct communication without a hub or router is not guaranteed to work.
-

18.2 Configuring TCP/IP Settings

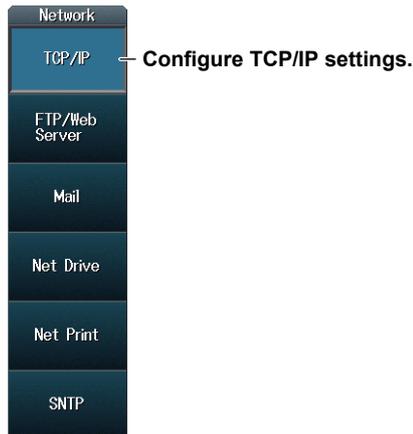
This section explains the following TCP/IP settings (which are used when connecting to a network).

- 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](#)

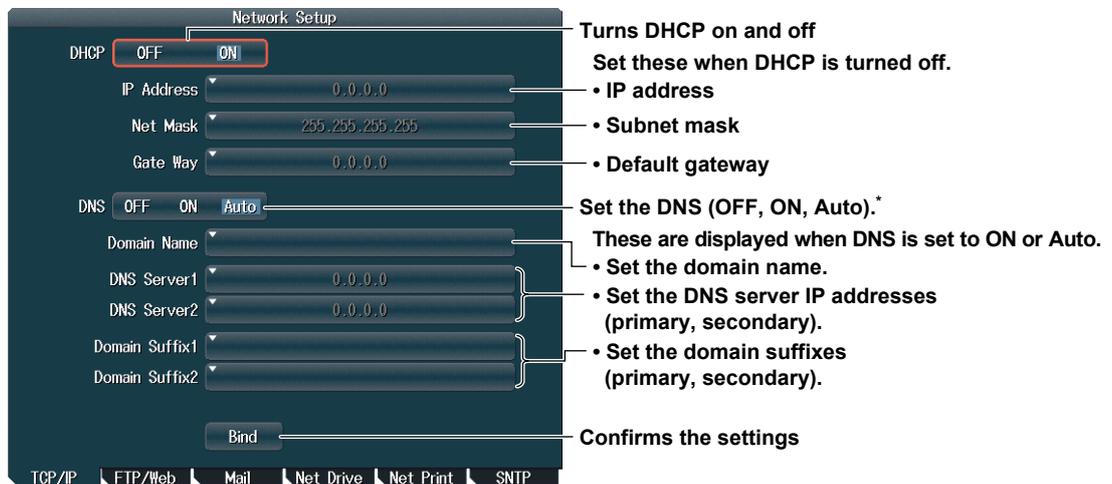
UTILITY Network Menu

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



TCP/IP Settings (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 DLM4000 from a PC (FTP Server)

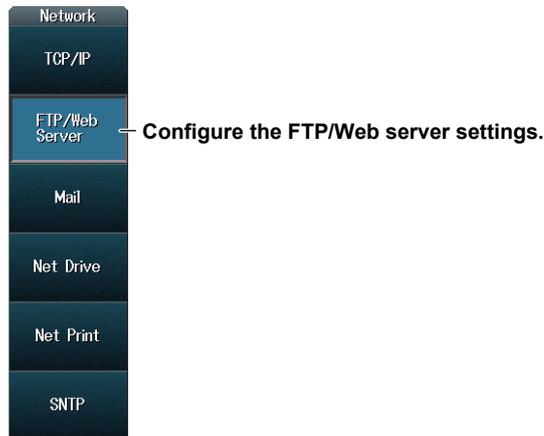
This section explains the following settings (which are used when accessing the DLM4000 from a PC on a network):

- User name
- Password
- Timeout
- Starting an FTP client

► “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.



Configuring the FTP Server (FTP/Web Server)

Press the **FTP/Web Server** soft key to display the following screen.



Starting an FTP Client

Start an FTP client on a PC.

Enter the user name and password that you set on the DLM4000's network setup screen, which is shown above, and connect to the DLM4000.

Note

If you set the user name to “anonymous,” you can connect to the DLM4000 without entering a password.

18.4 Monitoring the DLM4000 Display from a PC (Web Server)

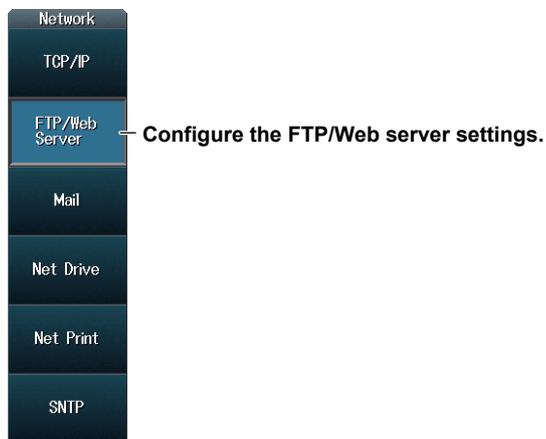
This section explains the following settings (which are used when connecting to the DLM4000 from a PC over a network to show the DLM4000's display on the PC and to start and stop waveform acquisition from the PC).

