DLM5034, DLM5038, DLM5054, DLM5058

Mixed Signal Oscilloscope

USER'S MANUAL

YOKOGAWA
Yokogawa Test & Measurement Corporation

IM DLM5058-02EN
3rd Edition

Thank you for purchasing the DLM5034, DLM5038, DLM5054, or DLM5058 Series Mixed Signal Oscilloscope.
This User's Manual explains how to use the instrument. To ensure correct use, please read this manual thoroughly before operation.
The manuals for this instrument are listed on the next page. Please read all manuals.

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 improvements to the product's performance and functionality. Refer to our website to view our latest manuals.
- 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

- September 2020 1st Edition
- March 2021 2nd Edition
- April 2023 3rd Edition

3rd Edition: April 2023 (YMI)

Manuals

The following manuals, including this one, are provided as manuals for this instrument. Please read all manuals.

Manual Title	Manual No.	Description
DLM5034, DLM5038, DLM5054, DLM5058 Mixed Signal Oscilloscope Features Guide	IM DLM5058-01EN	The included CD contains PDF data. This manual explains all the instrument's features other than the communication interface features.
DLM5034, DLM5038, DLM5054, DLM5058 Mixed Signal Oscilloscope User's Manual	IM DLM5058-02EN	This document. The included CD contains PDF data. The manual explains how to operate this instrument.
DLM5034, DLM5038, DLM5054, DLM5058 Mixed Signal Oscilloscope Getting Started Guide	IM DLM5058-03EN	Provided as a printed manual. This guide explains the handling precautions, common operations, troubleshooting measures, and specifications of this instrument.
DLM5034, DLM5038, DLM5054, DLM5058 Mixed Signal Oscilloscope Operation Guide	IM DLM5058-04EN	Provided as a printed manual. Explains the basic operations of this instrument. Operations are described in steps from "Preparation" to "Displaying Waveforms," "Measuring Waveforms," and "Saving Screen Captures."
DLM5034, DLM5038, DLM5054, DLM5058 Mixed Signal Oscilloscope Communication Interface User's Manual	IM DLM5058-17EN	The included CD contains PDF data. Explains the functions of the this instrument's communication interface, how to configure it, and the commands used to control this instrument from a PC through the interface.
DLM5034, DLM5038, DLM5054, DLM5058 Mixed Signal Oscilloscope	IM DLM5058-92Z1	Document for China

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

Manuals in the CD

The included CD (manual CD) contains the following English and Japanese manuals.

File Name	Manual No.	Description
Features Guide & Users Manual.pdf	IM DLM5058-01EN IM DLM5058-02EN	Features Guide and User's Manual
Communication Interface.pdf	IM DLM5058-17EN	Communication Interface User's Manual
	—	

To view the PDF data, you need Adobe Acrobat Reader or a software application that can open PDF data.

Online Help

The content similar to the Features Guide, IM DLM5058-01EN, is included in this instrument as a help file (some the content may be omitted). For instructions on how to use the help, see section 3.10 in the Getting Started Guide, IM DLM5058-03EN.

DLM Models and Conventions Used in This Manual

Models Explained

This manual explains the 8-channel model of this instrument. Channel settings vary depending on the model.

Prefixes k and K

Prefixes k and K used before units are distinguished as follows:

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

Displayed Characters

Bold characters in procedural explanations are used to indicate panel keys and soft keys that are used in the procedure and menu items that appear on the screen.

Notes and Cautions

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

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

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

CAUTION Calls attention to actions or conditions that could cause light injury to the user or 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 instrument.

Contents

1.1 Configuring Channels (Analog Signal)

This section explains the following settings for the vertical scale for analog signals:

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

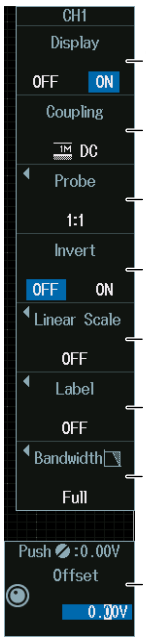
UTILITY menu
- Turning offset cancel on and off

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

CH Menu

1. Press any of the **CH1** to **CH8** keys. The channel key illuminates brightly, and the following menu appears.

- You can also tap the channel information display area ( ) at the top of the screen to select the CH menu.
- You can also tap **MENU** ( ) in the upper left of the screen and select the CH menu from VERTICAL on the top menu.



Turns the waveform display on or off

Input coupling

Probe

Turns waveform display inversion on or off

Linear scaling

Label

Bandwidth limit

Offset

Note

The available channel settings vary depending on the model.
- The available settings on 8ch models are as follows:
  CH1 to CH8
- The available settings on 4ch models are as follows:
  CH1 to CH4

2. If you press a channel key different from step 1, that channel becomes configurable.

Note

- When the waveform display is on, the channel key and the channel information display area illuminate. When the channel key and the channel information display area are turned off, if you press a key or tap the display area, the waveform display is turned on. When the channel key and the channel information display area are illuminated brightly, if you press a key or tap the display area, the waveform display is turned off.
- On the ACQUIRE menu, if you set the record length (Record Length) to the maximum record length, the waveforms of CH2, CH4, CH6, and CH8 cannot be acquired. For details on the ACQUIRE menu, see section 3.1.

Input Coupling (Coupling)

CAUTION

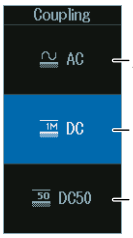
- The maximum input voltage for 1 MΩ input is 300 Vrms or 400 Vpeak when the frequency is 100 kHz or less. Applying a voltage greater than either of these limits may damage the input section. If the frequency is above 100 kHz, damage may occur even when the voltage is below this value.
- The maximum 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 such, even when a high voltage signal is received, the over-range indicator (see “WARNING” provided later) may not be displayed on the instrument’s screen. As necessary, switch the input coupling to DC to check the input signal voltage.
- If you change the input coupling setting while waveform acquisition is stopped, the input coupling on the instrument is actually changed when waveform acquisition is executed the next time. Be careful of the maximum input voltage.

French

ATTENTION

- La tension d'entrée maximum pour une entrée de 1 MΩ est de 300 Vrms ou 400 V crête lorsque la fréquence est inférieure ou égale à 100 kHz. Le fait d'appliquer une tension dépassant l'une de ces limites risque d'endommager la section d'entrée. Si la fréquence est supérieure à 100 kHz, des dommages risquent de survenir même lorsque la tension est inférieure à cette valeur.
- 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 plus atténué aux fréquences plus basses.* Ainsi, même si un signal haute tension est reçu, le voyant de dépassement de plage (voir «AVERTISSEMENT» fourni précédemment) risque de ne pas s'afficher à l'écran de l'instrument. Le cas échéant, basculez le couplage d'entrée sur CC (courant continu) afin de vérifier la tension du signal d'entrée.
- Si vous modifiez le paramètre de couplage d’entrée alors que l’acquisition de forme d’onde est arrêtée, le couplage d’entrée sur l’instrument est en réalité modifié lorsque la prochaine acquisition de forme d’onde est exécutée. Faites attention à la tension d’entrée maximale.

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



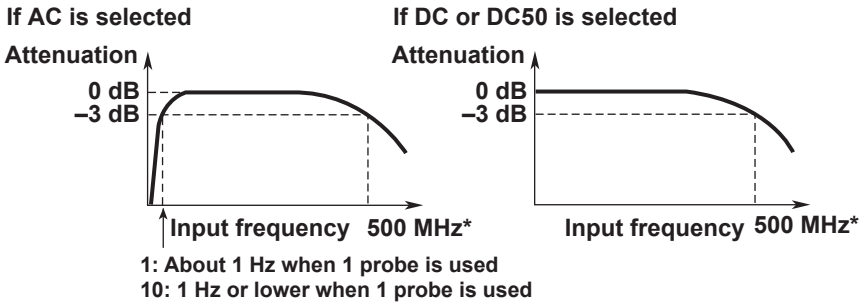
AC
Displays only the AC component of the input signal through 1 MΩ

DC
Displays both the DC and AC components of the input signal through 1 MΩ

DC50
Displays both the DC and AC components of the input signal through 50 Ω

Input Coupling

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

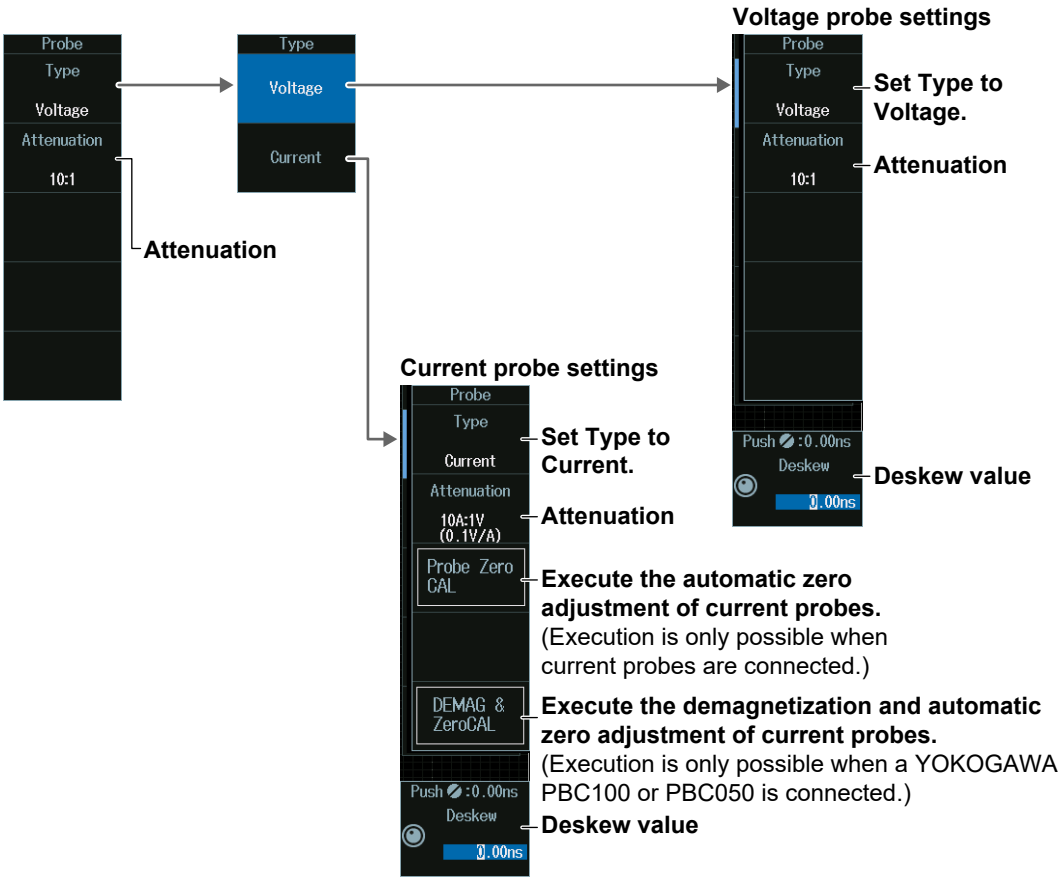


1: About 1 Hz when 1 probe is used
10: 1 Hz or lower when 1 probe is used

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

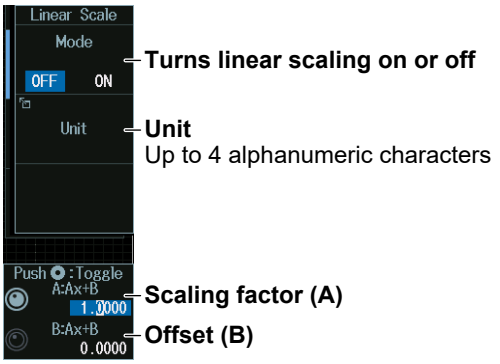
Probe (Probe)

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



Linear Scaling (Linear Scale)

Press the **Linear Scale** soft key to display the following menu.

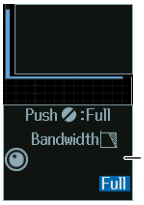


Label Display (Label)

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

Bandwidth Limit (Bandwidth)

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



Bandwidth limit

Offset (Offset)

When the CH menu is displayed, the jog shuttle controls the offset.

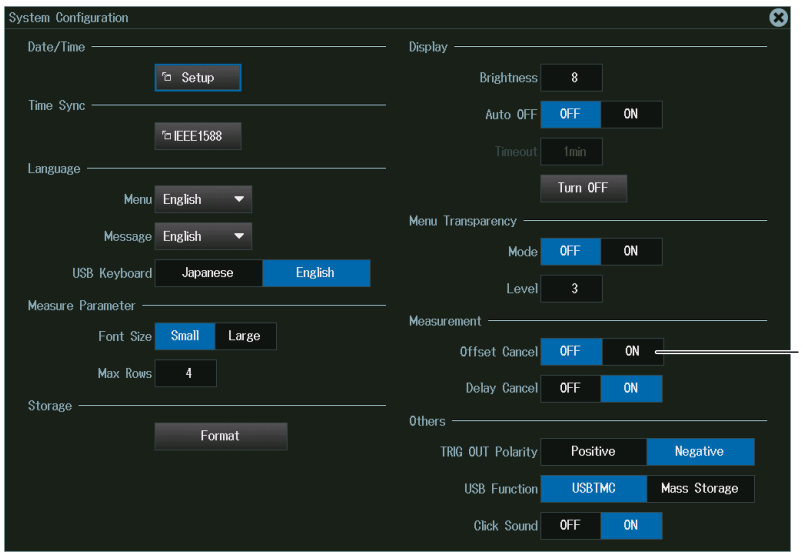
Jog shuttle setting menu

Offset

Offset Cancel (Offset Cancel)

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

You can also tap **MENU** (MENU) in the upper left of the screen and select the UTILITY menu from UTILITY on the top menu.



Turns offset cancel on or off

Note

- The offset setting applies to all input coupling settings (AC, DC, DC50).
- If you change the probe attenuation, the vertical scale settings change the values that have been scaled with the new attenuation ratio.
- The offset value does not change even if you change the vertical scale. However, if the offset value goes outside the selectable range, the offset is set to the maximum or minimum value in the vertical scale range. If you do not change the offset and set the vertical scale back to its original value, the offset returns to its original value.

1.2 Copying Channel Information (Analog Signals)

The analog signal input channel settings entered in section 1.1 can be copied to other channels.

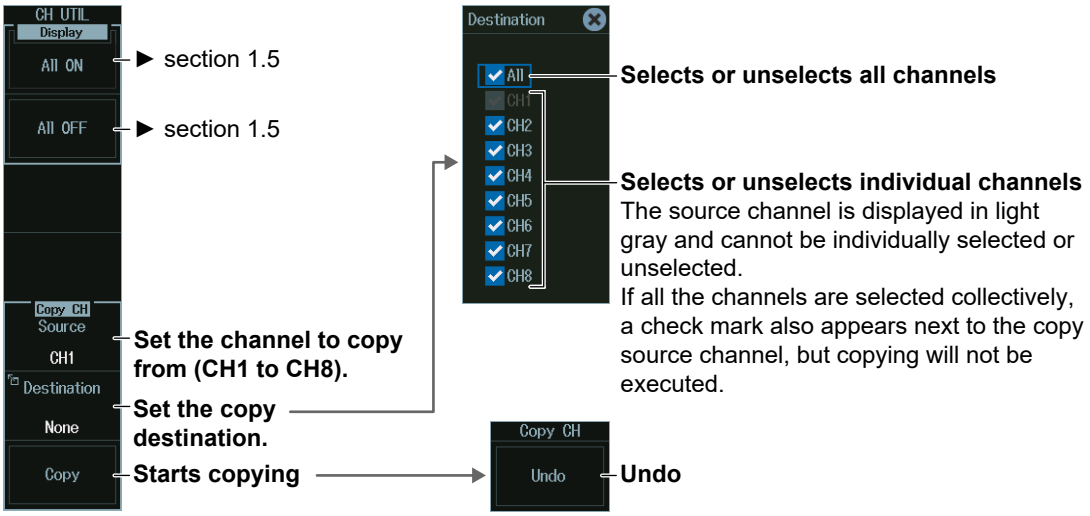
CH UTIL Menu
- Copying channel information

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

CH UTIL Menu

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

You can also tap **MENU** (MENU) in the upper left of the screen and select the CH UTIL menu from VERTICAL on the top menu.



Note

The available channel settings vary depending on the model.
- The available settings on 8ch models are as follows:
  CH1 to CH8
- The available settings on 4ch models are as follows:
  CH1 to CH4

1.3 Setting the Logic (Logic Signal)

This section explains the following settings for the vertical scale for logic signals:

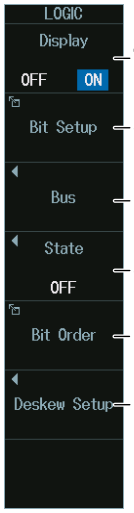
LOGIC menu
- Turning the waveform display on and off
- Bit settings
  Turning the bit display on and off
  Label name, threshold level, and noise rejection
- Bus display
  Turning the bus display on and off
  Bus bit assignment, label name, and format
- Bit and bus display order
- State display
  Turning the state display on and off
  Clock source; clock source polarity, detection level, and hysteresis; and state assignment
- Deskewing

► “Vertical Axis (Logic Signal)” in the Features Guide

LOGIC Menu

Press **LOGIC**. The LOGIC key illuminates brightly, and the following menu appears.

- You can also tap the state information display area ( ) at the top of the screen to select the LOGIC menu.
- You can also tap **MENU** ( ) in the upper left of the screen and select the LOGIC menu from VERTICAL on the top menu.



Turns the waveform display on or off

Set bits.

Bus display

State display

Bit and bus display order

Deskewing

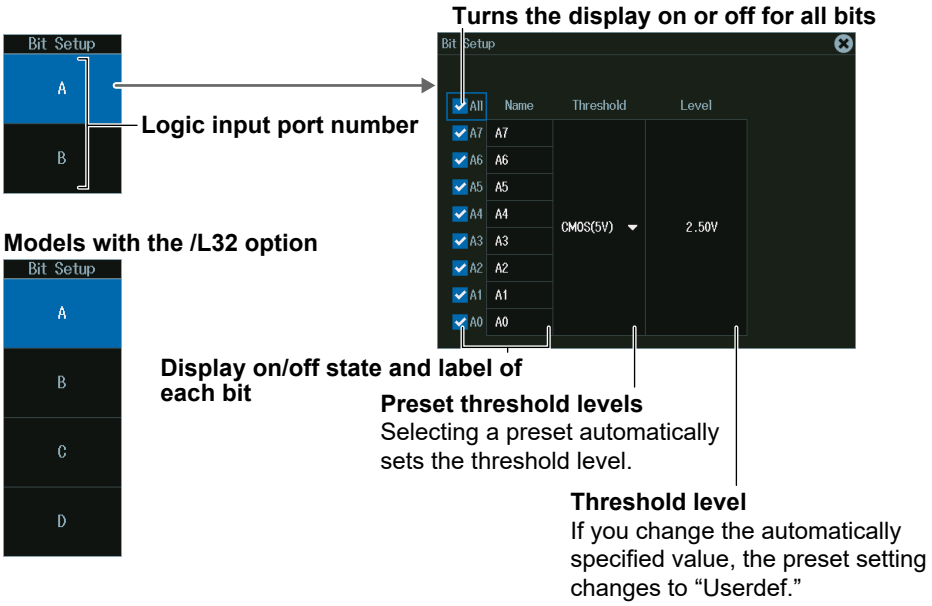
Note

On the ACQUIRE menu, if you set the record length (Record Length) to the maximum record length, the waveforms of C0 to C7 (LOGIC port C), D0 to D7 (LOGIC port D) cannot be acquired. For details on the ACQUIRE menu, see section 3.1.

Bit Settings (Bit Setup)

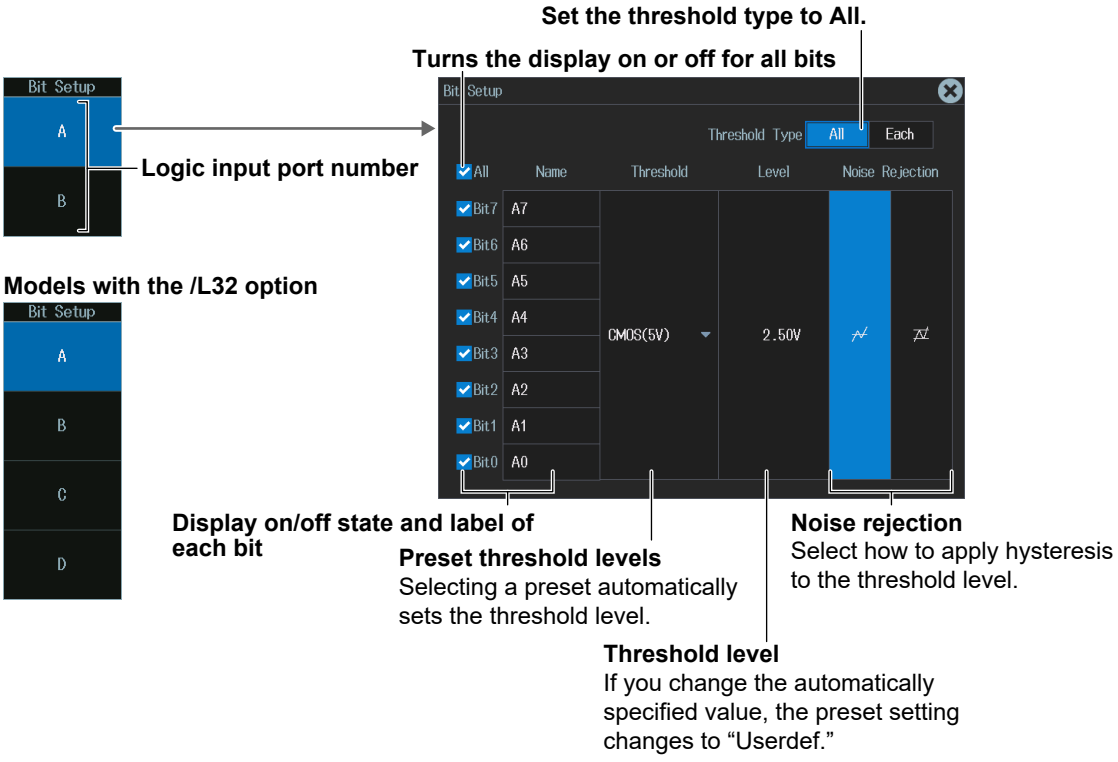
Press the **Bit Setup** soft key to display the following menu.

For Logic Probes Other Than the 701989

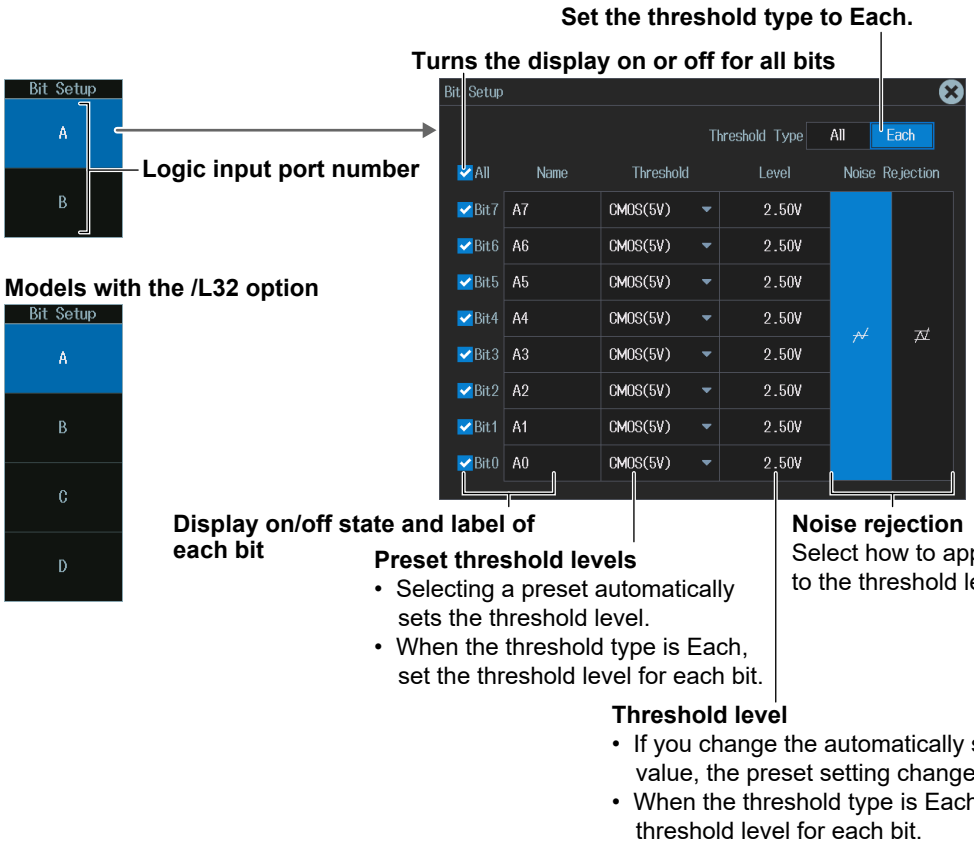


For the 701989 Logic Probe

- **When the Threshold Type is All**



- **When the Threshold Type is Each**

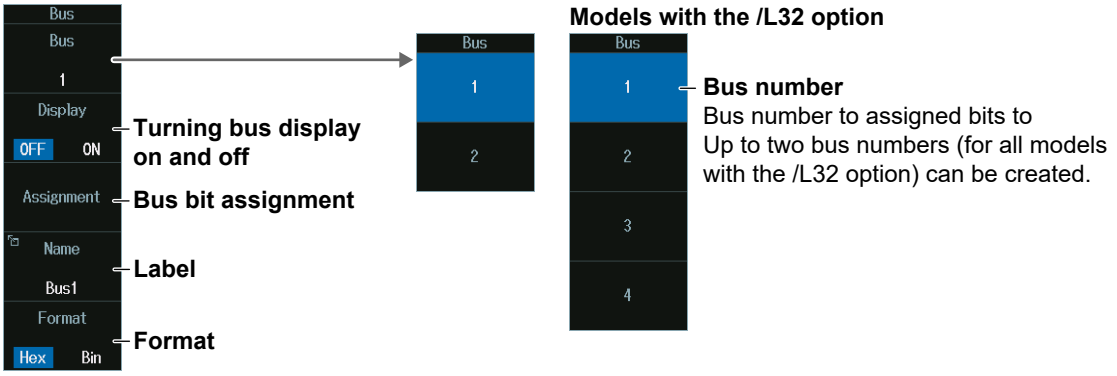


Note

- For logic probes other than the 701989, the threshold type is All. The setup menu is not displayed.
- Level and Noise Rejection in the bit settings (Bit Setup) are synchronized to those for when the trigger source is set to Logic.
  Noise Rejection can be set when the logic probe is 701989.

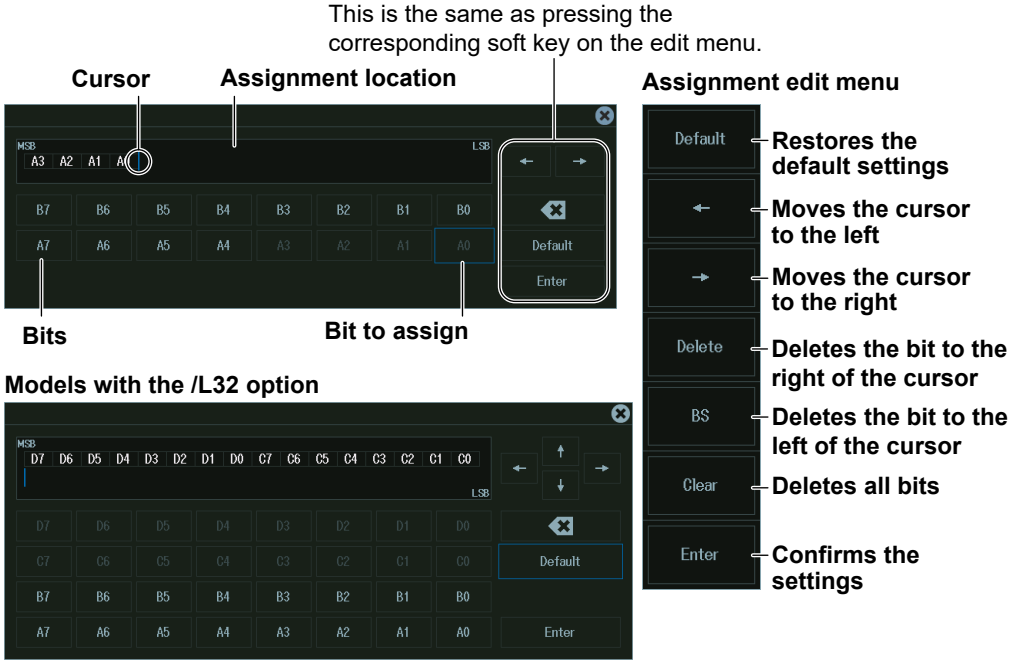
Bus Display (Bus)

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



Bus Bit Assignments

1. Press the **Assignment** soft key to display the assignment destination edit screen.
2. Press the cursor movement soft keys on the edit menu to move the cursor to the right of the position to assign the bit.
3. Turn the jog shuttle, or move the **SET** key up, down, left, or right to select the bit to assign from the bit group.
4. Press the SET key to assign the selected bit to the left of the cursor position.
5. Press the **ENTER** soft key to confirm the setting.

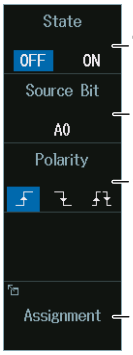


Note

If you need to change the bit assignments (arrangement) when all bits are assigned to the assignment destination, delete a portion of the bits first, and then edit the bit assignments (arrangement).

State Display (State)

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



Turns state display on or off

Clock source bit
Select the logic bit.

Clock source polarity (Polarity)

State assignment

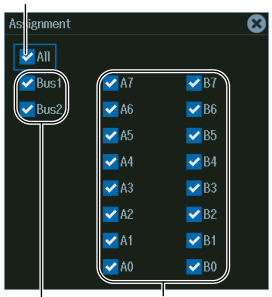
Note

The following clock source bit display applies to models with the /L32 option.
C0 to C7 (LOGIC port C), D0 to D7 (LOGIC port D)

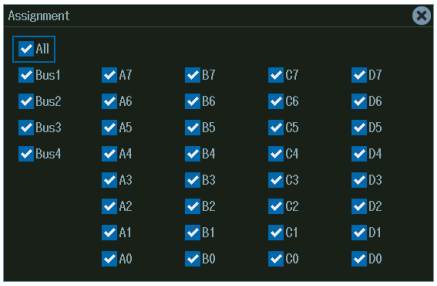
State Assignment

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

Turns the display on or off for all bits and the bus



Models with the /L32 option



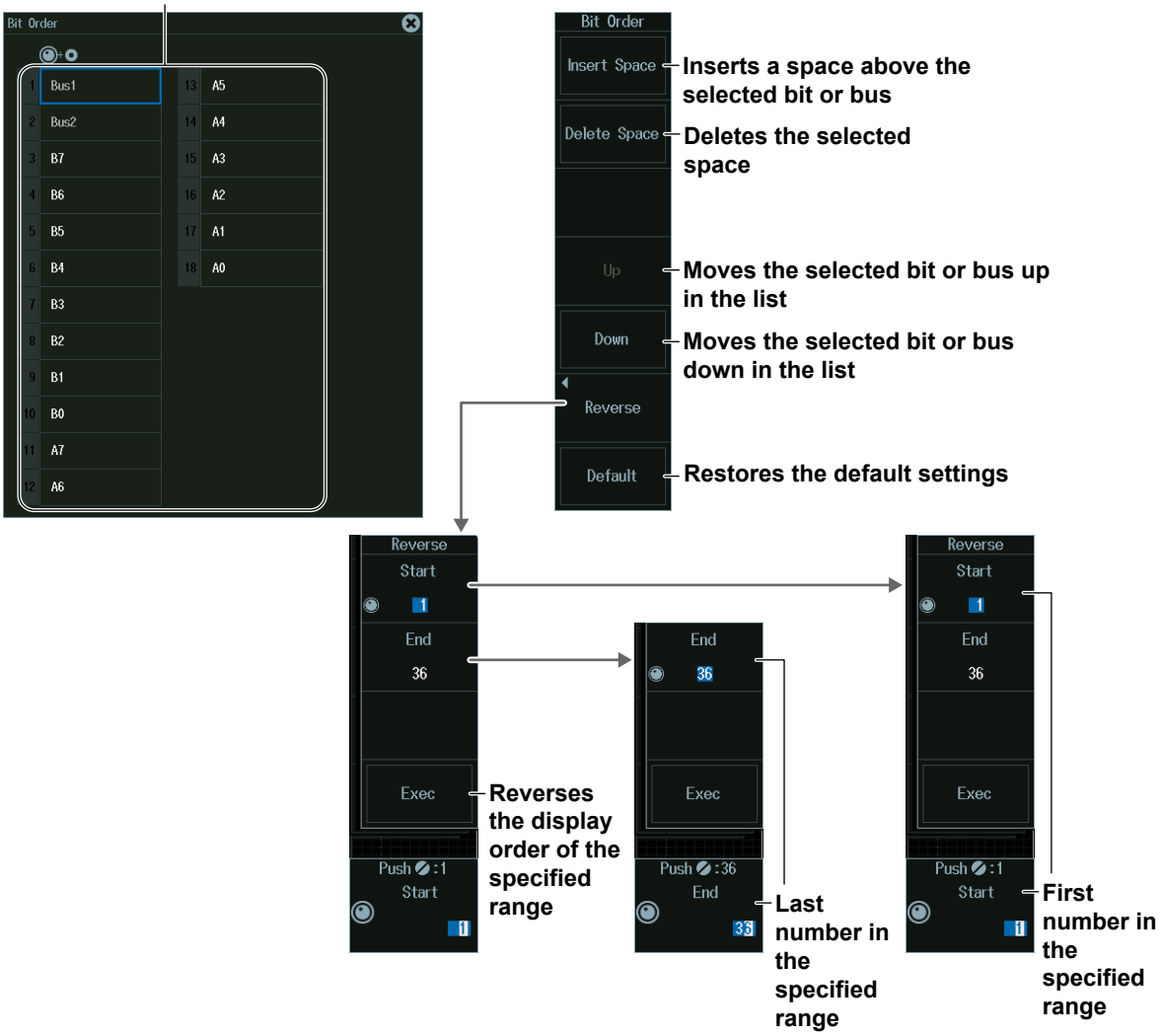
Turns each each bit on or off

Turns each bus display on or off

Display Order of Bits and the Buses (Bit Order)

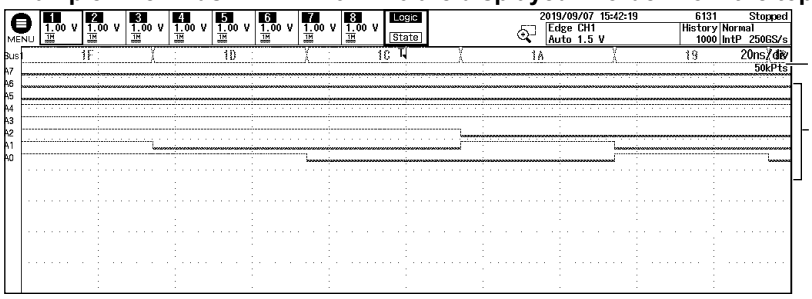
Press the **Bit Order** soft key to display the following menu.

Select a bit or the bus, and edit the display order.

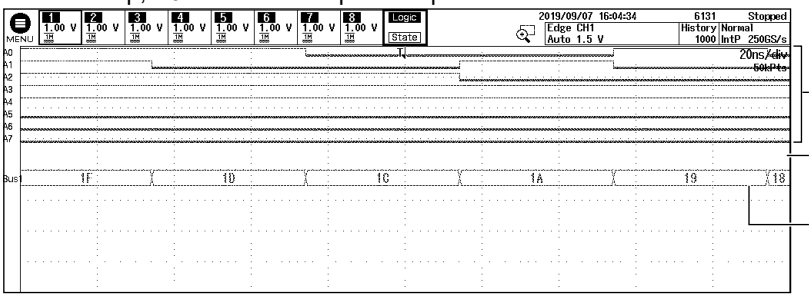


Bit and Bus Display Order

Example when Bus1→A7→A6 ... A0 are displayed in order from the top

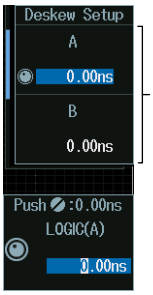


Example when the display order is reversed and a space is inserted
From the top, A0→A1 ... A7→Space→Space→Bus1



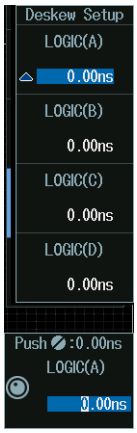
Deskewing (Deskew)

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



Select the logic port to deskew.

Models with the /L32 option



2. Press the soft key corresponding to the logic port you want to deskew.

3. Turn the jog shuttle to set the time offset adjustment (skew).

- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
- Deskewing is performed on all eight bits collectively.

Jog shuttle setting menu

Deskewing

1.4 Setting the Vertical Axis (Analog and Logic Signals)

This section explains the following settings for the vertical scale:

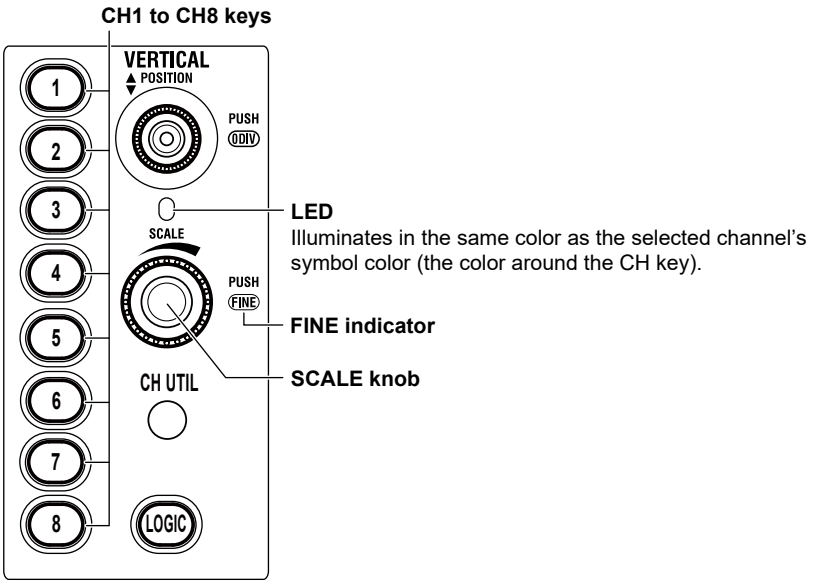
SCALE knob
- Vertical scale (analog signal)
- Display size (logic signal)

▲▼ POSITION knob
- Vertical position (analog and logic signals)

► **"Display Range (SCALE knob)," "Vertical Scale (SCALE knob)," "Vertical Position (POSITION knob)" in the Features Guide**

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.
   - You can also tap the channel information or state display area ( ) at the top of the screen to select the channel.
   - The LED between the **SCALE** and ▲▼ **POSITION** knobs illuminates in the symbol color of the selected channel.
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.



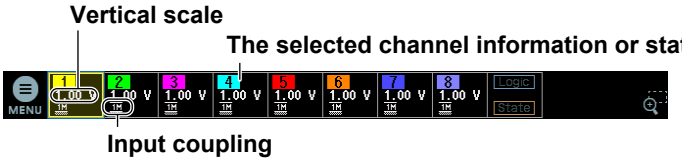
Note

The number of channel keys varies depending on the model.
- The channel keys on 8ch models are as follows:
  CH1 to CH8
- The channel keys on 4ch models are as follows:
  CH1 to CH4

Preview

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

Vertical Scale

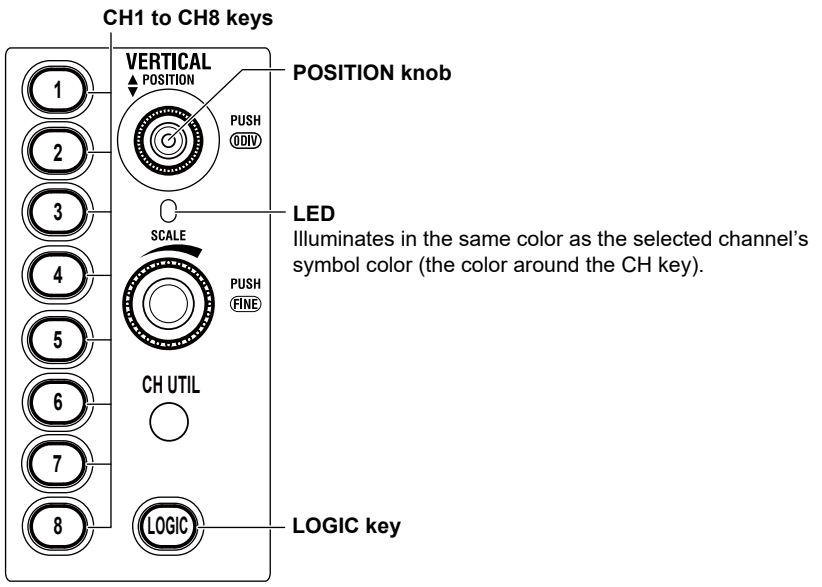


Display Range (SCALE knob)

1. Press the **LOGIC** key to make the SCALE knob control the LOGIC setting.
   - The LOGIC key illuminates brightly.
   - The LED between the SCALE and ▲▼ POSITION knobs illuminates in the same color as the LOGIC symbol color.
2. Turn the **SCALE** knob to set the display size.

Vertical Position (POSITION knob)

1. Press a key from **CH1** to **CH8** or **LOGIC** to select the channel that you want to set the vertical waveform position for.
   - You can also tap the channel information or state display area (or) at the top of the screen to select what the POSITION knob controls.
   - The LED between the **SCALE** and ▲▼ **POSITION** knobs illuminates in the symbol color of the selected channel.
2. Turn the ▲▼ **POSITION** knob to set the vertical position.
   If the POSITION knob is controlling a channel from CH1 to CH8, pressing POSITION will set the vertical position to 0 div.



Note

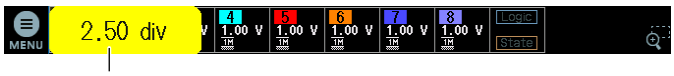
The number of channel keys varies depending on the model.

- The channel keys on 8ch models are as follows:
  CH1 to CH8
- The channel keys on 4ch models are as follows:
  CH1 to CH4

Preview

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

Vertical Channel Position (Position)



While you control the knob, the vertical waveform position value is displayed in the corresponding channel information display area. Displayed with the same background color as the symbol color of the selected channel (example of CH1) The display disappears after a few seconds when you stop controlling the knob.

Indicates that the input waveform is outside the effective data range (within ±5 div of the Main window center) This also appears when the input waveform moves outside the range as a result of changing the vertical scale.

1.5 All ON/All OFF

You can collectively show or hide all the analog signal input channel waveforms.

CH UTIL Menu
- All ON/All OFF

► “All ON/All OFF (Display)” in the Features Guide

CH UTIL Menu

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

You can also tap **MENU** (MENU) in the upper left of the screen and select the CH UTIL menu from VERTICAL on the top menu.

All ON
Shows all channels collectively

All OFF
Hides all channels collectively

Note

Logic signals cannot be collectively shown or hidden.

1.6 Setting the Horizontal Scale (Time Scale)

This section explains the following settings for the horizontal scale (time scale):

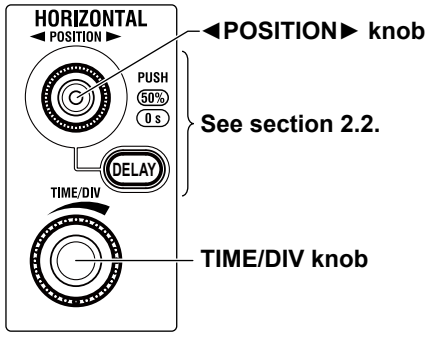
TIME/DIV Knob
- Horizontal scale (time scale) sensitivity

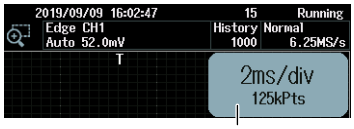
◄POSITION► knob
See section 2.2.

► "Time Scale (TIME/DIV knob)" in the Features Guide

Horizontal Scale (Time Scale) Sensitivity (TIME/DIV knob)

Turn the **TIME/DIV** knob to set the horizontal scale sensitivity.





While you control the knob, the time scale value and display record length are displayed in the upper right of the screen. The display disappears after a few seconds when you stop controlling the knob.

◄POSITION► Knob

Turn the ◄ POSITION ► knob to move the waveforms displayed on the screen horizontally. The trigger position moves along with the waveform.
You can set the trigger position to 50% by pressing the knob.
When waveform acquisition (RUN/STOP) is running, you can turn the ◄ POSITION ► knob to move the waveforms horizontally the waveform display is being updated. For details on the trigger position, see section 2.2.

2.1 Setting the Trigger Mode and Trigger Hold-off Time

This section explains the following settings for updating the displayed waveform:

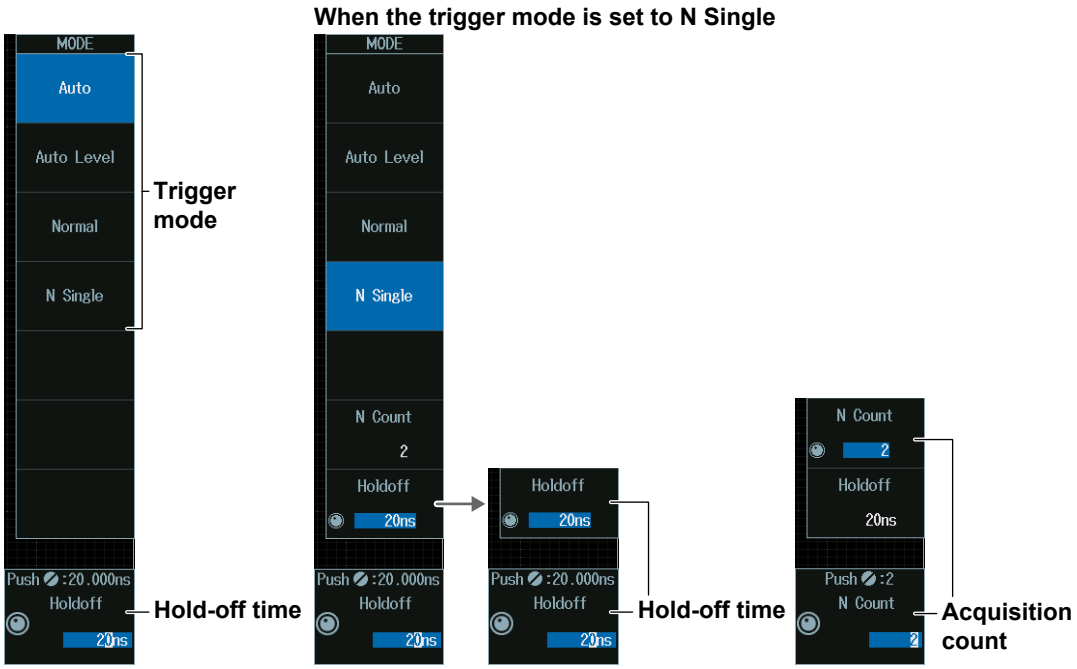
- Trigger mode, acquisition count
- Hold-off time

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

MODE Menu

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

You can also tap **MENU** (MENU) in the upper left of the screen and select the MODE menu from TRIGGER on the top menu that is displayed.



Trigger Mode

Auto	If the trigger conditions are met within a timeout period,[1] the instrument updates the displayed waveforms on each trigger occurrence. If not, this instrument automatically updates the displayed waveforms. If the time axis is set to a value that would cause the display to switch to roll mode, roll mode display will be enabled.[2]
Auto Level	If a trigger occurs before a timeout,[1] the instrument updates the waveform in the same way that it does in Auto mode. If a trigger does not occur before a timeout, the instrument automatically changes the trigger level to the center value of the trigger source amplitude, triggers on that value, and updates the displayed waveform. If the time axis is set to a value that would cause the display to switch to roll mode, roll mode display will be enabled.[2]
Normal	The instrument updates the waveform display only when the trigger conditions are met.
N Single	The instrument acquires signals each time the trigger conditions are met until a specified number of signals have been acquired, stops acquisition, and displays all of the acquired signals.