- User name
- Password
- Timeout
- Connecting to the DLM4000 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.



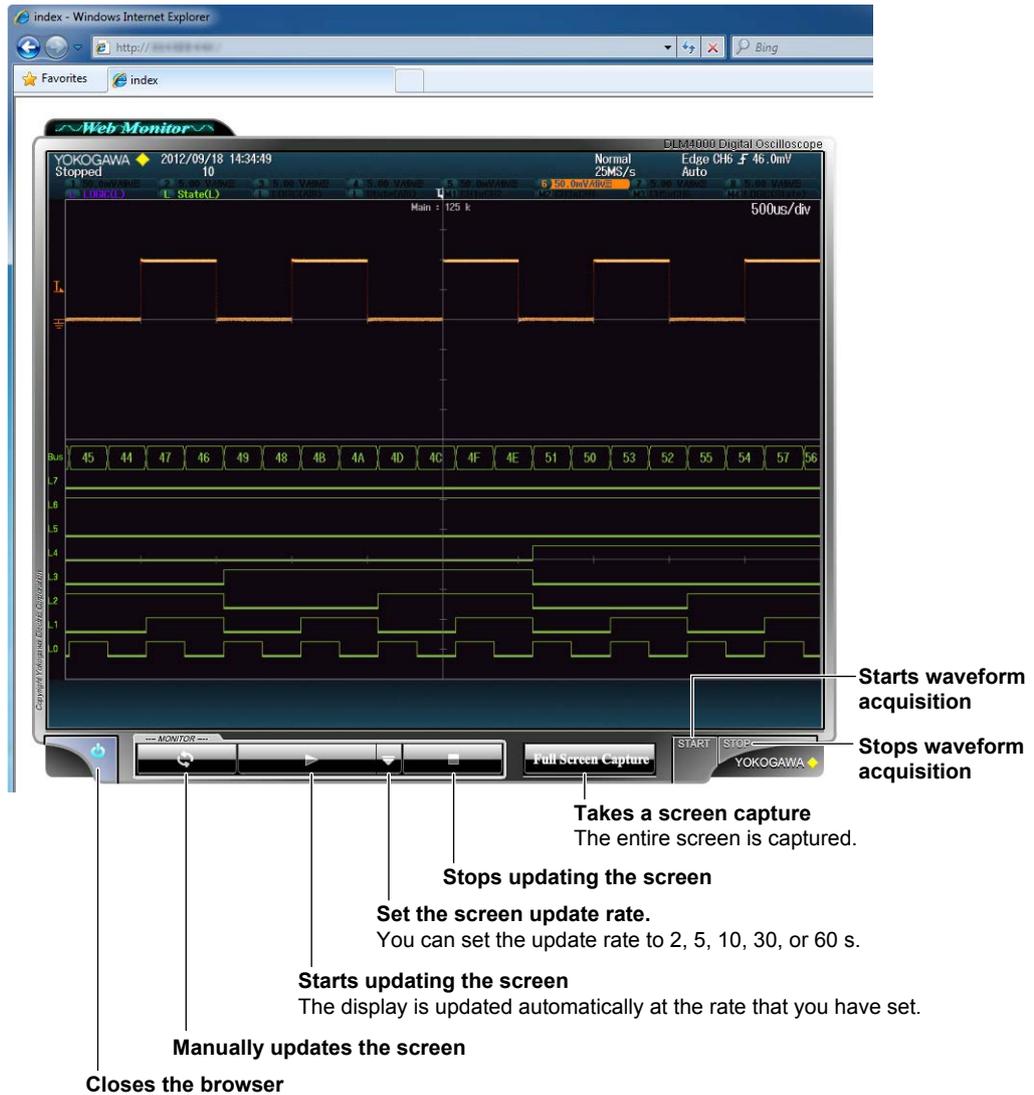
Configuring the Web Server (FTP/Web Server)

Press the **FTP/Web Server** soft key to display the following screen.



Connecting to the DLM4000 from a PC

1. Open a Web browser on a PC that is connected to the network.
2. Enter the following address.
 http://xxx.xxx.xxx.xxx/
 (Type the DLM4000's IP address for xxx.xxx.xxx.xxx.)
3. Enter the user name and password that you set on the DLM4000's network setup screen, which is shown on the previous page, and connect to the DLM4000.
 The following screen appears.



Note

- Disable the popup blocker feature on your Web browser when you want to capture the screen.
- If you set the user name to "anonymous," you can connect to the DLM4000 without entering a password.