1 The timeout period is 100 ms or the time corresponding to 10 divisions on the time axis, whichever is longer.
2 Waveforms are displayed so that they flow from the right of the screen to the left.

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 instrument 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.

Acquisition Count (N Count)

1. Press the **N Count** soft key.
2. Turn the **jog shuttle** to set the acquisition count.
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

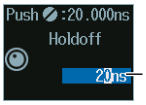
Jog shuttle setting menu

The number of waveforms to acquire

Hold-off Time (Holdoff)

1. Press the **Holdoff** soft key.
2. Turn the **jog shuttle** to set the hold-off time.
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu



Hold-off time

2.2 Setting the Trigger Position and Trigger Delay

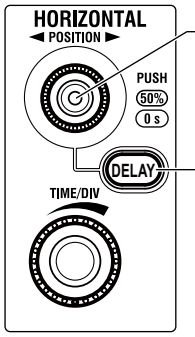
This section explains the following settings for updating the displayed waveform:

- Trigger position
- Trigger delay
- Turning delay cancel on and off

► “Trigger Position (POSITION Knob),” “Trigger Delay (DELAY),” “Delay Cancel (Delay Cancel),” in the Features Guide

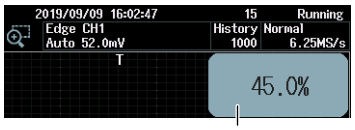
Trigger Position (◄POSITION► knob)

1. Turn the ◄**POSITION**► knob to set the trigger position.
   The specified trigger position is shown at the top of the screen while you control the knob. The display disappears after a few seconds when you stop controlling the knob.



◄POSITION► knob
Press the knob to initialize the trigger position value or trigger delay value.

Trigger delay



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

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 screen while you control the knob. The display disappears after a few seconds when you stop controlling the knob.

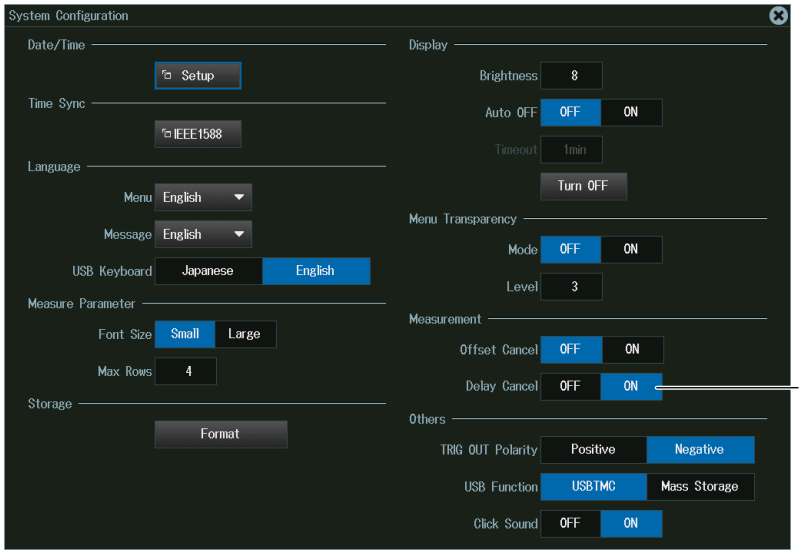
You can set the trigger delay even when waveforms are not being acquired.

3. Press the **DELAY** key again. The DELAY key turns off, and you can set the trigger position.

Delay Cancel (Delay Cancel)

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

You can also tap **MENU** (MENU) in the upper left of the screen and select the UTILITY menu from UTILITY on the top menu.



Note

The delay value is retained even if you change the horizontal scale sensitivity by turning the TIME/DIV knob.

Trigger Delay Cancel

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

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

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

2.3 Triggering on an Edge Trigger

This section explains the following settings for triggering on trigger source edges:

- Trigger source
  Trigger slope, HF rejection, noise rejection,
  level for detecting trigger source edges, source bit
- Probe attenuation
- Input range

► **"Edge Trigger [EDGE]," "Trigger Source (Source)," "Trigger Slope (Slope/Polarity)," "Trigger Level (Level)," "HF Rejection (HF Rejection)," "Noise Rejection (Noise Rejection)" in the Features Guide**

EDGE Menu

Press **EDGE**. The menu that appears varies depending on the specified trigger source.

You can also tap **MENU** (MENU) in the upper left of the screen and select the EDGE menu from TRIGGER on the top menu that is displayed.

When the Trigger Source Is a Channel from CH1 to CH8

Select the source from CH1 to CH8 when using a signal received through an analog input terminal on the front panel as a trigger source.

Set the trigger source to a channel from1 to CH8.

Trigger slope

HF rejection

Noise rejection

Level for detecting trigger source edges

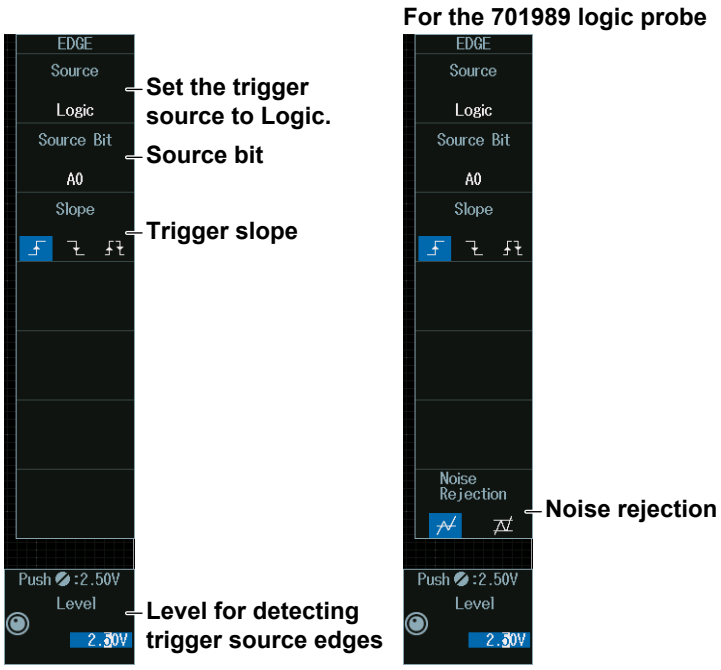
Note

The available trigger source settings vary depending on the model.

- The available settings on 8ch models are as follows:
  CH1 to CH8
- The available settings on 4ch models are as follows:
  CH1 to CH4

When the Trigger Source Is Logic

Set the source to Logic when using a signal received through a LOGIC signal input port on the front panel as a trigger source. If you select LOGIC, you need to set the source bit (A0 to A7, B0 to B7, C0 to C7, or D0 to D7).

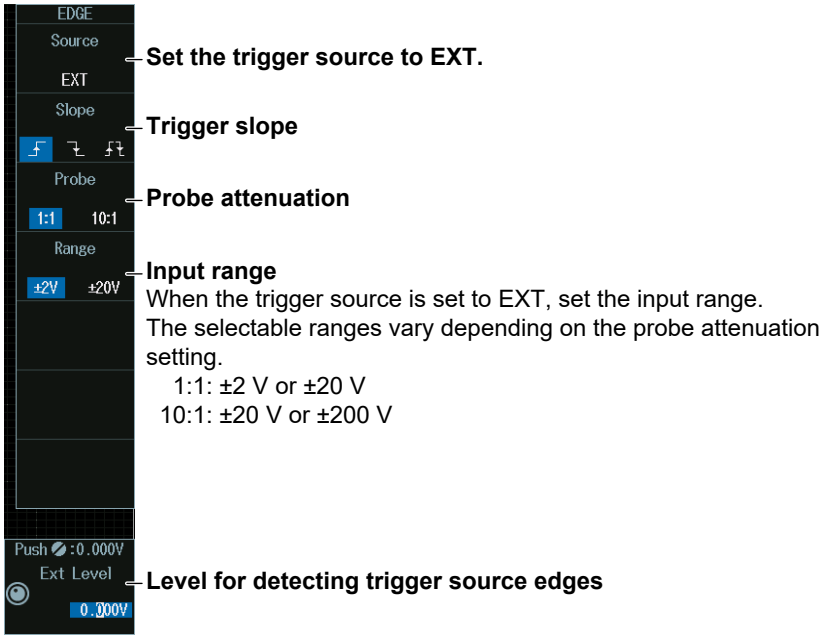


Note

The following source bit display applies to models with the /L32 option.
C0 to C7 (LOGIC port C), D0 to D7 (LOGIC port D)

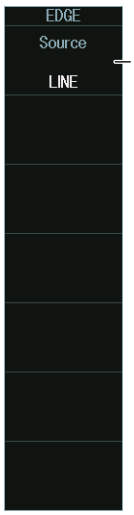
When the Trigger Source Is EXT (External trigger signal)

Set the source to EXT when using an external signal received through the external trigger input terminal (TRIGGER IN) on the rear panel as a trigger source.



When the Trigger Source Is LINE

Set the source to LINE when using the instrument's power source as a trigger source.
The instrument only triggers on the rising edge.



Set the trigger source to LINE.

Level for Detecting Trigger Source Edges (CH Level, Level, Ext Level)

Turn the **jog shuttle** to set the level for detecting trigger source edges.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

When the trigger source is set to CH1 to CH8

Level for detecting trigger source edges

When the trigger source is LOGIC

Level for detecting trigger source edges

Level

The level is displayed in unit of bits or pods depending on the connected logic probe and logic probe settings.

2.4 Triggering on the OR of Multiple Edge Triggers

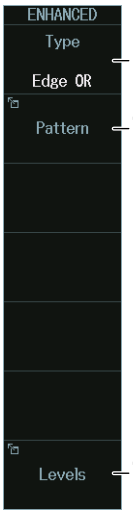
This section explains the following settings for triggering on the logical OR of multiple edge triggers:

- Trigger source pattern
  Trigger source, trigger slope
- Trigger level
  Level for detecting trigger source edges, HF rejection, noise rejection

► “Edge OR Trigger [ENHANCED],” “Noise Rejection (Noise Rejection)” in the Features Guide

ENHANCED Edge OR Menu

1. Press **ENHANCED** to display the ENHANCED menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the ENHANCED menu from TRIGGER on the top menu that is displayed.
2. Press 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.

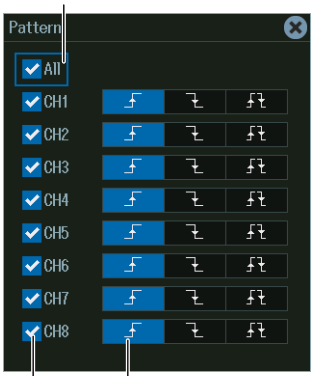
Trigger source pattern

Trigger level

Trigger Source Pattern (Pattern)

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

Selecting this check box selects all the channels.

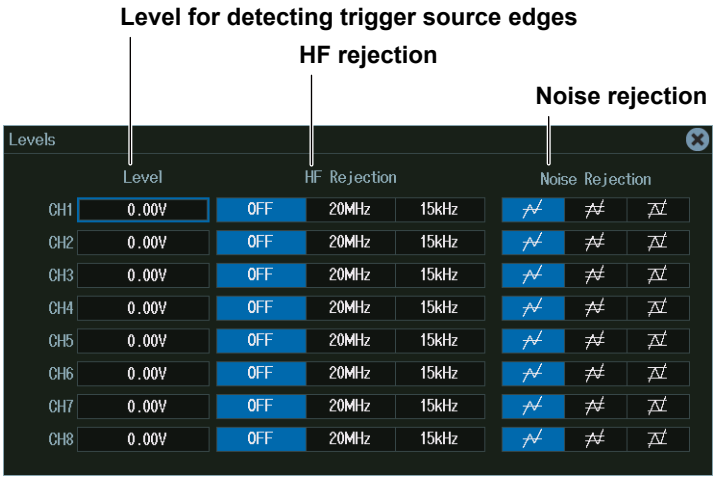


Trigger slope

Select the check boxes of the channels to be used as the trigger sources.

Trigger Levels (Levels)

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



Note

The available channel settings vary depending on the model.

- The available settings on 8ch models are as follows:
  CH1 to CH8
- The available settings on 4ch models are as follows:
  CH1 to CH4

2.5 Triggering on Multiple Input Patterns

This section explains the following settings for triggering on multiple input patterns:

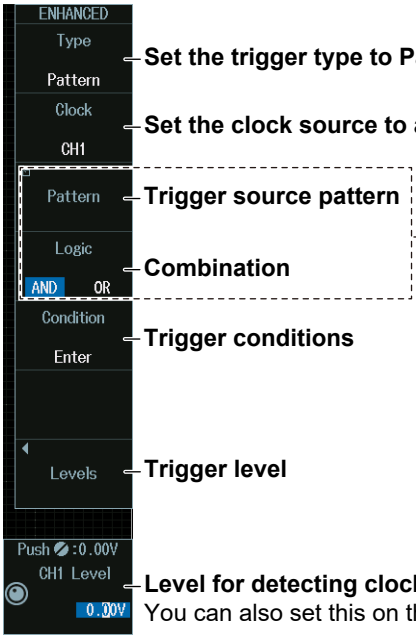
- Clock source
  Source bit
- Comparison condition
  Trigger source pattern, combination
- Trigger conditions
- Time conditions, reference times
- Trigger level
  Level for detecting trigger source edges, HF rejection, noise rejection
- Level for detecting clock source edges

► "Pattern Trigger [ENHANCED]," "HF Rejection (HF Rejection)," "Noise Rejection (Noise Rejection)" in the Features Guide

ENHANCED Pattern Menu

1. Press **ENHANCED** to display the ENHANCED menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the ENHANCED menu from TRIGGER on the top menu that is displayed.
2. Press the **Type** soft key. From the setup menu that appears, select **Pattern** to display the following menu.

When the Clock Source Is a Channel from CH1 to CH8



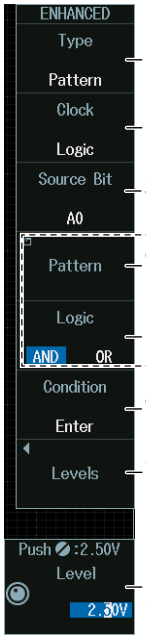
You can also set this on the trigger level (Levels) setup screen.

Note

The available channel settings vary depending on the model.

- The available settings on 8ch models are as follows:
  CH1 to CH8
- The available settings on 4ch models are as follows:
  CH1 to CH4

When the Clock Source Is Logic



Set the trigger type to Pattern.

Set the clock source to Logic.

Source bit

Trigger source pattern

Combination

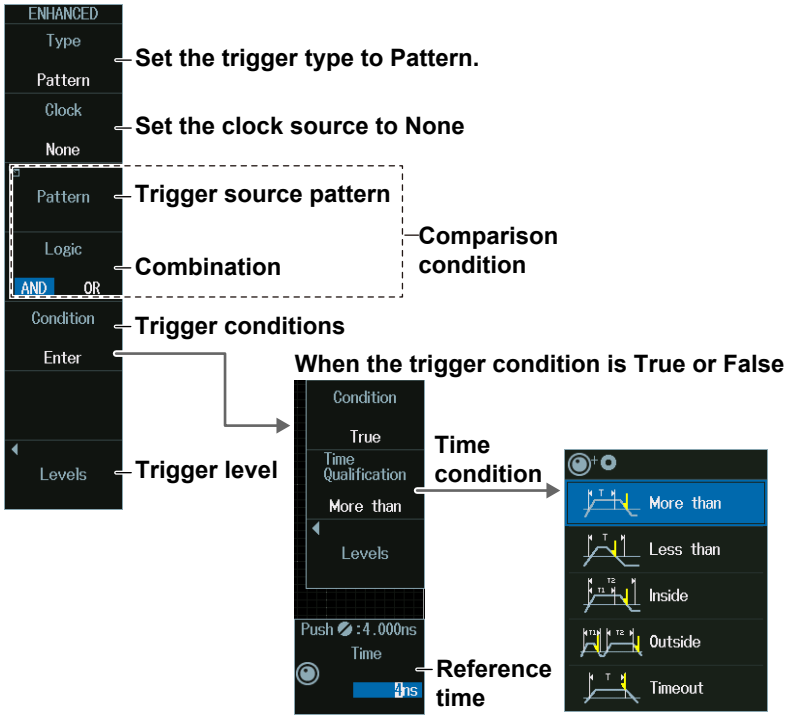
Comparison condition

Trigger conditions

Trigger level

Level for detecting clock source edges
You can also set this on the trigger level (Levels) setup screen.

No Clock Source (None)



Set the trigger type to Pattern.

Set the clock source to None

Trigger source pattern

Combination

Comparison condition

Trigger conditions

Trigger level

When the trigger condition is True or False

Time condition

Reference time

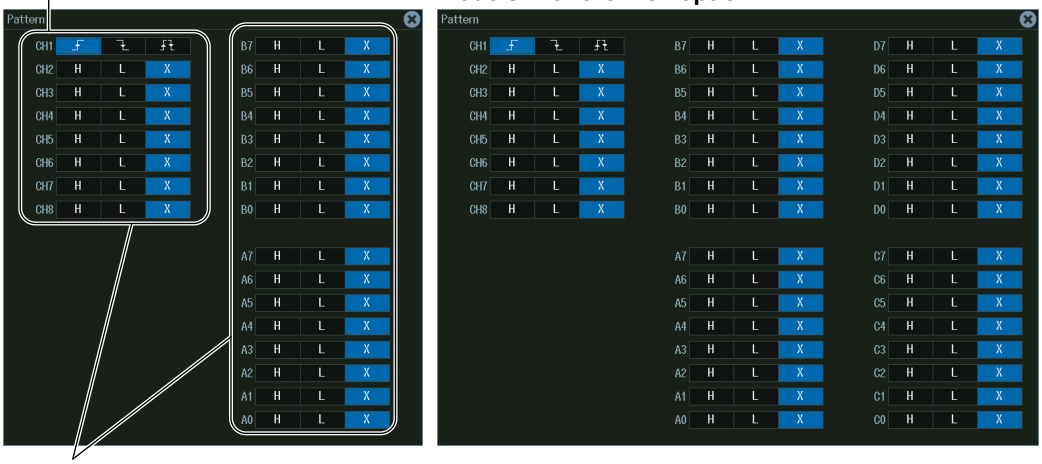
Trigger Source Pattern (Pattern)

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

When the Clock Source Is a Channel from CH1 to CH8 or Logic

Set the slope of the signal set as the clock source

Models with the /L32 option



Set the pattern of the trigger source (signal other than the clock source).

Note

- The available channel settings vary depending on the model.
  - The available settings on 8ch models are as follows:
    CH1 to CH8
  - The available settings on 4ch models are as follows:
    CH1 to CH4
- You cannot set a pattern to a signal that is set as the clock source.
- The following clock source bit display applies to models with the /L32 option.
  C0 to C7 (LOGIC port C), D0 to D7 (LOGIC port D)

No Clock Source

The same menu appears as that shown above for when the clock source is a channel from CH1 to CH8 or Logic.

Set the pattern for all trigger sources (all signals from CH1 to CH8 and Logic).

Trigger Levels (Levels)

When the Trigger Source Is Set to CH1 to CH8

Press the **Levels** soft key and then the **CH** soft key to display the following menu.

Level for detecting trigger source states

HF rejection

Noise rejection

Note

The available channel settings vary depending on the model.

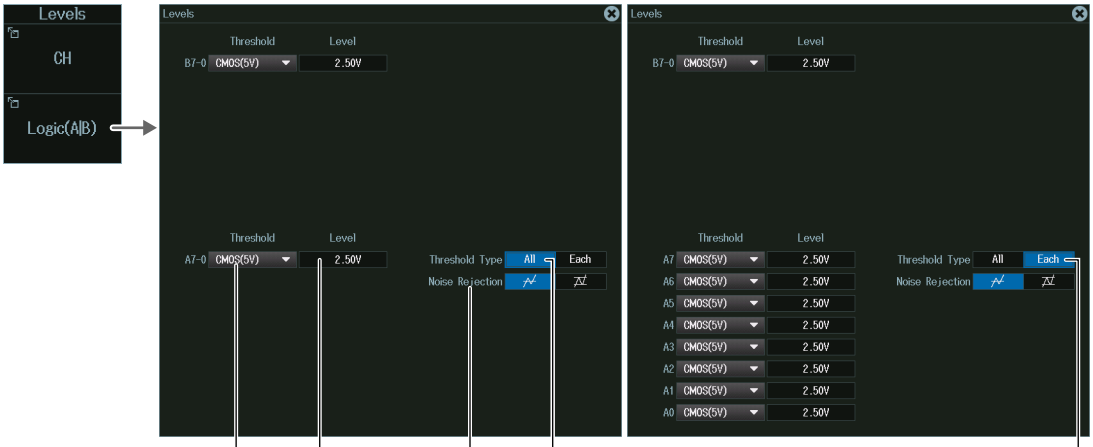
- The available settings on 8ch models are as follows:
  CH1 to CH8
- The available settings on 4ch models are as follows:
  CH1 to CH4

When the Trigger Source Is Logic (Example for LOGIC port A)

Press the **Levels** soft key and then the **Logic(A|B)** soft key to display the following menu.

For the 701989 Logic Probe

• When the Threshold Type is All **• When the Threshold Type is Each**



Set the threshold type to All.

Set the threshold type to Each.

Noise rejection

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

Preset threshold levels
Selecting a preset automatically sets the threshold level.

For Logic Probes Other Than the 701989

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

Preset threshold levels
Selecting a preset automatically sets the threshold level.

Note

The following clock source bit display applies to models with the /L32 option.
C0 to C7 (LOGIC port C), D0 to D7 (LOGIC port D)

Level for Detecting Clock Source Edges (CH Level, Level)

1. Press the **CH Level** or **Level** soft key.
2. Turn the **jog shuttle** to set the level for detecting clock source edges.
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

When the trigger source is set to CH1 to CH8

Level for detecting clock source edges

When the trigger source is LOGIC

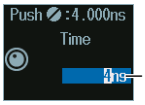
Level for detecting clock source edges

Time Conditions (Time Qualification) and Reference Times (Time, Time1, Time2) (When clock source is none (None) and the trigger condition is True or False)

1. Press the **Time Qualification** soft key to set the time conditions.
2. Turn the **jog shuttle** to set the reference times.
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

When the time condition is More than or Less than



Reference time

When the time condition is Inside

Reference time 1

Reference time 2

Press SET (upper right on the front panel) to switch between reference time 1 and reference time 2.

Satisfaction of Conditions

Set what kind of relationship must be established between Comparison condition achievement time and the specified reference times (Time, Time1, Time2) for the instrument to trigger.

More than	When Comparison condition achievement time is longer than the specified reference time
Less than	When Comparison condition achievement time is shorter than the specified reference time
Inside	When Comparison condition achievement time is longer than reference time Time1 but shorter than reference time Time2.
Outside	When Comparison condition achievement time is shorter than reference time Time1 or longer than reference time Time2.

For details on the trigger points when the time condition is met, see chapter 4, “Trigger” in the Features Guide (IM DLM5058-01EN).

2.6 Triggering on a Pulse Width Trigger

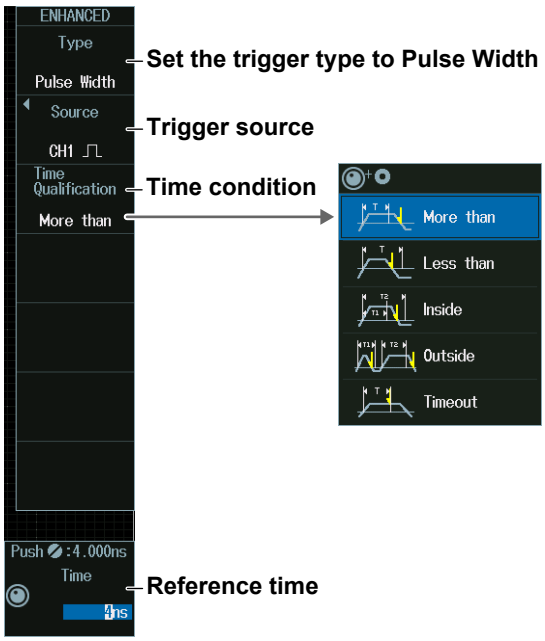
This section explains the following settings for triggering on pulse width:

- Trigger source
  Polarity, HF rejection, noise rejection, source bit,
  level for detecting trigger source edges
- Time conditions, reference times

► “Pulse Width Trigger [ENHANCED],” “HF Rejection (HF Rejection),”
“Noise Rejection (Noise Rejection)” in the Features Guide

ENHANCED Pulse Width Menu

1. Press **ENHANCED** to display the ENHANCED menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the ENHANCED menu from TRIGGER on the top menu that is displayed.
2. Press the **Type** soft key. From the setup menu that appears, select **Pulse Width** to display the following menu.



Trigger Source (Source)

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

When the Trigger Source Is a Channel from CH1 to CH8

Set the trigger source to a channel from1 to CH8.

Trigger source polarity

HF rejection

Noise rejection

Level for detecting trigger source edges

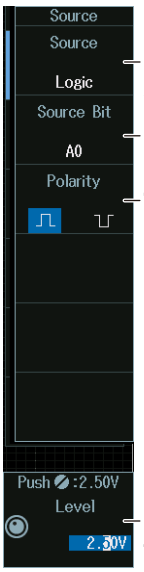
Note

The available channel settings vary depending on the model.

- The available settings on 8ch models are as follows:
  CH1 to CH8
- The available settings on 4ch models are as follows:
  CH1 to CH4

When the Trigger Source Is Logic

For the 701989 logic probe

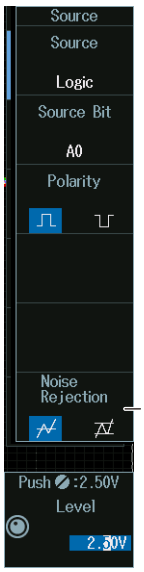


Set the trigger source to Logic.

Source bit

Trigger source polarity

Level for detecting trigger source edges



Noise rejection

Note

The following source bit display applies to models with the /L32 option.
C0 to C7 (LOGIC port C), D0 to D7 (LOGIC port D)

Level for Detecting Trigger Source Edges (CH Level, Level)

Turn the **jog shuttle** to set the level for detecting trigger source edges.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

When the trigger source is set to CH1 to CH8

Level for detecting trigger source edges

When the trigger source is LOGIC

Level for detecting trigger source edges

Level

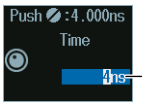
The level is displayed in unit of bits or pods depending on the connected logic probe and logic probe settings.

Time Conditions (Time Qualification) and Reference Times (Time, Time1, Time2)

1. Press the **Time Qualification** soft key to set the time conditions.
2. Turn the **jog shuttle** to set the reference times.
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

When the time condition is More than, Less than, or Timeout



Reference time

When the time condition is Inside

Reference time 1

Reference time 2

Press SET (upper right on the front panel) to switch between reference time 1 and reference time 2.

Satisfaction of Conditions

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

More than	When the pulse width is longer than the specified reference time
Less than	When the pulse width is shorter than the specified reference time
Inside	When the pulse width is longer than Time1 but shorter than Time2
Outside	When the pulse width is shorter than Time1 or longer than Time2
Timeout	When the pulse width reaches the specified reference time

For details on the trigger points when the time condition is met, see chapter 4, "Trigger" in the Features Guide (IM DLM5058-01EN). When Timeout is selected, the instrument triggers when a timeout occurs.

2.7 Triggering on Rise Times and Fall Times

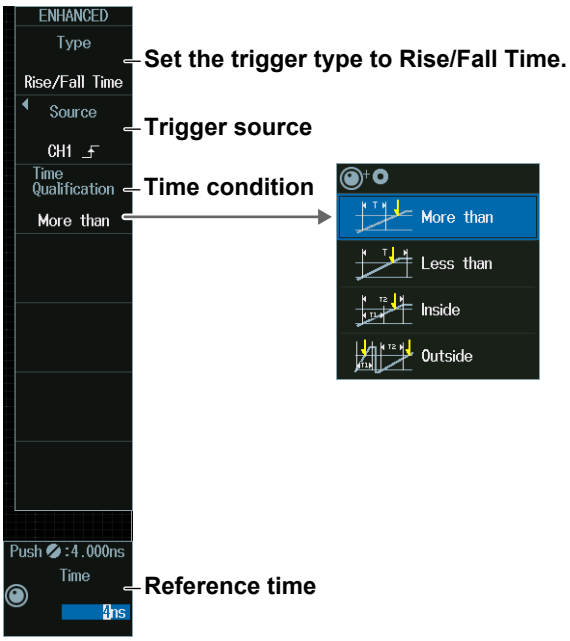
This section explains the following settings for triggering on rise times and fall times:

- Trigger source
  Trigger slope, HF rejection, level for detecting trigger source edges
- Time conditions, reference times

► “Rise/Fall Time Trigger [ENHANCED],” “HF Rejection (HF Rejection)” in the Features Guide

ENHANCED Rise/Fall Time Menu

1. Press **ENHANCED** to display the ENHANCED menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the ENHANCED menu from TRIGGER on the top menu that is displayed.
2. Press the **Type** soft key. From the setup menu that appears, select **Rise/Fall Time** to display the following menu.



Set the trigger type to Rise/Fall Time.

Trigger source

Time condition

Reference time

Trigger Source (Source)

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

Trigger source

Trigger slope

HF rejection

Level for detecting trigger source edges (Upper)

Level for detecting trigger source edges (Lower)

Note

The available trigger source settings vary depending on the model.

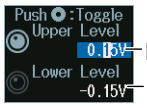
- The available settings on 8ch models are as follows:
  CH1 to CH8
- The available settings on 4ch models are as follows:
  CH1 to CH4

Level for Detecting Trigger Source Edges (Upper Level, Lower Level)

Turn the **jog shuttle** to set the level for detecting trigger source edges.

- Press **SET** (upper right on the front panel) to switch between Upper Level and Lower Level.
- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu



Level for detecting trigger source edges (Upper)

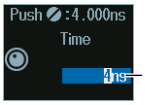
Level for detecting trigger source edges (Lower)

Time Conditions (Time Qualification) and Reference Times (Time, Time1, Time2)

1. Press the **Time Qualification** soft key to set the time conditions.
2. Turn the **jog shuttle** to set the reference times.
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

When the time condition is More than or Less than



Reference time

When the time condition is Inside

Reference time 1

Reference time 2

Press SET (upper right on the front panel) to switch between reference time 1 and reference time 2.

Satisfaction of Conditions

Set what kind of relationship must be established between the trigger source's rise or fall times and the specified reference times (Time, Time1, Time2) for the instrument to trigger.

More than	When the rise time or fall time is longer than the specified reference time
Less than	When the rise time or fall time is shorter than the specified reference time
Inside	When the rise time or fall time is longer than reference time Time1 but shorter than reference time Time2.
Outside	When the rise time or fall time is shorter than reference time Time1 or longer than reference time Time2.

For details on the trigger points when the time condition is met, see chapter 4, "Trigger" in the Features Guide (IM DLM5058-01EN).

2.8 Triggering on Runt Signals

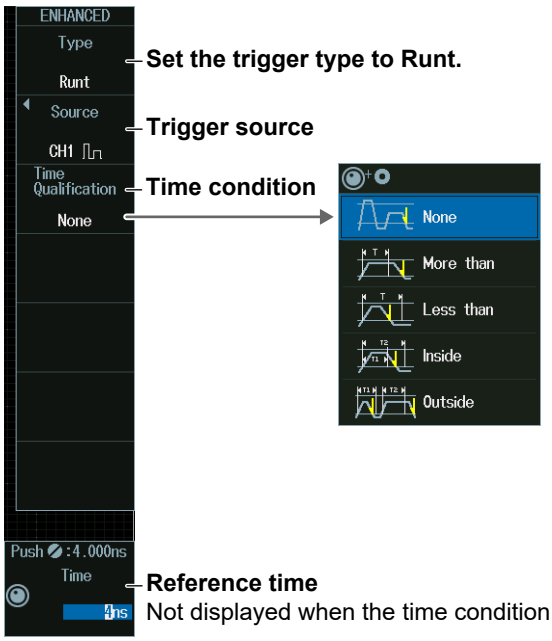
This section explains the following settings for triggering on runt signals:

- Trigger source
  Trigger source polarity, HF rejection, noise rejection,
  level for detecting trigger source edges
- Time conditions, reference times

► **"Runt Trigger [ENHANCED]," "HF Rejection (HF Rejection)," "Noise Rejection (Noise Rejection)" in the Features Guide**

ENHANCED Runt Menu

1. Press **ENHANCED** to display the ENHANCED menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the ENHANCED menu from TRIGGER on the top menu that is displayed.
2. Press the **Type** soft key. From the setup menu that appears, select **Runt** to display the following menu.



Set the trigger type to Runt.

Trigger source

Time condition

Reference time
Not displayed when the time condition is set to None

Trigger Source (Source)

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

Trigger source

Trigger source polarity

HF rejection

Noise rejection

Level for detecting trigger source edges (Upper)

Level for detecting trigger source edges (Lower)

Note

The available trigger source settings vary depending on the model.

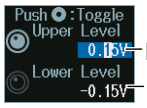
- The available settings on 8ch models are as follows:
  CH1 to CH8
- The available settings on 4ch models are as follows:
  CH1 to CH4

Level for Detecting Trigger Source Edges (Upper Level, Lower Level)

Turn the **jog shuttle** to set the level for detecting trigger source edges.

- Press **SET** (upper right on the front panel) to switch between Upper Level and Lower Level.
- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu



Level for detecting trigger source edges (Upper)

Level for detecting trigger source edges (Lower)

Time Conditions (Time Qualification) and Reference Times (Time, Time1, Time2)

1. Press the **Time Qualification** soft key to set the time conditions.
2. Turn the **jog shuttle** to set the reference times.
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

When the time condition is More than or Less

Reference time

When the time condition is Inside

Reference time 1

Reference time 2

Press SET (upper right on the front panel) to switch between reference time 1 and reference time 2.

Satisfaction of Conditions

Set what kind of relationship must be established between the runt signal's pulse width and the specified reference times (Time, Time1, Time2) for the instrument to trigger.

None	Without a time condition
More than	When the runt signal's pulse width is longer than the specified reference time
Less than	When the runt signal's pulse width is shorter than the specified reference time
Inside	When the runt signal's pulse width is longer than Time1 but shorter than Time2
Outside	When the runt signal's pulse width is shorter than Time1 or longer than Time2

For details on the trigger points when the time condition is met, see chapter 4, "Trigger" in the Features Guide (IM DLM5058-01EN).

2.9 Triggering on a Timeout Period

This section explains the following settings for triggering on a timeout period:

- Trigger source
  Trigger source polarity, HF rejection, noise rejection, and source bit
  Level used to detect trigger source edges
- Timeout Period

► “Timeout Trigger [ENHANCED],” “HF Rejection (HF Rejection),” “Noise Rejection (Noise Rejection)” in the Features Guide

ENHANCED Timeout Menu

1. Press **ENHANCED** to display the ENHANCED menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the ENHANCED menu from TRIGGER on the top menu that is displayed.
2. Press the **Type** soft key. From the setup menu that appears, select **Timeout** to display the following menu.

Set the trigger type to Timeout.

Trigger source

Timeout period

Trigger Source (Source)

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

When the Trigger Source Is a Channel from CH1 to CH8

Set the trigger source to a channel from1 to CH8.

Trigger source polarity

HF rejection

Noise rejection

Level for detecting trigger source edges

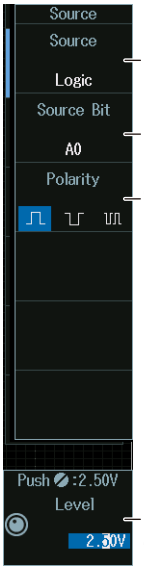
Note

The available trigger source settings vary depending on the model.

- The available settings on 8ch models are as follows:
  CH1 to CH8
- The available settings on 4ch models are as follows:
  CH1 to CH4

When the Trigger Source Is Logic

For the 701989 logic probe

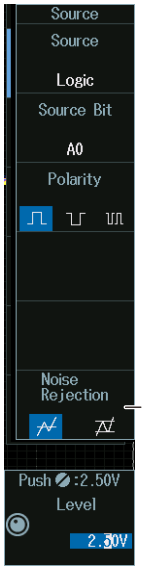


Set the trigger source to Logic.

Source bit

Trigger source polarity

Level for detecting trigger source edges



Noise rejection

Note

The following source bit display applies to models with the /L32 option.
C0 to C7 (LOGIC port C), D0 to D7 (LOGIC port D)

Level for Detecting Trigger Source Edges (CH Level, Level)

Turn the **jog shuttle** to set the level for detecting trigger source edges.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

When the trigger source is set to CH1 to CH8

Level for detecting trigger source edges

When the trigger source is LOGIC

Level for detecting trigger source edges

Level

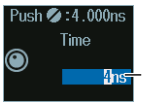
The level is displayed in unit of bits or pods depending on the connected logic probe and logic probe settings.

Timeout Period (Time)

Turn the **jog shuttle** to set the timeout period.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu



Timeout period

2.10 Triggering on a Window Trigger

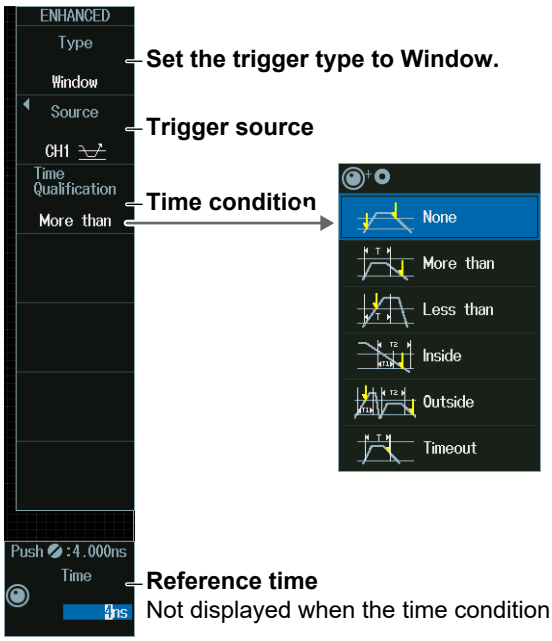
This section explains the following settings for triggering on a window (level range):

- Trigger source
  Trigger source polarity, HF rejection, noise rejection,
  and level range window
- Time conditions, reference times

► “Window Trigger [ENHANCED],” “HF Rejection (HF Rejection),”
“Noise Rejection (Noise Rejection)” in the Features Guide

ENHANCED Window Menu

1. Press **ENHANCED** to display the ENHANCED menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the ENHANCED menu from TRIGGER on the top menu that is displayed.
2. Press the **Type** soft key. From the setup menu that appears, select **Window** to display the following menu.



Set the trigger type to Window.

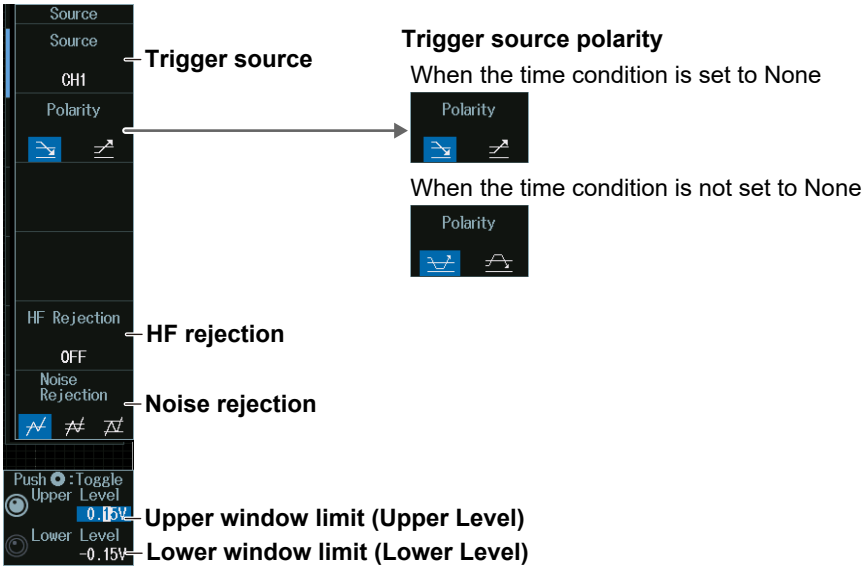
Trigger source

Time condition

Reference time
Not displayed when the time condition is set to None

Trigger Source (Source)

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



Note

The available trigger source settings vary depending on the model.

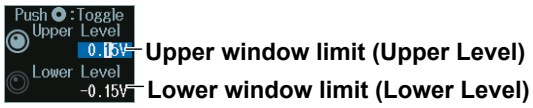
- The available settings on 8ch models are as follows:
  CH1 to CH8
- The available settings on 4ch models are as follows:
  CH1 to CH4

Upper and Lower Window Limits (Upper Level, Lower Level)

Turn the **jog shuttle** to set the level range window.

- Press **SET** (upper right on the front panel) to switch between Upper Level and Lower Level.
- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

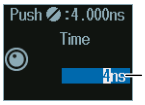


Time Conditions (Time Qualification) and Reference Times (Time, Time1, Time2)

1. Press the **Time Qualification** soft key to set the time conditions.
2. Turn the **jog shuttle** to set the reference times.
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

When the time condition is More than, Less than, or Timeout



Reference time

When the time condition is Inside

Reference time 1

Reference time 2

Press SET (upper right on the front panel) to switch between reference time 1 and reference time 2.

Satisfaction of Conditions

Set what kind of relationship must be established between the time that the waveform stays inside or outside the window and the specified reference times (Time, Time1, Time2) for the instrument to trigger.

None	Without a time condition (when the waveform enters or leaves the window)
More than	When the time that the waveform stays inside or outside the window is longer than the specified reference time
Less than	When the time that the waveform stays inside or outside the window is shorter than the specified reference time
Inside	When the time that the waveform stays inside or outside the window is longer than reference time Time1 but shorter than reference time Time2.
Outside	When the time that the waveform stays inside or outside the window is shorter than reference time Time1 or longer than reference time Time2.
Timeout	When the time that the waveform stays inside or outside the window reaches the specified reference time

For details on the trigger points when the time condition is met, see chapter 4, “Trigger” in the Features Guide (IM DLM5058-01EN). When Timeout is selected, the instrument triggers when a timeout occurs.

2.11 Triggering on the OR of Multiple Window Triggers

This section explains the following settings for triggering on the logical OR of multiple window triggers (without a time condition):

- Trigger source pattern
  Trigger source, trigger source polarity
- Trigger level
  Level range window, HF rejection, noise rejection

► **"Window OR Trigger [ENHANCED]," " HF Rejection (HF Rejection)," "Noise Rejection (Noise Rejection)" in the Features Guide**

ENHANCED Window OR Menu

1. Press **ENHANCED** to display the ENHANCED menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the ENHANCED menu from TRIGGER on the top menu that is displayed.
2. Press the **Type** soft key. From the setup menu that appears, select **Window OR** to display the following menu.

Set the trigger type to Window OR.

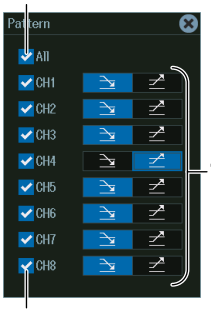
Trigger source pattern

Trigger level

Trigger Source Pattern (Pattern)

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

Selecting this check box selects all the channels.

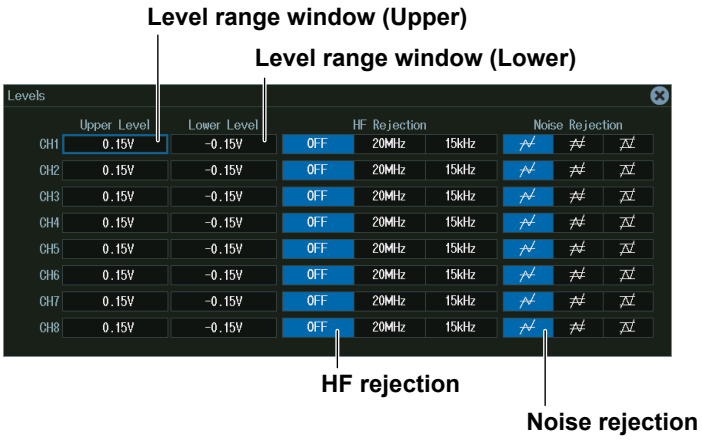


Trigger source polarity

Select the check boxes of the channels to be used as the trigger sources.

Trigger Levels (Levels)

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



Note

The available trigger source, pattern, and trigger level settings vary depending on the model.

- The available settings on 8ch models are as follows:
  CH1 to CH8
- The available settings on 4ch models are as follows:
  CH1 to CH4

2.12 Triggering on Edge Intervals

This section explains the following settings for triggering on edge intervals:

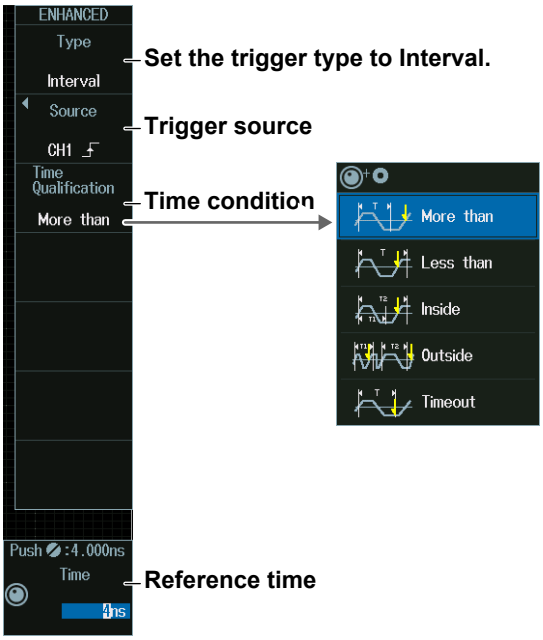
- Trigger source
  Trigger slope, HF rejection, noise rejection, source bit,
  level for detecting trigger source edges

- Time conditions, reference times

► “Interval Trigger [ENHANCED],” “HF Rejection (HF Rejection),”
“Noise Rejection (Noise Rejection)” in the Features Guide

ENHANCED Interval Menu

1. Press **ENHANCED** to display the ENHANCED menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the ENHANCED menu from TRIGGER on the top menu that is displayed.
2. Press the **Type** soft key. From the setup menu that appears, select **Interval** to display the following menu.



Trigger Source (Source)

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

When the Trigger Source Is a Channel from CH1 to CH8

Set the trigger source to a channel from1 to CH8.

Trigger slope

HF rejection

Noise rejection

Level for detecting trigger source edges

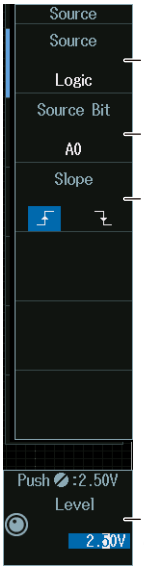
Note

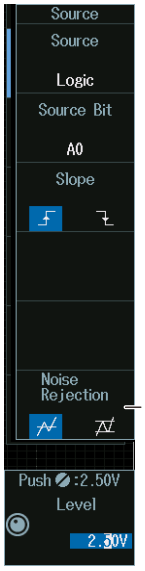
The available trigger source settings vary depending on the model.

- The available settings on 8ch models are as follows:
  CH1 to CH8
- The available settings on 4ch models are as follows:
  CH1 to CH4

When the Trigger Source Is Logic

For the 701989 logic probe





Set the trigger source to Logic.

Source bit

Trigger slope

Noise rejection

Level for detecting trigger source edges

Note

The following source bit display applies to models with the /L32 option.
C0 to C7 (LOGIC port C), D0 to D7 (LOGIC port D)

Level for Detecting Trigger Source Edges (CH Level, Level)

Turn the **jog shuttle** to set the level for detecting trigger source edges.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

When the trigger source is set to CH1 to CH8

Level for detecting trigger source edges

When the trigger source is LOGIC

Level for detecting trigger source edges

Level

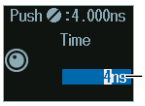
The level is displayed in unit of bits or pods depending on the connected logic probe and logic probe settings.

Time Conditions (Time Qualification) and Reference Times (Time, Time1, Time2)

1. Press the **Time Qualification** soft key to set the time conditions.
2. Turn the **jog shuttle** to set the reference times.
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

When the time condition is More than, Less than, or Timeout



Reference time

When the time condition is Inside

Reference time 1

Reference time 2

Press SET (upper right on the front panel) to switch between reference time 1 and reference time 2.