18.5 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

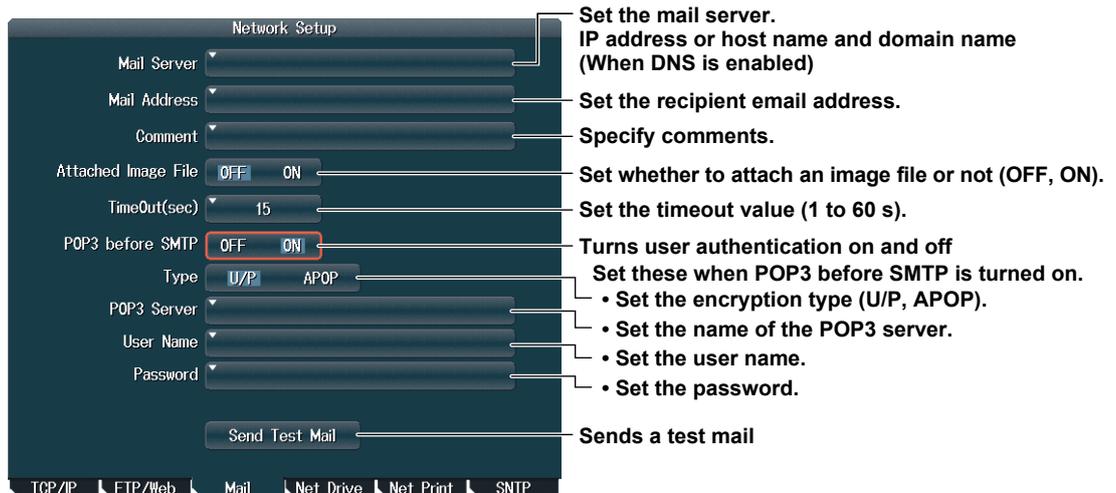
UTILITY Network Menu

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



Configuring Mail (Mail)

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



18.6 Connecting to a Network Drive

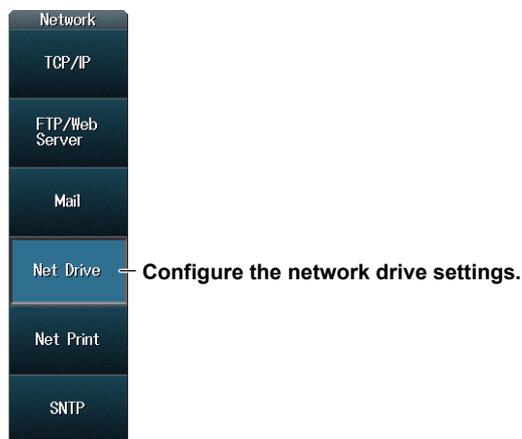
This section explains the following settings (which are used when accessing a network drive through an Ethernet connection to load or save various DLM4000 data).

- 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](#)

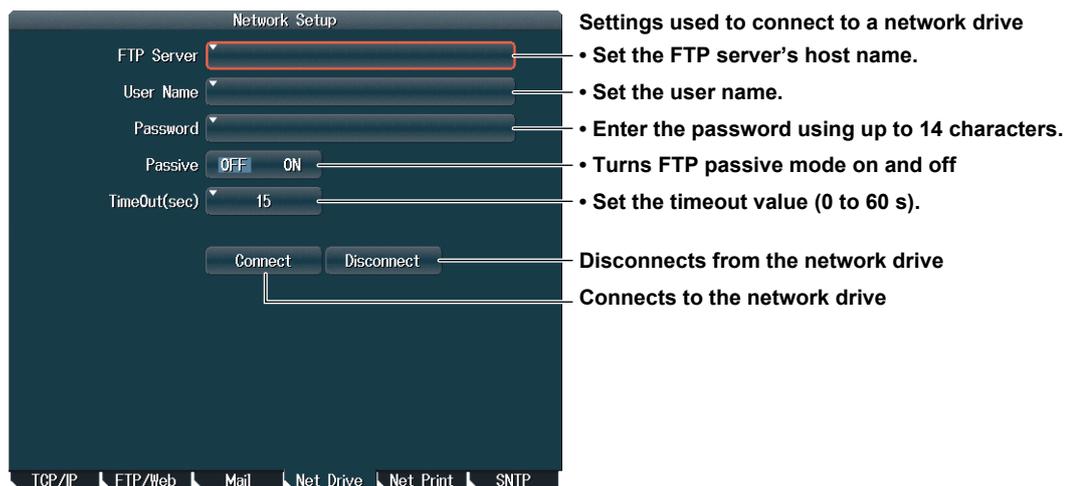
UTILITY Network Menu

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



Configuring a Network Drive and Connecting to It (Net Drive)

Press the **Net Drive** soft key to display the following screen.