Satisfaction of Conditions

Set what kind of relationship must be established between the interval between two consecutive edges (rising or falling) and the specified reference times (Time, Time1, Time2) for the instrument to trigger.

More than	When the edge interval is longer than the specified reference time
Less than	When the edge interval is shorter than the specified reference time
Inside	When the edge interval is longer than Time1 but shorter than Time2
Outside	When the edge interval is shorter than Time1 or longer than Time2
Timeout	When the edge interval reaches the specified reference time

For details on the trigger points when the time condition is met, see chapter 4, “Trigger” in the Features Guide (IM DLM5058-01EN). When Timeout is selected, the instrument triggers when a timeout occurs.

2.13 Triggering on FlexRay Bus Signals (Option)

This section explains the following settings for triggering on FlexRay bus signals:

- Trigger source
  Bit rate, bus channel assignment, HF rejection
- Level and hysteresis for detecting trigger source states
- Trigger type
  Trigger conditions

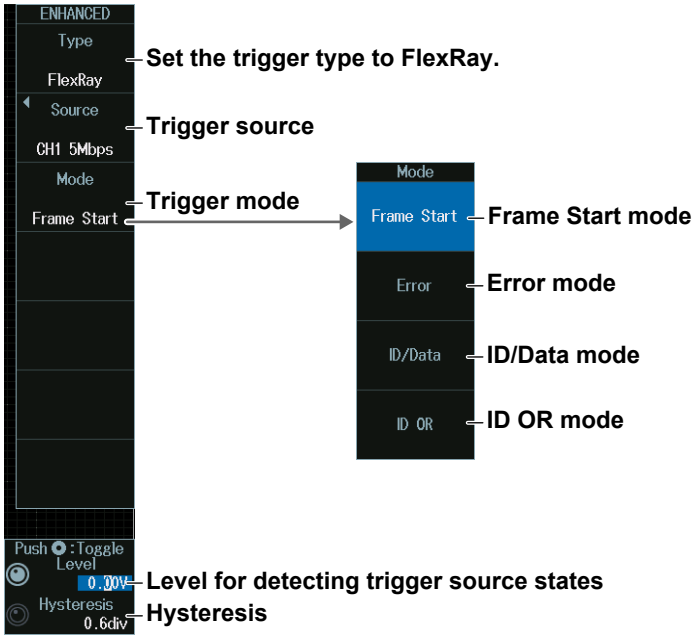
► “FlexRay Bus Trigger [ENHANCED, option],” “HF Rejection (HF Rejection)” in the Features Guide

Auto Setup

The instrument 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.

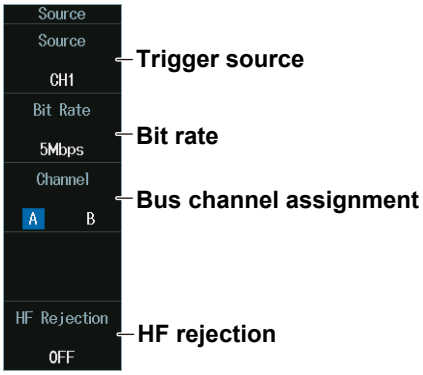
ENHANCED FlexRay Menu

1. Press **ENHANCED** to display the ENHANCED menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the ENHANCED menu from TRIGGER on the top menu that is displayed.
2. Press the **Type** soft key. From the setup menu that appears, select **FlexRay** to display the following menu.



Trigger Source (Source)

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



Note

The available trigger source settings vary depending on the model.

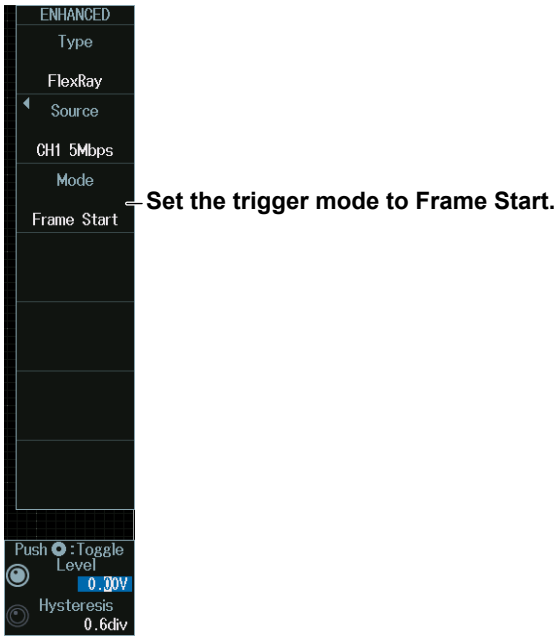
- The available settings on 8ch models are as follows:
  CH1 to CH8
- The available settings on 4ch models are as follows:
  CH1 to CH4

Trigger Mode (Mode)

Frame Start Mode (Frame Start)

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

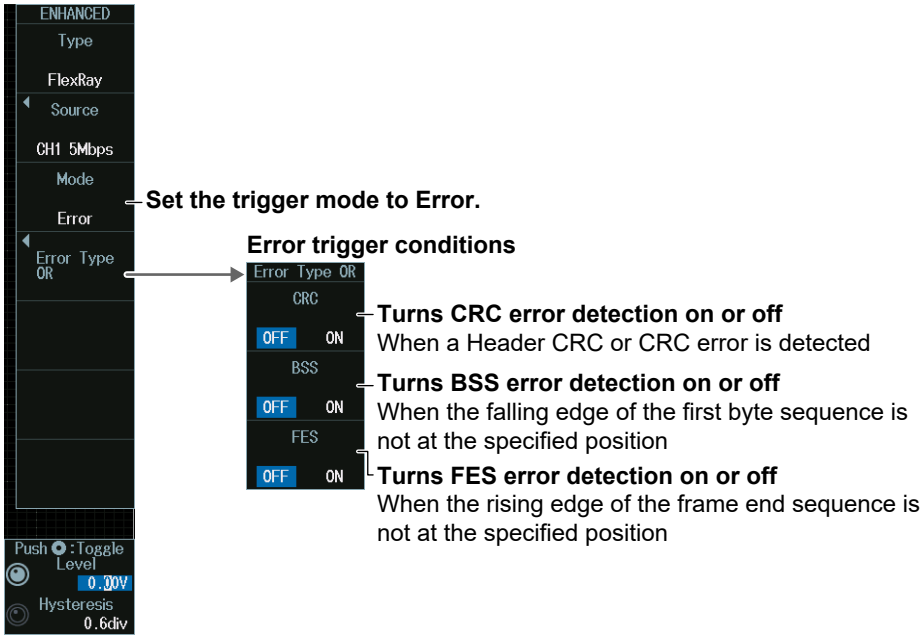
The instrument triggers on the start of FlexRay bus signal frames.



Error Mode (Error)

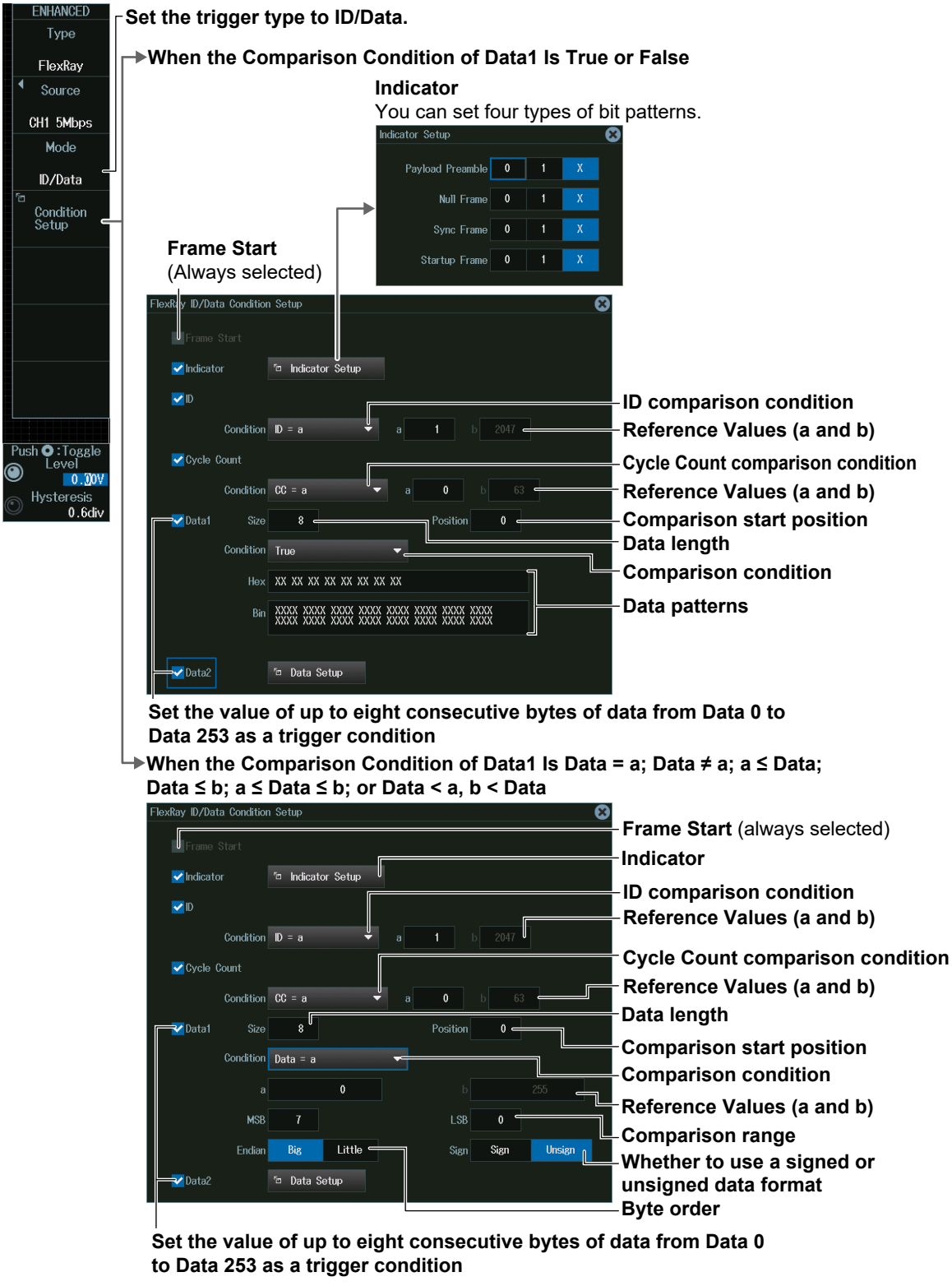
Press the **Mode** soft key and then the **Error** soft key to display the following menu.

The instrument triggers by detecting FlexRay bus signal errors.



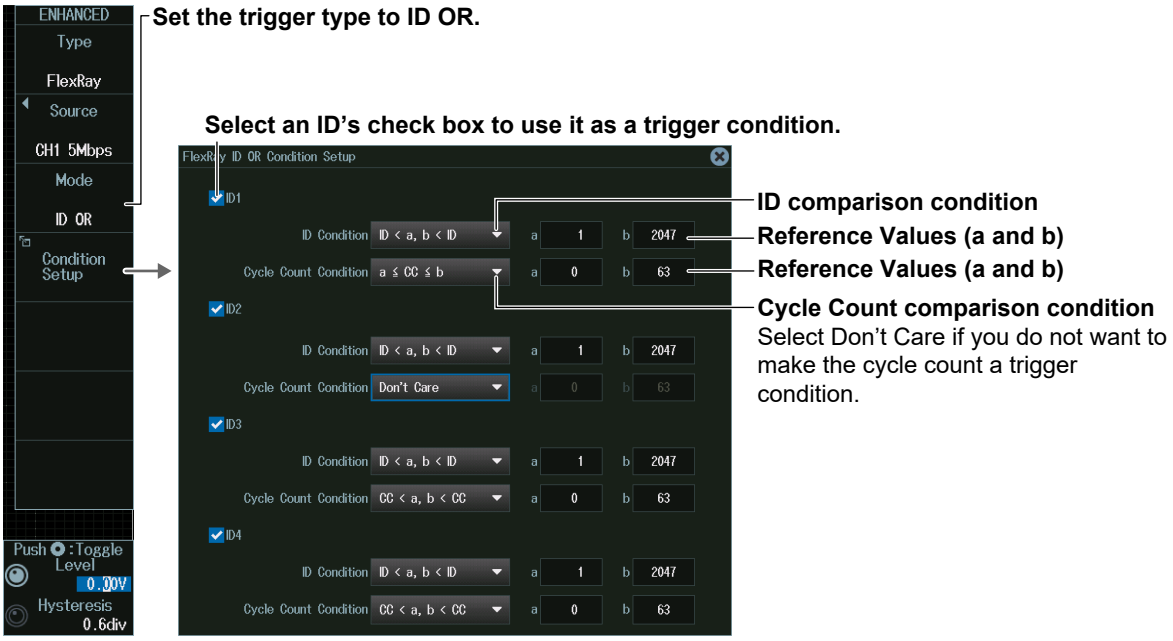
ID/Data Mode (ID/Data)

1. Press the **Mode** soft key and then the **ID/Data** soft key.
2. Press the **Condition Setup** soft key to display the following menu.
   The instrument 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.



ID OR Mode (ID OR)

1. Press the **Mode** soft key and then the **ID OR** soft key.
2. Press the **Condition Setup** soft key to display the following menu.
   The instrument triggers when the condition of one of the four IDs is met. Items whose check boxes are selected are used as trigger conditions.



Level for Detecting Trigger Source States (Level, Hysteresis)

Turn the **jog shuttle** to set the level or hysteresis.

- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
- To set the level, you can drag the level display line on the screen.

Jog shuttle setting menu

Press SET (upper right on the front panel) to switch between level and hysteresis.

2.14 Triggering on CAN Bus Signals (Option)

This section explains the following settings for triggering on CAN bus signals:

- Trigger source
  Bit rate, recessive level, HF rejection, sample point
- Level and hysteresis for detecting trigger source states
- Trigger type
  Trigger conditions

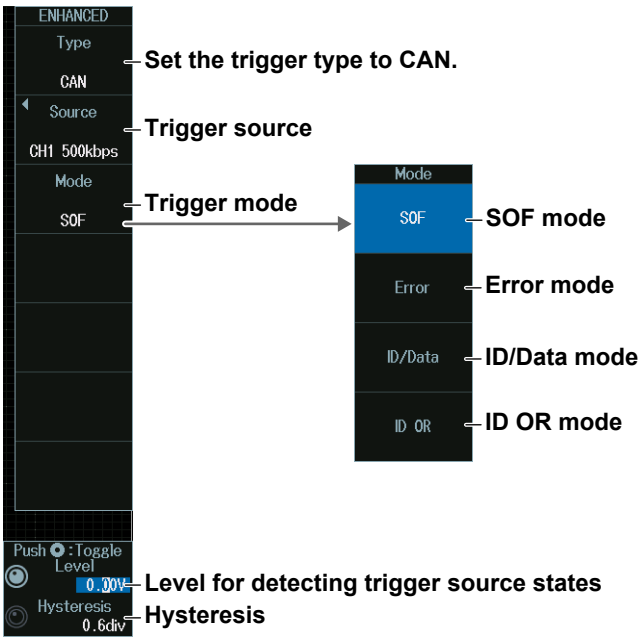
► "CAN Bus Trigger [ENHANCED, option]," "HF Rejection (HF Rejection)" in the Features Guide

Auto Setup

The instrument 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.

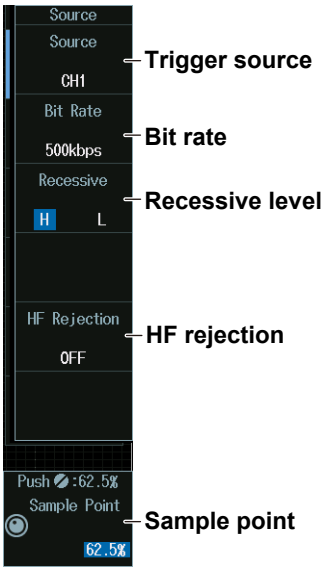
ENHANCED CAN Menu

1. Press **ENHANCED** to display the ENHANCED menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the ENHANCED menu from TRIGGER on the top menu that is displayed.
2. Press the **Type** soft key. From the setup menu that appears, select **CAN** to display the following menu.



Trigger Source (Source)

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



When the bit rate is set to User Define

Note

The available trigger source settings vary depending on the model.

- The available settings on 8ch models are as follows:
  CH1 to CH8
- The available settings on 4ch models are as follows:
  CH1 to CH4

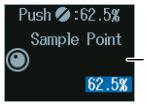
Sample Point (Sample Point) and Bit Rate (Bit Rate)

When the bit rate is not set to User Define

Turn the **jog shuttle** to set the sample point.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the pop-up list that appears on the screen.

Jog shuttle setting menu



When the bit rate is set to User Define

Turn the **jog shuttle** to set the sample point.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the pop-up list that appears on the screen.

Jog shuttle setting menu

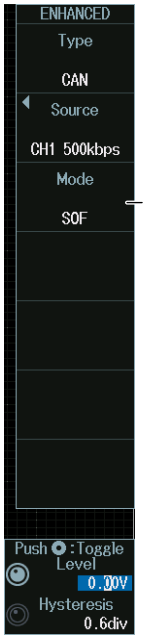
Press SET (upper right on the front panel) to switch between bit rate and sample point.

Trigger Mode (Mode)

SOF Mode (Start of Frame)

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

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



Set the trigger mode to SOF.

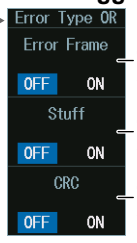
Error Mode (Error)

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

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

Set the trigger mode to Error.

Error trigger conditions



Turns error frame detection on or off
When an active error flag is detected

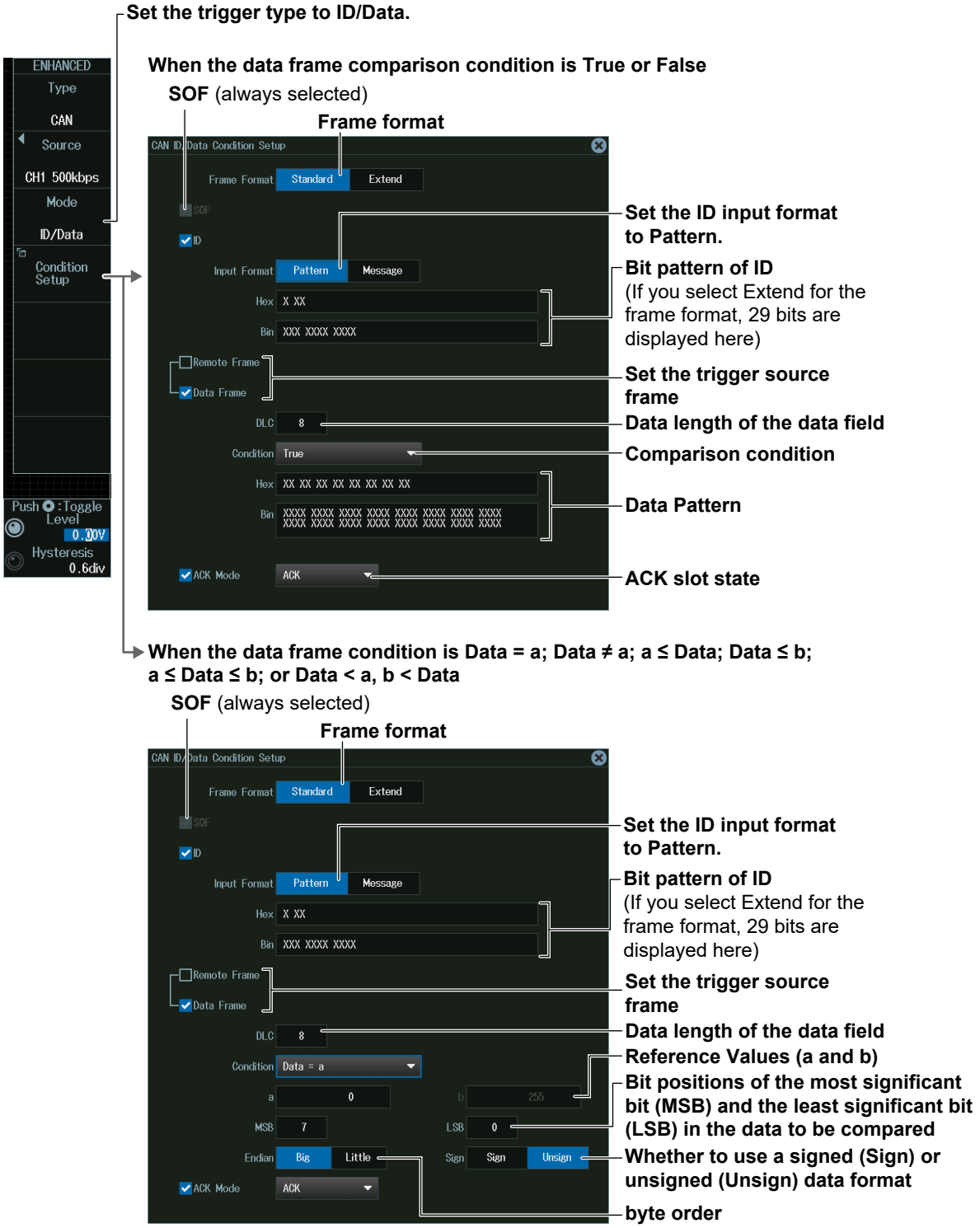
Turns stuff error detection on or off
When stuff bits are not inserted properly

Turns CRC error detection on or off
When a CRC error is detected

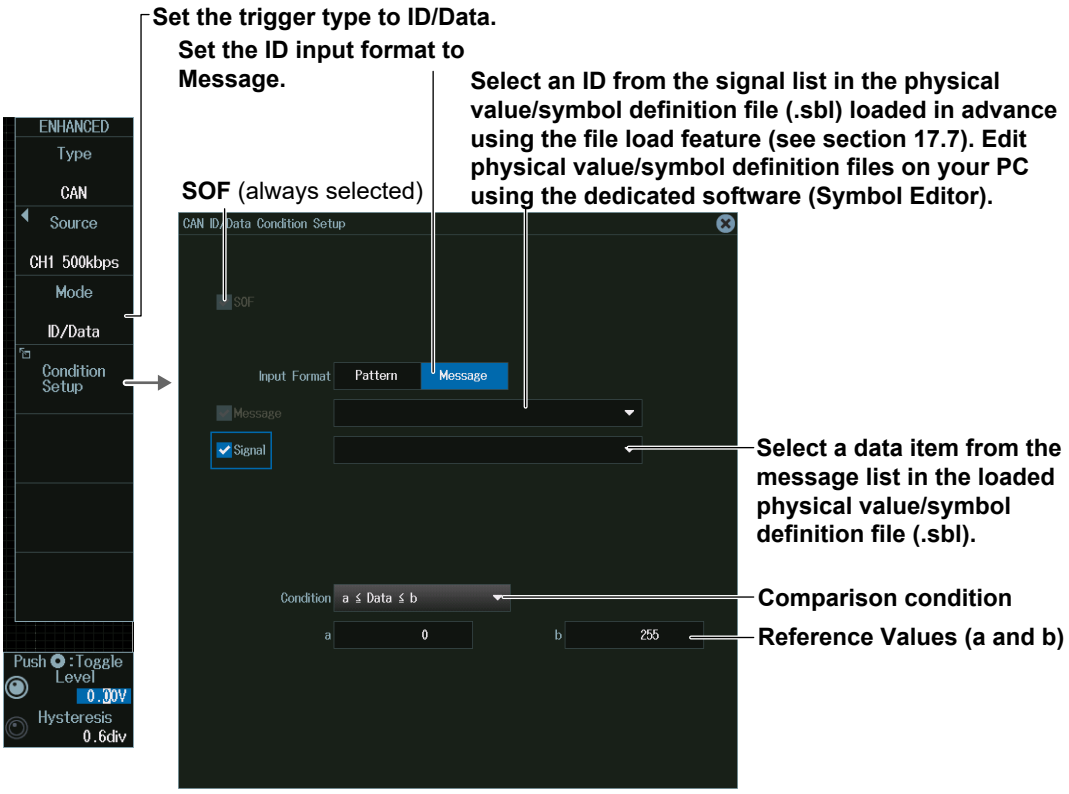
ID/Data Mode (ID/Data)

1. Press the **Mode** soft key and then the **ID/Data** soft key.
2. Press the **Condition Setup** soft key to display the following menu.
   The instrument triggers on the AND of the SOF, ID, frame type (Remote Frame or Data Frame), Data, and ACK Mode conditions. Items whose check boxes are selected are used as trigger conditions.

- **When ID Input Format Is Pattern**



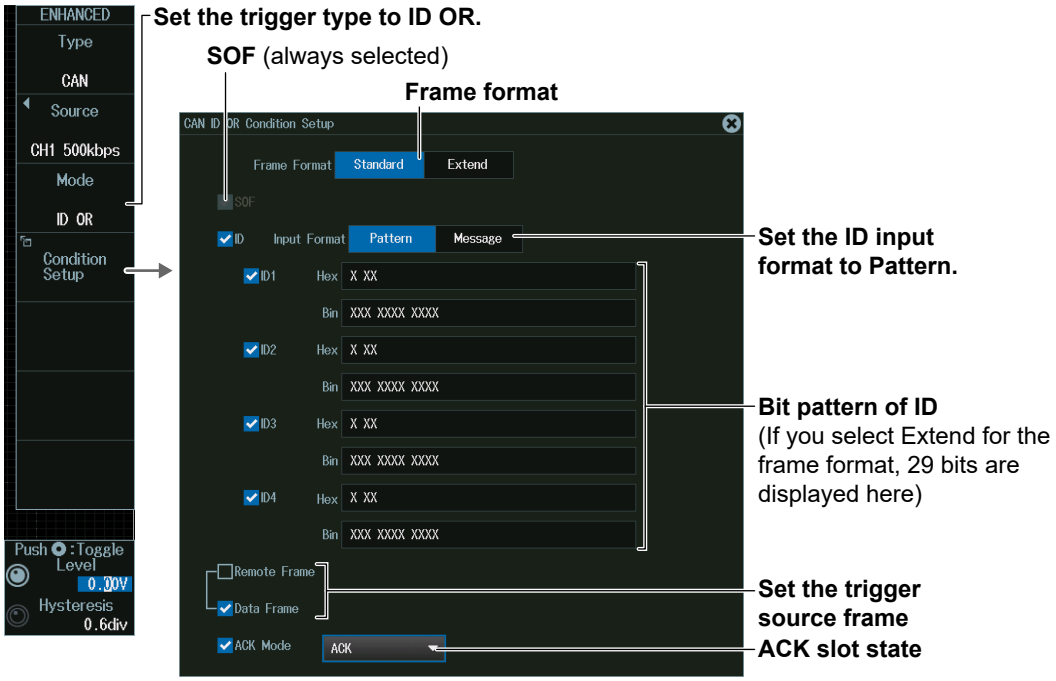
- **When ID Input Format Is Message**



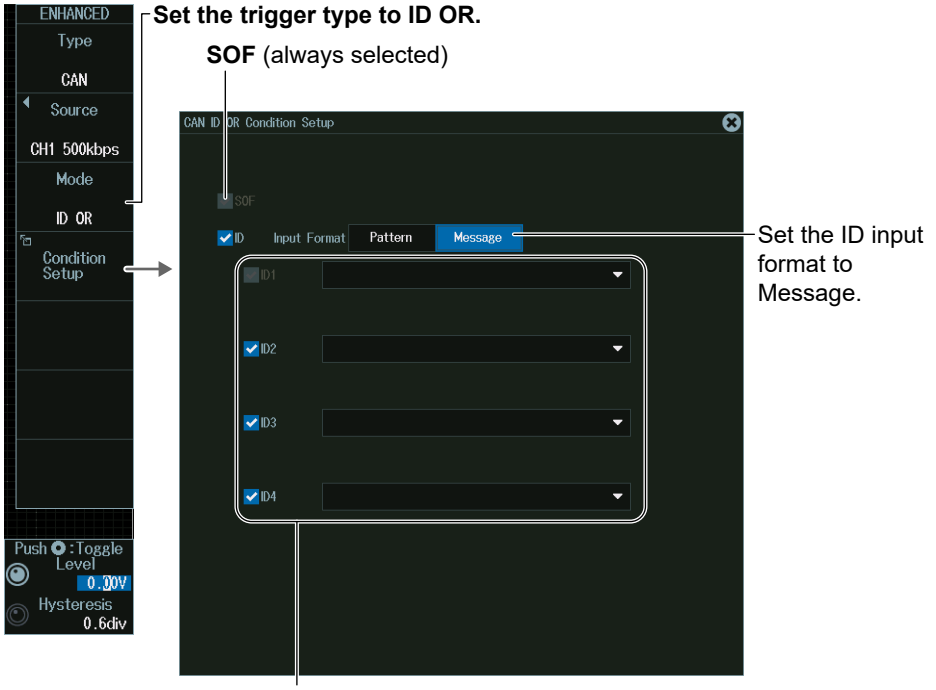
ID OR Mode (ID OR)

1. Press the **Mode** soft key and then the **ID OR** soft key.
2. Press the **Condition Setup** soft key to display the following screen.
   The instrument triggers on the AND of the SOF, frame type (Remote Frame or Data Frame), and ACK Mode 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 Pattern**



- **When ID Input Format Is Message**



Level for Detecting Trigger Source States (Level, Hysteresis)

Turn the **jog shuttle** to set the level or hysteresis.

- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
- To set the level, you can drag the level display line on the screen.

Jog shuttle setting menu

Level for detecting trigger source states

Hysteresis

Press SET (upper right on the front panel) to switch between level and hysteresis.

2.15 Triggering on CAN FD Bus Signals (Option)

This section explains the following settings for triggering on CAN FD signals:

- Trigger source
  Bit rate, sample point, data phase bit rate,
  data phase sample point, recessive level, HF rejection
- Level and hysteresis for detecting trigger source states
- Trigger type
  Trigger conditions
- CAN FD standard

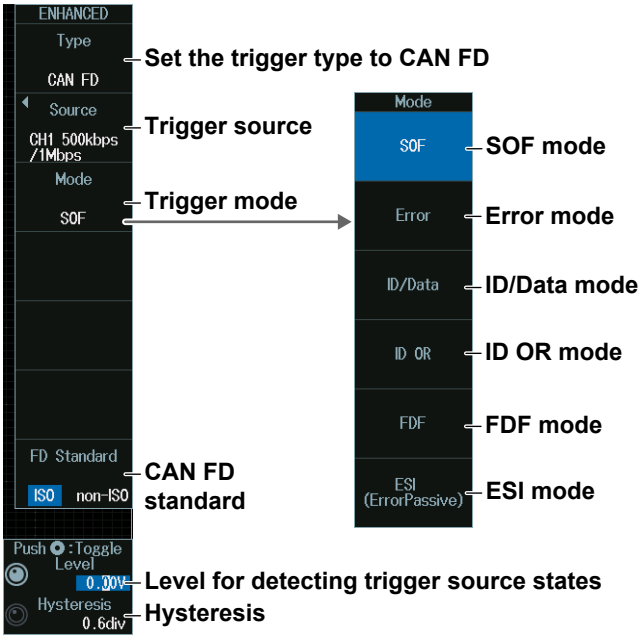
► “CAN FD Bus Trigger [ENHANCED, option],” “HF Rejection (HF Rejection)” in the Features Guide

Auto Setup

The instrument 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.

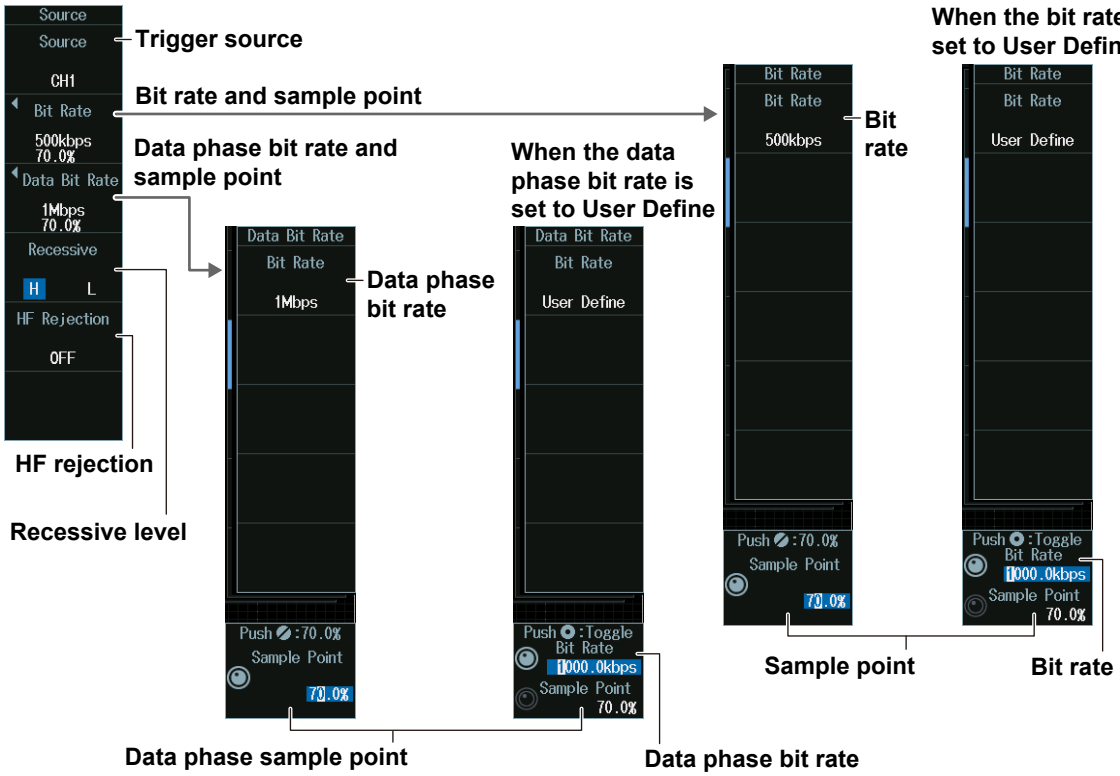
ENHANCED CAN FD Menu

1. Press **ENHANCED** to display the ENHANCED menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the ENHANCED menu from TRIGGER on the top menu that is displayed.
2. Press the **Type** soft key. From the setup menu that appears, select **CAN FD** to display the following menu.



Trigger Source (Source)

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



Note

The available trigger source settings vary depending on the model.

- The available settings on 8ch models are as follows:
  CH1 to CH8
- The available settings on 4ch models are as follows:
  CH1 to CH4

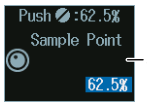
Sample Point (Sample Point) and Bit Rate (Bit Rate)

When the bit rate is not set to User Define

Turn the **jog shuttle** to set the sample point.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the pop-up list that appears on the screen.

Jog shuttle setting menu

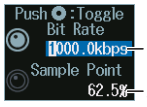


When the bit rate is set to User Define

Turn the **jog shuttle** to set the bit rate and sample point.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the pop-up list that appears on the screen.

Jog shuttle setting menu



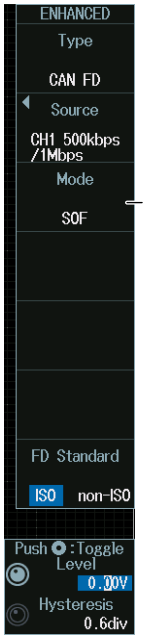
Press SET (upper right on the front panel) to switch between bit rate and sample point.

Trigger Mode (Mode)

SOF Mode (Start of Frame)

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

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

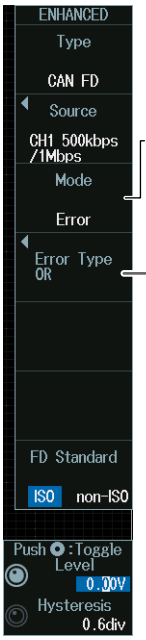


Set the trigger mode to SOF.

Error Mode (Error)

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

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



Set the trigger mode to Error.

Error trigger conditions

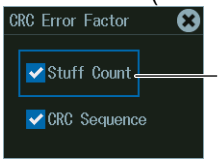
When FD Standard is set to ISO

Turns error frame detection on or off
When an active error flag is detected

Turns stuff error detection on or off
When stuff bits are not inserted properly

Turns fixed stuff error detection on or off
When fixed CRC stuff bits are not inserted properly

Turns CRC error detection on or off
When a CRC error is detected When the specified error factor is detected if the CAN FD standard (FD Standard) is set to ISO



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

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

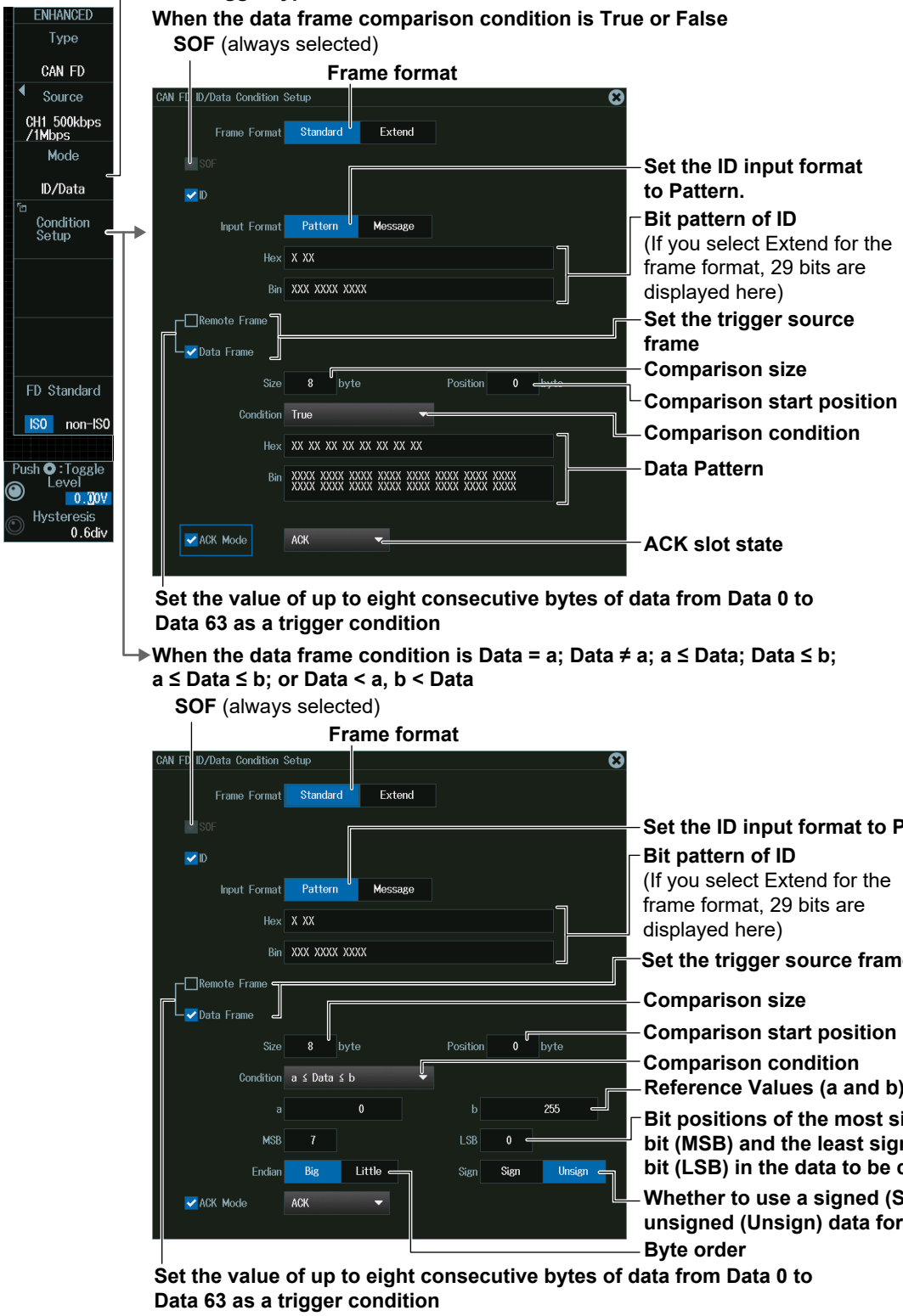
When FD Standard is set to non-ISO

(When CRC is set to ON)

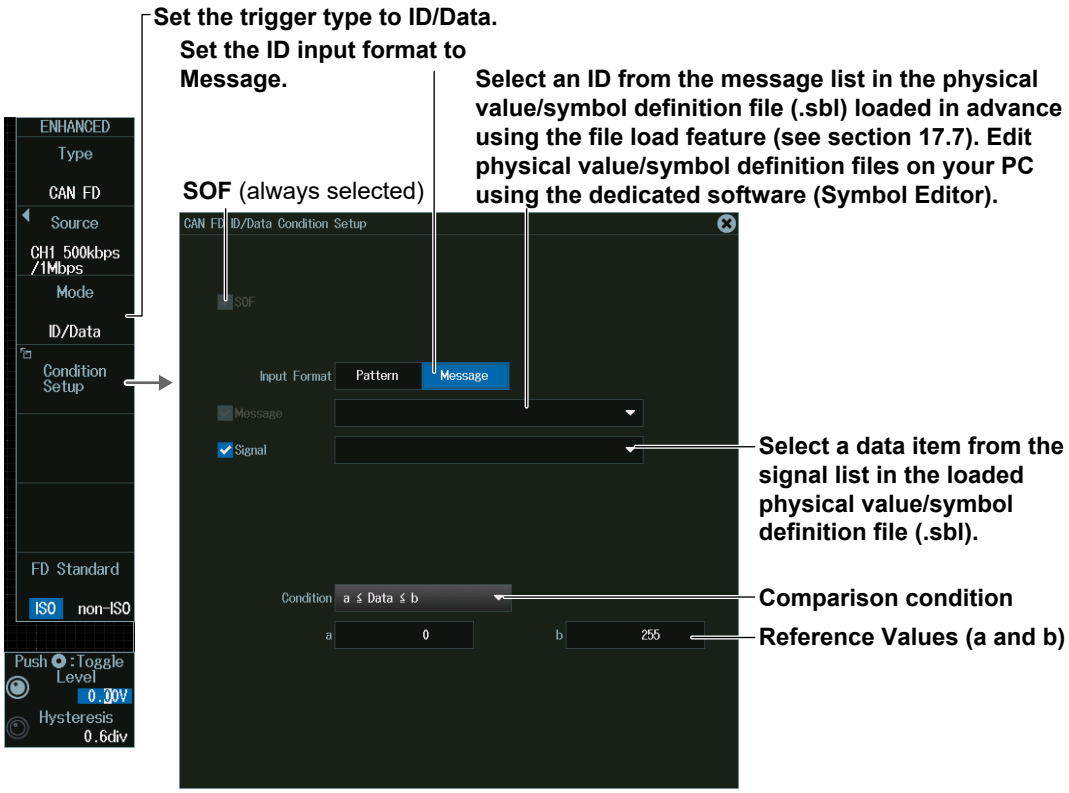
ID/Data Mode (ID/Data)

1. Press the **Mode** soft key and then the **ID/Data** soft key.
2. Press the **Condition Setup** soft key to display the following menu.
   The instrument triggers on the AND of the SOF, ID, frame type (Remote Frame or Data Frame), Data, and ACK Mode conditions. Items whose check boxes are selected are used as trigger conditions.

- **When ID Input Format Is Pattern**



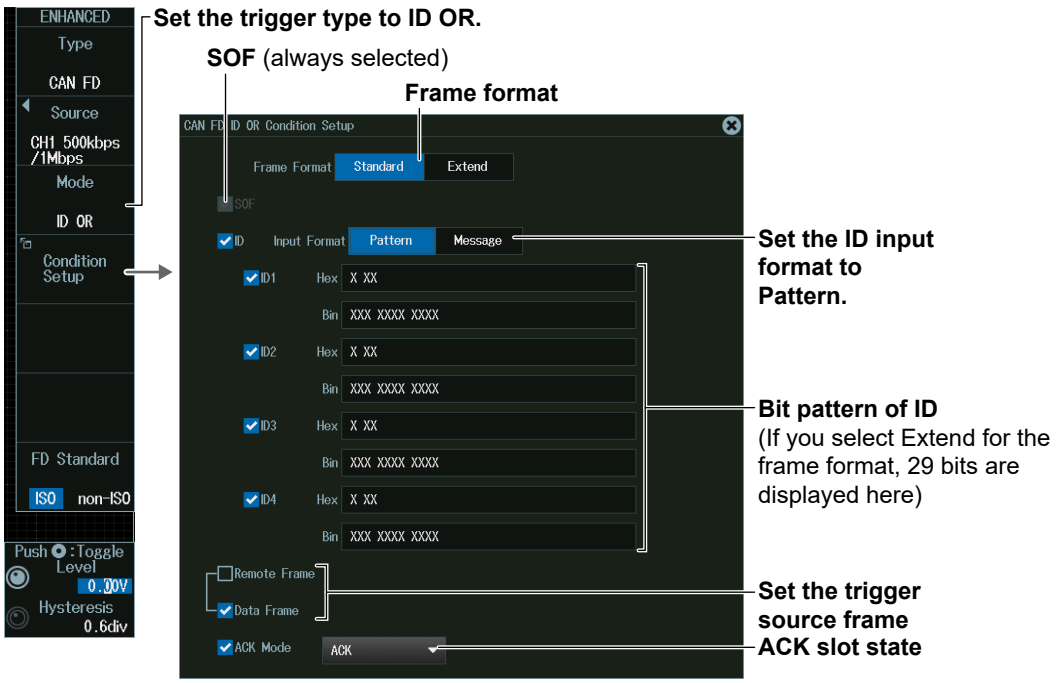
- **When ID Input Format Is Message**



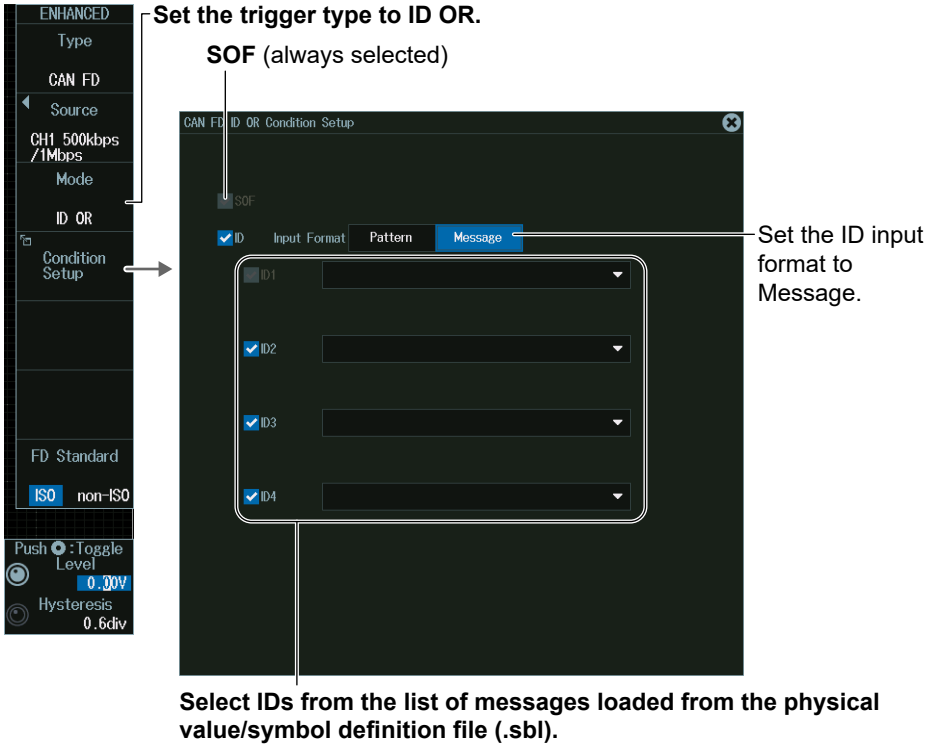
ID OR Mode (ID OR)

1. Press the **Mode** soft key and then the **ID OR** soft key.
2. Press the **Condition Setup** soft key to display the following menu.
   The instrument triggers on the AND of the SOF, frame type (Remote Frame or Data Frame), and ACK Mode 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 Pattern**

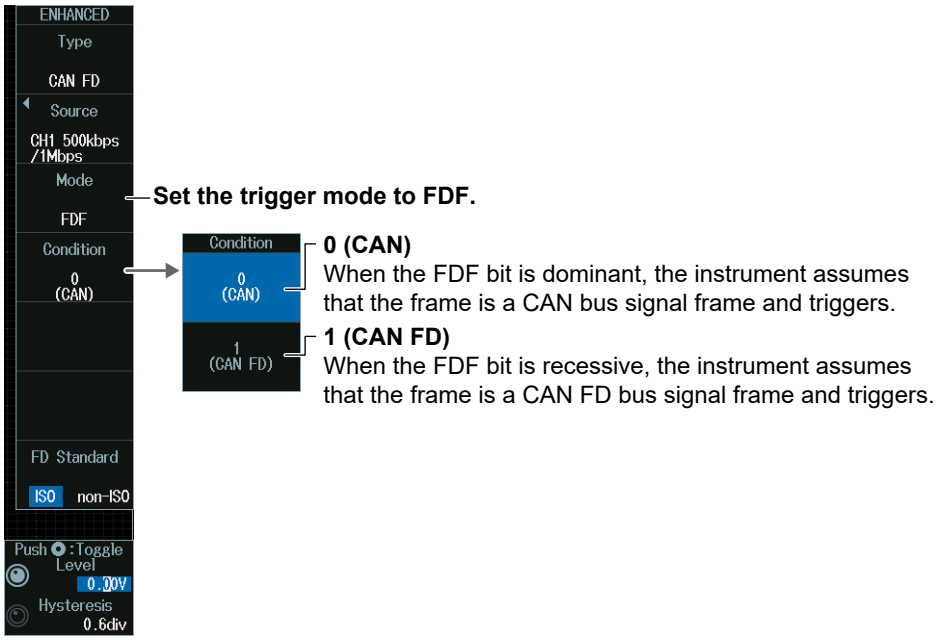


- **When ID Input Format Is Message**



FDF Mode (FDF)

1. Press the **Mode** soft key and then the **FDF** soft key.
2. Press the **Condition Setup** soft key to display the following menu.
   Set the FDF bit state as a trigger condition.



ESI Mode (ESI (Error Passive))

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

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

Set the trigger type to ESI (ErrorPassive).

CAN FD Standard

Press the **FD Standard** soft key to select the frame format.

For details on frames, see chapter 4, “CAN FD Bus Trigger,” in IM DLM5058-01EN.

Level for Detecting Trigger Source States (Level, Hysteresis)

Turn the **jog shuttle** to set the level or hysteresis.

- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
- To set the level, you can drag the level display line on the screen.

Jog shuttle setting menu

Level for detecting trigger source states

Hysteresis

Press SET (upper right on the front panel) to switch between level and hysteresis.

2.16 Triggering on LIN Bus Signals (Option)

This section explains the following settings for triggering on LIN bus signals:

- Trigger source
  Bit rate, HF rejection, sample point
- Level and hysteresis for detecting trigger source states
- Trigger type
  Trigger conditions

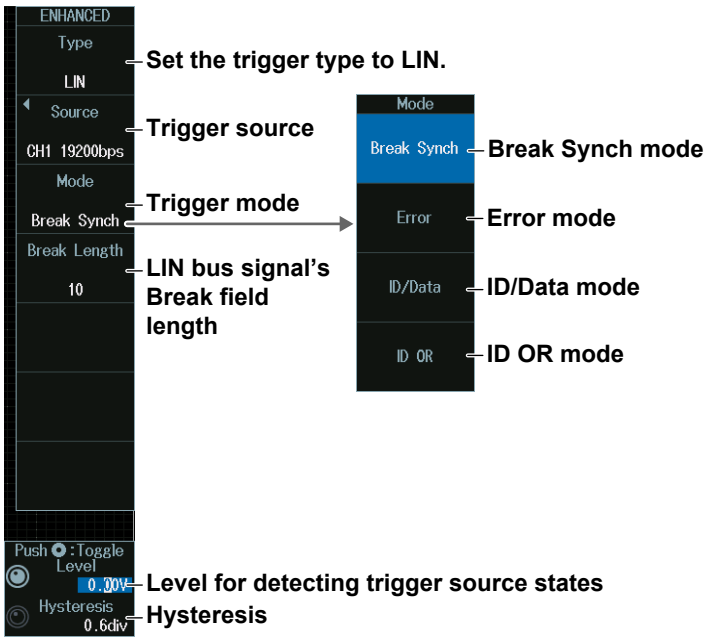
► **"LIN Bus Trigger [ENHANCED, option]," "HF Rejection (HF Rejection)" in the Features Guide**

Auto Setup

The instrument 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.

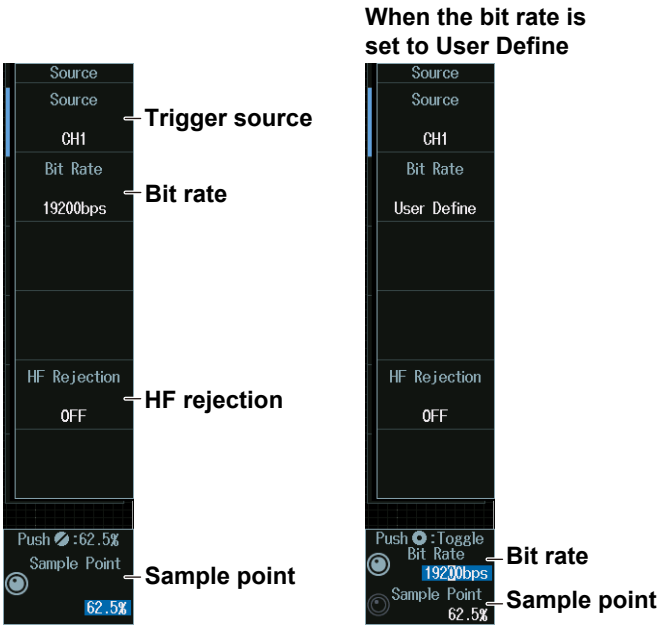
ENHANCED LIN Menu

1. Press **ENHANCED** to display the ENHANCED menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the ENHANCED menu from TRIGGER on the top menu that is displayed.
2. Press the **Type** soft key. From the setup menu that appears, select **LIN** to display the following menu.



Trigger Source (Source)

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



Note

The available trigger source settings vary depending on the model.

- The available settings on 8ch models are as follows:
  CH1 to CH8
- The available settings on 4ch models are as follows:
  CH1 to CH4

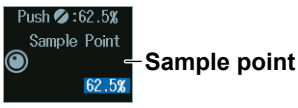
Sample Point (Sample Point) and Bit Rate (Bit Rate)

When the bit rate is not set to User Define

Turn the **jog shuttle** to set the sample point.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the pop-up list that appears on the screen.

Jog shuttle setting menu

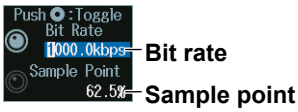


When the bit rate is set to User Define

Turn the **jog shuttle** to set the bit rate and sample point.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the pop-up list that appears on the screen.

Jog shuttle setting menu



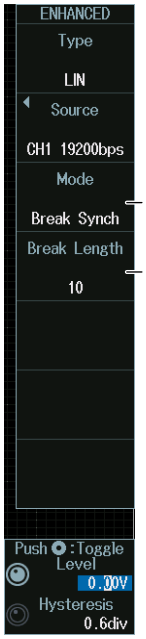
Press SET (upper right on the front panel) to switch between bit rate and sample point.

Trigger Mode (Mode)

Break Synch Mode

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

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



Set the trigger mode to Break Synch.

Low-pulse bit length that is used to detect breaks

Error Mode

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

The instrument triggers when it detects an error.

Set the trigger mode to Error.

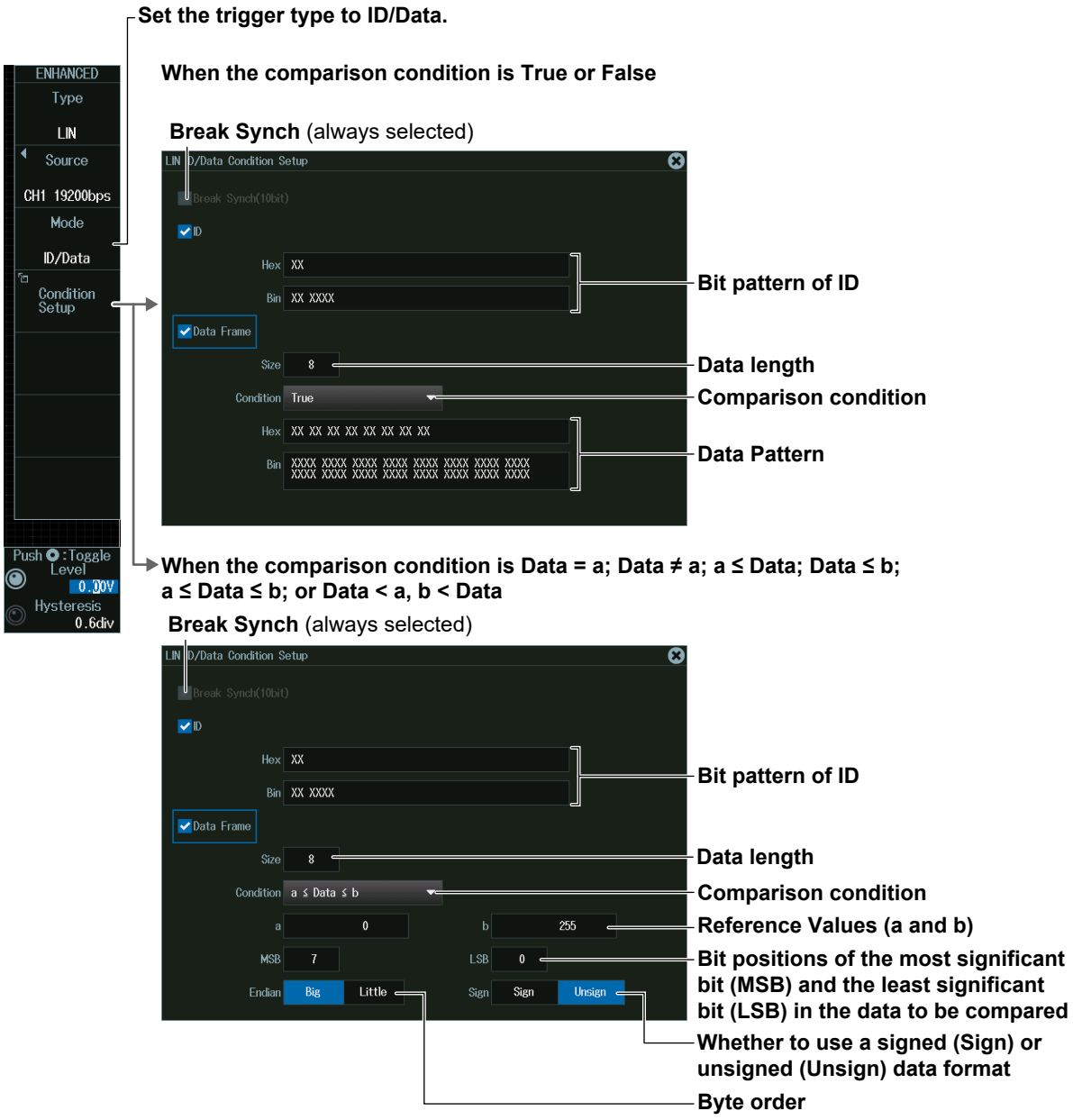
Error trigger conditions

Turns parity error detection on or off
When the computed parity result of the Protected Identifier Field is in error

Turns sync error detection on or off
When the Synch Field is not 0x55

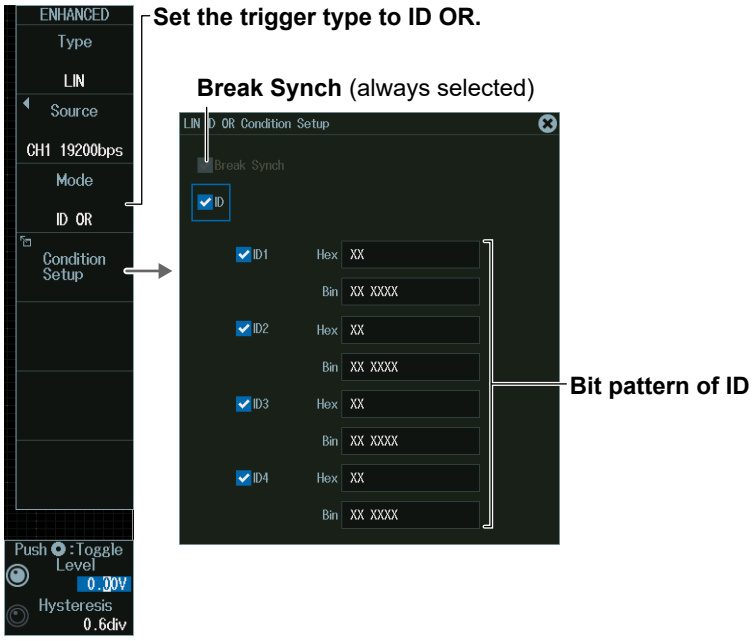
ID/Data mode

1. Press the **Mode** soft key and then the **ID/Data** soft key.
2. Press the **Condition Setup** soft key to display the following menu.
   The instrument triggers on the AND of the Break Synch, ID, and Data Frame conditions. Items whose check boxes are selected are used as trigger conditions.



ID OR Mode

1. Press the **Mode** soft key and then the **ID OR** soft key.
2. Press the **Condition Setup** soft key to display the following menu.
   The instrument 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.



Level for Detecting Trigger Source States (Level, Hysteresis)

Turn the **jog shuttle** to set the level or hysteresis.

- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
- To set the level, you can drag the level display line on the screen.

Jog shuttle setting menu

Level for detecting trigger source states

Hysteresis

Press SET (upper right on the front panel) to switch between level and hysteresis.

2.17 Triggering on CXPI Bus Signals (Option)

This section explains the following settings for triggering on CXPI bus signals:

- Trigger source
  Bit Rate, T Sample, Clock Tolerance, HF Rejection
- Level and hysteresis for detecting trigger source states
- Trigger type
  Trigger conditions

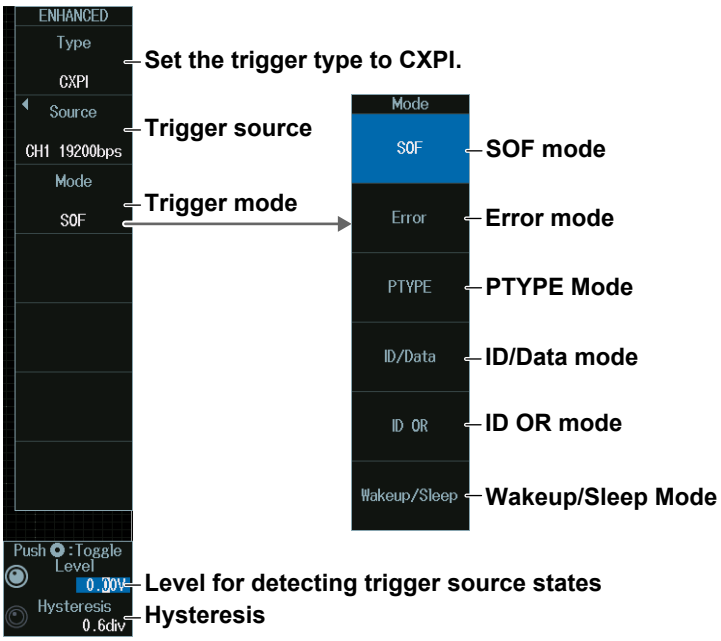
► **"CXPI Bus Trigger [ENHANCED, option]," "HF Rejection (HF Rejection)" in the Features Guide**

Auto Setup

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

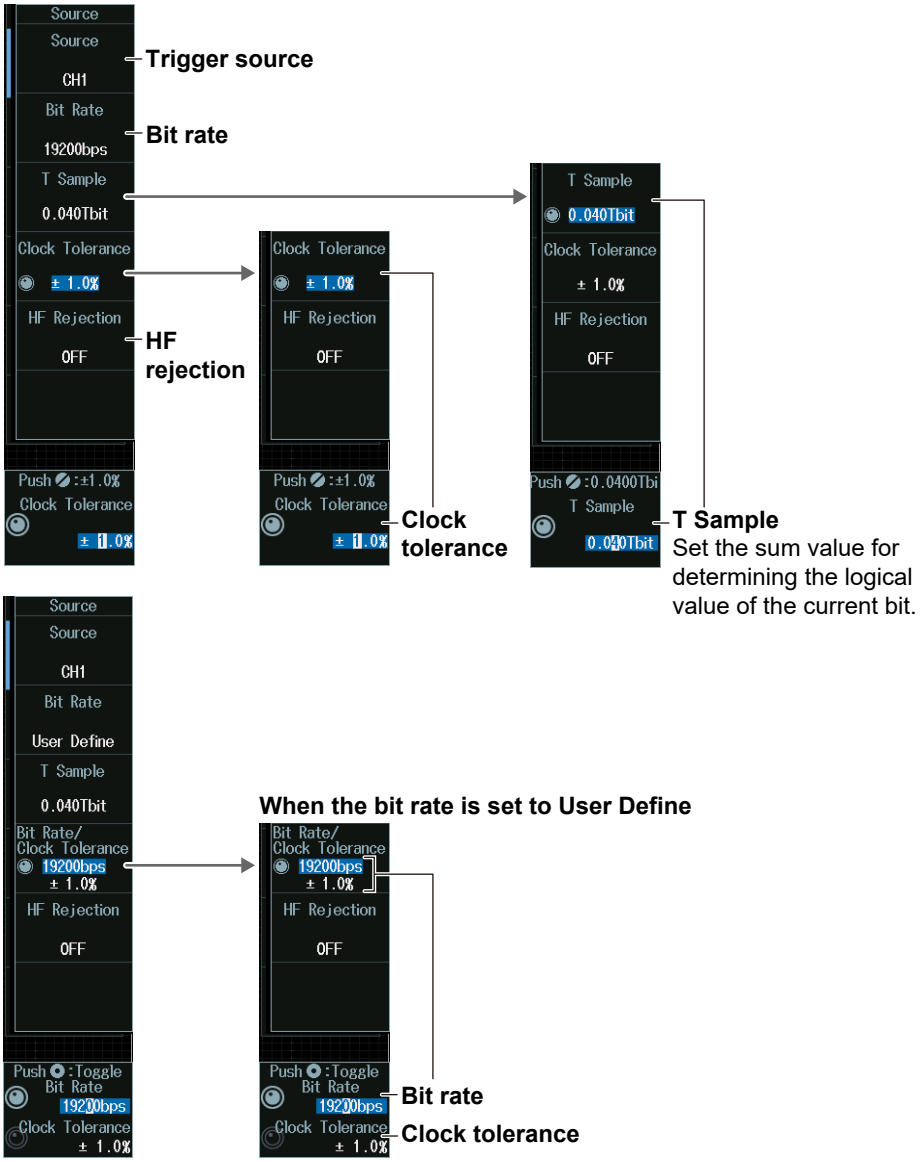
ENHANCED CXPI Menu

1. Press **ENHANCED** to display the ENHANCED menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the ENHANCED menu from TRIGGER on the top menu that is displayed.
2. Press the **Type** soft key. From the setup menu that appears, select **CXPI** to display the following menu.



Trigger Source (Source)

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



Note

The available trigger source settings vary depending on the model.

- The available settings on 8ch models are as follows:
  CH1 to CH8
- The available settings on 4ch models are as follows:
  CH1 to CH4

Clock Tolerance (Clock Tolerance) and Bit Rate (Bit Rate)

When the bit rate is not set to User Define

Turn the **jog shuttle** to set the clock tolerance.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

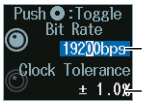
Clock tolerance

When the bit rate is set to User Define

Turn the **jog shuttle** to set the bit rate and clock tolerance.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu



Bit rate

Clock tolerance

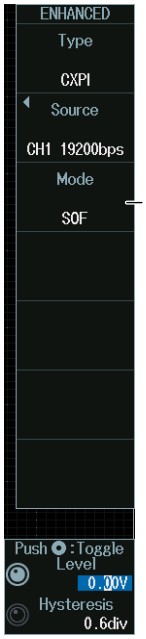
Press SET (upper right on the front panel) to switch between bit rate and clock tolerance.

Trigger Mode (Mode)

SOF Mode (Start of Frame)

Press the **Mode** soft key and then the **SOF** soft key. The following menu appears.

The instrument triggers on the start position of CXPI bus signal frames.

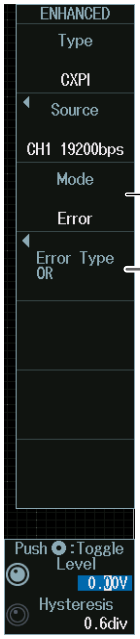


Set the trigger mode to SOF.

Error Mode

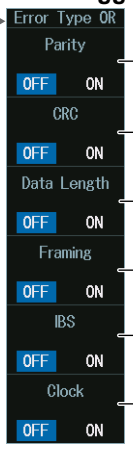
Press the **Mode** soft key and then the **Error** soft key to display the following menu.

The instrument triggers when it detects various types of errors.



Set the trigger mode to Error.

Error trigger conditions



Turns parity error detection on or off
When a parity error is detected

Turns CRC error detection on or off
When a CRC error is detected

Turns data length error detection on or off
When the DLC value and the number of data pieces in the data field (data length) do not match

Turns framing error detection on or off
When the logical value of the stop bit of a field or the stop bit of data is 0

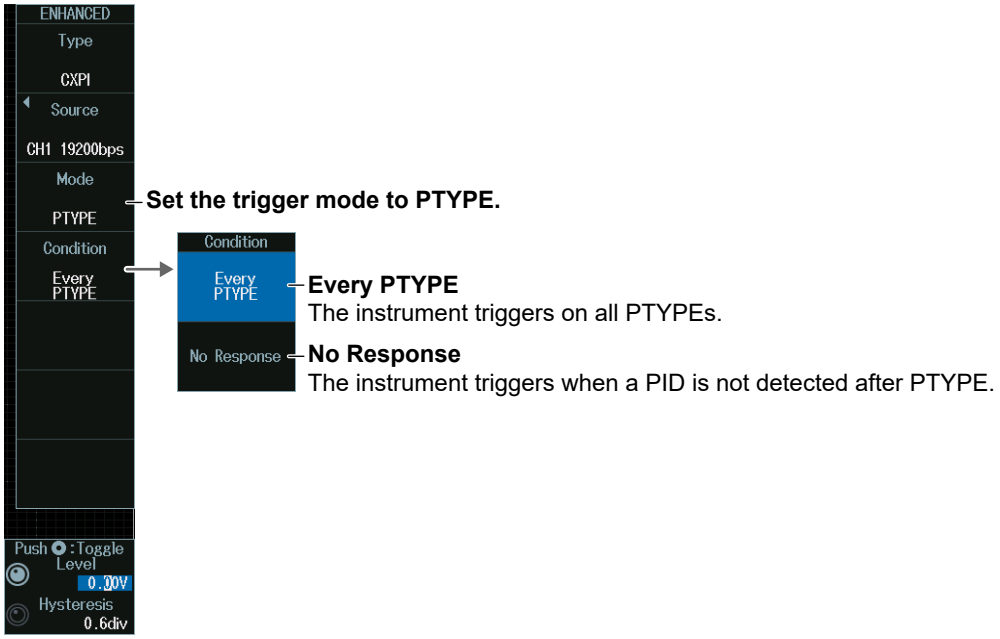
Turns IBS error detection on or off
When the number of IBS bits is 10 or more

Turns clock error detection on or off
When the clock width exceeds the specified tolerance

PTYPE mode

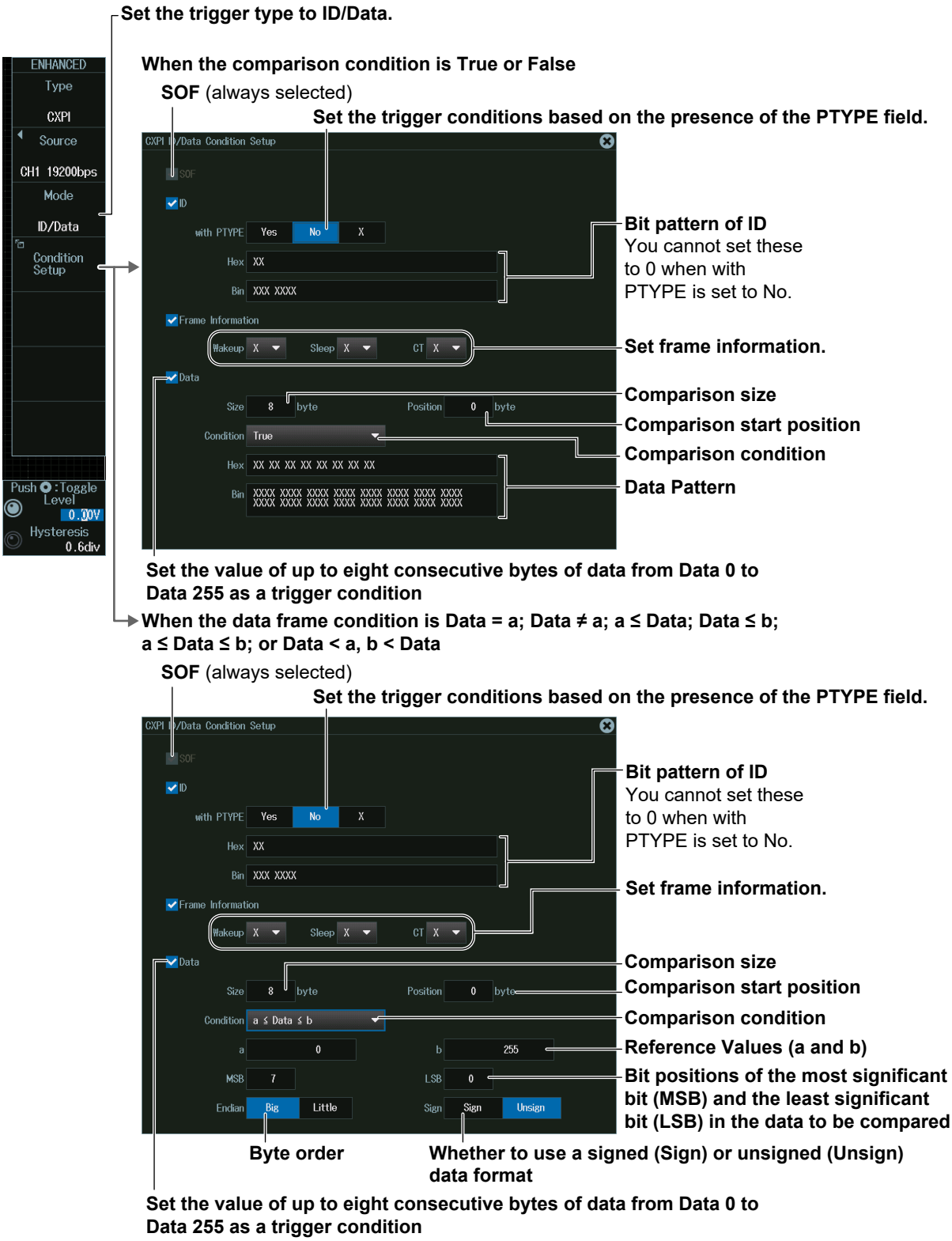
Press the **Mode** soft key and then the **PTYPE** soft key to display the following menu.

The instrument triggers by detecting CXPI bus signal's PTYPEs.



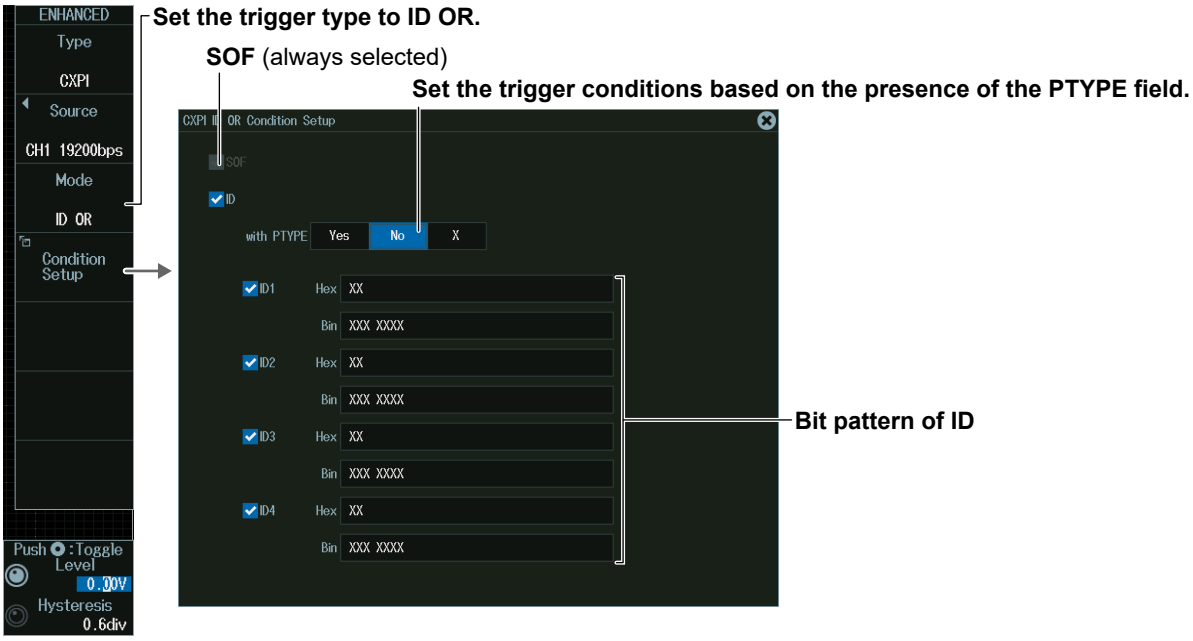
ID/Data mode

1. Press the **Mode** soft key and then the **ID/Data** soft key.
2. Press the **Condition Setup** soft key to display the following menu.
   The instrument triggers on the AND of SOF, ID, frame information, and data. Items whose check boxes are selected are used as trigger conditions.



ID OR Mode

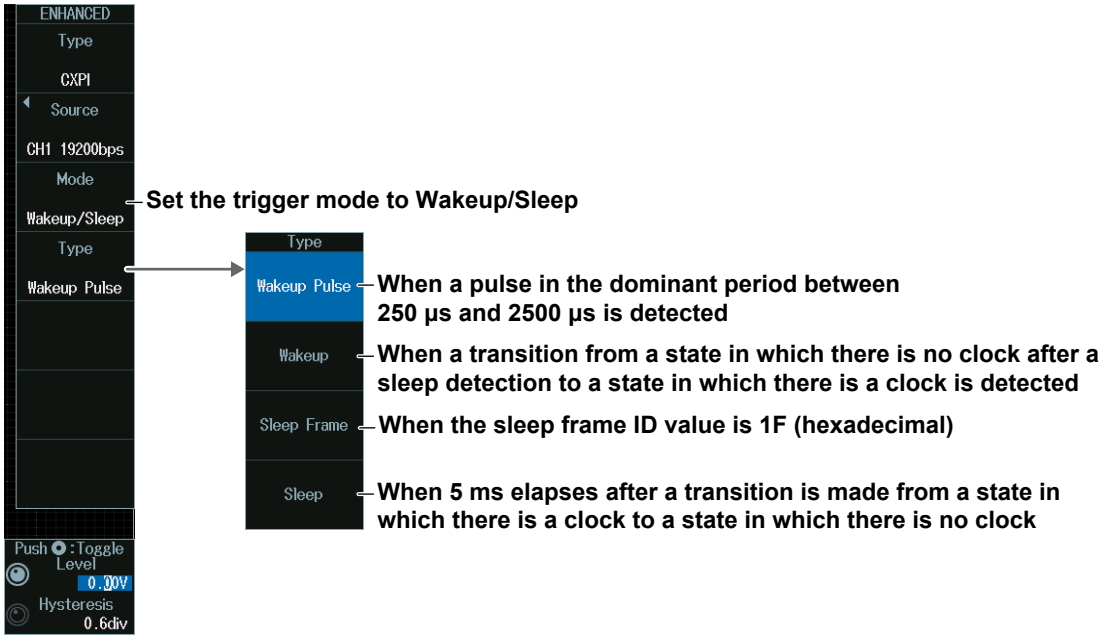
1. Press the **Mode** soft key and then the **ID OR** soft key.
2. Press the **Condition Setup** soft key to display the following menu.
   The instrument triggers on the AND of the SOF condition and the condition of one of the four IDs. Items whose check boxes are selected are used as trigger conditions.



Wakeup/Sleep Mode

Press the Mode soft key and then the **Wakeup/Sleep** soft key to display the following menu.

The instrument triggers by detecting the specified type.



Level for Detecting Trigger Source States (Level, Hysteresis)

Turn the **jog shuttle** to set the level or hysteresis.

- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
- To set the level, you can drag the level display line on the screen.

Jog shuttle setting menu

Level for detecting trigger source states

Hysteresis

Press SET (upper right on the front panel) to switch between level and hysteresis.

2.18 Triggering on SENT Signals (Option)

This section explains the following settings for triggering on SENT signals:

- Trigger source
  HF rejection, source bit
- Level and hysteresis for detecting trigger source states
- Trigger type
  Trigger conditions
- Format

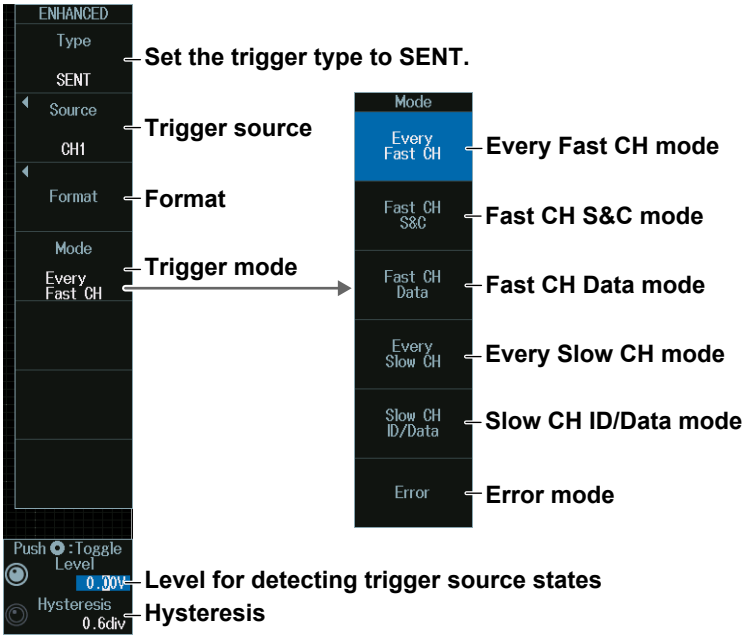
► “SENT Trigger [ENHANCED, option],” “HF Rejection (HF Rejection)” in the Features Guide

Auto Setup

The instrument can automatically set the source format, level, and hysteresis from the received SENT bus signal and trigger on it. For details, see section 12.6.

ENHANCED SENT Menu

1. Press **ENHANCED** to display the ENHANCED menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the ENHANCED menu from TRIGGER on the top menu that is displayed.
2. Press the **Type** soft key. From the setup menu that appears, select **SENT** to display the following menu.



Trigger Source (Source)

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

When the Trigger Source Is a Channel from CH1 to CH8

Set the trigger source to a channel from1 to CH8.

HF rejection

Level for detecting trigger source states

Hysteresis

Note

The available trigger source settings vary depending on the model.

- The available settings on 8ch models are as follows:
  CH1 to CH8
- The available settings on 4ch models are as follows:
  CH1 to CH4

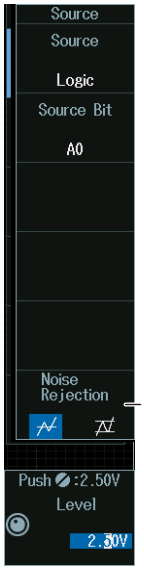
When the Trigger Source Is Logic

For the 701989 logic probe

Set the trigger source to Logic.

Source bit

Level for detecting trigger source states



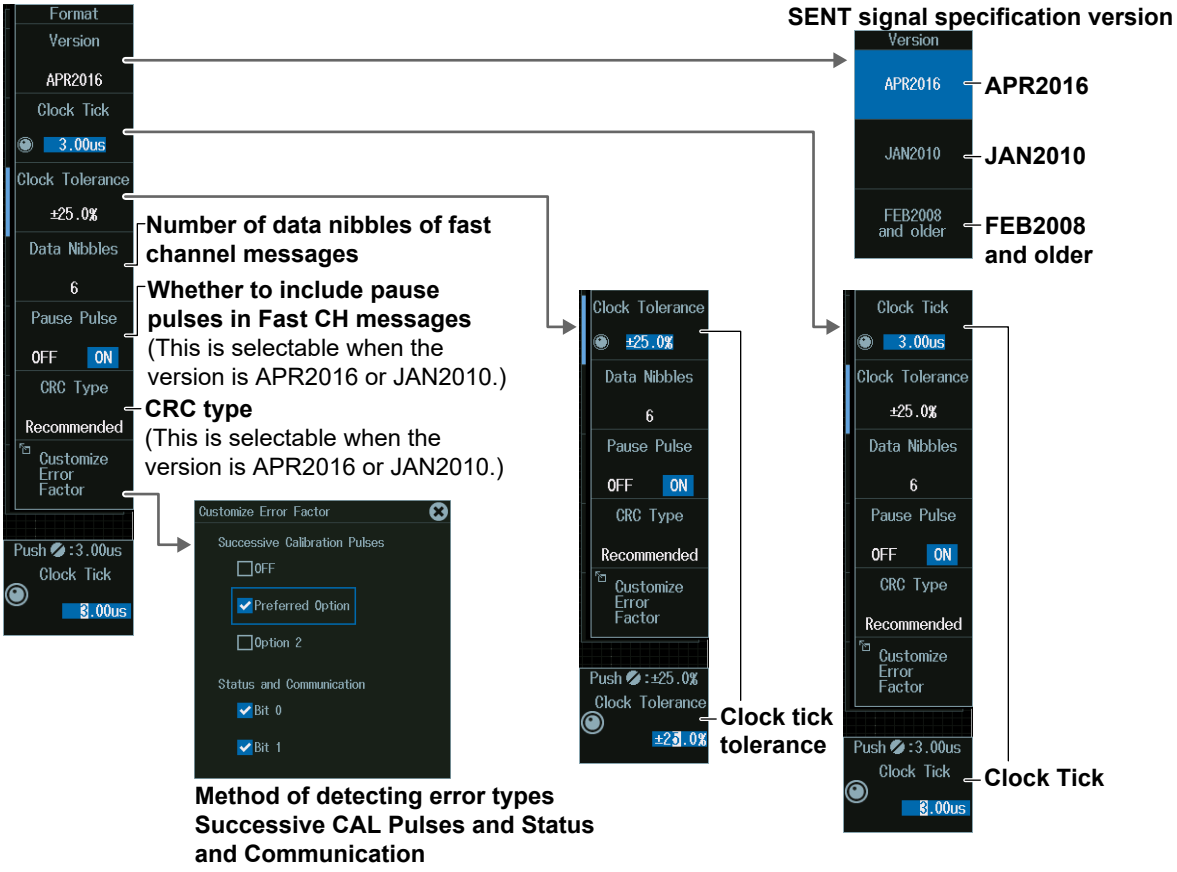
Noise rejection

Note

The following source bit display applies to models with the /L32 option.
C0 to C7 (LOGIC port C), D0 to D7 (LOGIC port D)

Format (Format)

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



Setting the Clock Tick (Clock Tick)

1. Press the **Clock Tick** soft key.
2. Turn the **jog shuttle** to display the waveforms that have been found.
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Clock Tick Tolerance (Clock Tolerance)

1. Press the **Clock Tolerance** soft key.
2. Turn the **jog shuttle** to display the waveforms that have been found.
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

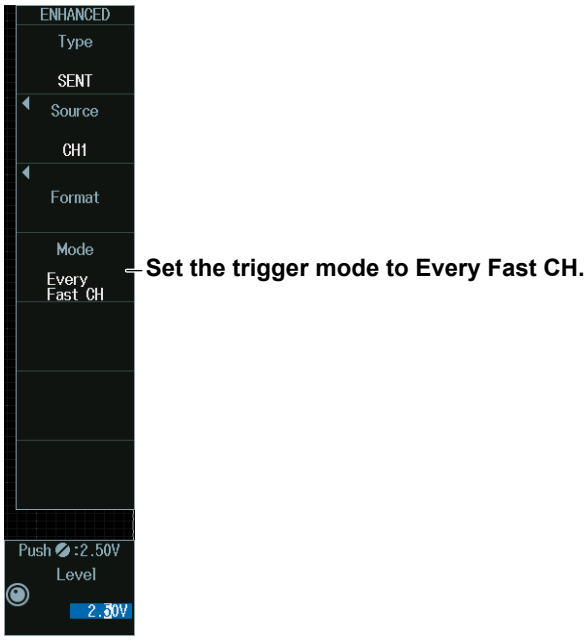
Jog shuttle setting menu

Trigger Mode (Mode)

Every Fast CH mode

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

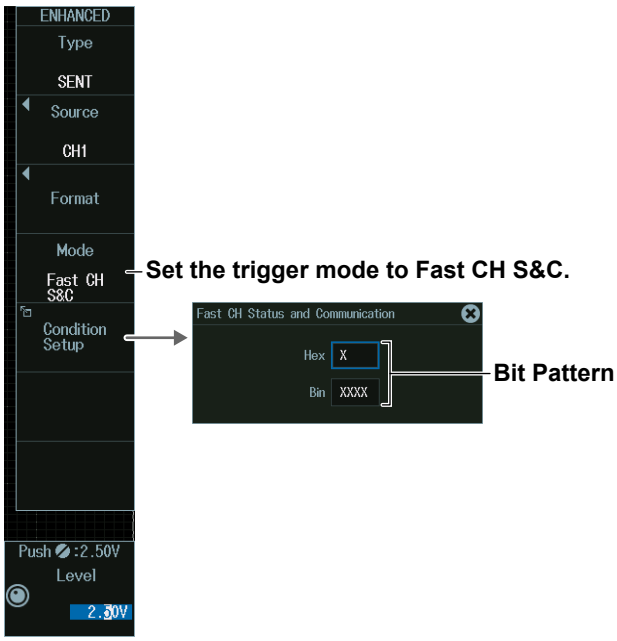
The instrument triggers when it detects a fast channel message.



Fast CH S&C mode

Press the **Mode** soft key and then the **Fast CH S&C** soft key to display the following menu.

The instrument triggers on the status and communication bit pattern.

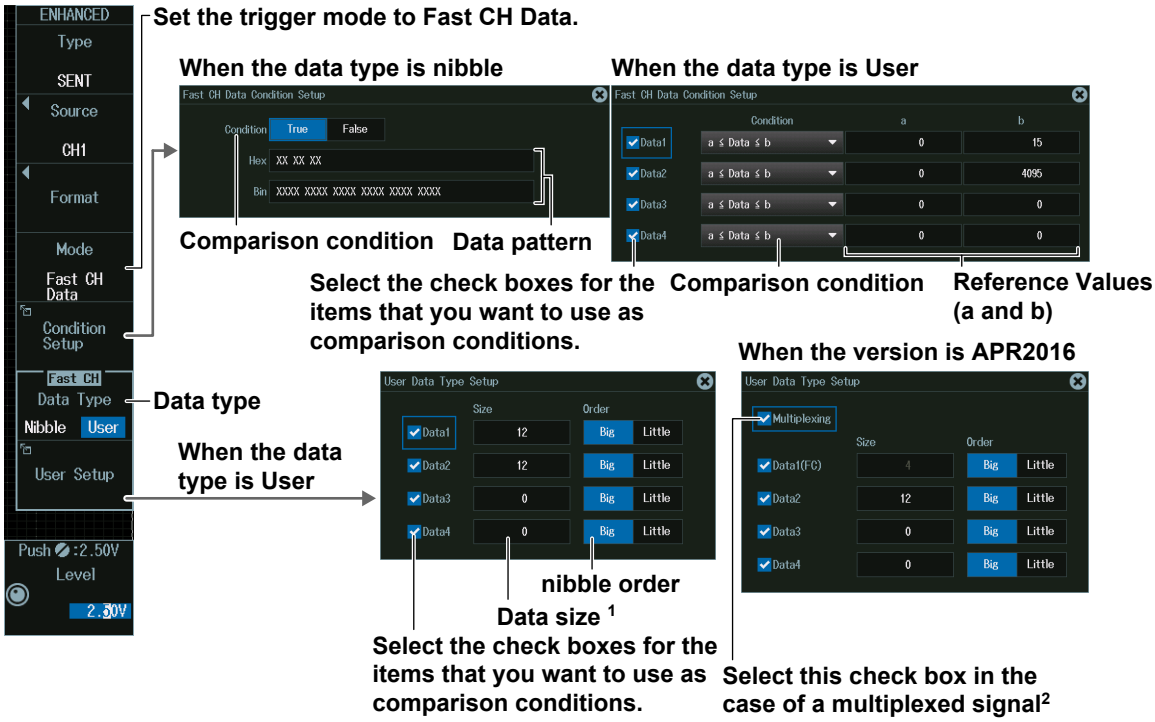


Fast CH Data mode

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

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

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



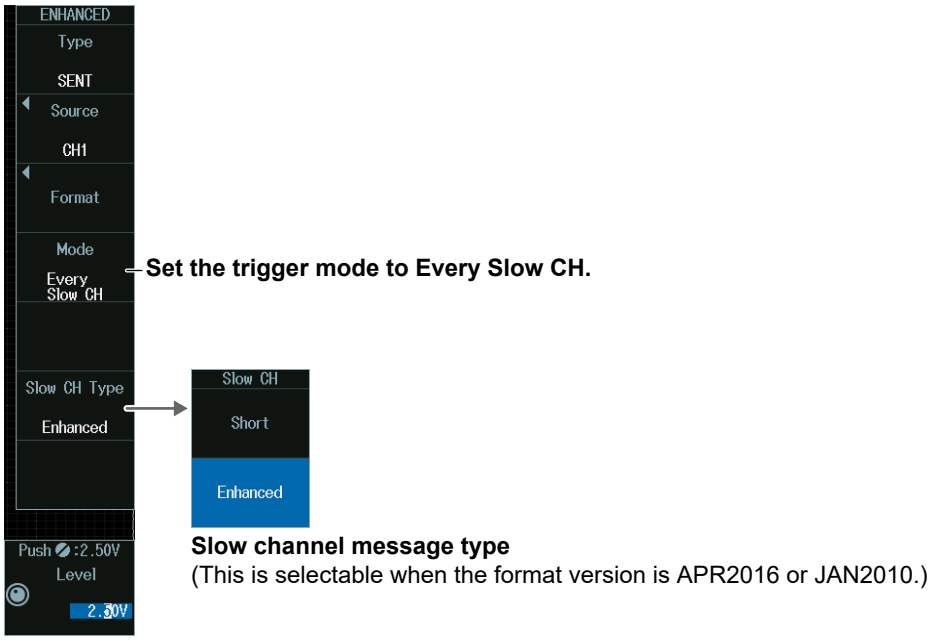
1 The total number of bits for Data1 to Data4 is up to 24. If you try to exceed the total number of bits, the data size of other pieces of Data is reduced.

2 When the check box for Multiplexing is selected, the Size of Data1 is fixed to 4 to correspond to FC.

Every Slow CH mode

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

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



Set the trigger mode to Every Slow CH.