18.7 Configuring a Network Printer

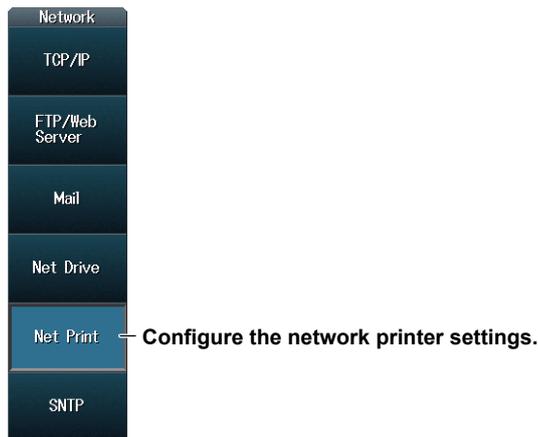
This section explains the following settings (which are used when printing screen captures to a network printer).

- LPR server
- LPR name
- Timeout

► “Network Printer (Net Print)” in the Features Guide

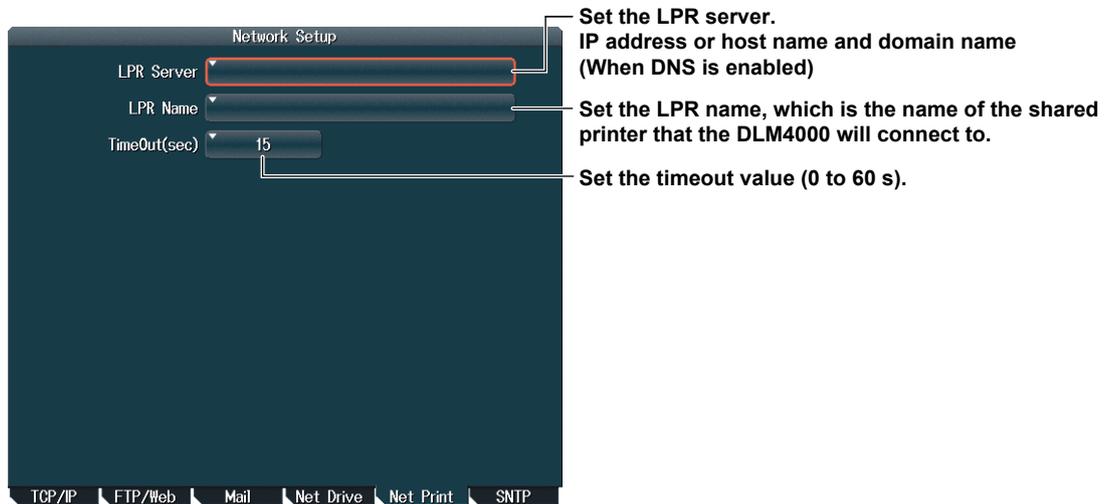
UTILITY Network Menu

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



Network Printer Settings (Net Print)

Press the **Net Print** soft key to display the following screen.



18.8 Using SNTP to Set the Date and Time

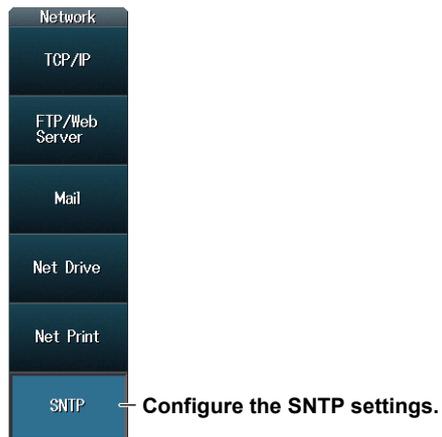
This section explains how to use SNTP to set the date and time of the DLM4000.

- SNTP server
- Timeout
- Executing time adjustment
- Automatic adjustment

► [“SNTP \(SNTP\)” in the Features Guide](#)

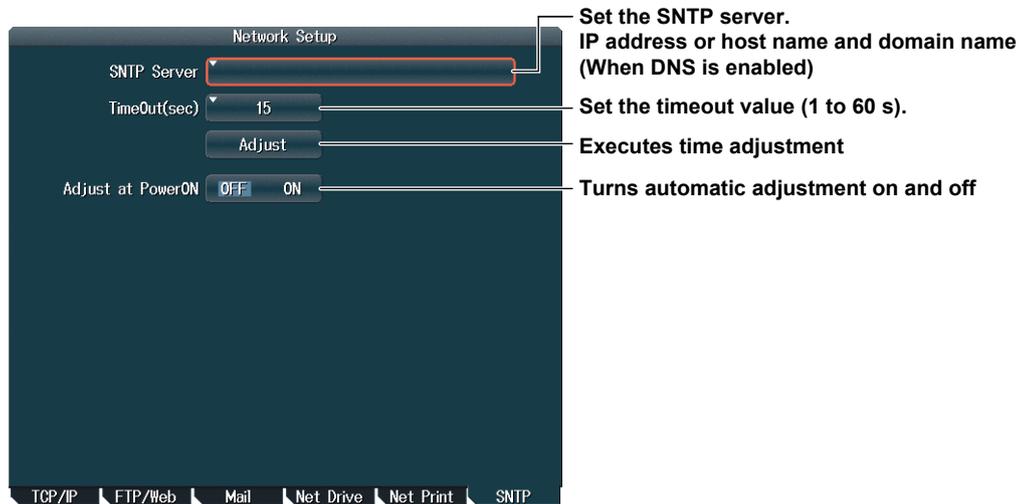
UTILITY Network Menu

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



SNTP Settings (SNTP)

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



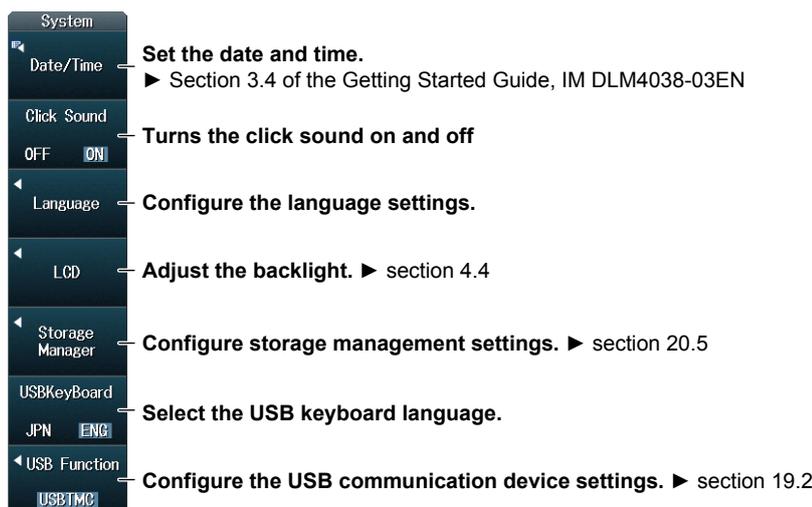
19.1 Turning the Click Sound On and Off and Changing the Menu Language, Message Language, and USB Keyboard Language

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](#)

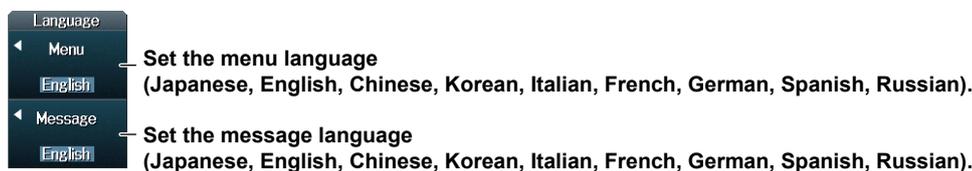
UTILITY System Configuration Menu

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



Setting the Language (Language)

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



Note

Some terminology is always displayed in English.

Setting the USB Keyboard Language (USBKeyboard)

You can use the following keyboards that conform to USB Human Interface Devices (HID) Class Ver. 1.1.

ENG: 104-key keyboards

JPN: 109-key keyboards

For details on how DLM4000 keys are mapped to the keys on a USB keyboard, see appendix 2 in the Getting Started Guide, IM DLM4038-03EN.

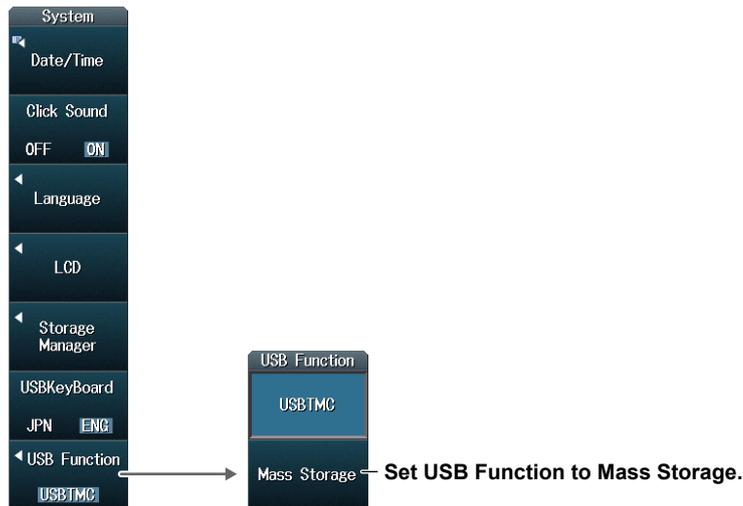
19.2 Using the DLM4000 as a USB Storage Device

This section explains the setting that enables you to use the DLM4000 as a USB storage device through a USB connection made between the USB port on the DLM4000 rear panel and a PC.

► [“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.



Note

- From a PC, you can access the DLM4000 internal memory as a storage device. You cannot access the DLM4000 network drives or the storage media connected to the DLM4000 USB ports.
- When USB communication is set to Mass Storage, a connected PC can use the DLM4000 as a read-only storage device.
- If you operate the files from the DLM4000, the DLM4000 will temporarily disconnect the connection from the PC so that the screen displayed on the PC can be refreshed.