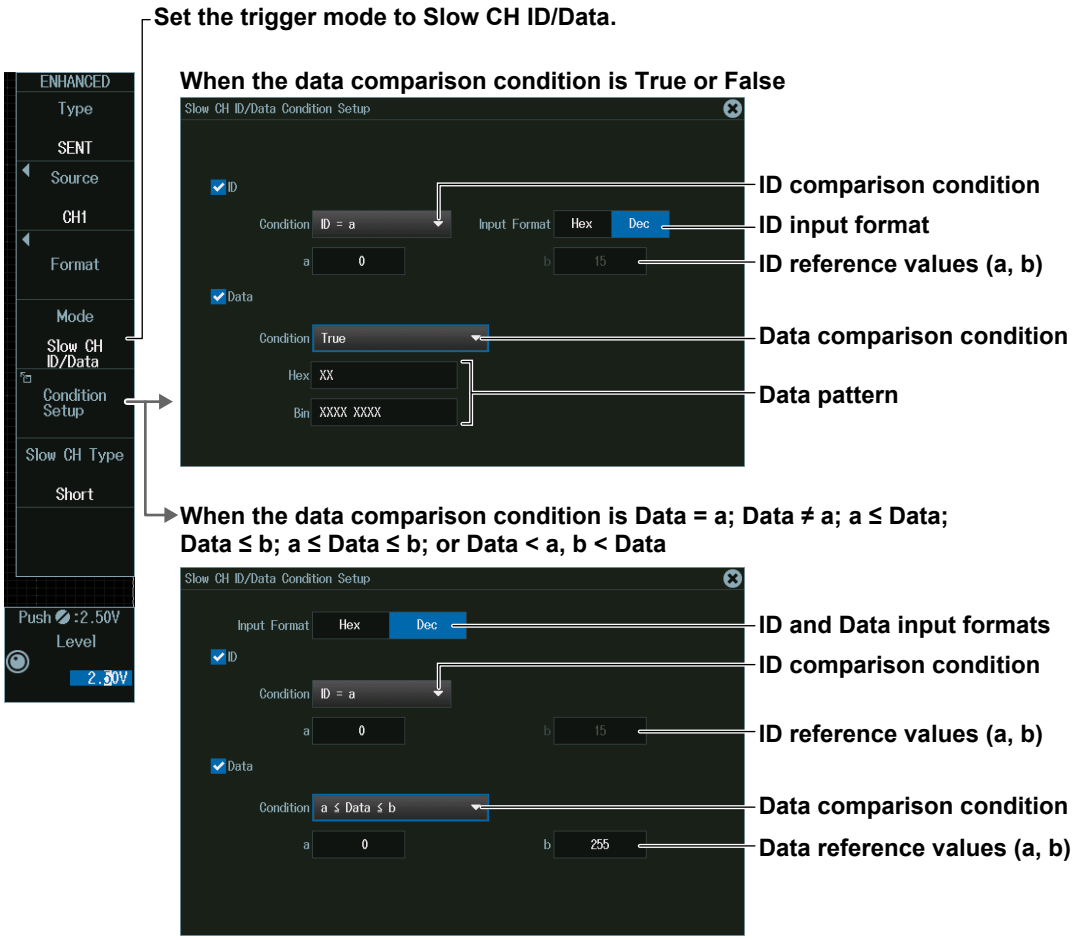
Slow channel message type
(This is selectable when the format version is APR2016 or JAN2010.)

Slow CH ID/Data mode

1. Press the **Mode** soft key and then the **Slow CH ID/Data** soft key.
2. Press the **Condition Setup** soft key. The menu that appears varies depending on the specified slow channel message type.

   The instrument 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**



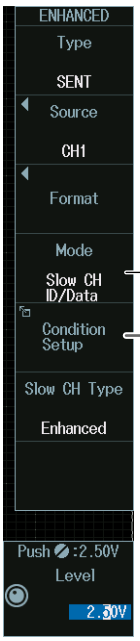
Setting ID/Data Reference Values a and b

Input format setting		Hex	Dec
Selectable range for reference values a and b	ID	0 to F	0 to 15
	Data	00 to FF	00 to 255

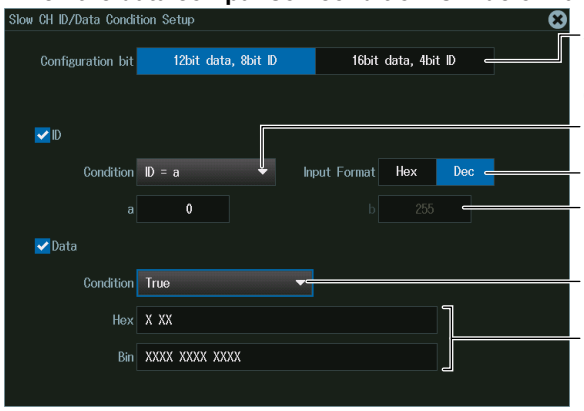
- **When the Message Type Is Enhanced**

  - **When the ID and Data Message Formats Are Set to "12bit data, 8bit ID"**

Set the trigger mode to Slow CH ID/Data.

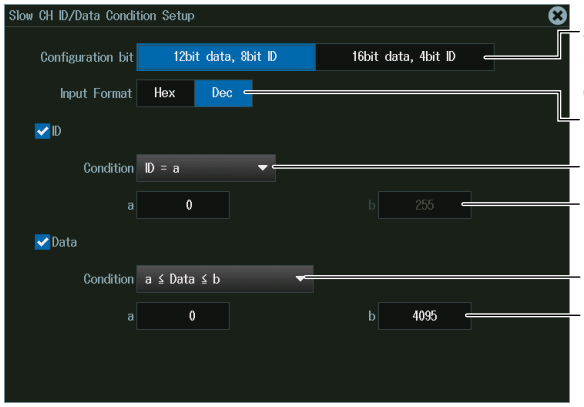


When the data comparison condition is True or False



Set the ID and data message formats to 12bit data and 8bit ID.
ID comparison condition
ID input format
ID reference values (a, b)
Data comparison condition
Data pattern

When the data comparison condition is Data = a; Data ≠ a; a ≤ Data; Data ≤ b; a ≤ Data ≤ b; or Data < a, b < Data



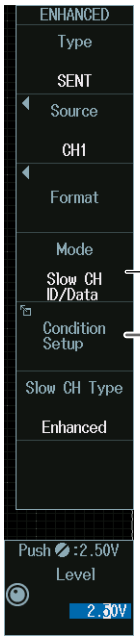
Set the ID and data message formats to 12bit data and 8bit ID.
ID and Data input formats
ID comparison condition
ID reference values (a, b)
Data comparison condition
Data reference values (a, b)

Setting ID/Data Reference Values a and b

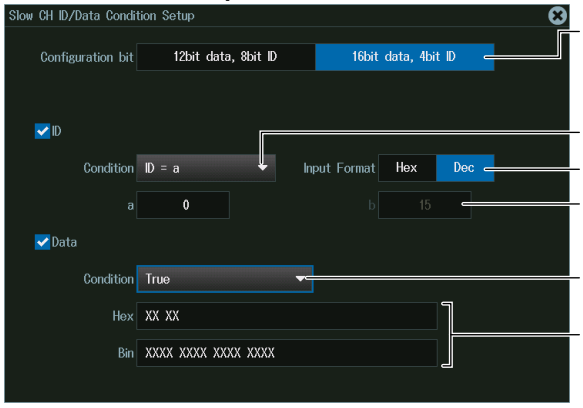
Input format setting		Hex	Dec
Selectable range for reference values a and b	ID	00 to FF	0 to 255
	Data	000 to FFF	0 to 4095

• When the ID and Data Message Formats Are Set to “16bit data, 4bit ID”

Set the trigger mode to Slow CH ID/Data.



When the data comparison condition is True or False



Set the ID and data message formats to 16bit data and 4bit ID.

ID comparison condition

ID input format

ID reference values (a, b)

Data comparison condition

Data pattern

When the data comparison condition is Data = a; Data ≠ a; a ≤ Data; Data ≤ b; a ≤ Data ≤ b; or Data < a, b < Data

Set the ID and data message formats to 16bit data and 4bit ID.

ID and Data input formats

ID comparison condition

ID reference values (a, b)

Data comparison condition

Data reference values (a, b)

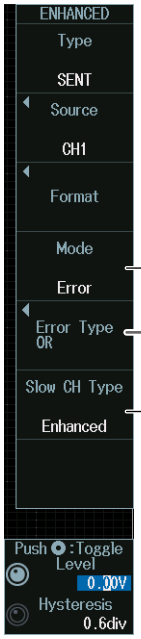
Setting ID/Data Reference Values a and b

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

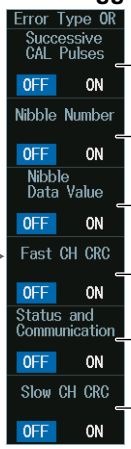
Press the **Mode** soft key and then the **Error** soft key to display the following menu.

The instrument triggers when it detects various types of errors.



Set the trigger mode to Error.

Error trigger conditions



Turns Successive CAL Pulses[1] error detection on or off
When there is a difference of 1/64 tick or more in the next or previous SYNC/CAL

Turns Nibble Number error detection on or off
When the number of nibbles in a single message does not match the specified value

Turns Nibble Data Value error detection on or off
When any of the Status and Communication, Data, and CRC tick counts is abnormal

Turns Fast CH CRC error detection on or off
When a Fast CH CRC error is detected

Turns Status and Communication[2] error detection on or off
Status and Communication bit 0 or bit 1 is 1

Turns Slow CH CRC error detection on or off
When a Slow CH CRC error is detected

1 Not selectable when Successive Calibration Pulses is set to OFF for Customize Error Factor in “Setting the Format (Format) (page 2-68)

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 2-68)

Slow channel message type
(This is selectable when the format version is APR2016 or JAN2010.)

Level for Detecting Trigger Source States (Level, Hysteresis)

Turn the **jog shuttle** to set the level or hysteresis.

- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
- To set the level, you can drag the level display line on the screen.

Jog shuttle setting menu

When the trigger source is set to CH1 to CH8

Level for detecting trigger source states

Hysteresis

Press SET (upper right on the front panel) to switch between level and hysteresis.

When the trigger source is LOGIC

Level for detecting trigger source states

2.19 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, data length, error detection method, clock tolerance, HF rejection, sync signal noise rejection
- Time range of each slot
  Start position of each slot and the end position of the last slot
- Level and hysteresis for detecting trigger source states
- Trigger type
  Trigger conditions

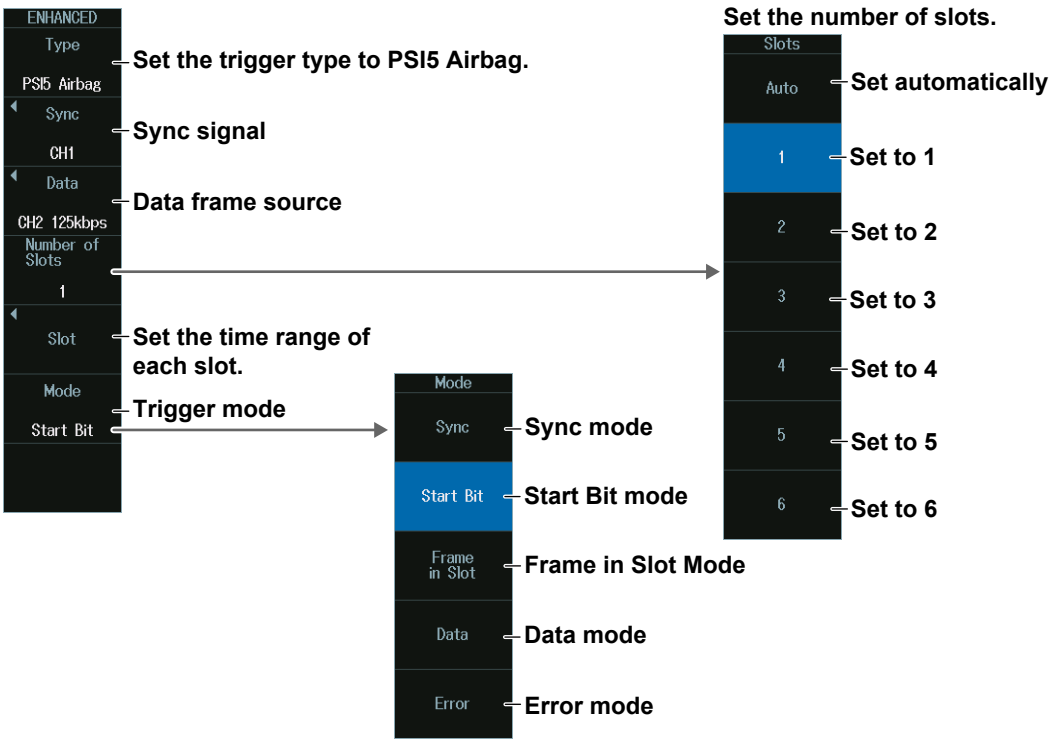
► **"PSI5 Airbag Trigger [ENHANCED, option]," "HF Rejection (HF Rejection)" in the Features Guide**

Auto Setup

The instrument 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

1. Press **ENHANCED** to display the ENHANCED menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the ENHANCED menu from TRIGGER on the top menu that is displayed.
2. Press the **Type** soft key. From the setup menu that appears, select **PSI5 Airbag** to display the following menu.



Sync Signal (Sync)

Press the **Sync** soft key. The following menu appears.

Set the sync signal to a channel from CH1 to CH8 or None.
When you set the sync signal to a channel from CH1 to CH4, the data frame sources also set to CH1 to CH4.
When you set the sync signal to a channel from CH5 to CH8, the data frame sources also set to CH5 to CH8.

HF rejection
Not displayed when the sync signal is set to None

Level for detecting sync signal states

Hysteresis

Note

The available sync signals vary depending on the model.

- The available settings on 8ch models are as follows:
  CH1 to CH8
- The available settings on 4ch models are as follows:
  CH1 to CH4

Level for Detecting Sync Signal States (Level, Hysteresis)

Turn the **jog shuttle** to set the level or hysteresis.

- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
- To set the level, you can drag the level display line on the screen.

Jog shuttle setting menu

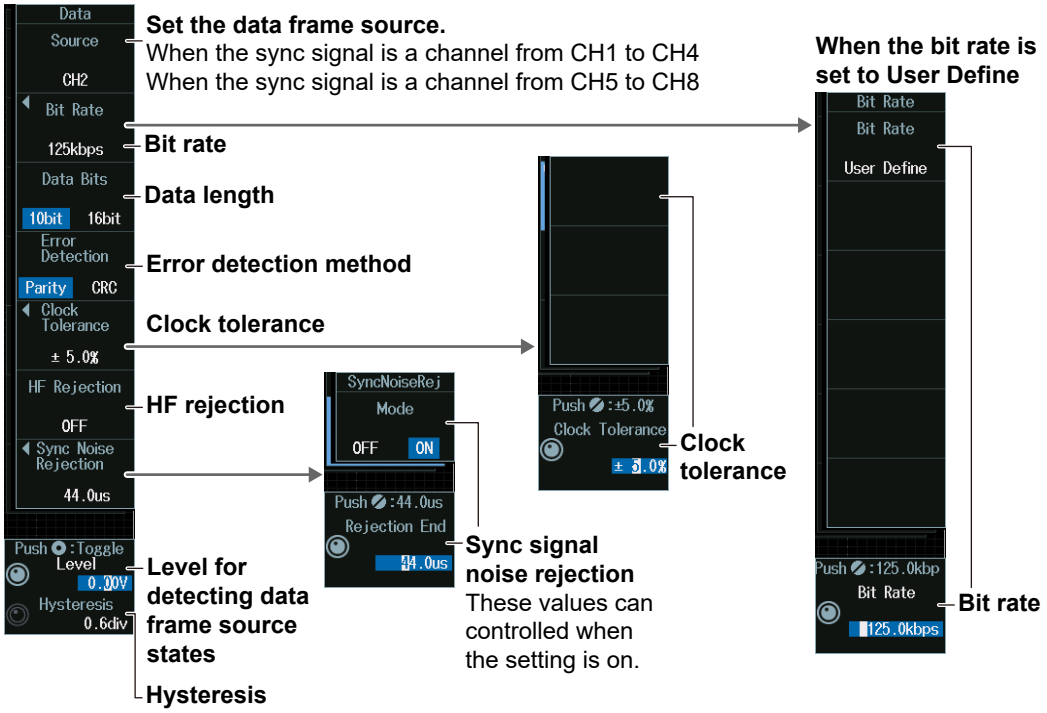
Level for detecting sync signal states

Hysteresis

Press SET (upper right on the front panel) to switch between level and hysteresis.

Data Frame Source (Data)

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



Level for Detecting Data Frame Source States (LEVEL, Hysteresis)

Turn the **jog shuttle** to set the level or hysteresis.

- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
- To set the level, you can drag the level display line on the screen.

Jog shuttle setting menu

Press SET (upper right on the front panel) to switch between level and hysteresis.

Clock Tolerance (Clock Tolerance)

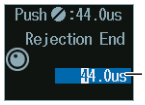
1. Press the **Clock Tolerance** soft key.
2. Turn the **jog shuttle** to set the clock tolerance.
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Sync Noise Rejection End (Rejection End)

1. Press the **Sync Noise Rejection** soft key.
2. Turn the **jog shuttle** to set the time period to the end of noise rejection.
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

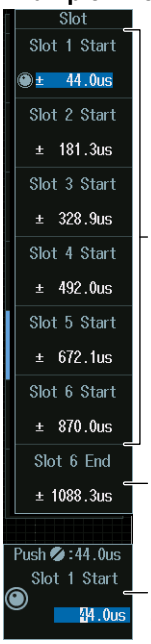


Sync noise rejection end

Setting the Time Range of Each Slot (Slot)

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

Example when the number of slots is set to 6



Select the slot for setting the start position.

Select the last slot for setting the end position.

Set the start position of each slot and the end position of the last slot.

Set the start position (Start) of each slot and the end position (End) of the last slot.

1. Press any of the **Slot 1 Start** to **Slot 6** or **Slot End** soft key.
2. Turn the **jog shuttle** to set the start (Start) or end (End) position.
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Set Slot Start and Slot End.

Note

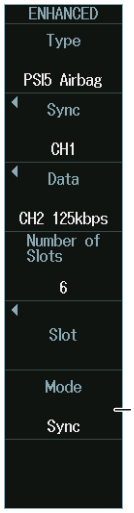
- The slot start position that can be set varies depending on the number of slots (Number of Slots), which specifies the trigger source frame pattern.
- The slot end position that can be set is the largest number specified by Number of Slots.

Trigger Mode (Mode)

Sync Mode

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

The instrument triggers on the rising edge of sync pulses.

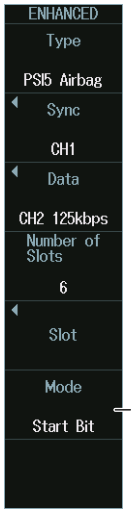


Set the trigger mode to Sync.

Start Bit Mode

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

The instrument triggers on start bits.

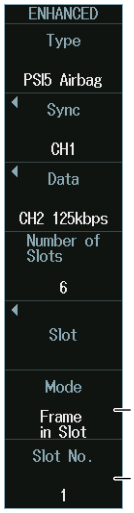


Set the trigger mode to Start Bit.

Frame in Slot Mode

Press the **Mode** soft key and then the **Frame in Slot** soft key to display the following menu.

The instrument triggers on data frames included in the selected slot. Frame in Slot mode will not be available if the sync signal (Sync) is set to None.



Set the trigger mode to Frame in Slot.

Set the slot number for specifying the trigger source frame pattern.

- 1 to N (the number of slots) when the number of slots* on the Setup menu is set to a number from 1 to 6
- 1 to 6 when the number of slots on the Setup menu is set to Auto

Data Mode

1. Press the **Mode** soft key and then the **Data** soft key.
2. Press the **Condition Setup** soft key to display the following menu.
   The instrument triggers on data frames included in the selected slot.

Set the trigger mode to Data.

When the data comparison condition is True or False

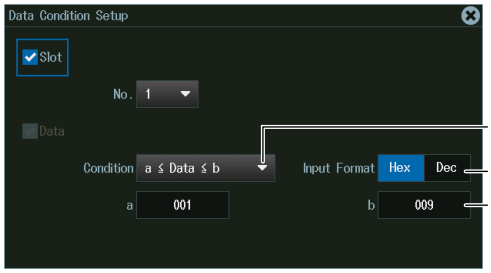
Trigger source slot number

Data (always selected)

Data comparison condition

Data pattern

When the data frame condition is Data = a; Data ≠ a; a ≤ Data; Data ≤ b; a ≤ Data ≤ b; or Data < a, b < Data



Data comparison condition

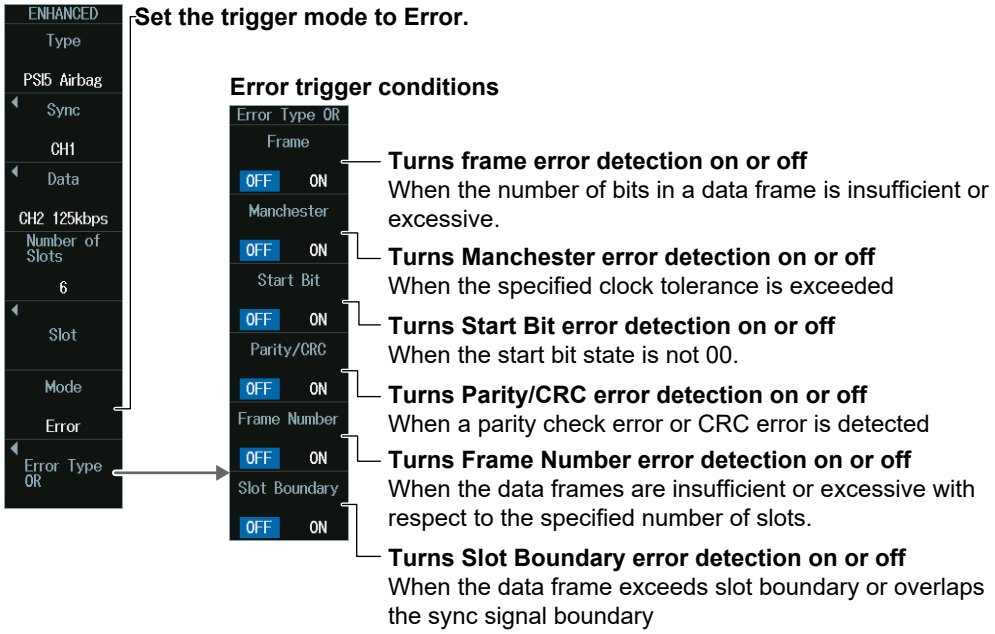
Data input format

Reference Values (a and b)

Error Mode

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

The instrument triggers when it detects various types of errors.



2.20 Triggering on UART Signals (Option)

This section explains the following settings for triggering on UART signals:

- Trigger source
  Bit rate, bit order, polarity, HF rejection, source bit, sample point
- Format
- Level and hysteresis for detecting trigger source states
- Trigger type
  Trigger conditions

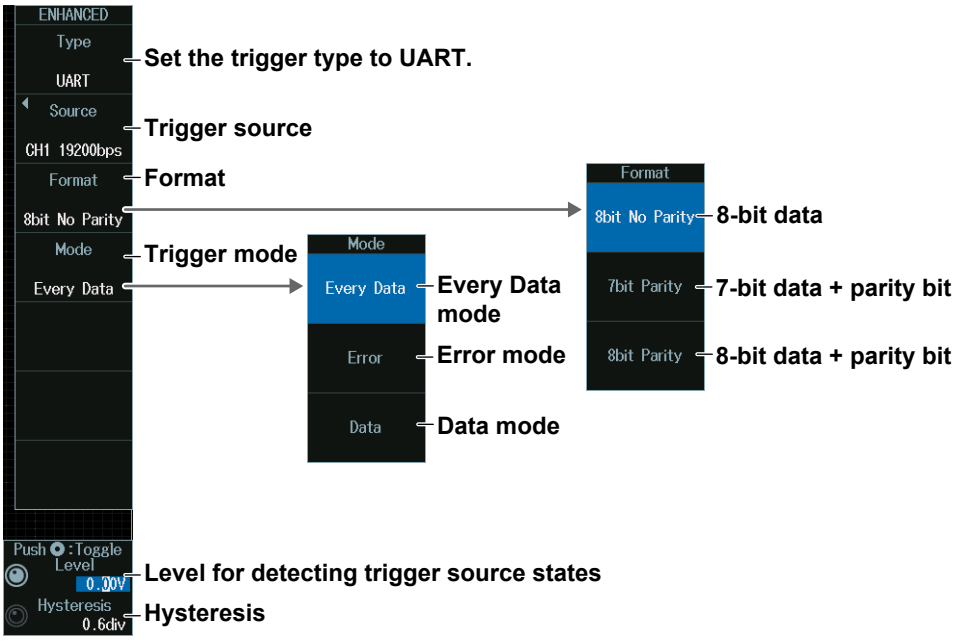
► “UART Trigger [ENHANCED, option],” “HF Rejection (HF Rejection)” in the Features Guide

Auto Setup

The instrument 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

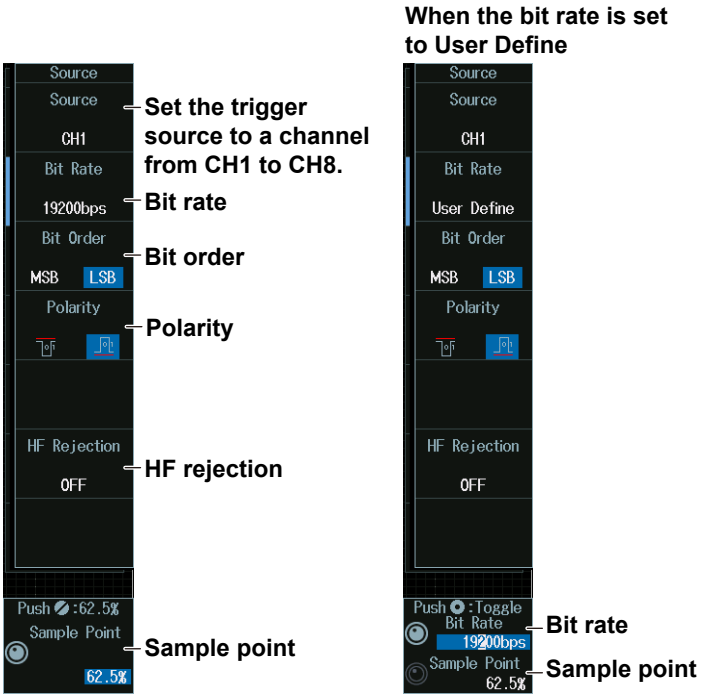
1. Press **ENHANCED** to display the ENHANCED menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the ENHANCED menu from TRIGGER on the top menu that is displayed.
2. Press the **Type** soft key. From the setup menu that appears, select **UART** to display the following menu.



Trigger Source (Source)

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

When the Trigger Source Is a Channel from CH1 to CH8

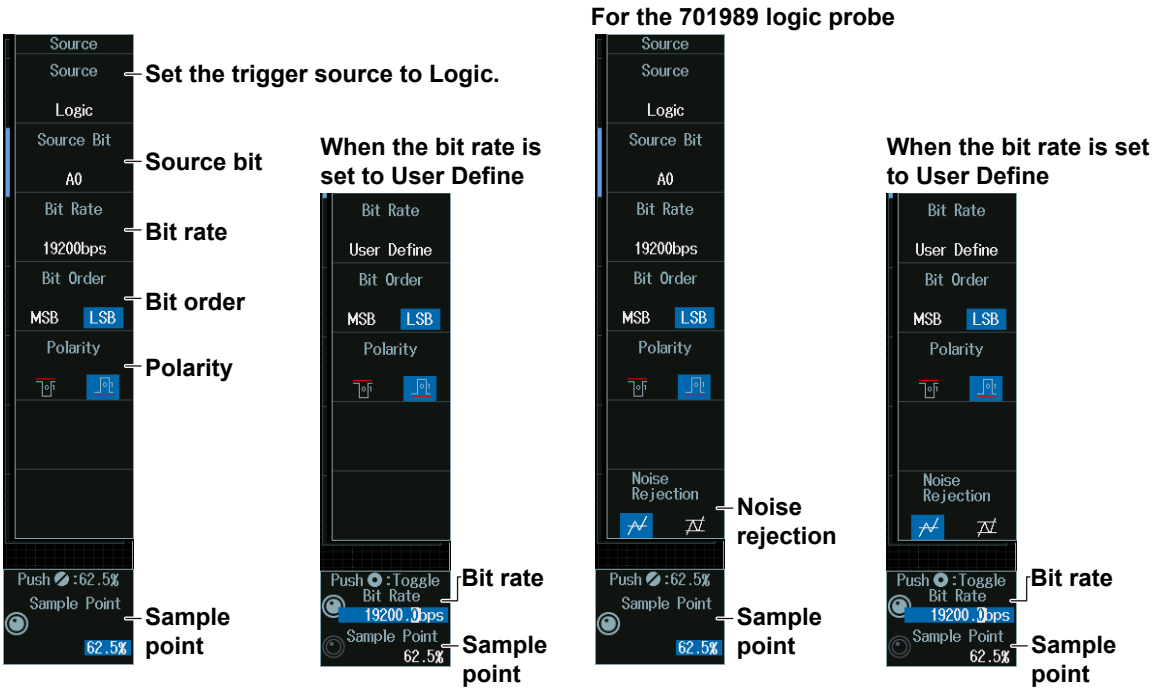


Note

The available trigger source settings vary depending on the model.

- The available settings on 8ch models are as follows:
  CH1 to CH8
- The available settings on 4ch models are as follows:
  CH1 to CH4

When the Trigger Source Is Logic



Note

The following source bit display applies to models with the /L32 option.
C0 to C7 (LOGIC port C), D0 to D7 (LOGIC port D)

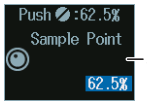
Sample Point (Sample Point) and Bit Rate (Bit Rate)

When the bit rate is not set to User Define

Turn the **jog shuttle** to set the bit rate and sample point.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the pop-up list that appears on the screen.

Jog shuttle setting menu

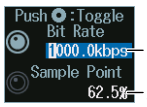


When the bit rate is set to User Define

Turn the **jog shuttle** to set the sample point.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the pop-up list that appears on the screen.

Jog shuttle setting menu



Press SET (upper right on the front panel) to switch between bit rate and sample point.

Trigger Mode (Mode)

Every Data mode

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

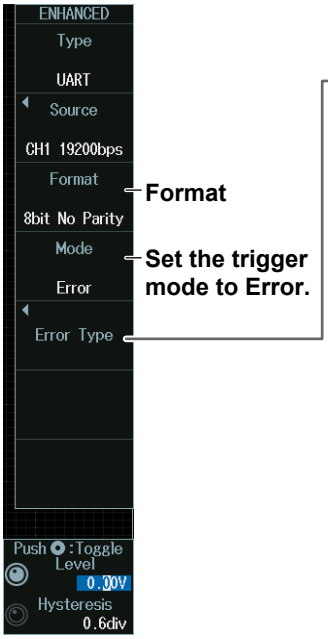
The instrument triggers on all data.

Set the trigger mode to Every Data.

Error Mode

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

The instrument triggers when it detects various types of errors.

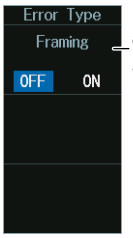


Format

Set the trigger mode to Error.

Error trigger conditions

When the format is 8bit No Parity



Turns framing error detection on or off
When the logical value of the stop bit is 0

When the format is 7bit Parity or 8bit Parity

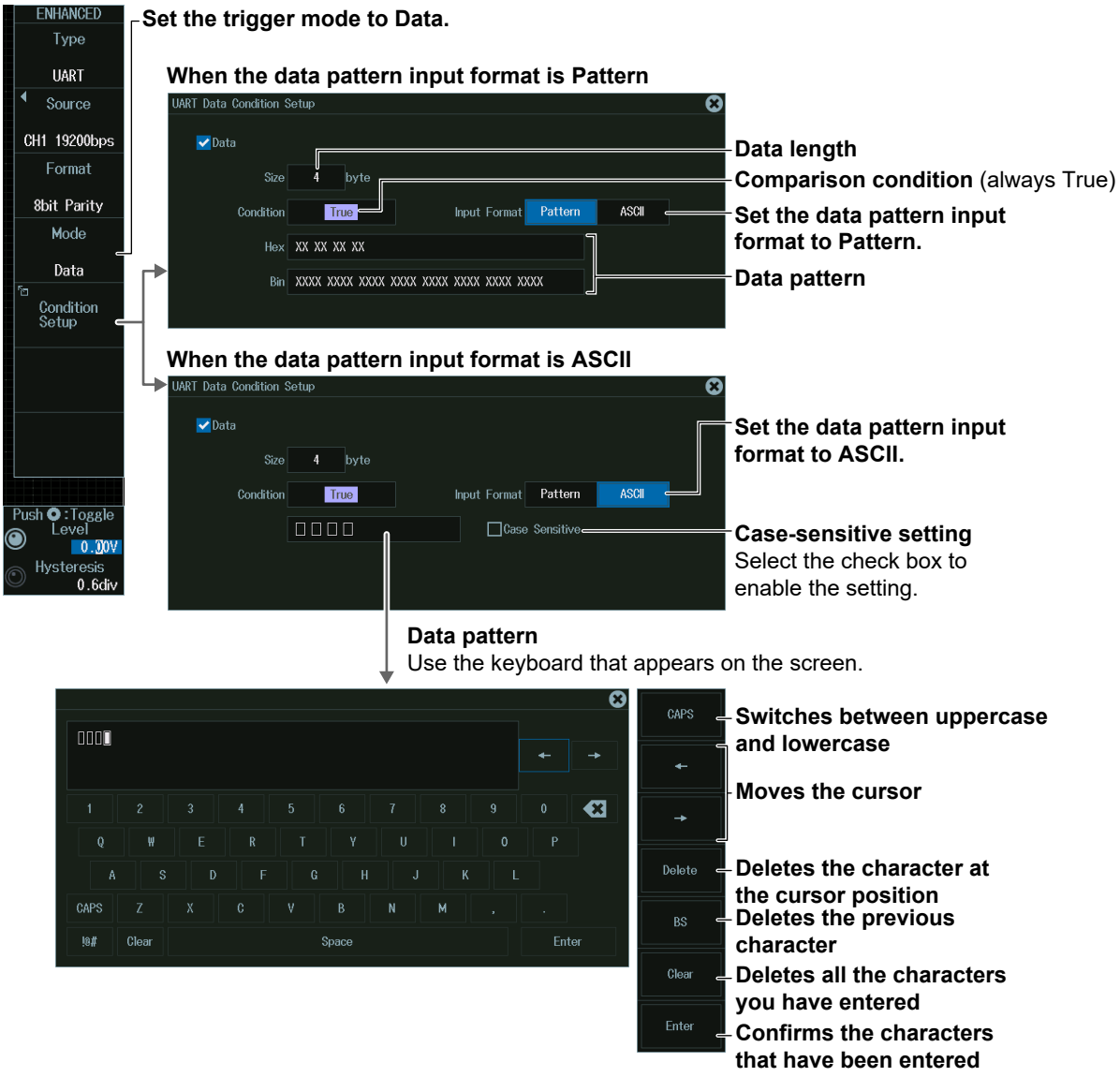
Turns framing error detection on or off
When the logical value of the stop bit is 0

Turns parity error detection on or off
When a parity error is detected in the received character

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

Data Mode

1. Press the **Mode** soft key and then the **Data** soft key.
2. Press the **Condition Setup** soft key to display the following menu.
   The instrument triggers when the data pattern is matched.



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. Example: AB'CR'D (four characters), XY'SP' (three characters), P'NUL'WU (four characters)
- The entered string, including the character codes for the case, 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.

Level for Detecting Trigger Source States (Level, Hysteresis)

Turn the **jog shuttle** to set the level or hysteresis.

- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
- To set the level, you can drag the level display line on the screen.

Jog shuttle setting menu

When the trigger source is set to CH1 to CH8

Level for detecting trigger source states

Hysteresis

Press SET (upper right on the front panel) to switch between level and hysteresis.

When the trigger source is LOGIC

Level for detecting trigger source states

2.21 Triggering on I²C Bus Signals (Option)

This section explains the following settings for triggering on I²C bus signals:

- SCL source and SDA source
  HF rejection, source bit, level and hysteresis for detecting SCL and SDA source states
- Trigger type
  Trigger conditions

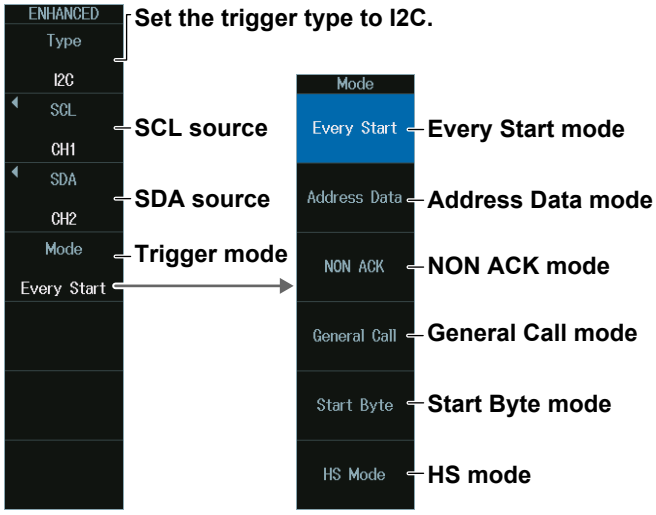
► "I²C Bus Trigger [ENHANCED, option]," "HF Rejection (HF Rejection)" in the Features Guide

Auto Setup

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

ENHANCED I2C Menu

1. Press **ENHANCED** to display the ENHANCED menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the ENHANCED menu from TRIGGER on the top menu that is displayed.
2. Press the **Type** soft key. From the setup menu that appears, select **I2C** to display the following menu.



SCL Source (SCL), SDA Source (SDA)

Press the **SCL** or **SDA** soft key. The menu that appears varies depending on the specified source.

When the SCL Source or SDA Source Is a Channel from CH1 to CH8

SCL

Set the SCL source to a channel from1 to CH8.

HF rejection

Level for detecting SCL source states

Hysteresis

SDA

Set the SDA source.

- When the SCL source is a channel from CH1 to CH4 (CH1 to CH4)
- When the SCL source is a channel from CH5 to CH8 (CH5 to CH8)

HF rejection

Level for detecting SDA source states

Hysteresis

Note

The available trigger source settings vary depending on the model.

- The available settings on 8ch models are as follows:
  CH1 to CH8
- The available settings on 4ch models are as follows:
  CH1 to CH4

When the SCL Source Is Logic

When the SCL source is set to Logic, the SDA source is fixed to Logic.

SCL source

Set the SCL source to Logic.

Source bit

Level for detecting SCL source states

SCL source
For the 701989 Logic Probe

Noise rejection

SDA Source

Cannot be used

Level for detecting SCL source states

SDA Source
For the 701989 Logic Probe

Noise rejection

Note

The following source bit display applies to models with the /L32 option.
C0 to C7 (LOGIC port C), D0 to D7 (LOGIC port D)

Level for Detecting SCL and SDA Source States (Level, Hysteresis)

Turn the **jog shuttle** to set the level or hysteresis.

- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
- To set the level, you can drag the level display line on the screen.

Jog shuttle setting menu

When the SCL or SDA source is set to CH1 to CH8

Level used to detect SCL or SDA source states

Hysteresis

Press SET (upper right on the front panel) to switch between level and hysteresis.

When the SCL or SDA source is Logic

Level used to detect SCL or SDA source states

Trigger Mode (Mode)

Every Start Mode

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

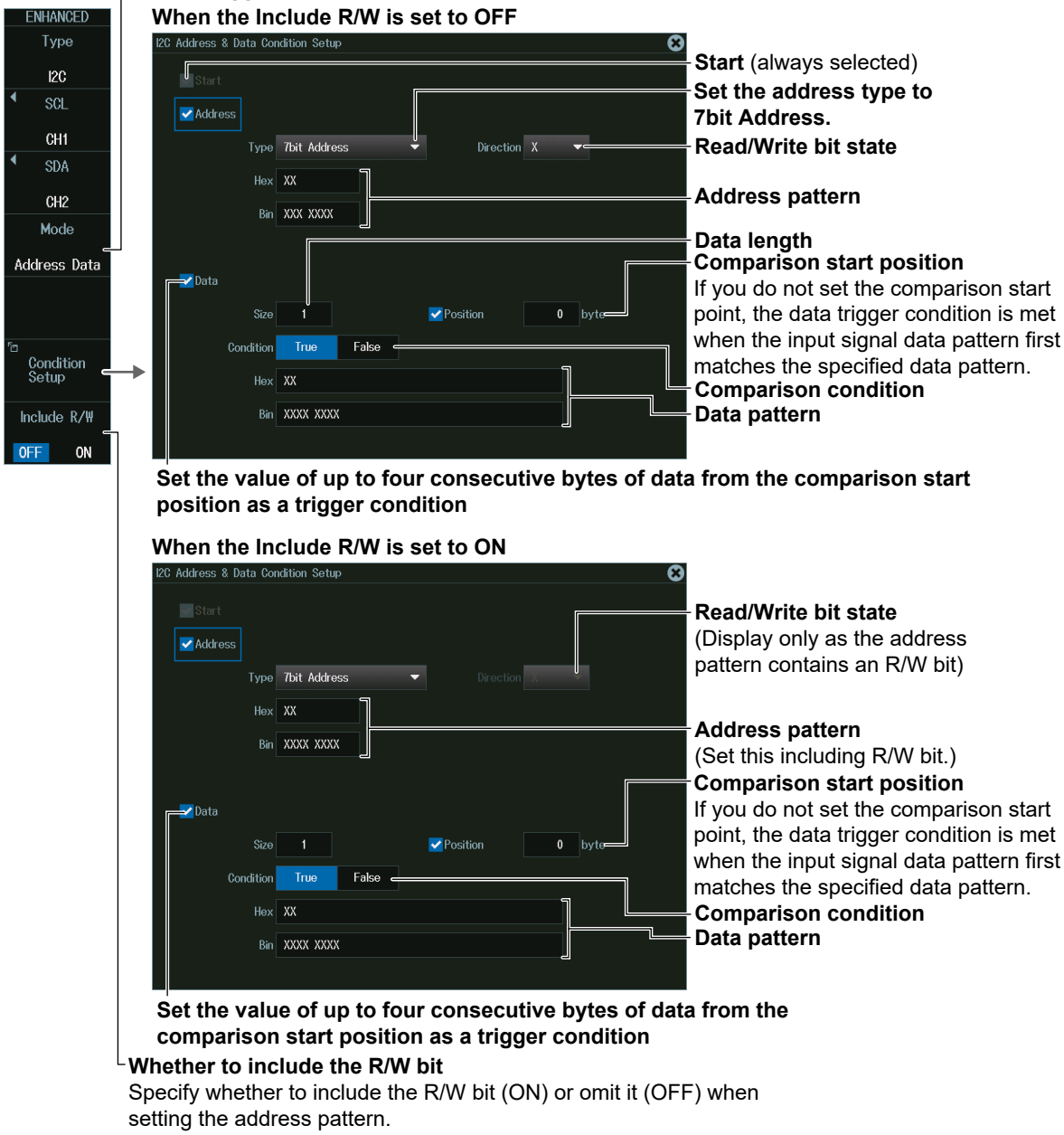
The instrument triggers when it detects a start condition.

Set the trigger mode to Every Start.

Address Data mode

1. Press the **Mode** soft key and then the **Address Data** soft key.
2. Press the **Condition Setup** soft key to display the following menu.
   The instrument 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**



Set the trigger mode to AddressData.

When the Include R/W is set to OFF

Start (always selected)

Set the address type to 7bit Address.

Read/Write bit state

Address pattern

Data length

Comparison start position

If you do not set the comparison start point, the data trigger condition is met when the input signal data pattern first matches the specified data pattern.

Comparison condition

Data pattern

Set the value of up to four consecutive bytes of data from the comparison start position as a trigger condition

When the Include R/W is set to ON

Read/Write bit state

(Display only as the address pattern contains an R/W bit)

Address pattern

(Set this including R/W bit.)

Comparison start position

If you do not set the comparison start point, the data trigger condition is met when the input signal data pattern first matches the specified data pattern.

Comparison condition

Data pattern

Set the value of up to four consecutive bytes of data from the comparison start position as a trigger condition

Whether to include the R/W bit

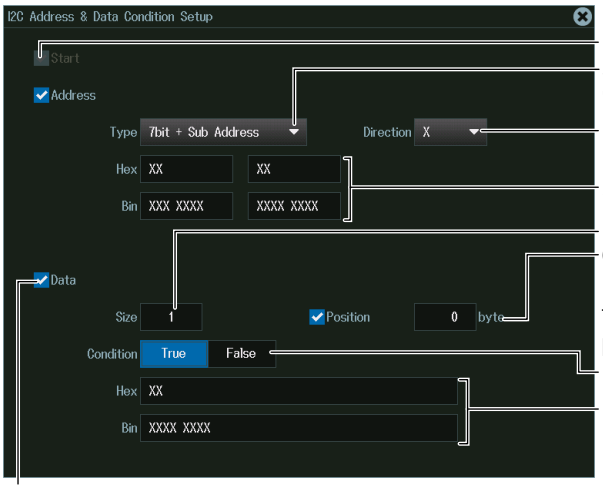
Specify whether to include the R/W bit (ON) or omit it (OFF) when setting the address pattern.

Note

R/W bit inclusion (Include R/W) can also be set by using Analyzing and Searching I2C Bus Signals and then Bus Setup (Setup). Settings are synchronized. For details on I2C bus signal analysis, see section 12.9.

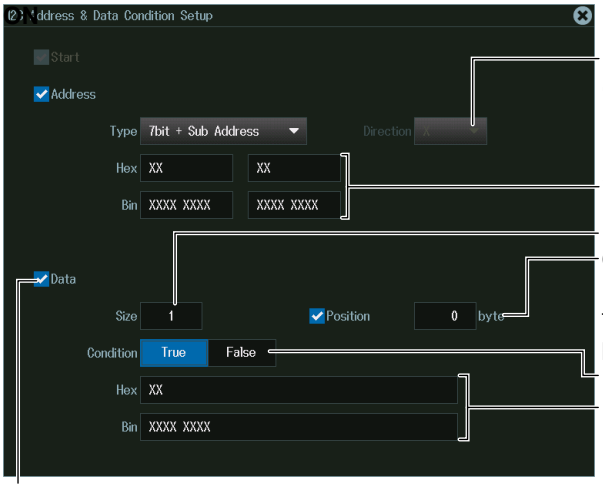
- **When Address Type Is 7bit+Sub Address**

When the Include R/W is set to OFF



Start (always selected)
Set the address type to 7bit + Sub Address.
Read/Write bit state
Address pattern
Data length
Comparison start position
If you do not set the comparison start point, the data trigger condition is met when the input signal data pattern first matches the specified data pattern.
Comparison condition
Data pattern
Set the value of up to four consecutive bytes of data from the comparison start position as a trigger condition

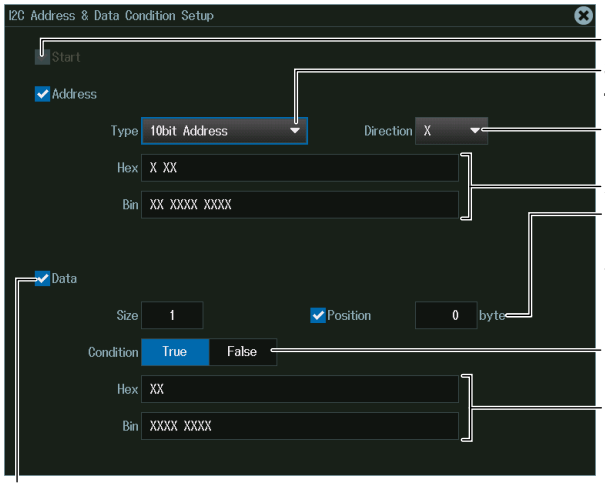
When the Include R/W is set to



Read/Write bit state
(Display only as the address pattern contains an R/W bit)
Address pattern
(Set this including R/W bit.)
Data length
Comparison start position
If you do not set the comparison start point, the data trigger condition is met when the input signal data pattern first matches the specified data pattern.
Comparison condition
Data pattern
Set the value of up to four consecutive bytes of data from the comparison start position as a trigger condition

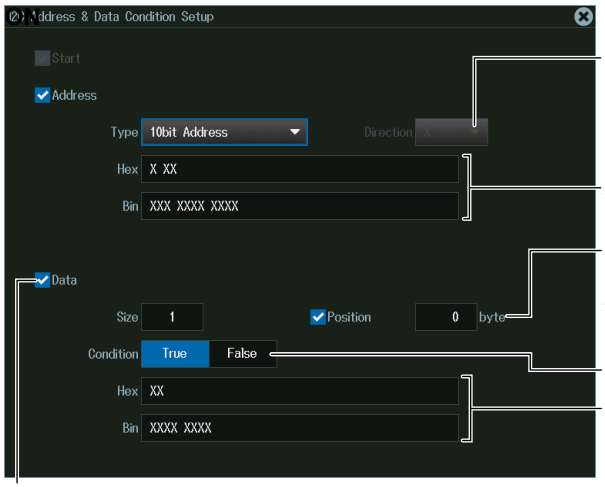
- **When Address Type Is 10bit Address**

When the Include R/W is set to OFF



Start (always selected)
Set the address type to 10bit Address.
Read/Write bit state
Address pattern
Comparison start position
If you do not set the comparison start point, the data trigger condition is met when the input signal data pattern first matches the specified data pattern.
Comparison condition
Data pattern
Set the value of up to four consecutive bytes of data from the comparison start position as a trigger condition

When the Include R/W is set to

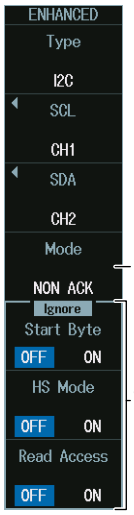


Read/Write bit state
(Display only as the address pattern contains an R/W bit)
Address pattern
(Set this including R/W bit.)
Comparison start position
If you do not set the comparison start point, the data trigger condition is met when the input signal data pattern first matches the specified data pattern.
Comparison condition
Data pattern
Set the value of up to four consecutive bytes of data from the comparison start position as a trigger condition

NON ACK Mode

Press the **Mode** soft key and then the **NON ACK** soft key. The following menu appears.

The instrument triggers when the acknowledgment bit is Nack.

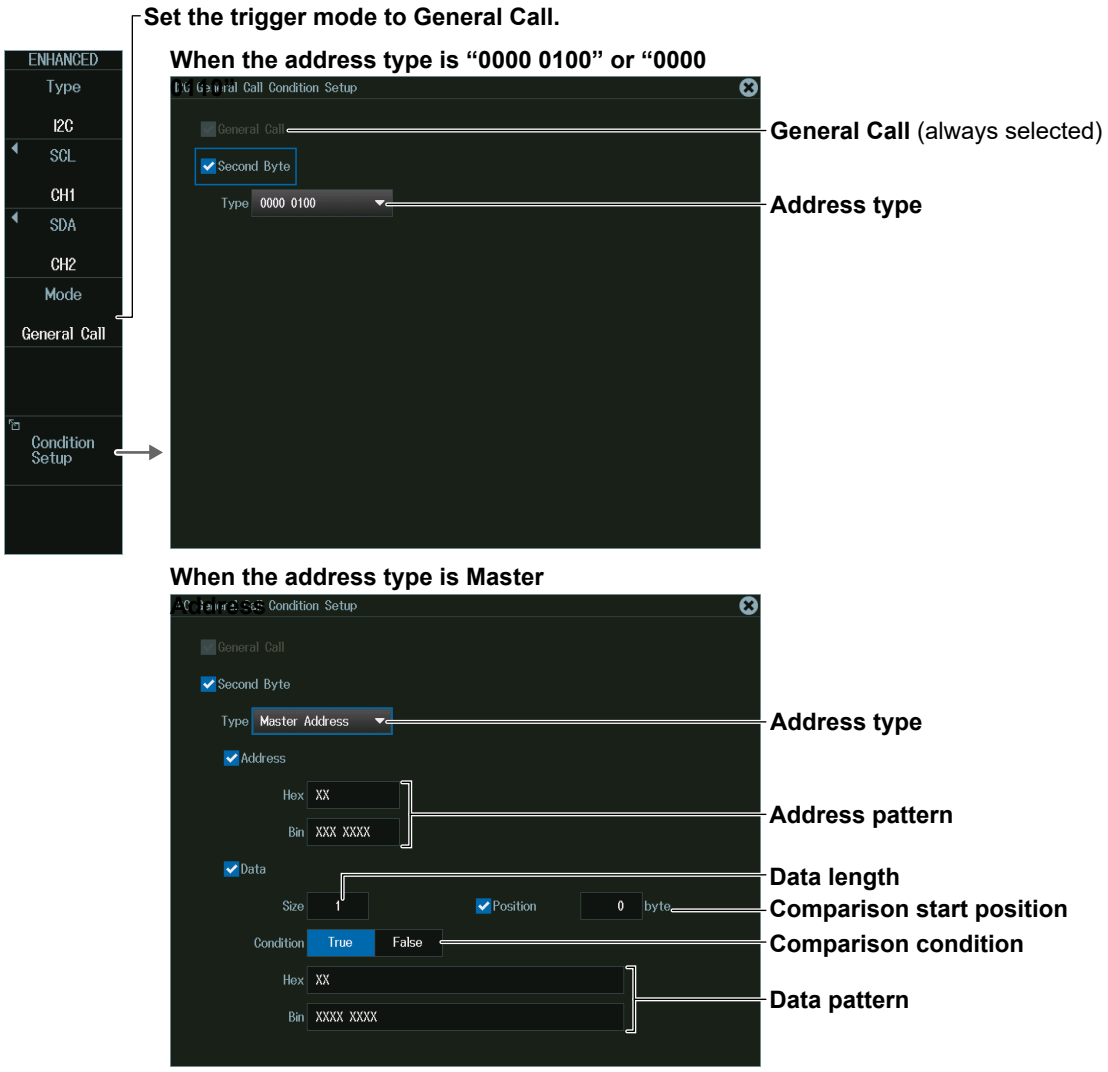


Set the trigger mode to NON ACK.

Whether to make the acknowledge bit of each signal a trigger source
- Start byte
- HS mode master code
- Read access byte

General Call Mode

1. Press the **Mode** soft key and then the **General Call** soft key.
2. Press the **Condition Setup** soft key to display the following menu.
   When Second Byte is set to Master Address, the instrument triggers on the AND of the general call address (0000 0000), second byte address pattern, data pattern, and comparison start position conditions.
   Otherwise, the instrument triggers on the AND of general call address (0000 0000) and Second Byte address pattern conditions. Items whose check boxes are selected are used as trigger conditions.



Start Byte Mode

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

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

Set the trigger mode to Start Byte.

HS mode

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

The instrument triggers when it detects a high speed mode master code.

Set the trigger mode to HS Mode.

2.22 Triggering on SPI Bus Signals (Option)

This section explains the following settings for triggering on SPI bus signals:

- Wiring system (Mode)
- Clock source
  Polarity, HF rejection, source bit, level and hysteresis for detecting clock source edges
- Data source
  HF rejection, source bit, level and hysteresis for detecting data source states
- Chip select source
  Active state, source bit, level and hysteresis for detecting chip select source states
- Trigger conditions

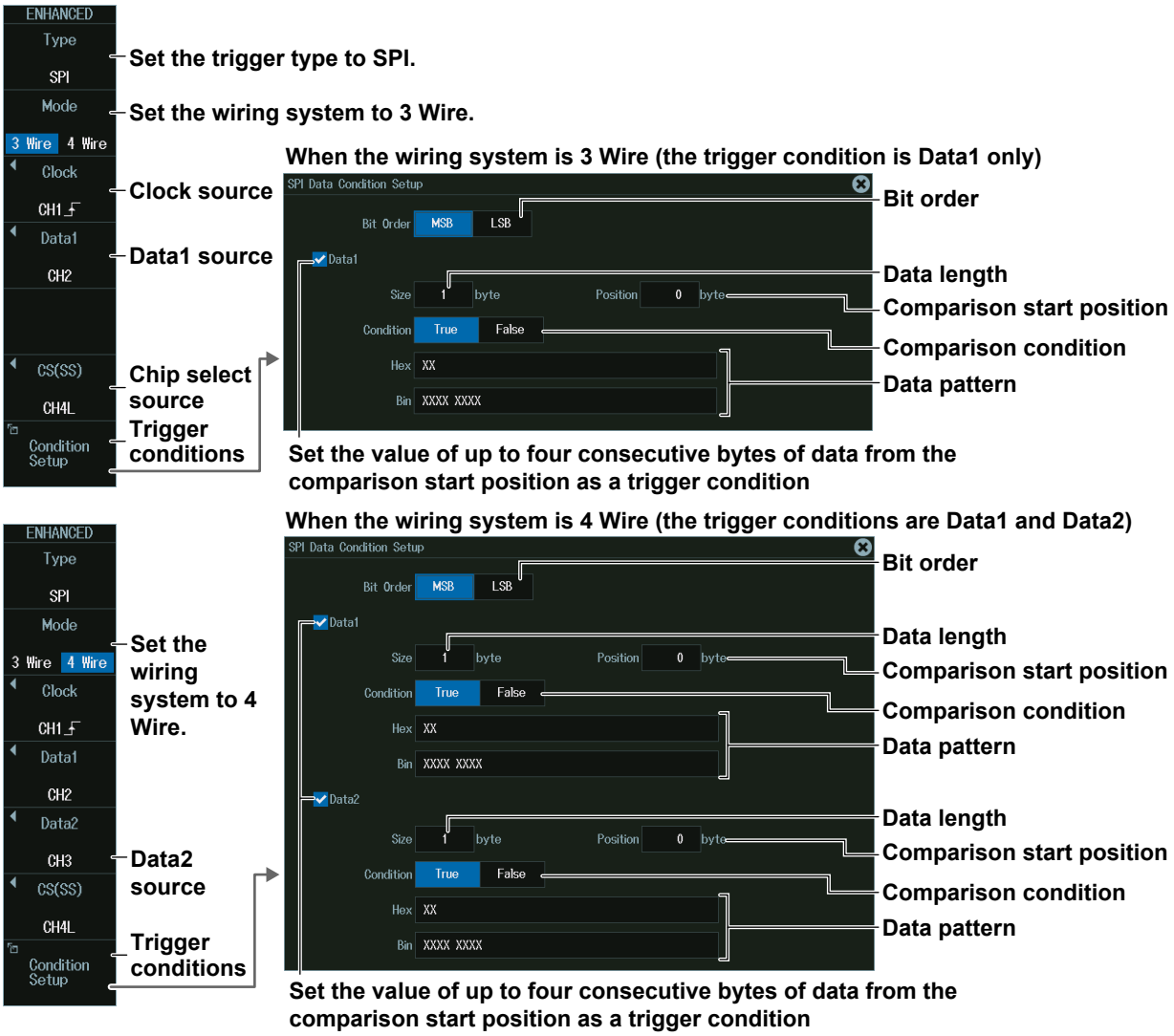
► “SPI Bus Trigger [ENHANCED, option],” “HF Rejection (HF Rejection)” in the Features Guide

Auto Setup

The instrument 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

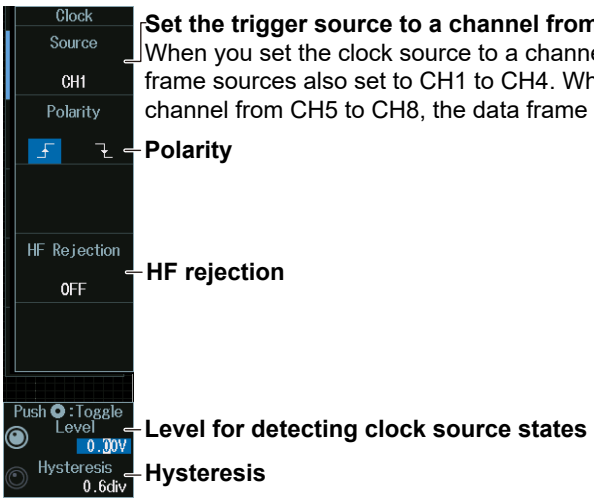
1. Press **ENHANCED** to display the ENHANCED menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the ENHANCED menu from TRIGGER on the top menu that is displayed.
2. Press the **Type** soft key. From the setup menu that appears, select **SPI**



Clock Source (Clock)

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

When the Clock Source Is a Channel from CH1 to CH8



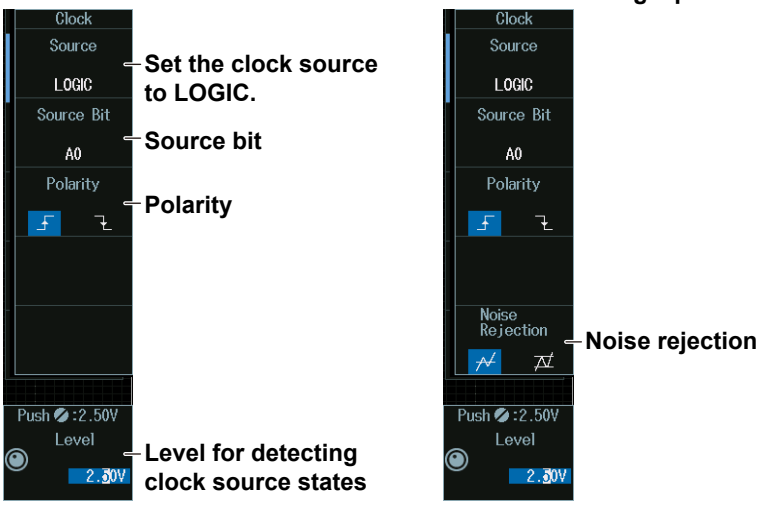
Note

The available trigger source settings vary depending on the model.

- The available settings on 8ch models are as follows:
  CH1 to CH8
- The available settings on 4ch models are as follows:
  CH1 to CH4

When the Clock Source Is LOGIC

For the 701989 logic probe



Note

The following source bit display applies to models with the /L32 option.
C0 to C7 (LOGIC port C), D0 to D7 (LOGIC port D)

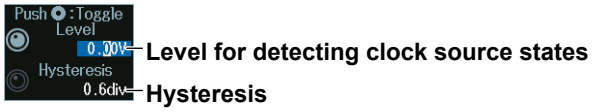
Level for Detecting Clock Source States (Level, Hysteresis)

Turn the **jog shuttle** to set the level or hysteresis.

- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
- To set the level, you can drag the level display line on the screen.

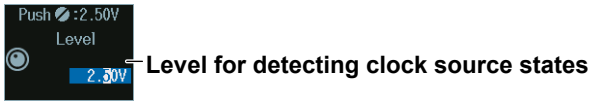
Jog shuttle setting menu

When the clock source is set to CH1 to CH8



Press SET (upper right on the front panel) to switch between level and hysteresis.

When the clock source is Logic

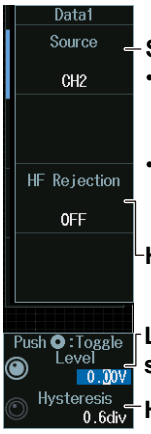


Data 1 Source (Data1), Data 2 Source (Data2)

Press the **Data1** or **Data2** soft key. The menu that appears varies depending on the specified data source. This section gives an explanation of the settings when the wiring system is 4 Wire. If the wire system is set to 3 Wire, there will be no data 2 source (Data2) menu.

When the Clock Source Is a Channel from CH1 to CH8 (for 4 Wire)

Data1 source



Set the Data 1 source.
- 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, set the source to CH5 to CH8.

HF rejection

Level for detecting data 1 source states

Hysteresis

Data2 source

Set the Data 2 source.
- 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, set the source to CH5 to CH8.

HF rejection

Level for detecting data 2 source states

Hysteresis

Note

The available data source settings vary depending on the model.
- The available settings on 8ch models are as follows:
  CH1 to CH8
- The available settings on 4ch models are as follows:
  CH1 to CH4

When the Clock Source Is Logic (for 4 Wire)

When the clock source is set to Logic, data 1 source and data 2 source are fixed to Logic.

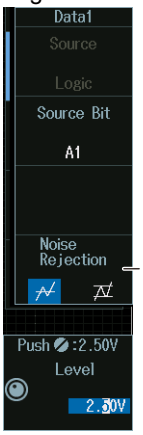
Data1 source

Cannot be used

Source bit

Level for detecting data 1 source states

Data1 source
For the 701989 Logic Probe



Noise rejection

Data2 source

Cannot be used

Level for detecting data 2 source states

Data2 source
For the 701989 Logic Probe

Noise rejection

Note

The following source bit display applies to models with the /L32 option.
C0 to C7 (LOGIC port C), D0 to D7 (LOGIC port D)

Level for Detecting Data 1 Source and Data 2 Source States (LEVEL, Hysteresis)

Turn the **jog shuttle** to set the level or hysteresis.

- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
- To set the level, you can drag the level display line on the screen.

Jog shuttle setting menu

When the data source is set to CH1 to CH8

Level for detecting data source states

Hysteresis

Press SET (upper right on the front panel) to switch between level and hysteresis.

When the data source is Logic

Level for detecting data source states

Chip Select Source (CS (SS))

Press the **CS (SS)** soft key. The menu that appears varies depending on the specified chip select source.

When the Clock Source Is a Channel from CH1 to CH8

Set the chip select source.

- 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, set the source to CH5 to CH8.

Active state

HF rejection

Level for detecting chip select source states.

Hysteresis

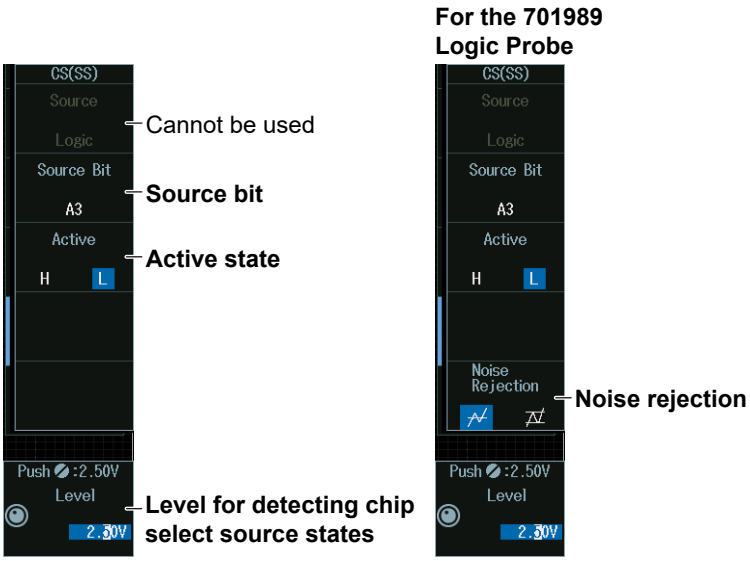
Note

The available data source settings vary depending on the model.

- The available settings on 8ch models are as follows:
  CH1 to CH8
- The available settings on 4ch models are as follows:
  CH1 to CH4

When the Clock Source Is Logic

When the clock source is set to Logic, the chip select source is fixed to Logic.



Note

The following source bit display applies to models with the /L32 option.
C0 to C7 (LOGIC port C), D0 to D7 (LOGIC port D)

Level for Detecting Chip Select Source States (Level, Hysteresis)

Turn the **jog shuttle** to set the level or hysteresis.

- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
- To set the level, you can drag the level display line on the screen.

Jog shuttle setting menu

When the chip select source is a channel from CH1 to CH8

Level for detecting chip select source states.

Hysteresis

Press SET (upper right on the front panel) to switch between level and hysteresis.

When the chip select source is Logic

Level for detecting chip select source states.

2.23 Triggering On User-Defined Serial Bus Signals

This section explains the following settings for triggering on user-defined serial bus signals:

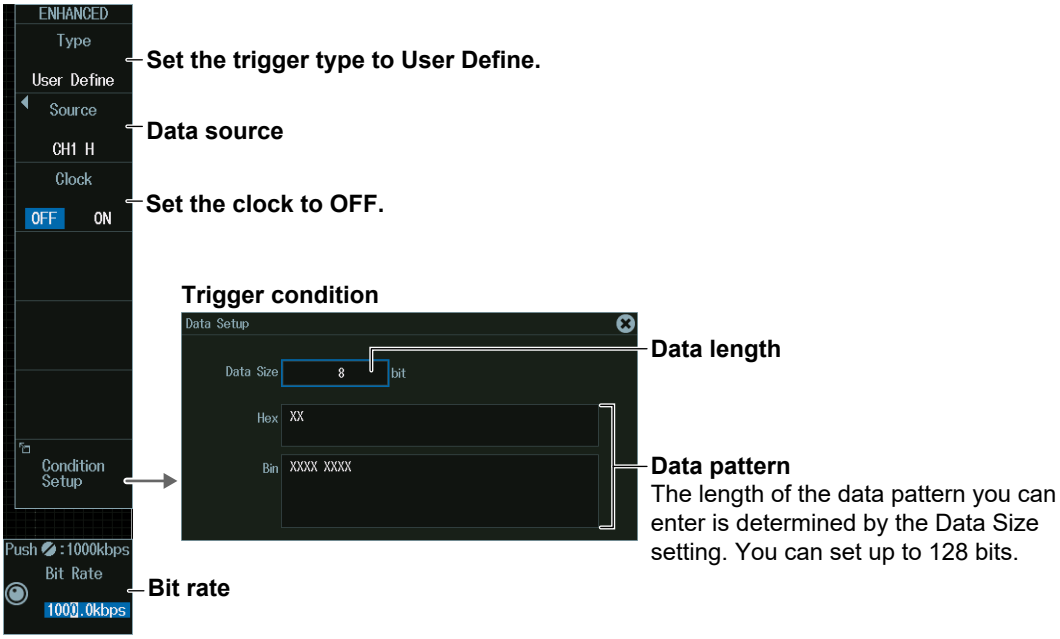
- Bit rate
- Data source
  Data source state, HF rejection, level and hysteresis for detecting data source states
- Turning the clock on and off
  - Clock source
    HF rejection, level and hysteresis for detecting clock source states
  - Enable source
    HF rejection, level and hysteresis for detecting enable source states
  - Latch source
    HF rejection, level and hysteresis for detecting latch source states
- Trigger conditions

► "User-Defined Serial Bus Trigger [User Define, ENHANCED]," "HF Rejection (HF Rejection)" in the Features Guide

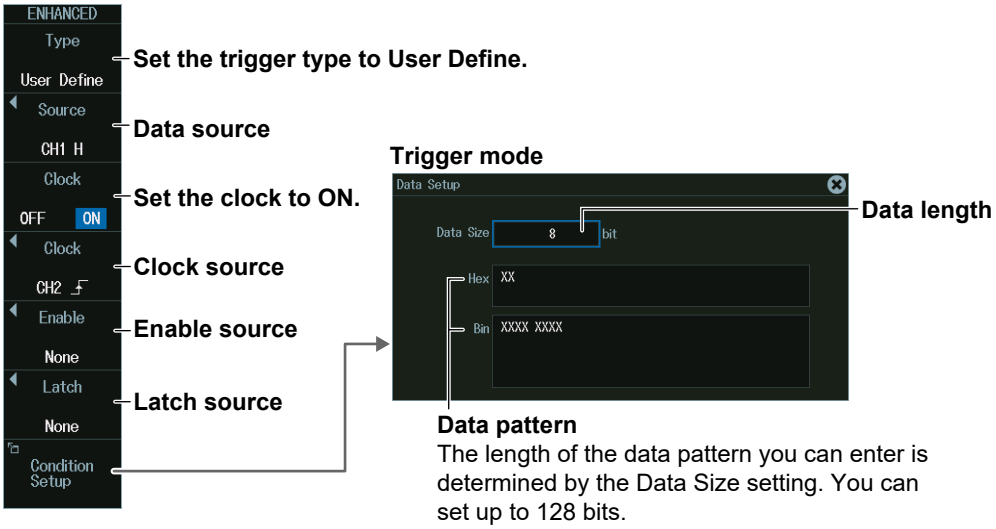
ENHANCED User Define Menu

1. Press **ENHANCED** to display the ENHANCED menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the ENHANCED menu from TRIGGER on the top menu that is displayed.
2. Press the **Type** soft key. From the setup menu that appears, select **User Define** to display the following menu.

Serial Bus without a Clock



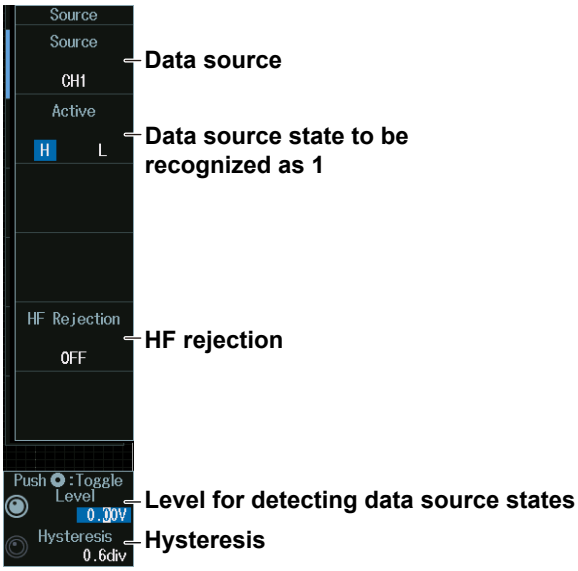
Serial Bus with a Clock



Data Source (Source)

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

Set the data source to compare with the pattern specified as a trigger condition.



Note

The available trigger source settings vary depending on the model.

- The available settings on 8ch models are as follows:
  CH1 to CH8
- The available settings on 4ch models are as follows:
  CH1 to CH4

Level for Detecting Data Source States (Level, Hysteresis)

Turn the **jog shuttle** to set the level or hysteresis.

- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
- To set the level, you can drag the level display line on the screen.

Jog shuttle setting menu

Level for detecting data source states

Hysteresis

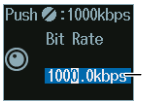
Press SET (upper right on the front panel) to switch between level and hysteresis.

Bit Rate (serial bus without a clock)

The instrument samples according to the bit rate.

1. Press the **Clock** soft key to select OFF.
2. Turn the **jog shuttle** to set the bit rate at which to sample the data source.
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

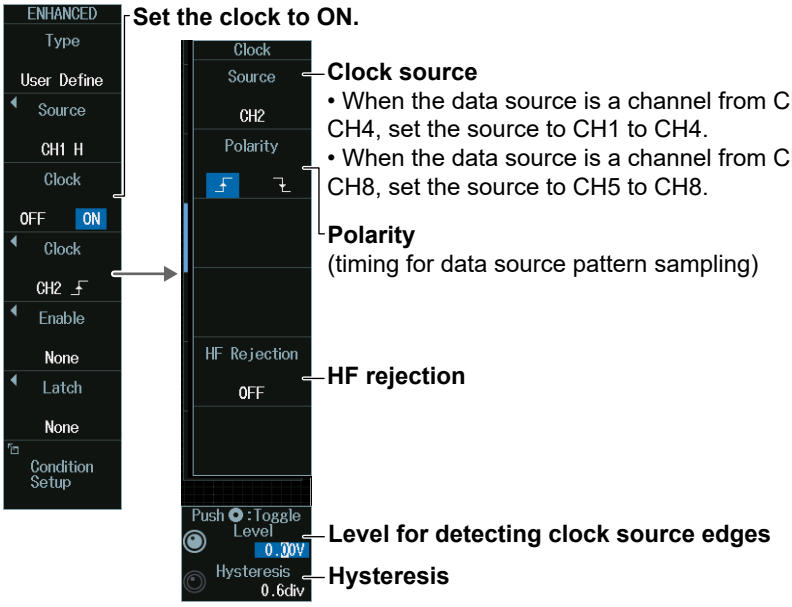


Bit rate

Clock Source (serial bus with a clock)

The instrument samples in sync with the clock source.

1. Press the **Clock** soft key to select ON.
2. Press the **Clock** soft key to display the following menu.
   Specify which clock source edge causes the data source to be sampled.



Set the clock to ON.

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
(timing for data source pattern sampling)

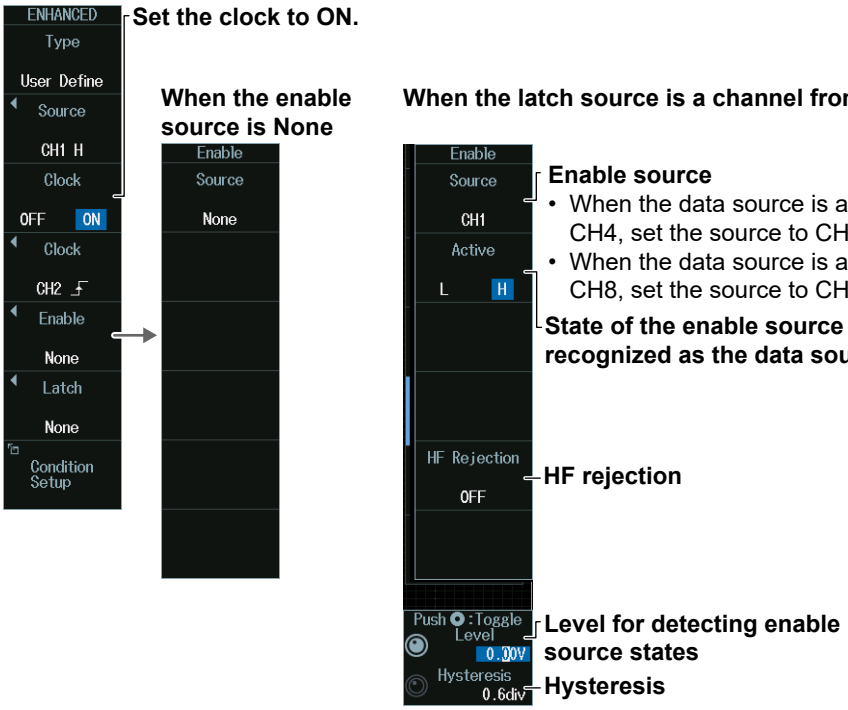
HF rejection

Level for detecting clock source edges

Hysteresis

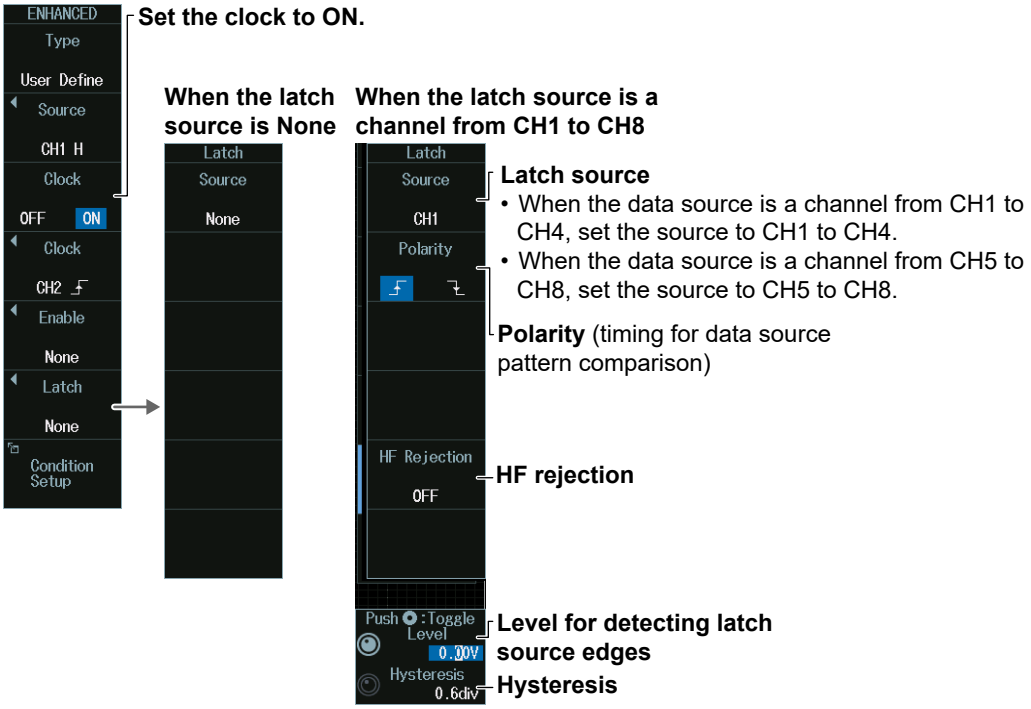
- **Setting the Enable Source**

3. Press the **Enable** soft key to display the following menu.
When the data source is sampled in sync with the clock source, the period for which the instrument tests the data source can be controlled using the enable source.



- **Setting the Latch Source**

4. Press the **Latch** soft key to display the following menu.
You can specify the timing at which the data source pattern sampled in sync with the clock source is compared with the specified pattern as a trigger condition.



Level for Detecting Clock, Enable, and Latch Source States (Level, Hysteresis)

Turn the **jog shuttle** to set the level or hysteresis.

- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
- To set the level, you can drag the level display line on the screen.

Jog shuttle setting menu

Level for detecting data source states

Hysteresis

Press SET (upper right on the front panel) to switch between level and hysteresis.

2.24 Triggering on a TV Trigger

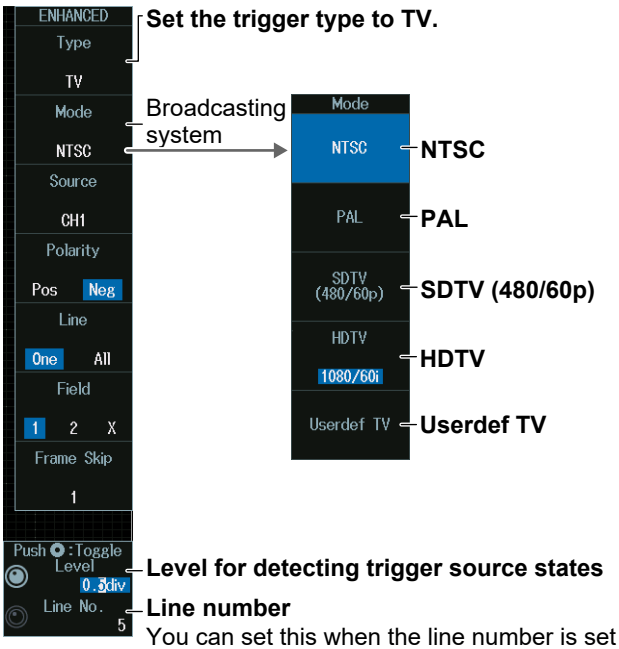
This section explains the following settings for triggering on a TV trigger:

- Broadcasting system
- Trigger source
  Polarity, line number, field number, frame skip, resolution
- Level for detecting trigger source states
- Channel source (Userdef TV)
  Polarity, HF rejection, horizontal sync frequency, sync guard frequency

► **"TV Trigger [ENHANCED]," "HF Rejection (HF Rejection)" in the Features Guide**

ENHANCED TV Menu

1. Press **ENHANCED** to display the ENHANCED menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the ENHANCED menu from TRIGGER on the top menu that is displayed.
2. Press the **Type** soft key. From the setup menu that appears, select **TV** to display the following menu.



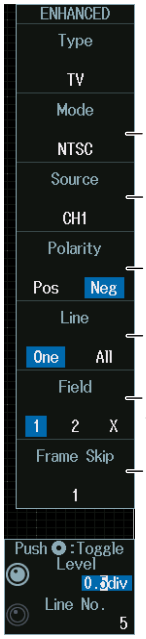
You can set this when the line number is set to One.

Broadcasting System (Mode)

NTSC mode

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

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



Set the broadcasting system to NTSC.

Trigger source

Polarity

Line number

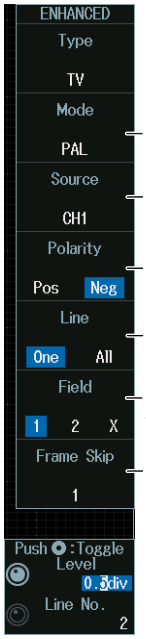
Field number
You can set this when the line number is set to 1.

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

PAL mode

Press the **Mode** soft key and then the **PAL** soft key. The following menu appears.

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



Set the broadcasting system to PAL.

Trigger source

Polarity

Line number

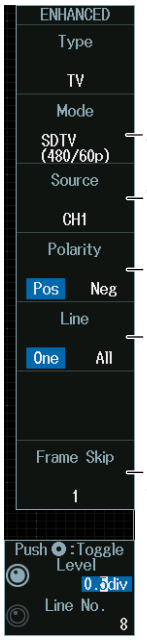
Field number
You can set this when the line number is set to 1.

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

SDTV (480/60p) Mode

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

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



Set the broadcasting system to SDTV(480/60p).

Trigger source

Polarity

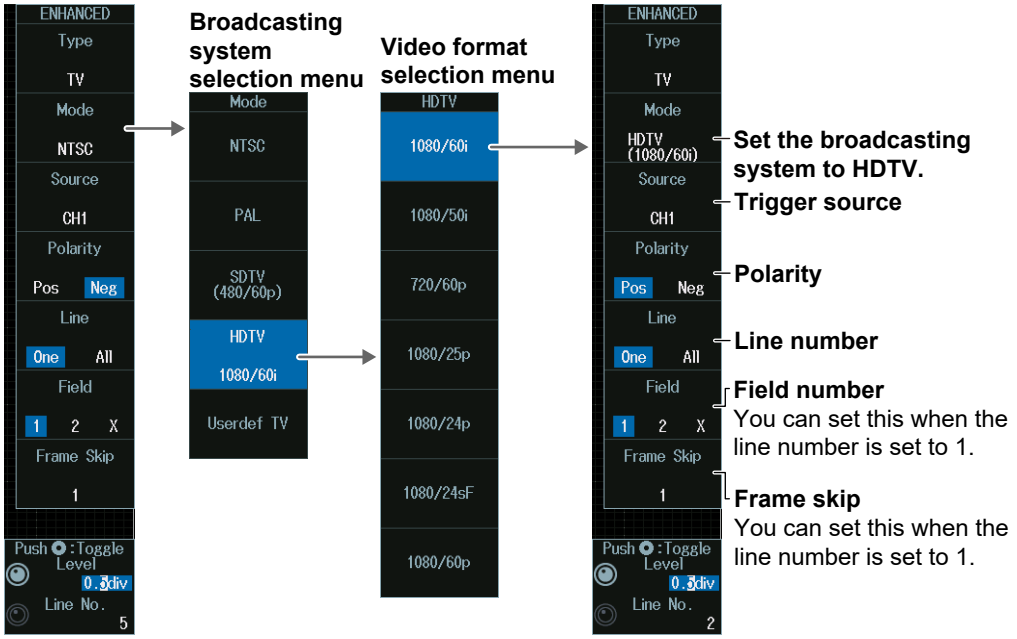
Line number

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

HDTV mode

Press the **Mode** soft key and then the **HDTV** soft key. From the video format selection menu, select the format. The following menu appears.

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



Set the broadcasting system to HDTV.

Trigger source

Polarity

Line number

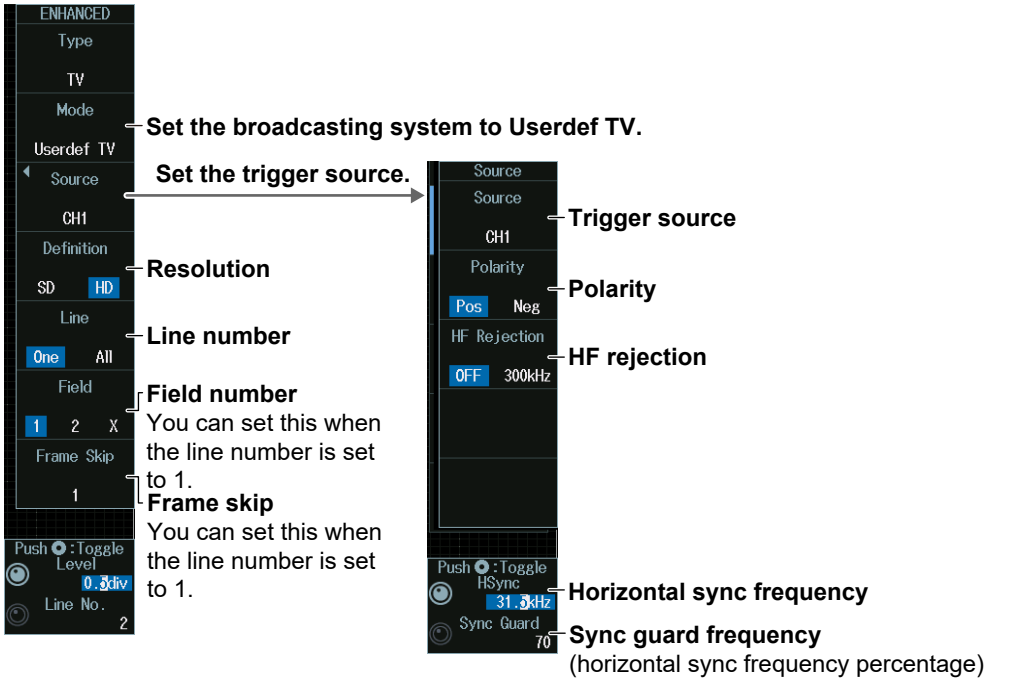
Field number
You can set this when the line number is set to 1.

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

Userdef TV Mode

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

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



Level and Line Number for Detecting Trigger Source States (Level, Line No.)

Turn the **jog shuttle** to set the level or line number.

- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
- To set the level, you can drag the level display line on the screen.

Jog shuttle setting menu

Press SET (upper right on the front panel) to switch between level and line number.

Setting the Horizontal Sync Frequency and Sync Guard Frequency (HSync/Sync Guard)

You can set these parameters when the broadcasting system is set to Userdef TV.

1. Press the **Source** soft key.
2. Turn the **jog shuttle** to set the horizontal sync frequency or sync guard frequency.
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Press SET (upper right on the front panel) to switch between horizontal sync frequency and sync guard frequency.

2.25 Triggering on Combination Triggers (B TRIG)

This section explains the following settings for triggering on a combination trigger:

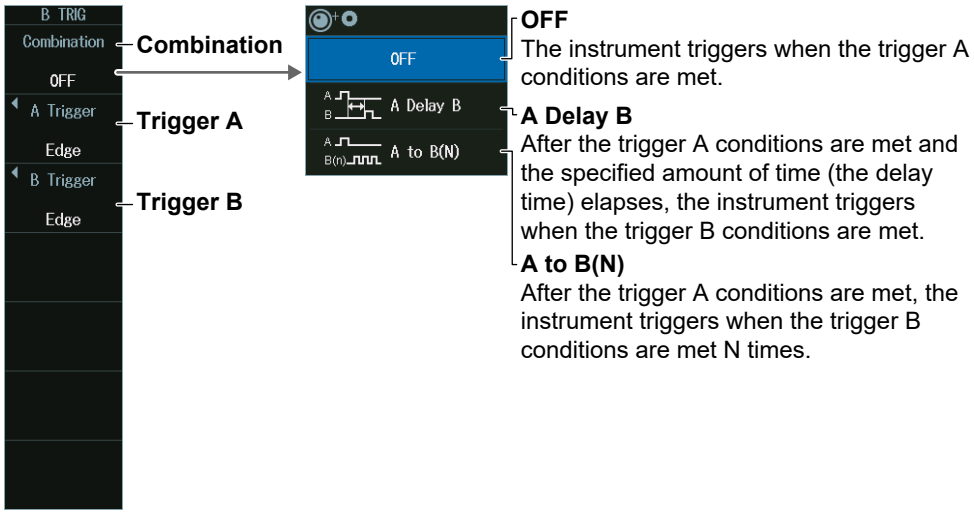
- Combination
  Delay time for condition B, number of times condition B must be met
- Trigger A: Condition A
- Trigger B: Condition B

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

B TRIG Menu

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

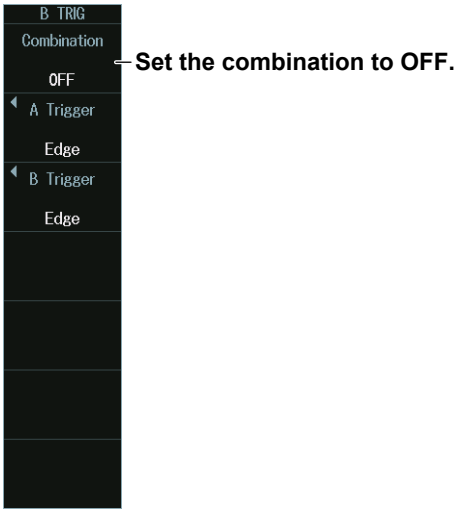
You can also tap **MENU** (MENU) in the upper left of the screen and select the B TRIG menu from TRIGGER on the top menu that is displayed.



Combination (Combination)

OFF

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



A Delay B

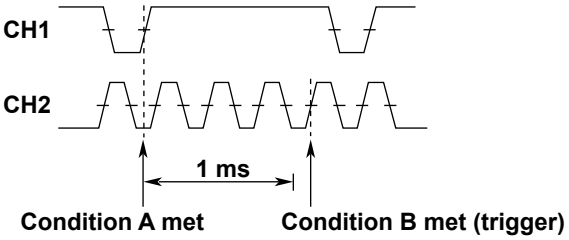
Press the **Combination** soft key and then the **A Delay B** soft key to display the following menu.

Set the combination to A Delay B.

Delay from condition A

A Delay B

After the trigger A conditions are met and the specified amount of time elapses, the instrument triggers when the trigger B conditions are first met.



Condition A: Edge trigger, CH1 = ↓,
Condition B: Edge trigger, CH2 = ↓, Delay = 1 ms

Delay (Delay) from Condition A

Turn the **jog shuttle** to set the delay.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Delay time

A to B(N)

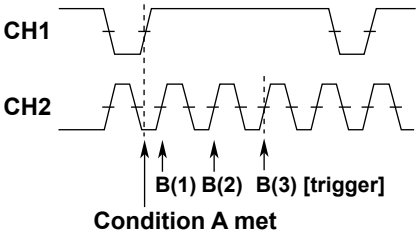
Press the **Combination** soft key and then the **A to B(N)** soft key to display the following menu.

Set the combination to A to B(N).

Number of times condition B must be met

A to B(N)

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



Condition A: Edge trigger, CH1 = ↓,
Condition B: Edge trigger, CH2 = ↓, N = 3

Number of Times Condition B Must Be Met (N Count)

Turn the **jog shuttle** to set the number of times the conditions must be met.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

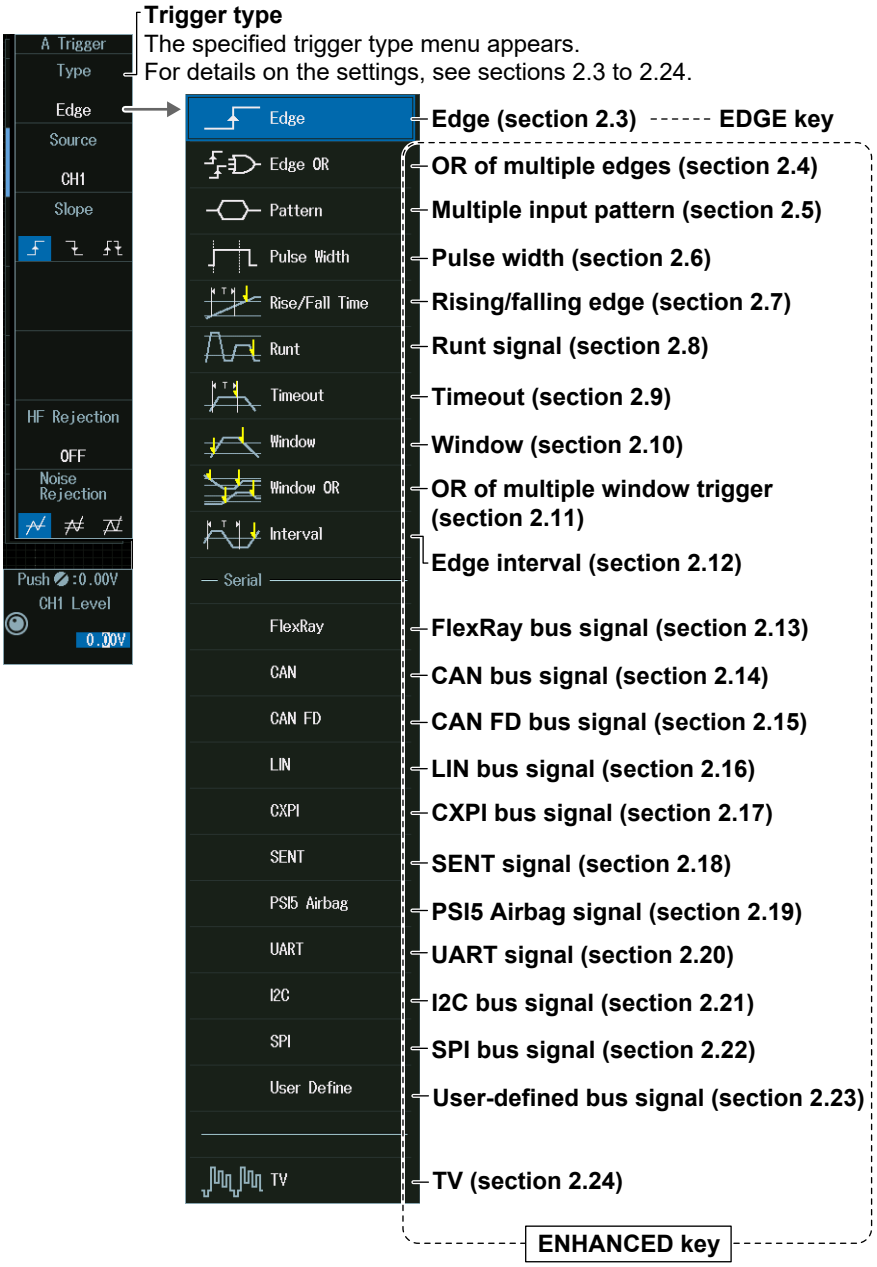
Number times the condition must be met

Trigger A (A Trigger)

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

The procedure using the menu is same as that for edge trigger (section 2.3) and enhanced trigger (sections 2.4 to 2.24).