When using a DLM4000 with firmware version earlier than 2.00 as a USB storage device

On models with firmware version earlier than 2.00, 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 2.00, if the DLM4000 is accessed from a Windows XP or Windows Vista PC, the files on the DLM4000 internal memory can be read, deleted, and saved.

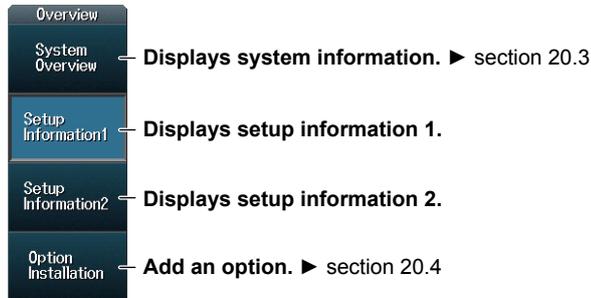
19.3 Viewing Setup Information (Overview)

This section explains how to view the current DLM4000 setup information.

► [“Overview \(Overview\)” in the Features Guide](#)

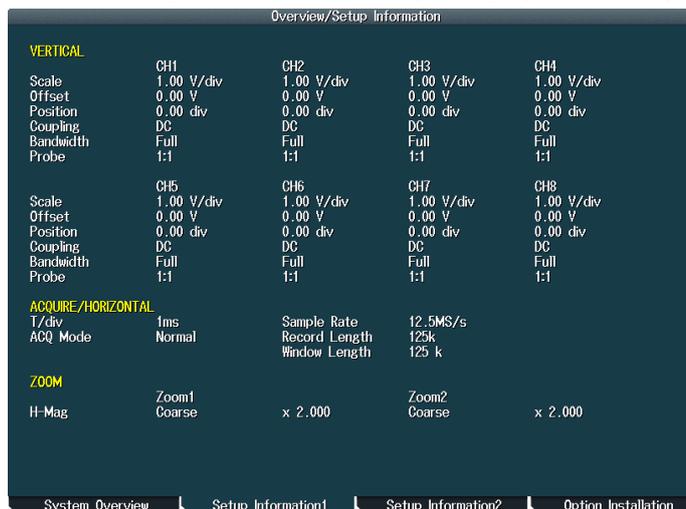
UTILITY Overview Menu

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



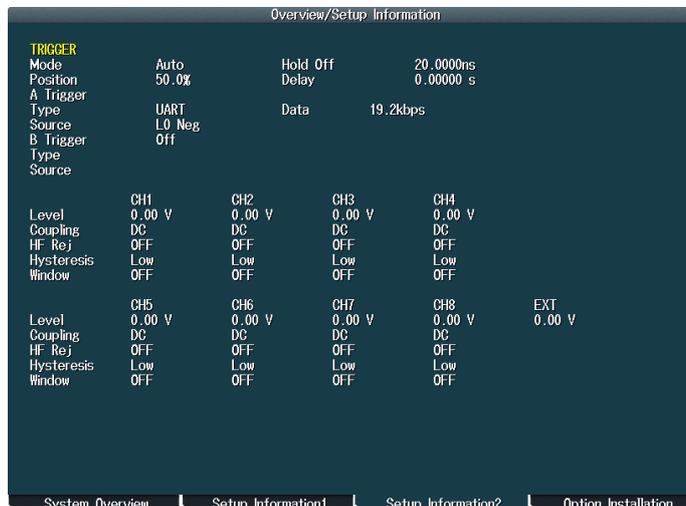
Displaying Setup Information 1 (Setup Information1)

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.



19.4 Setting the Measured Value Font Size and Whether to Use the Default Settings of Legacy Models

This section explains the following settings (which are used when setting the font sizes of cursor-measurement values and automatically measured values and the DLM4000 default values).

- Measured value font size
- Whether to use the 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.

The image shows a screenshot of the 'Preference' menu on a device. The menu items are: Trigger Out, Pos Neg, Offset Cancel, Delay Cancel, Font Size, and Legacy Mode. Each item has a corresponding description and reference to a manual section. An arrow points from the 'Font Size' option to a sub-menu titled 'Font Size Measure & Cursor' which has 'Small' and 'Large' options. A separate annotation points to this sub-menu with the text: 'Set the font size of measured values (Small: 16 pt, Large: 24 pt).'

Preference	
Trigger Out	Set the output logic. ► Section 4.2 of the Getting Started Guide, IM DLM4038-03EN
Pos Neg	
Offset Cancel	Turns offset cancelling on and off ► section 1.1
OFF ON	
Delay Cancel	Turns delay cancelling on and off ► section 2.2
OFF ON	
Font Size	Set the font size of measured values (Small: 16 pt, Large: 24 pt).
Legacy Mode	Set whether to use the default values of legacy models.
OFF ON	

Default Values of Legacy Models (Legacy Mode)

OFF: The default values are the DLM4000 factory default values.