When you press EDGE or ENHANCED, the specified trigger conditions are assigned directly to trigger A conditions.



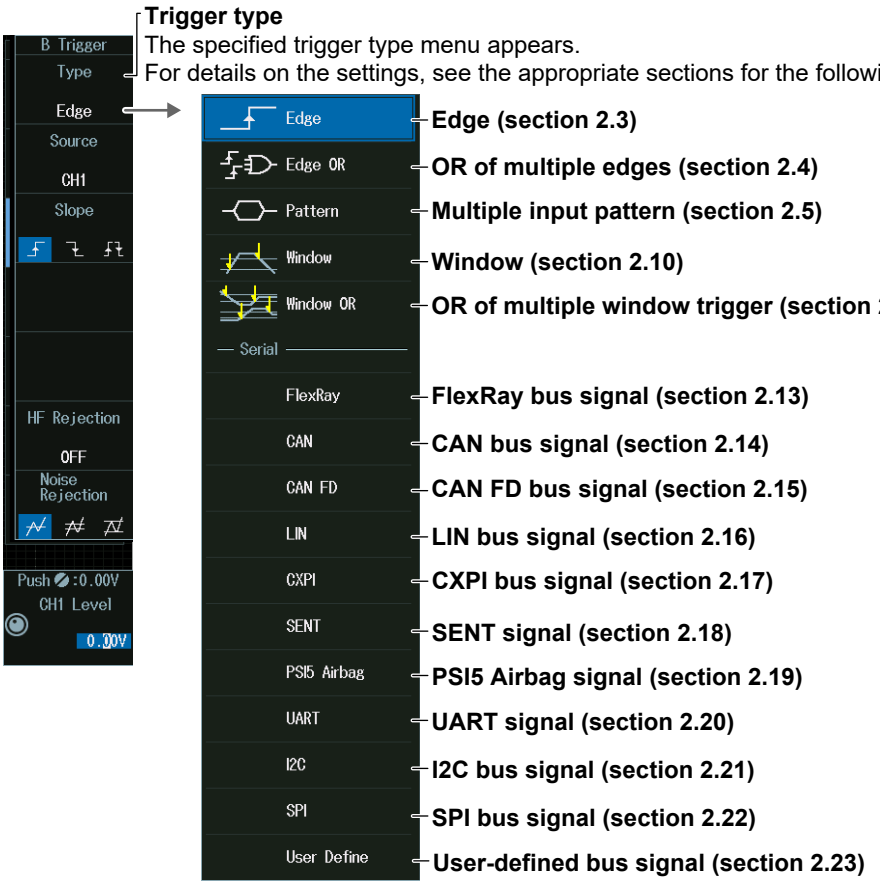
Note

The serial bus trigger (sections 2.13 to 2.23) can be assigned either to condition A or condition B.

Trigger B (B Trigger)

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

The procedure using the menu is same as that for edge trigger (section 2.3) and enhanced trigger (only the types in the following figure can be used). Note that because the settings are not passed on, set trigger B from the beginning.



Trigger type
The specified trigger type menu appears.
For details on the settings, see the appropriate sections for the following types.

- **Edge (section 2.3)**
- **OR of multiple edges (section 2.4)**
- **Multiple input pattern (section 2.5)**
- **Window (section 2.10)**
- **OR of multiple window trigger (section 2.11)**
- **FlexRay bus signal (section 2.13)**
- **CAN bus signal (section 2.14)**
- **CAN FD bus signal (section 2.15)**
- **LIN bus signal (section 2.16)**
- **CXPI bus signal (section 2.17)**
- **SENT signal (section 2.18)**
- **PSI5 Airbag signal (section 2.19)**
- **UART signal (section 2.20)**
- **I2C bus signal (section 2.21)**
- **SPI bus signal (section 2.22)**
- **User-defined bus signal (section 2.23)**

Note

- The serial bus trigger can be assigned either to condition A or condition B.
- When condition B is set to Window trigger, Time Qualification is fixed to None.
- When condition B is set to Pattern and the clock source is set to None, trigger conditions True and False cannot be selected.

2.26 Forcing the Instrument to Trigger (FORCE TRIG)

► “Trigger Type (Type)” in the Features Guide

Forced Trigger [FORCE TRIG]

Press **SHIFT+B TRIG (FORCE TRIG)**. The instrument triggers even when the trigger conditions are not met.

You can also tap **MENU** (MENU) in the upper left of the screen and select FORCE TRIG from TRIGGER on the top menu that is displayed.

2.27 Setting the Action-On-Trigger Function

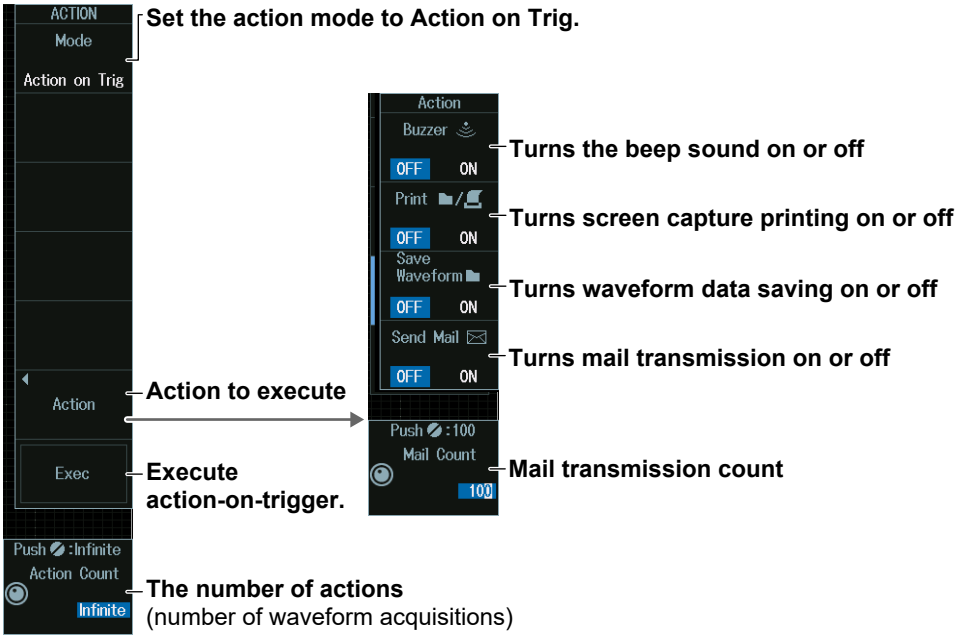
This section explains the following settings for executing the action-on-trigger function:

- Action mode
- Action to execute
- The number of actions
- Execute action-on trigger.

► "Executing Actions" in the Features Guide

ACTION Action on Trig Menu

1. Press **SHIFT+MODE**(ACTION GO/NO-GO) to display the ACTION menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the ACTION menu (ACTION GO/NO-GO) from TRIGGER on the top menu that is displayed.
2. Press the **Mode** soft key and then the **Action on Trig** soft key to display the following menu.



Executing an Action-on-Trigger (Exec)

Press the **Exec** soft key.

- While an action-on-trigger is in progress, Exec changes to Abort. If you want to abort, press the **Abort** soft key.
- The instrument executes the action each time it triggers until the specified number of actions is reached.

Note

- You cannot execute action-on-trigger if Print To is set to Multi when Print is set to ON on the PRINT menu. ► section 16.6
- If the action to execute is mail transmission and the specified number of mail transmissions is less than the number of specified actions, mail transmission will stop after the specified number of transmissions. If the specified number of mail transmissions is greater than the number of specified actions, mail transmission will stop after the specified number of actions.

Number of Actions (Action Count)

Turn the **jog shuttle** to set the number of actions.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

The number of actions

E-mail Send Count (Mail Count)

Turn the **jog shuttle** to set the number of actions.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Mail transmission count

2.28 Performing GO/NO-GO Determination

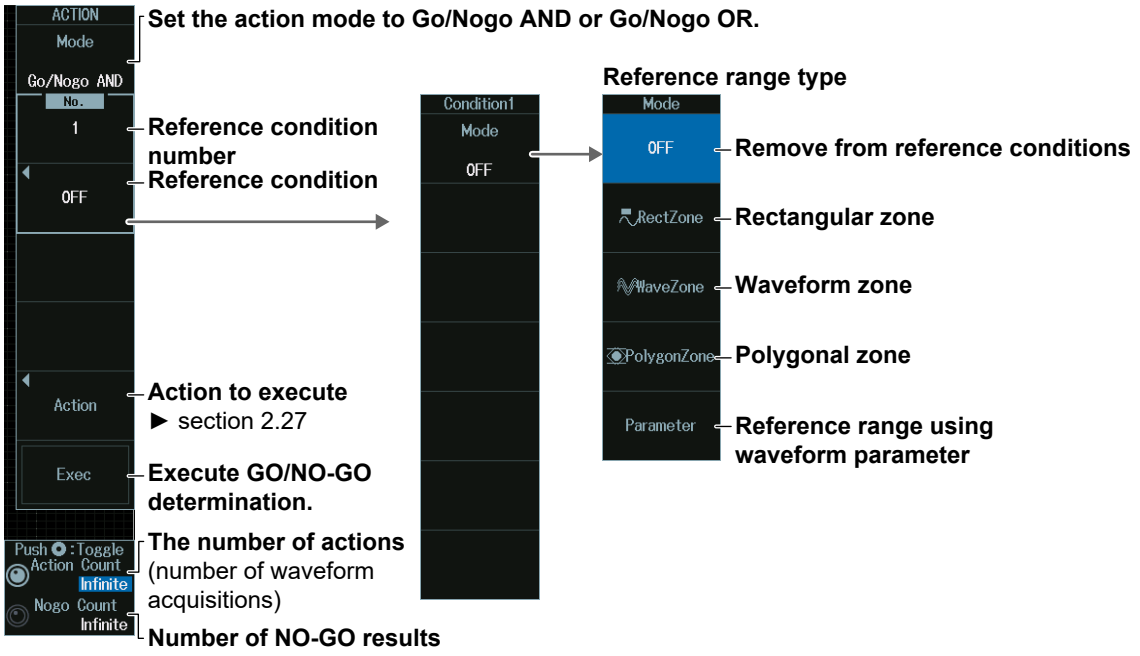
This section explains the following settings for performing GO/NO-GO determination:

- Action mode
- Number of actions, number of NO-GO determinations
- Reference condition
  Reference range type, determination source waveform, reference condition, determination source window, and zone settings
- Executing GO/NO-GO Determination

► "Executing Actions" in the Features Guide

ACTION Go/Nogo Menu

1. Press **SHIFT+MODE**(ACTION GO/NO-GO) to display the ACTION menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the ACTION menu (ACTION GO/NO-GO) from TRIGGER on the top menu that is displayed.
2. Press the **Mode** soft key and then the **Go/Nogo AND** or **Go/Nogo OR** soft key to display the following menu.



Executing GO/NO-GO Determination (Exec)

Press the **Exec** soft key.

- While a GO/NO-GO determination is in progress, Exec changes to Abort. If you want to abort, press the **Abort** soft key.
- The instrument executes actions until either the specified number of actions or the number of NO-GO determinations is reached.

Note

- You cannot execute action-on-trigger if Print To is set to Multi when Print is set to ON on the PRINT menu. ► section 16.6
- If the action to execute is mail transmission and the specified number of mail transmissions is less than the number of specified actions, mail transmission will stop after the specified number of transmissions. If the specified number of mail transmissions is greater than the number of specified actions, mail transmission will stop after the specified number of actions.

Reference Condition and Reference Range

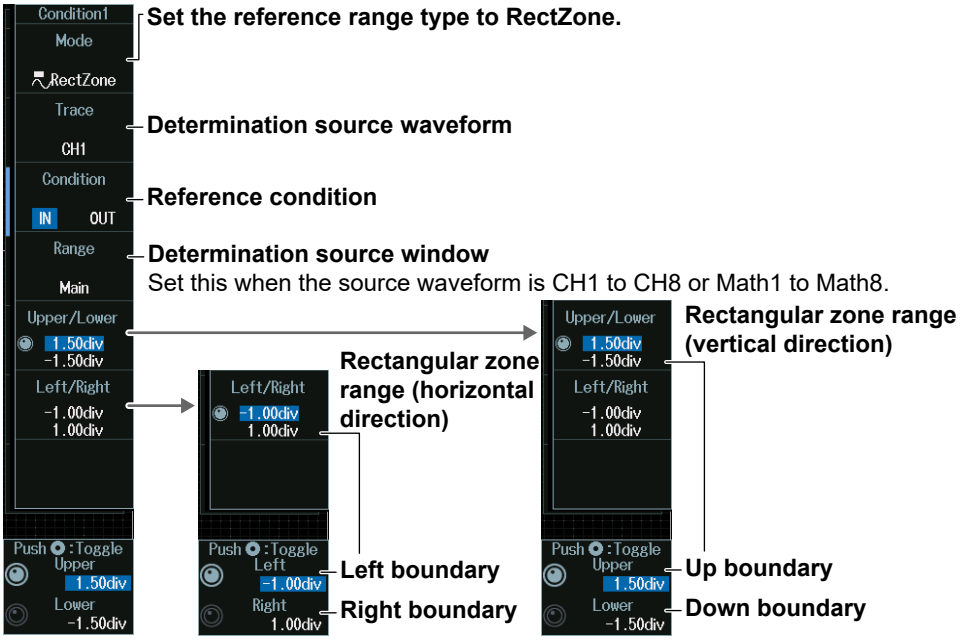
Depending on the determination source waveform, there are reference range types that you cannot specify.

Source Waveform	Reference Range Type			
	Rectangular zone	Waveform zone	Polygonal zone	Reference range using waveform parameter
CH1 to CH8	Yes	Yes	Yes	Yes
Logic	No	No	No	Yes
Math1 to Math8	Yes	Yes	Yes	Yes
XY1 to XY4	Yes	No	Yes	Yes
FFT1, FFT2	No	No	No	Yes

Rectangular Zone (RectZone)

Set the reference range (rectangular zone).

1. Press any of the reference condition **1** to **8** soft keys and then the **Mode** soft key.
   (Reference conditions 1 to 4 on 4ch models)
2. Press the **RectZone** soft key to display the following menu.



Note

The available source waveforms are as follows:

- No.1 to No.4
  CH1 to CH4, Math1 to Math4, XY1 to XY2
- No.5 to No.8 (8ch model)
  CH5 to CH8, Math5 to Math8, XY3 to XY4

Determination Source Window

To make Zoom1 or Zoom2 a determination source, turn on the Zoom1 or Zoom2 display from the ZOOM menu. For details, see section 10.1.

Rectangular Zone Range (Upper/Lower)

1. Press the **Upper/Lower** soft key.
2. Turn the **jog shuttle** to set the upper boundary (Upper) or lower boundary (Lower).
   - Press **SET** (upper right on the front panel) to switch between upper and lower boundaries.
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Upper boundary

Lower boundary

Press SET (upper right on the front panel) to switch between upper and lower boundaries.

Rectangular Zone Range (Left/Right)

1. Press the **Left/Right** soft key.
2. Turn the **jog shuttle** to set the left boundary (Left) or right boundary (Right).
   - Press **SET** (upper right on the front panel) to switch between left and right boundaries.
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Left boundary

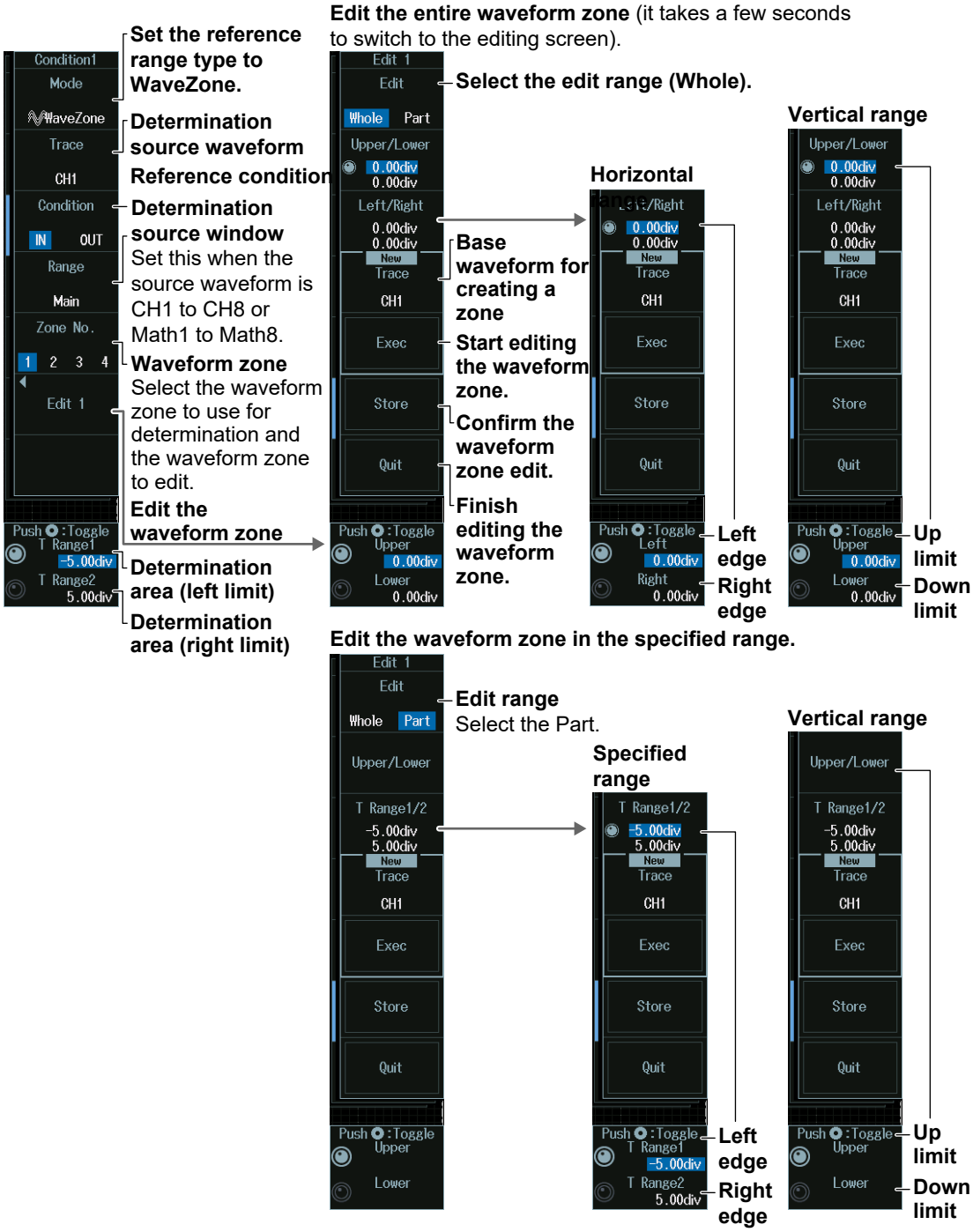
Right boundary

Press SET (upper right on the front panel) to switch between left and right boundaries.

Waveform Zone (WaveZone)

Set the reference range (waveform zone).

1. Press any of the reference condition **1** to **8** soft keys and then the **Mode** soft key.
   (Reference conditions 1 to 4 on 4ch models)
2. Press the **WaveZone** soft key to display the following menu.



Note

The available source waveforms are as follows:

- No.1 to No.4
  CH1 to CH4, Math1 to Math4
- No.5 to No.8 (8ch model)
  CH5 to CH8, Math5 to Math8

Editing the Waveform Zone
(Edit 1 to Edit 4: Reference conditions 1 to 4)
(Edit 5 to Edit 8: Reference conditions 5 to 8)

1. Press the **Zone No** soft key, and select the number of the waveform zone that you want to edit.

   The appearance of the waveform zone edit soft keys (Edit 1 to Edit 8) changes depending on the selected waveform zone number.

2. Press one of the soft keys from **Edit 1** to **Edit 8**, whichever is shown on the menu. An edit menu for the waveform zone that you selected will be displayed.

- **Selecting the Base Waveform**

  To edit without changing the base waveform, proceed to step 5.

3. Press the **Trace (New)** soft key, and from the displayed menu, select the base waveform.
4. Press the **Exec (New)** soft key. A waveform zone is created from the base waveform.

- **Editing the Entire Waveform Zone**

5. Press the **Edit** soft key to select **Whole**.
6. Press the **Upper/Lower** soft key or the **Left/Right** soft key to select the zone boundaries to edit.
7. Turn the **jog shuttle** to edit the waveform zone.

   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

   Jog shuttle setting menu

   Left boundary

   Right boundary

   Press SET (upper right on the front panel) to switch between left and right boundaries.

- **Editing a Part of the Waveform Zone**

5. Press the **Edit** soft key to select **Part**.
6. Press the **T Range1/2** soft key.
7. Turn the **jog shuttle** to edit the time scale range.

   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

   Jog shuttle setting menu

   Left edge

   Right edge

   Press SET (upper right on the front panel) to switch between left and right edges.

8. Press the **Upper/Lower** soft key to select the upper and lower zone boundaries.

9. Turn the **jog shuttle** to edit the waveform zone.
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

   Jog shuttle setting menu

   Up limit

   Down limit

   Press SET (upper right on the front panel) to switch between up limit and down limit.

- **Confirming the Waveform Zone**

10. Press the Store soft key to confirm the waveform zone that you edited and store it in the internal memory.

- **Finishing Waveform Zone Editing**

11. Press the **Quit** soft key to return from the edit screen to the previous menu.
    If you do not confirm the edited waveform zone at step 10, the changes that you made will be lost.

Note

- If you change the base waveform (Trace (New)) for creating a zone, the waveform zone that you edited up to that point will be lost.
- If you want to switch from the edit menu to a different menu, you need to finish editing first. Press the Quit soft key to finish editing.

Determination Area (T Range)

Turn the **jog shuttle** to set the determination area.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Determination area (left boundary)

Determination area (right boundary)

Press SET (upper right on the front panel) to switch between left and right determination period boundaries.

Polygonal Zone (PolygonZone)

Set the reference range (polygonal zone).

1. Press any of the reference condition **1** to **8** soft keys and then the **Mode** soft key.
   (Reference conditions 1 to 4 on 4ch models)
2. Press the **PolygonZone** soft key to display the following menu.

Set the reference range type to PolygonZone.

Determination source waveform

Reference condition

Determination source window
Set this when the source waveform is CH1 to CH8 or Math1 to Math8.

Select the polygonal zone.
Load a polygonal shape in advance into the specified zone number (Zone No.1 to Zone No.8) using the file load feature (see section 17.7).
Create polygonal shapes on your PC using the dedicated software (Mask Editor Software).

Moves the polygonal zone (vertical position)

Moves the polygonal zone (horizontal position)

Note

The available source waveforms are as follows:

- No.1 to No.4
  CH1 to CH4, Math1 to Math4, XY1 to XY2
- No.5 to No.8 (8ch model)
  CH5 to CH8, Math5 to Math8, XY3 to XY4

Moving the Polygonal Zone (V-Position, H-Position)

Turn the **jog shuttle** to move the polygonal zone.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Moves the polygonal zone (vertical position)

Moves the polygonal zone (horizontal position)

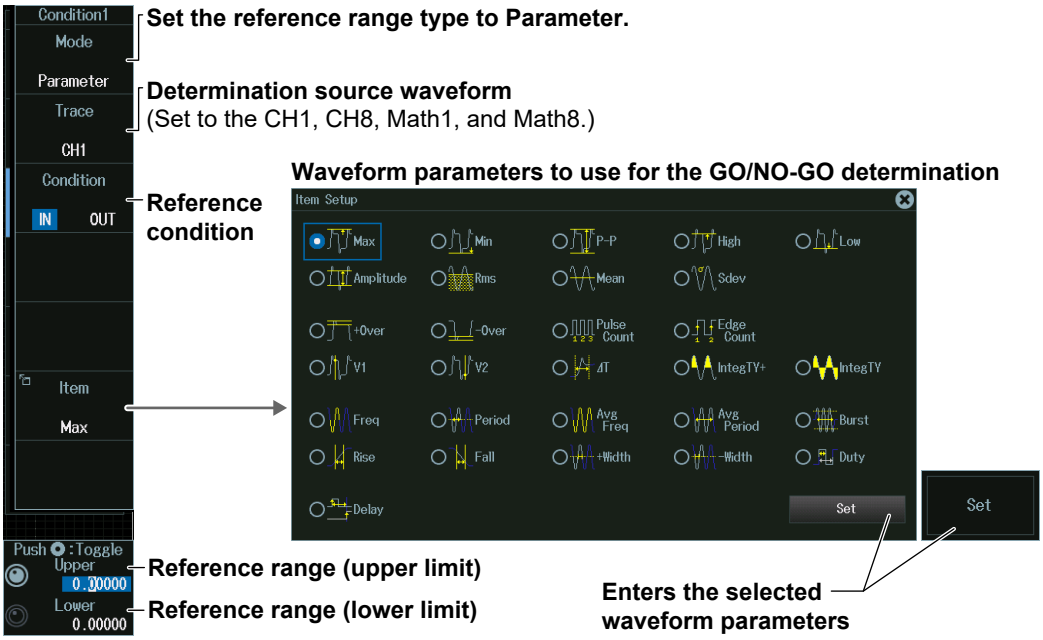
Press SET (upper right on the front panel) to switch between moving the polygonal zone horizontally or vertically.

Setting a Reference Range Using Parameters (Parameter)

Set the reference range (parameter).

1. Press any of the reference condition **1** to **8** soft keys and then the **Mode** soft key.
   (Reference conditions 1 to 4 on 4ch models)
2. Press the **Parameter** soft key to display the following menu.

When CH1 to CH8 or Math1 to Math8 Is the Determination Source Waveform



Note

Waveform Parameters

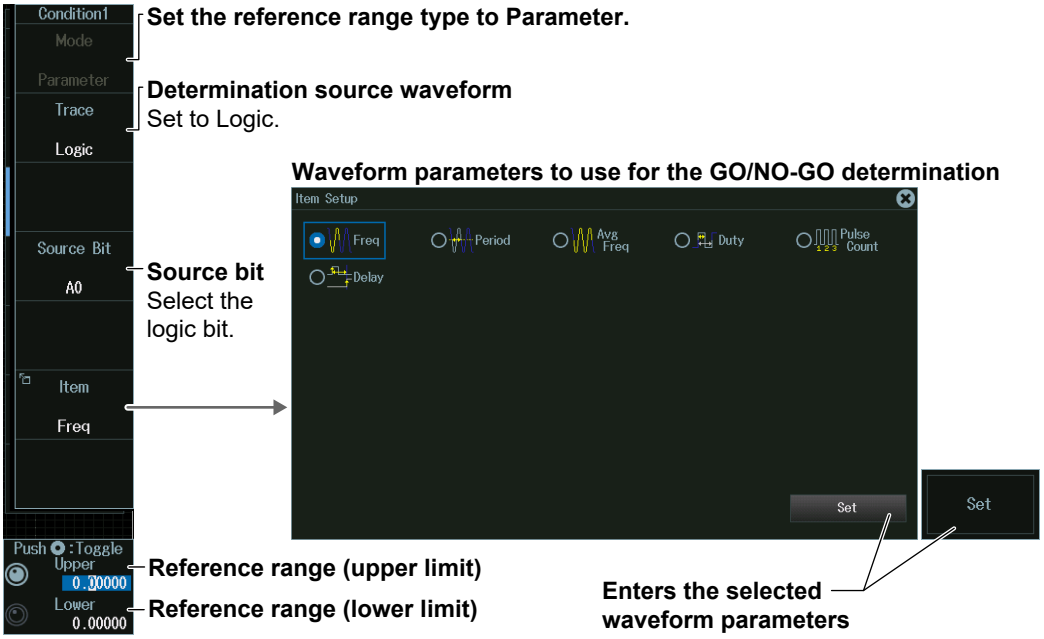
You can select the measurement items to use in GO/NO-GO determination from all of the items used for automated measurement of waveform parameters. For information on setting automated measurement of waveform parameters, see section 9.1.

Source Waveform

The available determination source waveform settings vary depending on the model.

- The available settings on 8ch models are as follows:
  CH1 to CH8, Math1 to Math8
- The available settings on 4ch models are as follows:
  CH1 to CH4, Math1 to Math4

When Logic Is the Determination Source Waveform



Note

Waveform Parameters

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, Delay

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

Source bit

The following source bit display applies to models with the /L32 option.

C0 to C7 (LOGIC port C), D0 to D7 (LOGIC port D)

When XY1 to XY4 Is the Determination Source Waveform

Set the reference range type to Parameter.

Determination source waveform
Set to a value from XY1 to XY4 (XY1 or XY2 on 4ch models).

Reference condition

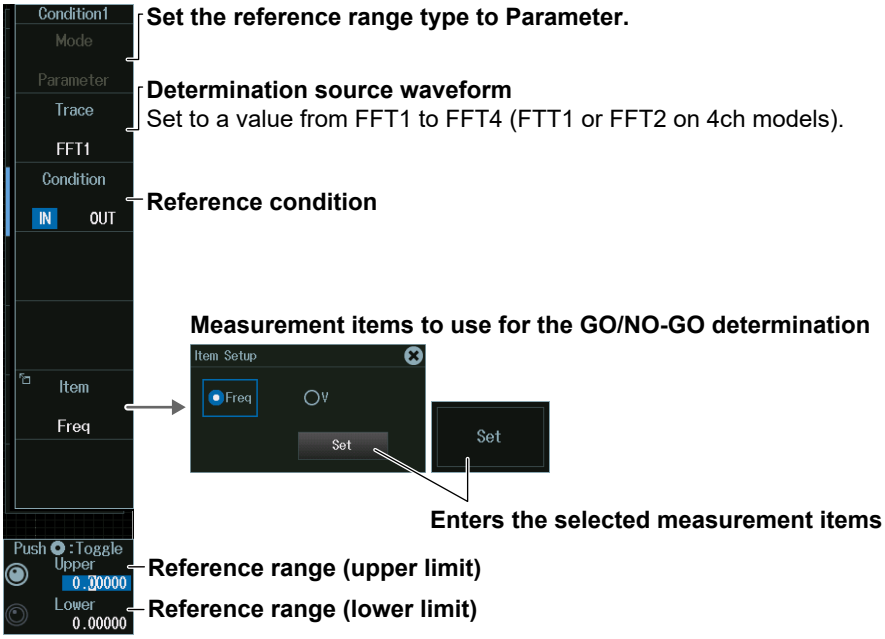
Reference range (upper limit)

Reference range (lower limit)

Note

The measurement item to use in the GO/NO-GO determination is the waveform area of XY1 to XY4 (XY1 and XY2 on 4ch models). 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 DLM5058-01EN.

When FFT1 to FFT4 Is the Determination Source Waveform



Set the reference range type to Parameter.

Determination source waveform
Set to a value from FFT1 to FFT4 (FTT1 or FFT2 on 4ch models).

Reference condition

Measurement items to use for the GO/NO-GO determination

Enters the selected measurement items

Reference range (upper limit)

Reference range (lower limit)

Note

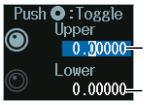
You can select the measurement item to use in the GO/NO-GO determination from the peak cursor measurement items (Freq, V) for FFT.
For details on peak cursor measurements, see section 7.2.

Reference Range (Upper/Lower)

Turn the **jog shuttle** to set the reference range.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu



Reference range (upper limit)

Reference range (lower limit)

Press SET (upper right on the front panel) to switch between upper and lower reference range limits.

3.1 Setting Conditions for Waveform Acquisition

This section explains the following settings for acquiring waveforms:

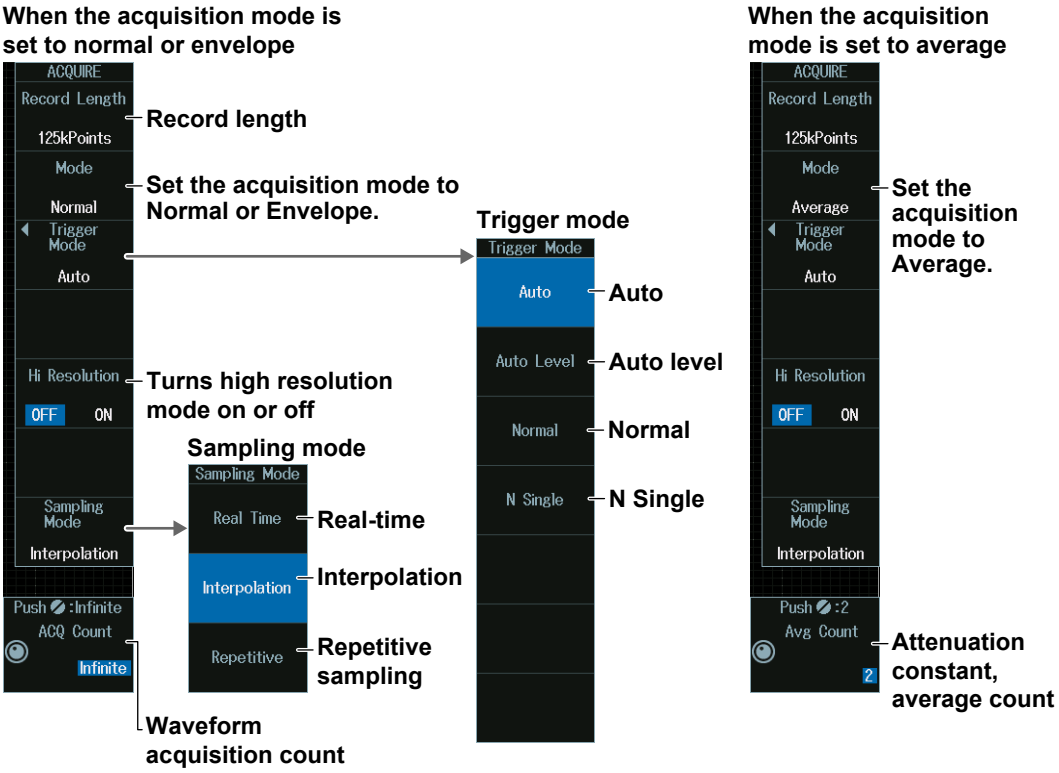
- Record length
- Acquisition mode
- Trigger mode
- Turning high resolution mode on or off
- Sampling mode
- Number of waveforms to acquire, attenuation constant, and number of times to average

► "Waveform Acquisition" in the Features Guide

ACQUIRE Menu

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

You can also tap **MENU** (MENU) in the upper left of the screen and select the ACQUIRE menu from ACQ/DISP on the top menu that is displayed.



Acquisition Mode (Mode)

Set the waveform acquisition mode.

Normal	Displays waveforms without processing the sampled data. Set the waveform acquisition count.
Envelope	Displays waveforms in envelope mode. Set the waveform acquisition count.
Average	Displays averaged waveforms. Set the attenuation constant and the number of times to average.

Note

- If you set the acquisition mode to Envelope when the sample rate is set to 1.25 GS/s or higher, the instrument actually operates in Normal mode. In envelope mode, [Envelope] appears in the upper right of the screen. If envelope is in use in high resolution mode, [Env:Hi-Res] appears.
- To average waveforms that have been acquired in N Single mode, set the acquisition mode to Normal, and turn on history feature's averaging.

Trigger Mode (Trigger Mode)

The trigger mode determines the conditions for updating the displayed waveforms. You can set the trigger mode by pressing the MODE key. For details, see section 2.1.

Sampling Mode (Sampling Mode)

Set how to sample the number of waveform data points per unit time.

Realtime	The instrument samples at the specified time scale.
Interpolation	In Interpolation mode, the instrument interpolates the data sampled at 2.5 GS/s up to 100 times using the (sinx)/x function.
Repetive	The instrument acquires repetitive signals multiple times and displays them as a single waveform. This makes it possible to sample at an apparent rate higher than the actual rate.

Note

In the following cases, repetitive sampling mood (Repetitive) cannot be used.

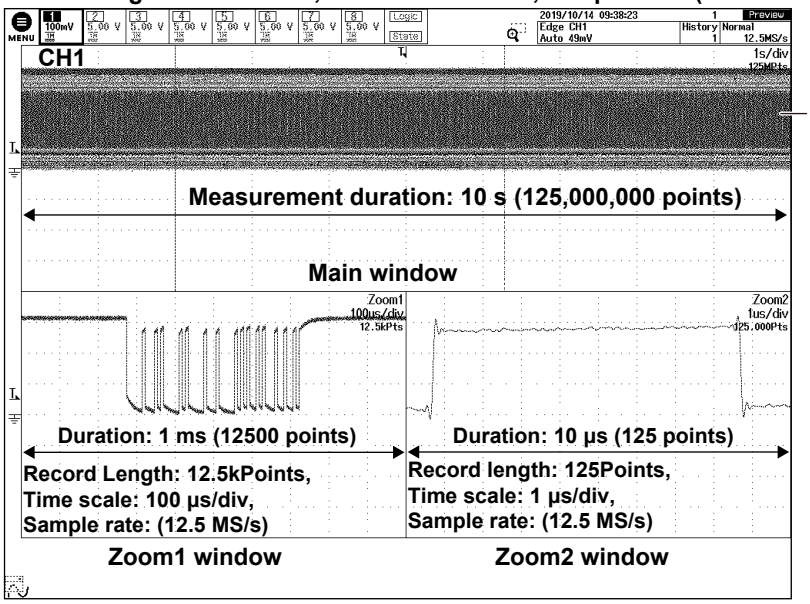
- When the trigger source is Logic
- When the record length is 2.5 Mpoint or more

Relationship between the Time Scale, Record Length, and Sample Rate

Record length refers to the number of data points that are stored to the acquisition memory for each channel.

Decreasing the time scale increases the sample rate. If you want to observe a long-term phenomenon at a high time resolution (at a high sample rate), set the record length to a high value. In the following waveform display example, the waveform of a CAN bus signal is measured for 10 seconds. The waveform is acquired for a long period (10 seconds), and the waveform is zoomed. This allows fine waveform variations to be viewed at a high sample rate.

Main window
Record length: 125MPoints, time scale: 1 s/div, sample rate: (12.5 MS/s)



Note

- When the record length is set the following values, a single waveform is acquired.
  - Models without the memory option
    25MPoints, 50MPoints, 125MPoints
  - Models with the /M1 option
    50MPoints, 125MPoints, 250MPoints
  - Models with the /M2 option
    125MPoints, 250MPoints, 500MPoints
- Note that when the record length is long, computation and measurement processing take longer than when the record length is short.
- There are limitations on waveform acquisition conditions and the number of waveforms that can be stored in the acquisition memory (the number of history waveforms) depending on the specified record length. For details, see chapter 6 in the Features Guide (IM DLM5058-01EN).

Number of Waveform Acquisitions (ACQ Count)

1. Press the **Mode** soft key and then the **Normal** or **Envelope** soft key.
2. Turn the **jog shuttle** to set the acquisition count.
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

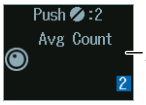
   Jog shuttle setting menu

Waveform acquisition count

Attenuation Constant and Average Count (Avg Count)

1. Press the **Mode** soft key and then the **Average** soft key.
2. Turn the **jog shuttle** to set the attenuation constant or average count.
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

   Jog shuttle setting menu



Attenuation constant, average count

Note

The calculation process of the attenuation constant and average count inside the instrument varies depending on the averaging process. Depending on the trigger mode of averaging mode (Average), they are processed as follows:

- **Auto, Auto Level, Normal, N Single**
  Avg Count indicates the attenuation constant (exponential averaging).
- **Single**
  Avg Count indicates the average count (simple averaging).

3.2 Acquiring Waveforms

► "Waveform Acquisition (RUN/STOP)," "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 waveform is displayed.
   - If you set the record length to a value that allows only one waveform to be acquired, pressing the RUN/STOP key will produce the same result as pressing the SINGLE key.
   - You can also tap **MENU** (MENU) in the upper left of the screen and select the RUN/STOP menu on the top menu that is displayed.
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 when the instrument triggers, it acquires and displays only one waveform and then stops waveform acquisition. The SINGLE key light turns off.
   - You can also tap **MENU** (MENU) in the upper left of the screen and select SINGLE on the top menu that is displayed.
   - The trigger mode is set to single mode.
   - To stop waveform acquisition, press the RUN/STOP key.

4.1 Setting Display Conditions

This section explains the following settings for viewing the display:

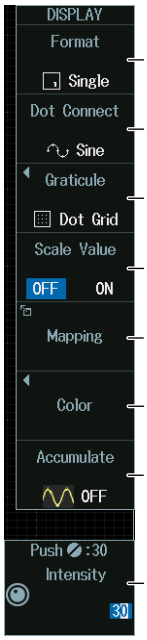
- Display format
- Display interpolation
- Grid
- Turning scale value display on or off
- Waveform mapping
- Color
- Waveform intensity

► "Display" in the Features Guide

DISPLAY Menu

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

You can also tap **MENU** (MENU) in the upper left of the screen and select the DISPLAY menu from ACQ/DISP on the top menu that is displayed.



Display format

Display interpolation

Grid

Turns the scale value display on or off

Waveform mapping

Color

► section 4.2

Waveform intensity

Display Format (Format)

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

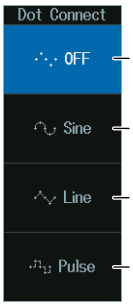
- **Automatically divide the areas**
  The number of areas is automatically determined by the number of displayed waveforms.
- **Not divide the screen**
- **Divide the screen into two areas**
- **Divide the screen into three areas**
- **Divide the screen into four areas**
- **Divide the screen into six areas**
- **Divide the screen into eight areas**

Note

Changing the number of screen divisions does not change the A/D converter resolution.

Display Interpolation (Dot Connect)

Press the **Dot Connect** soft key to display the following menu.



- **Display interpolation disabled**
  Displays waveforms with dots
- **Sine interpolation**
  Interpolates between two points using the sin x/x function
- **Linear interpolation**
  Linearly interpolates between two points
- **Pulse interpolation**
  Interpolates between two points in a staircase pattern

Note

In the following cases, the interpolation method is set to Pulse regardless of the interpolation method setting.

- The input signal is a logic signal.
- The acquisition mode is Envelope.
- The sampling mode is Repetitive Sampling.

Grid (Graticule)

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

Displays the grid with dotted lines

Displays the grid with solid lines

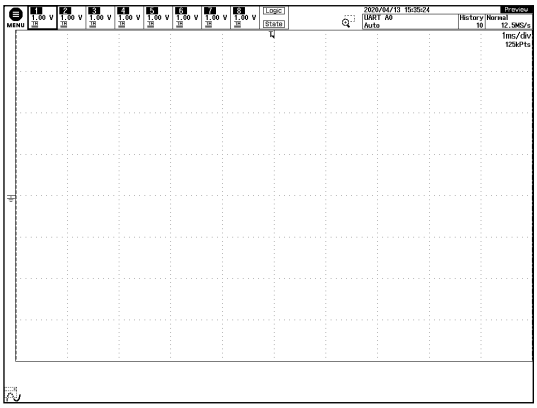
Displays a grid frame

Displays the grid with a crosshair

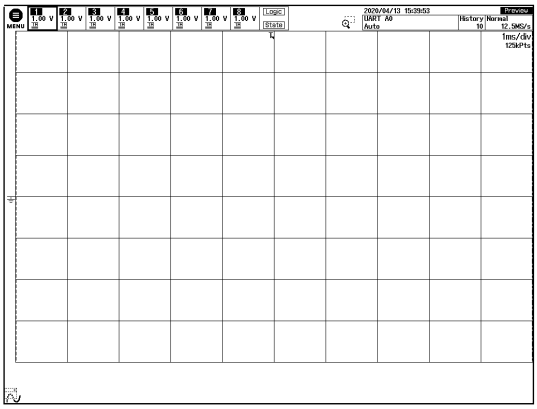
Turns fine grid display on or off

Grid Types

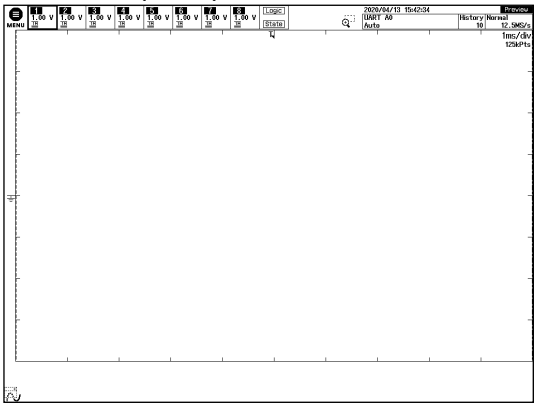
Dot Grid (dotted lines)



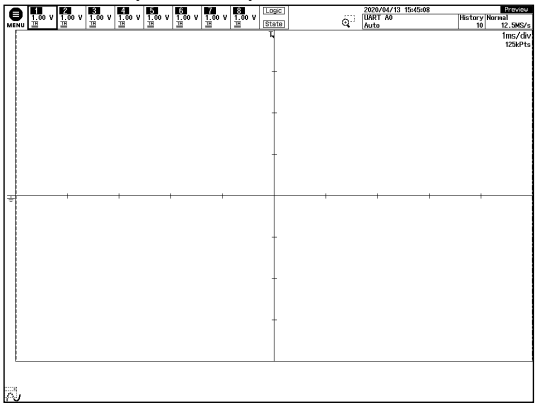
Line Grid (solid lines)



Frame Grid (frame)



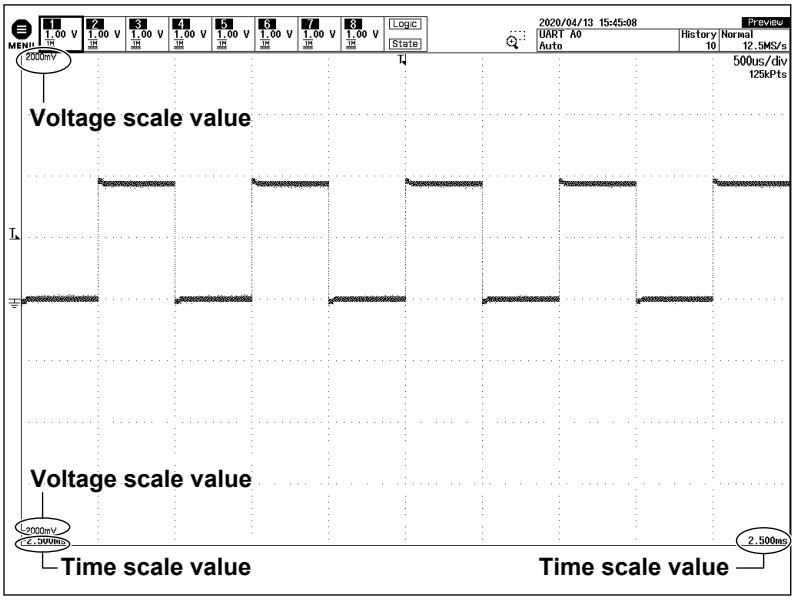
Cross Hair (crosshair)



Scale Value Display (Scale Value)

Press the **Scale Value** soft key to select On or Off.

You can display the upper and lower limits (scale values) of each channel's vertical or horizontal axes.

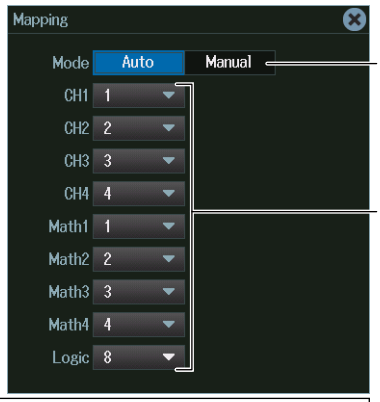


Waveform Mapping (Mapping)

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

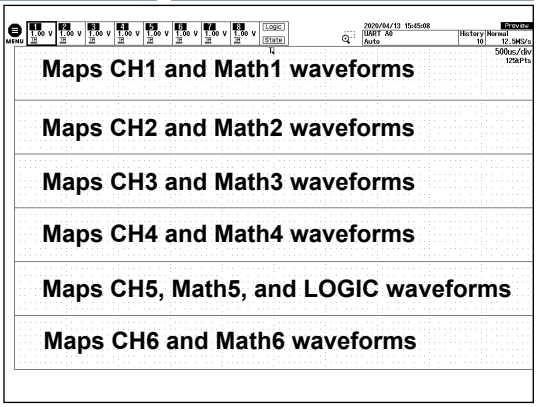
8ch model

4ch model



Mapping mode

When the waveform mapping mode is set to Manual, set how to map each channel's waveform to the divided screens.