ON: The default values are compatible with the DL7400 series default values.

20.1 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 19.1. 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 DLM4038-17EN.

Information

Code	Message	Chapter or 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.	2.22
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.	2.22
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.	12.5
27	The format was completed.	—
28	It was not turned off by the power switch of the front.	2.3*
30	Calculating the value of Lambda. Try to execute later.	Chapter 14
31	USB Function is set to Mass Storage mode. In this mode you can only read and write files.	Chapter 19
32	USB Function is set to Mass Storage For Windows 7 mode. In this mode you can only read files.	Chapter 19
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.	—

* Getting Started Guide, IM DLM4038-03EN

20.1 Messages and Corrective Actions

File Errors

Code	Message	Chapter or 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 or directory name. The name contains prohibited characters. Change it to a different name.	Chapter 17
529	Illegal file or directory 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	Network access is denied. 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

Code	Message	Chapter or Section
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 extension is invalid.	Chapter 17
542	Cannot save files greater than 2GB. Please either partially save the Zoom section, save in compressed format, or turn off unnecessary wave displays.	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
548	Computed waveforms cannot be saved with these settings.	Chapter 20*

* Features Guide, IM DLM4038-01EN

Printer Errors

Code	Message	Chapter or 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.	20.3
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	Chapter or 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	Chapter or Section
650	Running. Stop and execute again.	3.8*

* Getting Started Guide, IM DLM4038-03EN

20.1 Messages and Corrective Actions

Code	Message	Chapter or Section
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.	2.22
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.	10.1
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.	—
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.	—
673	Processing math on history. Abort or wait until it is completed, and execute again.	Chapter 15
674	Cannot 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.	3.8*
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
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	LOGIC input cannot be loaded into Ref.	Chapter 17
685	Cannot load into Ref with maximum record length.	—
686	Cannot execute during roll mode. Stop and execute again.	3.8*
687	It connects with PC Application.	—
688	Cannot execute on current record length.	—

* Getting Started Guide, IM DLM4038-03EN

Code	Message	Chapter or Section
689	Cannot execute during Preview mode.	—
690	The Format failure.	—
691	Cannot execute after history search. Reset history search and execute again.	15.2
692	Cannot execute, because history is not exist.	—
693	Cannot execute when the "Print To" setting of the PRINT key is "Multi".	16.5

Setting Errors

Code	Message	Chapter or 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.	12.5

* Getting Started Guide, IM DLM4038-03EN

System Errors

Code	Message	Chapter or Section
900	Setup data saving error. Setting information has not saved because the main power switch on the side panel is turned to OFF before the power switch on the front panel.	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
911	There is a problem to a probe power supply. Maintenance service is required.	—
913	Failed to update firmware. Maintenance service is required.	—
914	Fail to update Flash ROM. Maintenance service is required.	—
915	Internal temperature is too high. Maintenance service is required. It will shutdown automatically.	—

* Getting Started Guide, IM DLM4038-03EN

20.2 Carrying Out Self-Tests (Self Test)

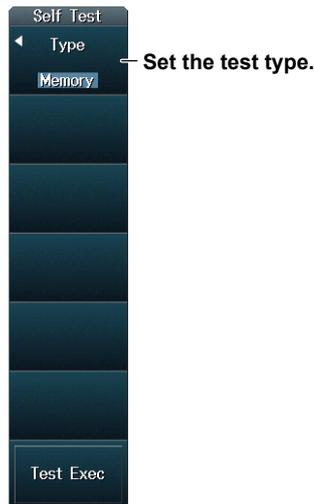
This section explains the following settings (which are used when testing whether or not the DLM4000's memory, keyboard, and printer are functioning properly).

- Test type
- Test execution

► [“Self-Test \(Selftest\)” in the Features Guide](#)

UTILITY Self Test Menu

Press **UTILITY** and then press the **Self Test** soft key to display the following menu.



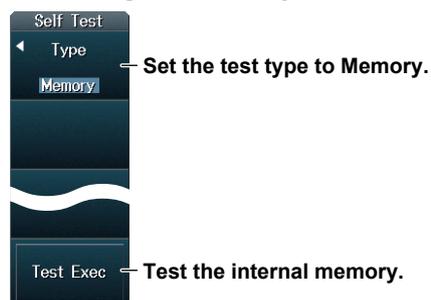
Setting the Test Type (Type)

- 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 occurs, “Fail” appears.
- KeyBoard: Tests whether the front panel keys and knobs are operating correctly and whether 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.

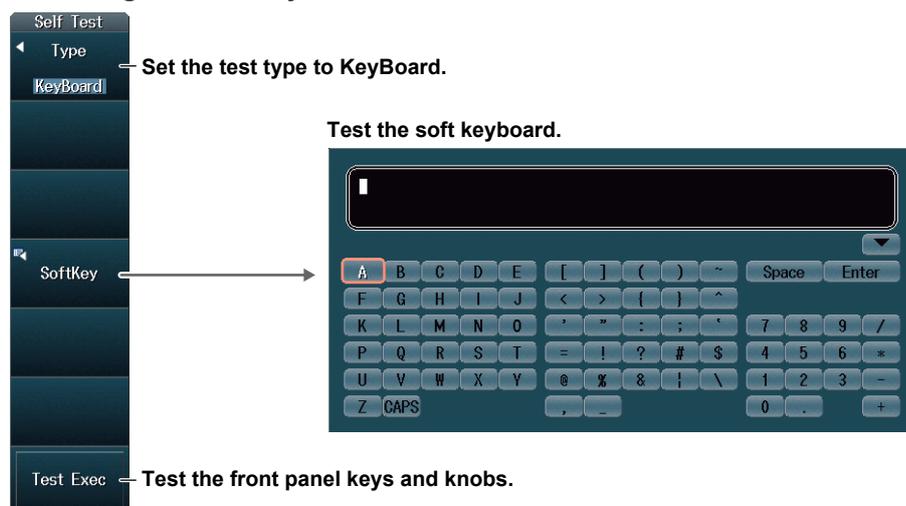
Note

Accuracy is a service test item. Under normal circumstances, you do not need to perform these tests.

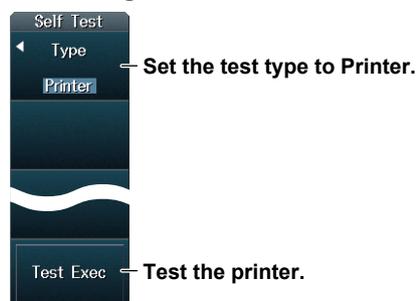
Executing the Memory Test



Executing the Soft Keyboard Test



Executing the Printer Test



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 the paper is not jammed.

20.3 Viewing System Information (Overview)

This section explains how to view the DLM4000 system information.

► [“Overview \(Overview\)” in the Features Guide](#)

UTILITY Overview Menu

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



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)
MAC Address	MAC Address
Media Capacity	Total internal memory size
Options	Optional features installed on the DLM4000
Default Language	Default language
Firm Version	Firmware version number
Linkage Date	Firmware version date

20.4 Adding Options to the DLM4000

This section explains how to add options after you have purchased the DLM4000.

You can use this additional option license feature on DLM4000s 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 DLM4000 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.



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 DLM4000. The additional option will be activated.

Viewing the System Information

To verify that the option has been installed, view the system information on the DLM4000 overview screen. For instructions on how to display the overview screen, see section 20.3.

Note

The SUFFIX (suffix code) inscribed in the name plate on the DLM4000 case indicates the installed options at the time of factory shipment. After you add options through additional option licenses, check the options on the DLM4000 overview screen.

20.5 Formatting Internal Memory

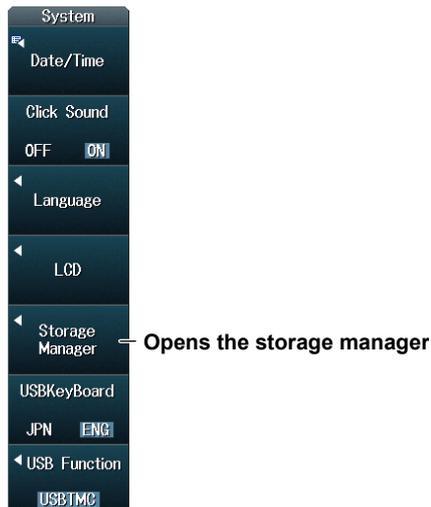
This section explains the following settings (which are used when formatting the DLM4000's internal memory).

- Storage management
- Formatting internal memory

▶ “System Configuration (System Configuration)” in the Features Guide

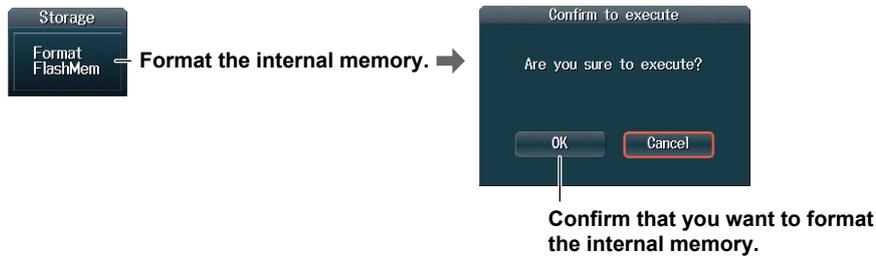
UTILITY System Configuration Menu

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



Storage Management (Storage Manager)

Press the **Storage Manager** soft key to display the following menu.



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.

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