Example when the screen is divided into six areas (Manual mode)

Display Color (Color)

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

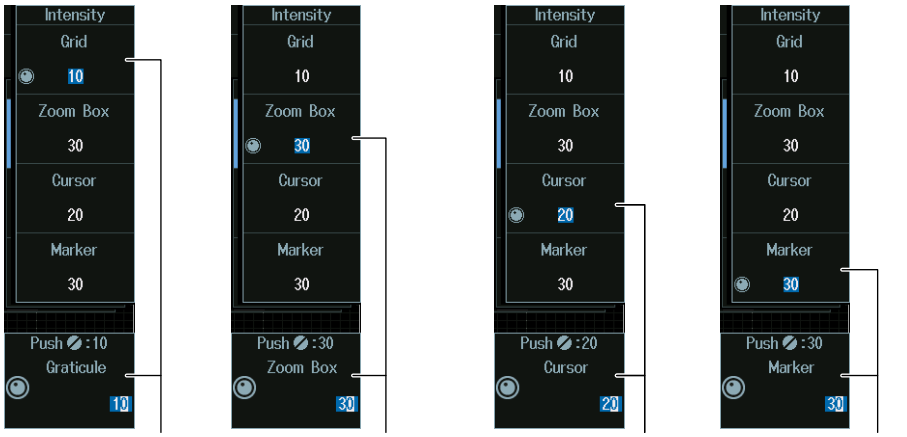
Graticule intensity

Waveform color

Serial bus trend color
This menu appears on models with the SENT option or the PSI5 Airbag option.

Intensity of the Grid, Zoom Box, Cursor, or Marker

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



Grid intensity **Zoom box intensity** **Cursor intensity** **Marker intensity**

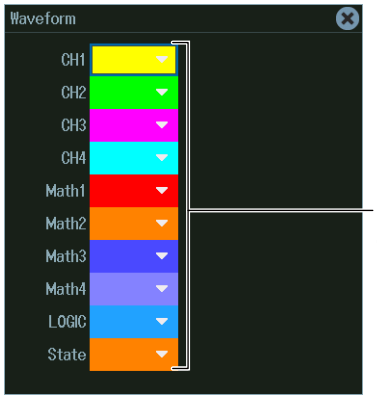
* You can enter the value when the jog shuttle icon is displayed on the soft key that controls each intensity. For instructions on how to use the numeric keypad through the the touch panel, see section 3.3 in IM DLM5058-03EN.

Waveform Color

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

8ch model

4ch model



Display color of each waveform

Serial Bus Trend Color

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

Display color of each trend

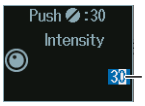
Waveform Intensity (Intensity)

Turn the **jog shuttle** to set the intensity.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

When accumulation is set to OFF



Intensity
Pressing RESET (upper right on the front panel) returns the value to 30.

When accumulation is set to Intensity or Color

Intensity

Set the accumulation time

Press SET (upper right on the front panel) to switch between Intensity and accumulation time.

4.2 Using the Accumulate Feature

This section explains the following settings for using the accumulate feature:

- Accumulation frequency
- Accumulation time

► “Accumulation (Accumulate)” in the Features Guide

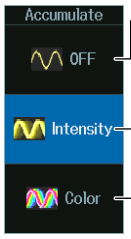
DISPLAY Menu

1. Press **DISPLAY** to display the following menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the DISPLAY menu from ACQ/DISP on the top menu that is displayed.

Accumulation display mode

Accumulation time

2. Press the **Accumulate** soft key to display the following menu.



OFF
Accumulation display is not used. The waveform acquired once is displayed at the specified intensity.

Intensity
The frequency of accumulated waveforms is expressed with intensity.

Color
Waveform accumulation frequency is expressed with color.

Color

The 15 waveform accumulation frequency levels are expressed using different colors that range from blue to green to yellow to red to white starting with the lowest frequency.

Accumulation Time

1. Press **SET** to set the jog shuttle setting menu display to Accum Time.
2. Turn the **jog shuttle** to set the accumulation time.
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the menu that appears on the screen.

Jog shuttle setting menu

Accumulation time

Note

Pressing CLEAR TRACE clears the accumulated waveforms.

Notes about Waveform Accumulation

- Automated measurement of waveform parameters and GO/NO-GO determination are performed on the most recent waveform.
- If you press RUN/STOP to stop waveform acquisition, accumulation stops. When you restart waveform acquisition, all the waveforms are cleared, and accumulation starts from the beginning.
- If the instrument does not trigger when the trigger mode is set to Normal, the waveform intensity is retained until the next time the instrument triggers.
- If you change the display format when accumulated waveforms are displayed, the instrument operates in the following manner.
  During accumulation: The instrument clears the screen and restarts displaying from the beginning.
  When accumulation is stopped: The instrument clears the waveforms and displays the most recent waveform.

4.3 Using the Snapshot and Clear Trace Features

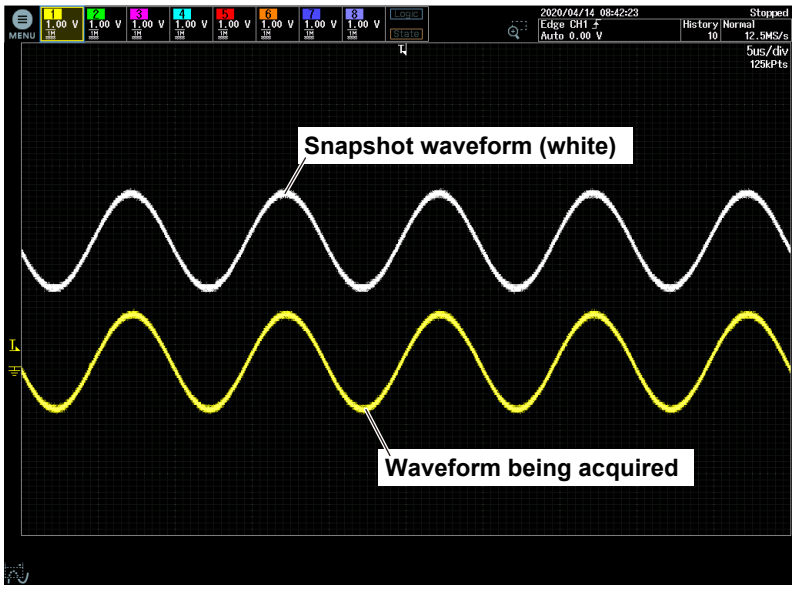
This section explains how to clear snapshots (temporary storage during waveform acquisition) and the waveform display.

- Snapshot
- Clear trace

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

Snapshot (SNAP SHOT)

1. Acquire waveforms.
   ► section 3.2
2. Press **SNAP SHOT** (📷∿).
   - The currently displayed waveform is retained on the screen as a snapshot displayed in white. Snapshot waveforms remain on the screen until you execute a clear trace operation.
   - You can also tap **MENU** (MENU) in the upper left of the screen and select the SNAP SHOT menu on the top menu that is displayed.



Clear Trace (CLEAR TRACE)

3. Press **CLEAR TRACE** (CLR∿).
   - All waveforms on the screen are cleared.
   - You can also tap **MENU** (MENU) in the upper left of the screen and select the CLEAR TRACE menu on the top menu that is displayed.

Note

If you execute a clear trace operation during waveform acquisition, the instrument clears all the history waveforms that it has acquired and restarts waveform acquisition from the first acquisition.

4.4 Adjusting the Backlight

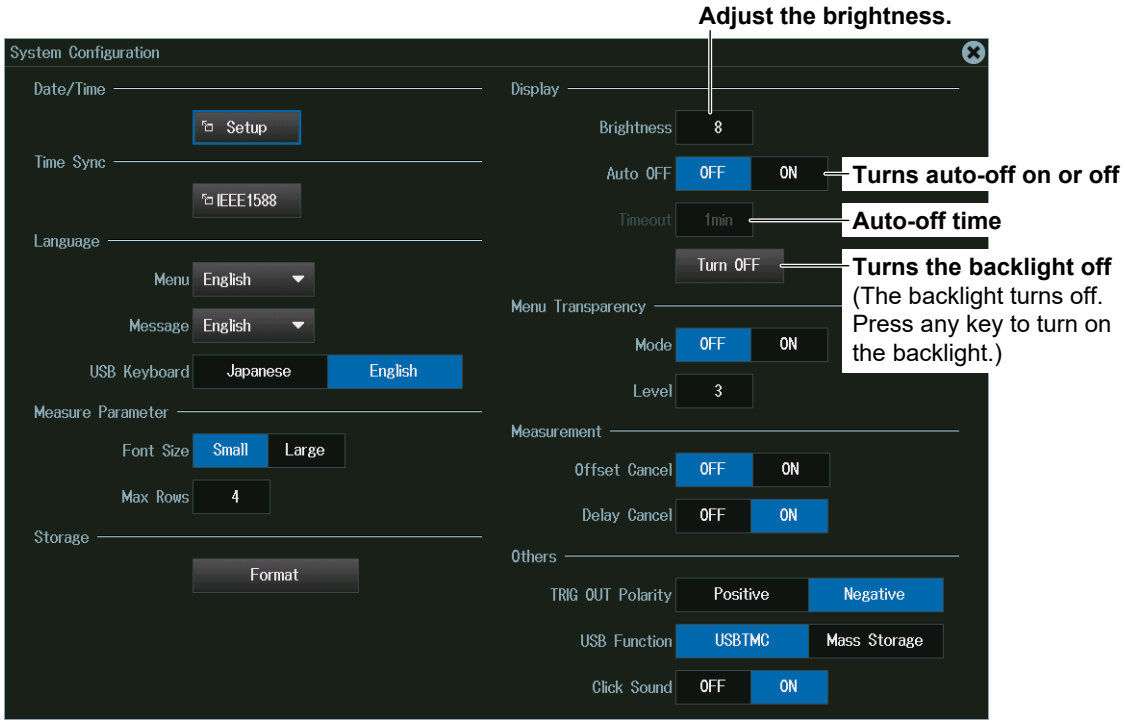
This section explains the following settings for adjusting the backlight:

- Brightness adjustment
- Turning auto power-off on or off
- Auto-off time
- Turning the backlight off

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

UTILITY System Configuration menu

1. Press **UTILITY** to display the UTILITY menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the UTILITY menu from UTILITY on the top menu.
2. Press the **System Configuration** soft key to display the following menu.



4.5 Displaying the Operation Screen Transparently

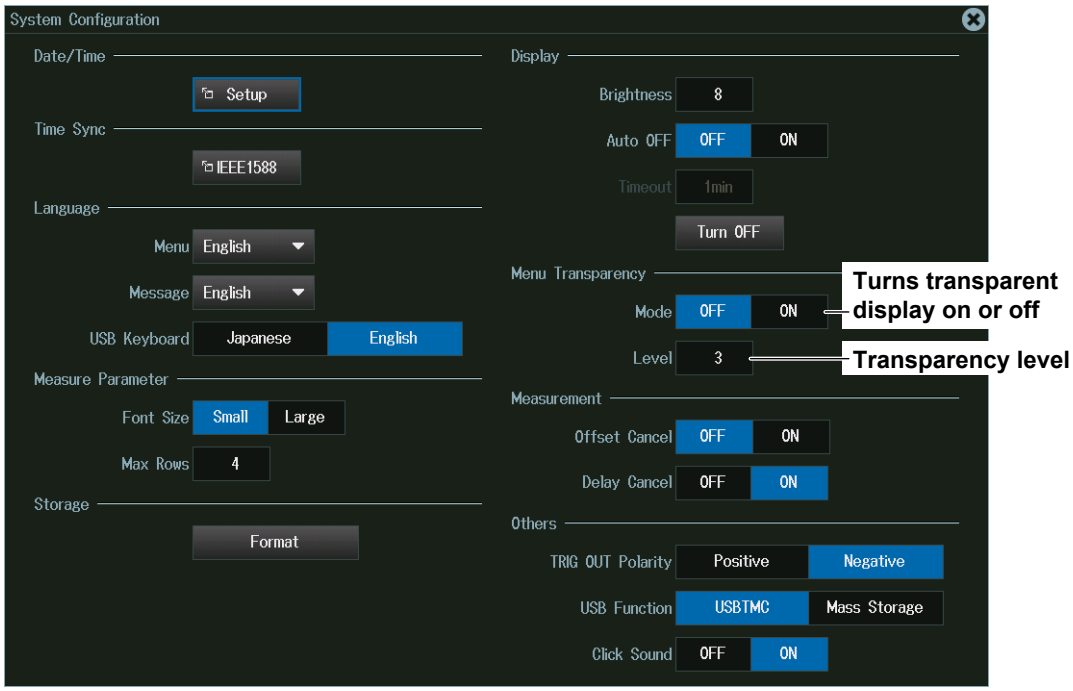
This section explains the following setting for displaying the operations screen (menus, dialog boxes, etc.) transparently.

- Turning transparent display on or off
- Transparency Level

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

UTILITY System Configuration menu

1. Press **UTILITY** to display the UTILITY menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the UTILITY menu from UTILITY on the top 4menu.
2. Press the **System Configuration** soft key to display the following menu.



Transparent Display

- **Turning Transparent Display On and Off (Mode)**
  When you turn transparent display on, the setup menus and dialog boxes that appear on the waveform display screen become transparent, allowing you to control the setup menus and dialog boxes while viewing the waveform shown in the background. You can also turn the mode on and off by tapping the transparent mode on/off icon displayed in the lower left of the waveform display screen.

- **Transparency Level (Level)**
  You can set the transparency level in the range of 1 (low) to 5 (high). The higher the transparency level, the clearer the waveform display shown in the background.

5.1 Displaying XY Waveforms

This section explains the following settings for displaying XY waveforms:

- XY waveform display
- X-axis and Y-axis source waveforms
- Display settings

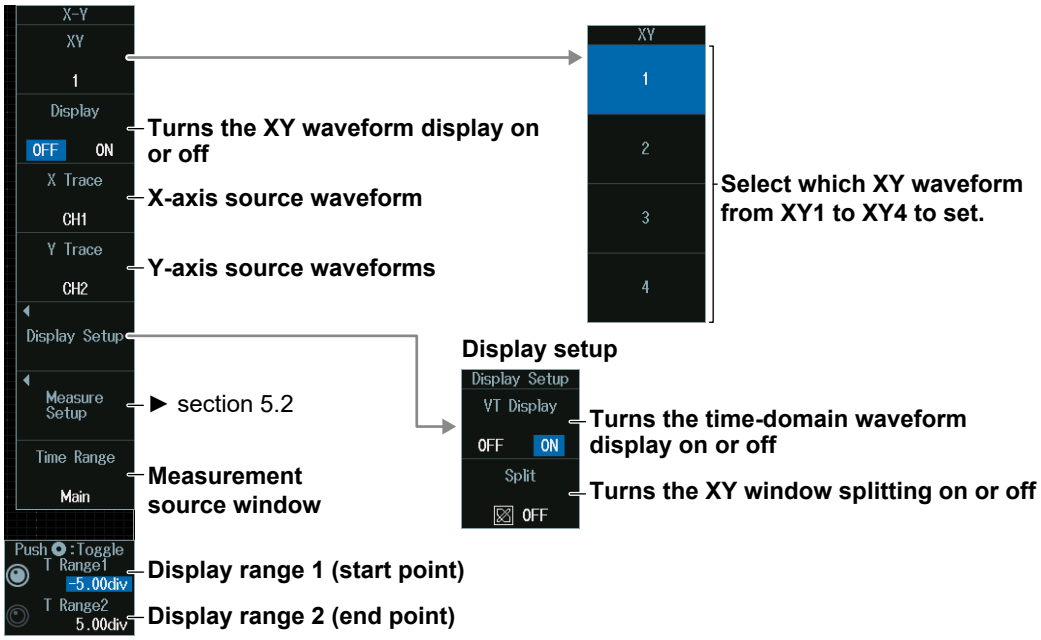
- Measurement source window
- Display range
- Display settings
  Turning time-domain waveform on or off, turning split display on or off

► "Displaying XY Waveforms" in the Features Guide

XY Menu

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

- You can also tap **MENU** (MENU) in the upper left of the screen and select the X-Y menu from ACQ/DISP on the top menu that is displayed.
- Up to four XY waveforms can be displayed. To switch the setup menu, press the XY soft key.



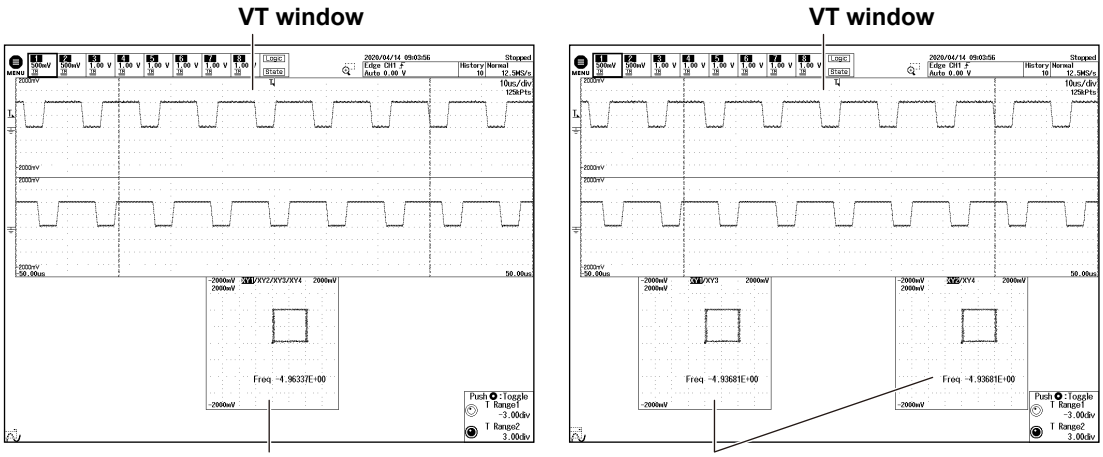
Note

Source Waveform (X Trace/Y Trace)

The available channel settings vary depending on the model.

- The available channel settings on 8ch models are as follows:
  XY1 and XY2: CH1 to CH4, Math1 to Math4
  XY3 and XY4: CH5 to CH8, Math5 to Math8
- The available channel settings on 4ch models are as follows:
  XY1 and XY2: CH1 to CH4, Math1 to Math4

XY Waveform Display (XY Window), VT Waveform Display (VT Window), XY Window Splitting



XY window (split display off)
XY1 to XY4 waveforms are displayed in the same window.

XY window (split display on)
XY1 to XY4 waveforms whose display is turned on are displayed in order starting with the left XY window, then the right XY window, then the left XY window, and so on.

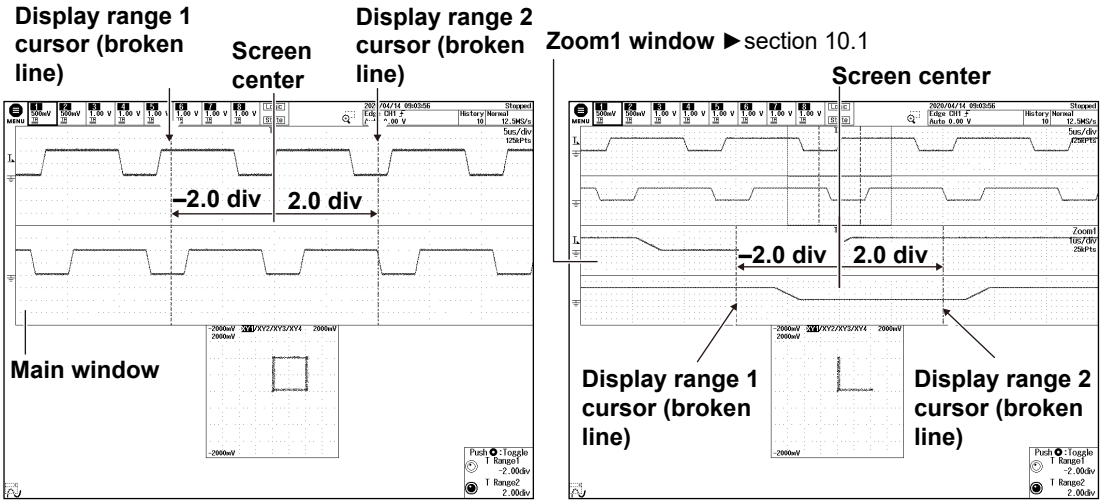
Measurement Source Window (Time Range) and Display Range (T Range1/T Range2)

1. Press the **Time Range** soft key to select the measurement source window.
2. Turn the **jog shuttle** to set the display range.
   - Press **SET** (upper right on the front panel) to switch between display range 1 (start point) and display range 2 (end point).
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Display range 1 (start point)
Display range 2 (end point)

Measurement Source Window and Display Range



When the source window is Main
The XY waveform in the range enclosed by the display range cursor on the main window is displayed.

When the source waveform is Zoom1 to Zoom2
The XY waveform in the range enclosed by the display range cursor on the zoom window is displayed. The display range cursor cannot be moved outside the zoom window range.

5.2 Performing Cursor Measurements and Area Calculations

This section explains the following settings for determining cursor measurement values and the area of the displayed XY waveform:

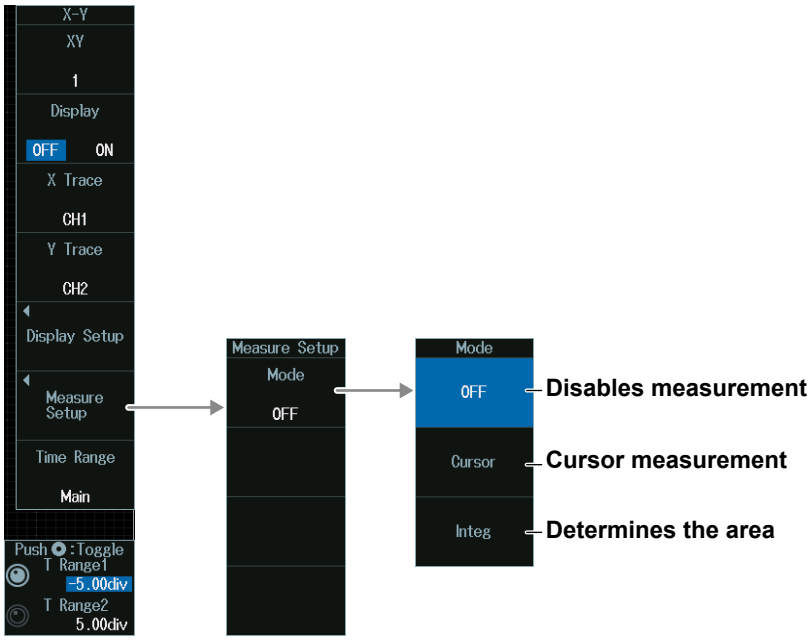
- Cursor measurements on the XY waveform display
- How to calculate the area of XY waveforms

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

XY Menu

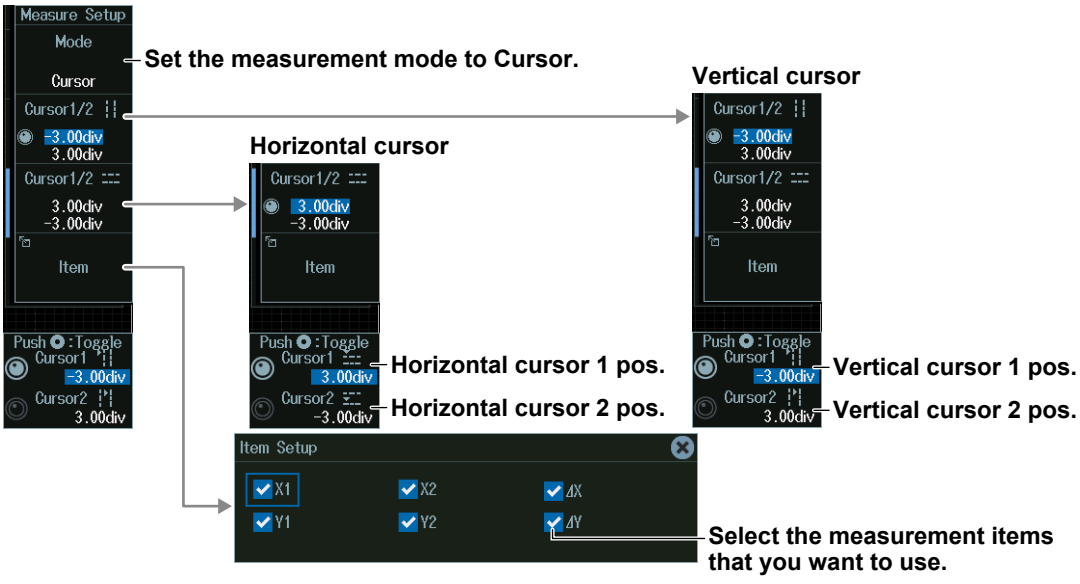
Press **SHIFT+DISPLAY (X-Y)** to display the X-Y menu.

You can also tap **MENU** (MENU) in the upper left of the screen and select the X-Y menu from ACQ/DISP on the top menu that is displayed.

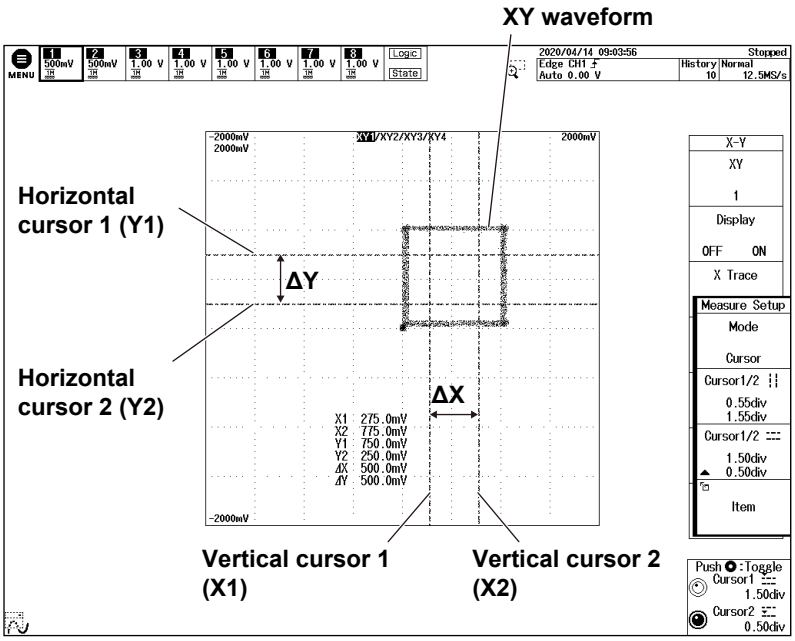


Cursor Measurement (Cursor)

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



Cursor Measurements on the XY Waveform Display



Vertical Cursor Position (Cursor1¦¦/Cursor2¦¦)

1. Press the **Cursor1/2¦¦** soft key.
2. Turn the **jog shuttle** to set vertical cursor 1 (Cursor1¦¦) or vertical cursor 2 (Cursor2¦¦).
   - Press **SET** (upper right on the front panel) to switch between vertical cursor 1 and vertical cursor 2.
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Vertical cursor 1 position

Vertical cursor 2 position

Note

Setting the Vertical Cursor Positions

If you press SET several times and make the jog shuttle control both vertical cursor 1 and vertical cursor 2, you can move them together.

When you move the two cursors together, the cursors no longer move when one of the cursors reaches the edge of the screen.

Horizontal Cursor Position (Cursor1===/Cursor2===)

1. Press the **Cursor1/2===** soft key.
2. Turn the **jog shuttle** to set horizontal cursor 1 (Cursor1===) or horizontal cursor 2 (Cursor2===).
   - Press **SET** (upper right on the front panel) to switch between horizontal cursor 1 and horizontal cursor 2.
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Horizontal cursor 1 position

Horizontal cursor 2 position

Note

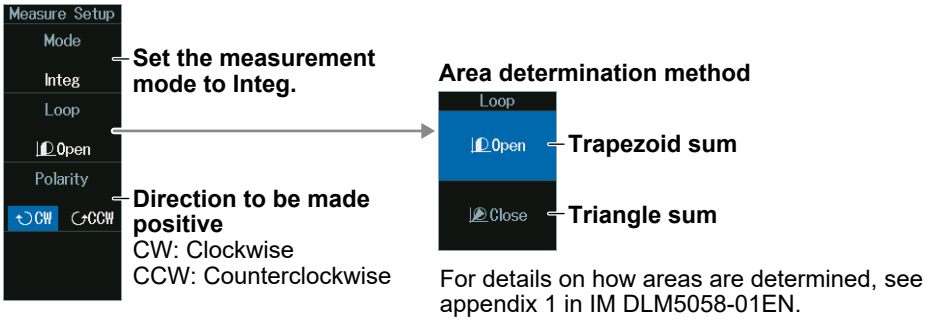
Setting the Horizontal Cursor Positions

If you press SET several times and make the jog shuttle control both horizontal cursor 1 and horizontal cursor 2, you can move them together.

When you move the two cursors together, the cursors no longer move when one of the cursors reaches the edge of the screen.

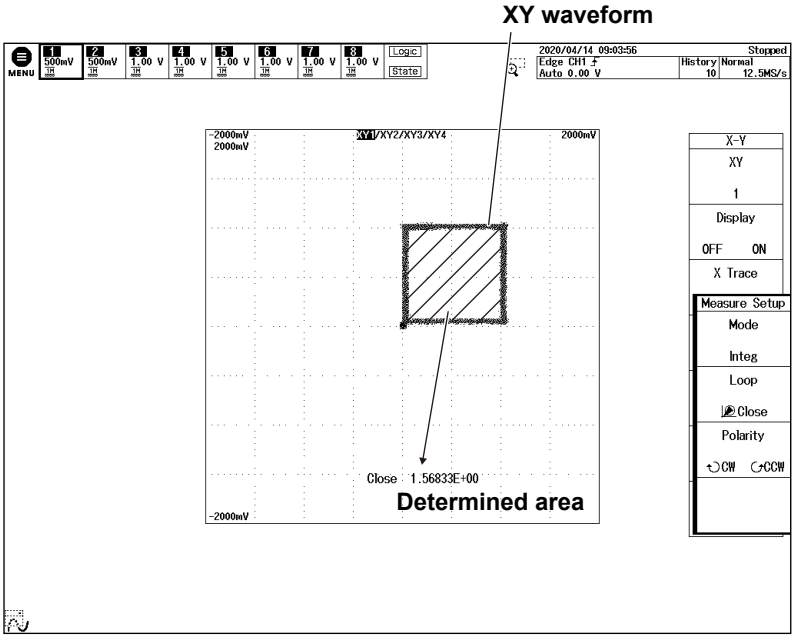
Performing Area Calculations (Integ)

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



For details on how areas are determined, see appendix 1 in IM DLM5058-01EN.

Area of XY Waveforms



6.1 Setting the Computation Mode

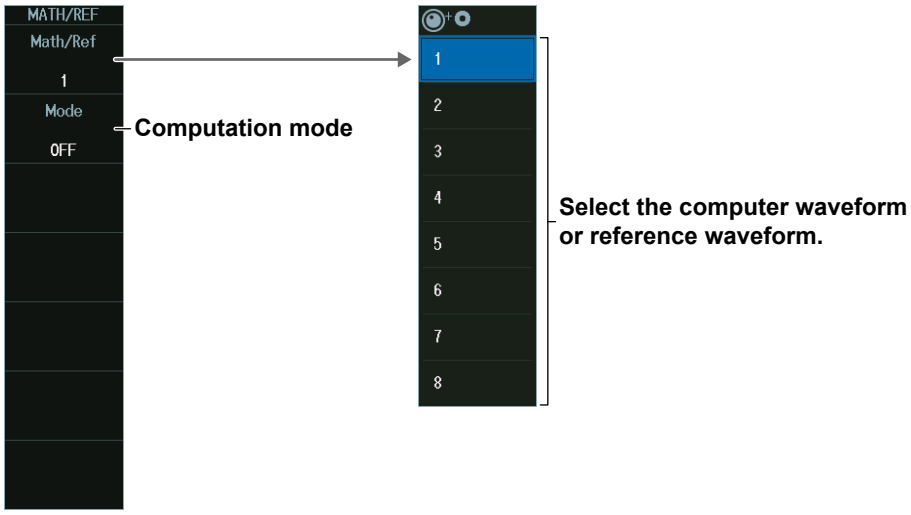
This section explains how to set the computation mode.

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

MATH/REF Menu

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

You can also tap **MENU** (MENU) in the upper left of the screen and select the MATH/REF menu from ANALYSIS on the top menu that is displayed.



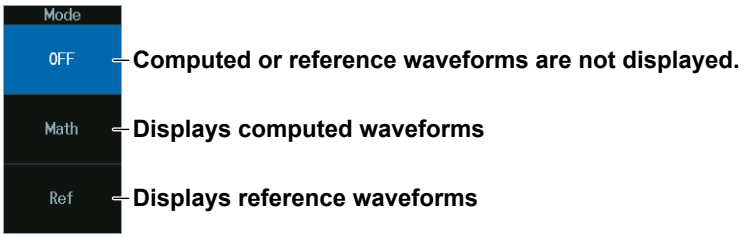
Note

Computed Waveforms or Reference Waveform (Math/Ref)

- The available settings vary depending on the model.
  - 8ch models: Math/Ref1 to Math/Ref8
  - 4ch models: Math/Ref1 to Math/Ref4
- Computed waveforms (MATH waveforms) are not displayed while acquiring waveforms in single mode. The instrument will display computed waveforms after it triggers and the roll mode display stops.
- On the ACQUIRE menu, if you set the record length (Record Length) to the maximum record length, Math/Ref2, Math/Ref4, Math/Ref6, and Math/Ref8 cannot be used. For details on the ACQUIRE menu, see section 3.1.

Computation Mode (Mode)

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



6.2 Performing Addition, Subtraction, and Multiplication

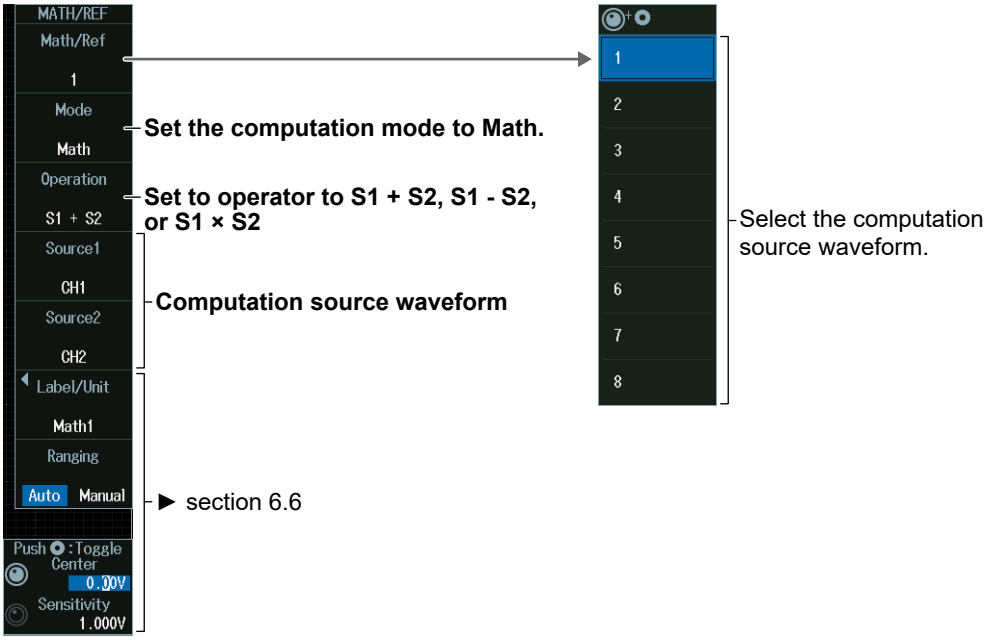
This section explains the following settings for performing addition, subtraction, and multiplication:

- Operators
- Computation source waveforms

► "Operators (Operation)" in the Features Guide

MATH/REF Menu

1. Press **MATH/REF** to display the following menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the MATH/REF menu from ANALYSIS on the top menu that is displayed.
2. Press the **Mode** soft key and then the **Math** soft key.
3. Press the **Operation** soft key, and then the **S1 + S2**, **S1 - S2**, or **S1 x S2** soft key to display the following menu.



Math Source Waveforms (Source1 and Source2)

Below are the computation source waveforms that you can assign to Source1 and Source2.

Model	Computed Waveform (Waveform of Computer Result)	Computation Source Waveforms That You Can Assign to Source1 and Source2
8ch	Math1	CH1 to CH4
	Math2	CH1 to CH4, Math1
	Math3	CH1 to CH4, Math1, Math2
	Math4	CH1 to CH4, Math1 to Math3
	Math5	CH5 to CH8
	Math6	CH5 to CH8, Math5
	Math7	CH5 to CH8, Math5, Math6
	Math8	CH5 to CH8, Math5 to Math7
4ch	Math1	CH1 to CH4
	Math2	CH1 to CH4, Math1
	Math3	CH1 to CH4, Math1, Math2
	Math4	CH1 to CH4, Math1 to Math3

6.3 Performing Filter Functions

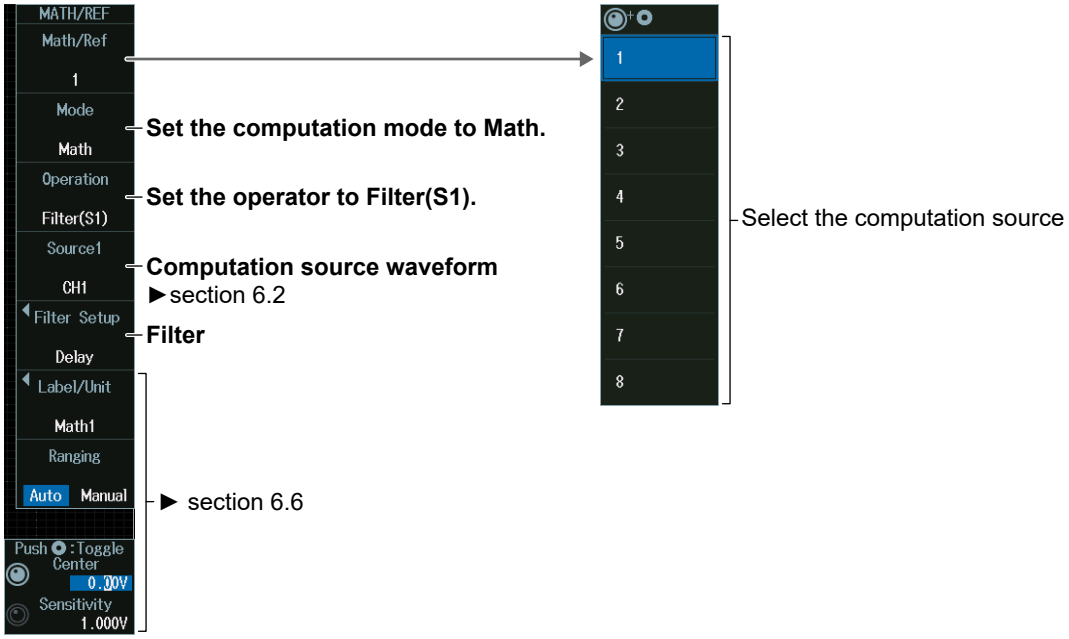
This section explains the following settings for applying filter functions (phase shift, moving average, IIR filter):

- Operators
- Computation source waveforms
- Filter

► "Operators (Operation)" in the Features Guide

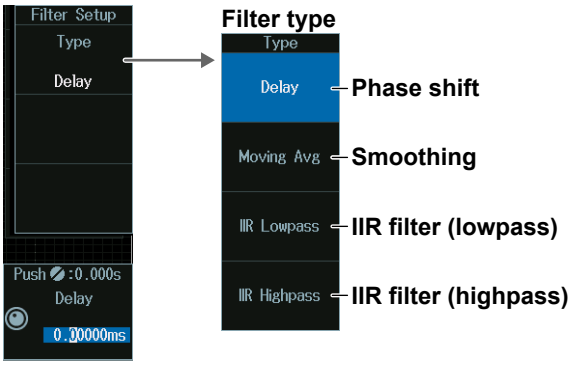
MATH/REF Menu

1. Press **MATH/REF** to display the following menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the MATH/REF menu from ANALYSIS on the top menu that is displayed.
2. Press the **Mode** soft key and then the **Math** soft key.
3. Press the **Operation** soft key and then the **Filter (S1)** soft key to display the following menu.



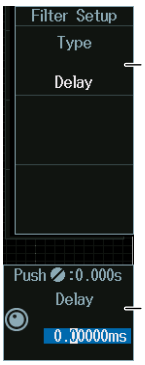
Filter (Filter Setup)

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



Phase Shifting (Delay)

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

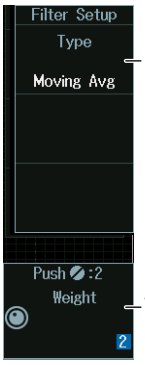


Set the filter type to Delay.

Delay

Smoothing (Moving Avg)

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

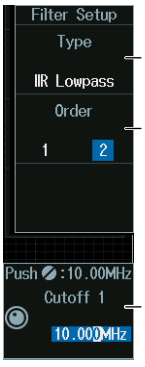


Set the filter type to Moving Avg.

Weighted points

IIR Filter (IIR Lowpass/IIR Highpass)

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



Set the filter type to IIR Lowpass or IIR Highpass.

Filter order

Cutoff frequency

6.4 Performing Integration

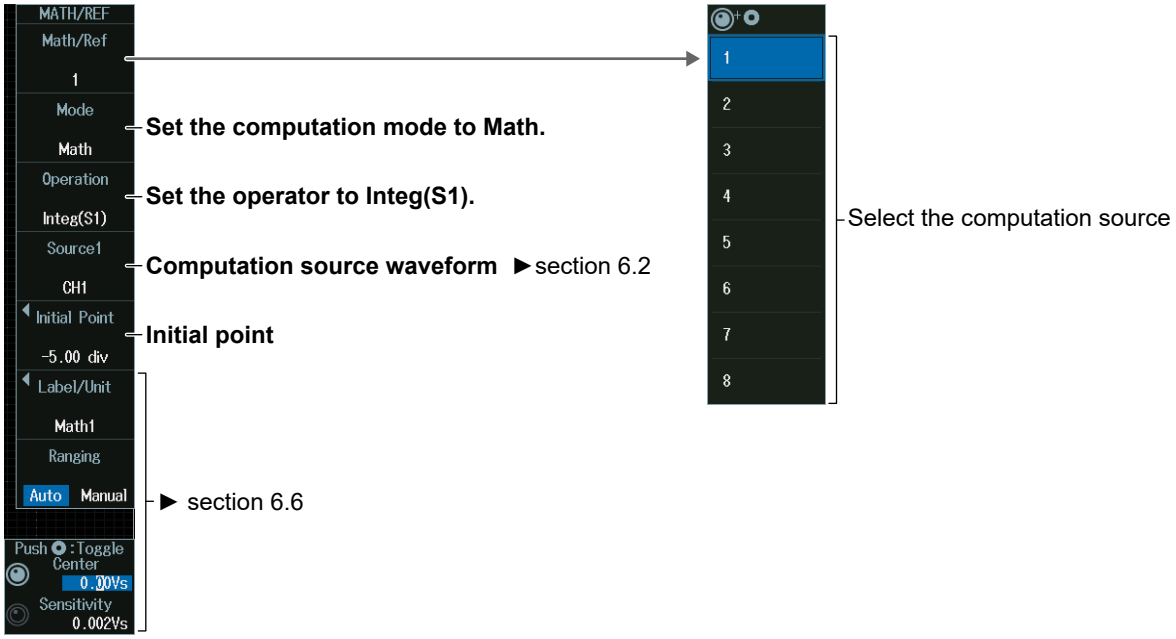
This section explains the following settings for performing integration:

- Operators
- Computation source waveforms
- Initial point

► "Operators (Operation)," "Initial Point (Initial Point)" in the Features Guide

MATH/REF Menu

1. Press **MATH/REF** to display the following menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the MATH/REF menu from ANALYSIS on the top menu that is displayed.
2. Press the **Mode** soft key and then the **Math** soft key.
3. Press the **Operation** soft key and then the **Integ(S1)** soft key to display the following menu.



Initial Point

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

6.5 Performing Count Computations

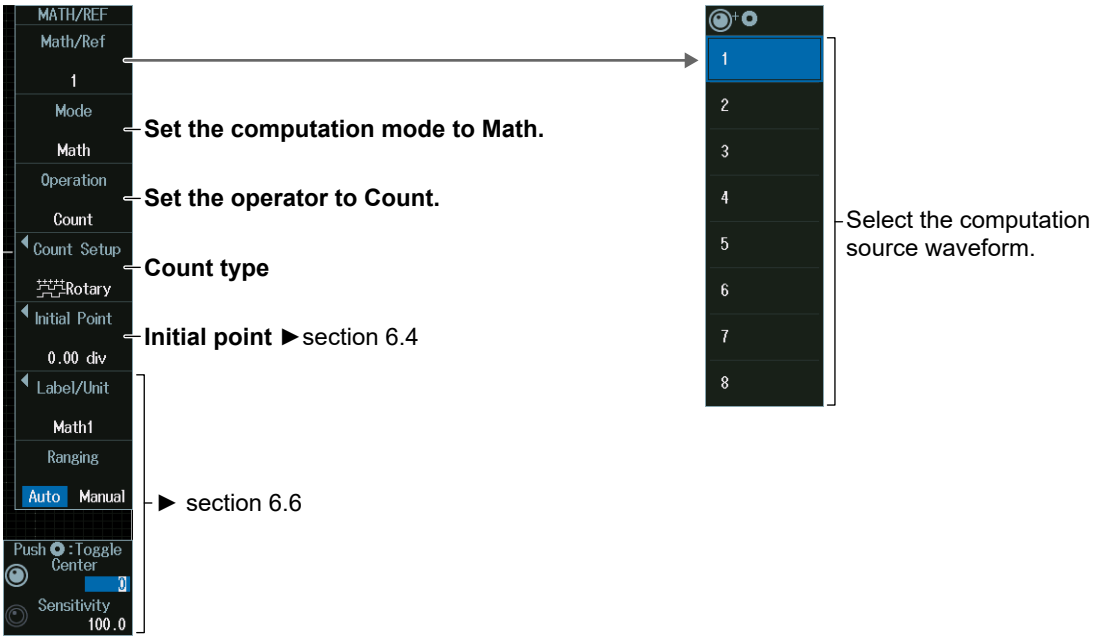
This section explains the following settings for performing edge count or rotary count:

- Operators
- Initial Point
- Count type
  Computation source waveform, polarity, level for detecting edges, rotary count threshold level, hysteresis

► “Operators (Operation),” “Edge Count or Rotary Count (Count)” in the Features Guide

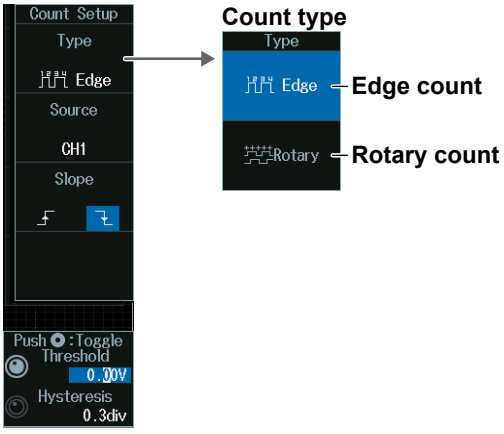
MATH/REF Menu

1. Press **MATH/REF** to display the following menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the MATH/REF menu from ANALYSIS on the top menu that is displayed.
2. Press the **Mode** soft key and then the **Math** soft key.
3. Press the **Operation** soft key and then the **Count(S1)** soft key to display the following menu.



Count Type (Type)

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



Edge Count (Edge)

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

Computation source waveform ►section 6.2

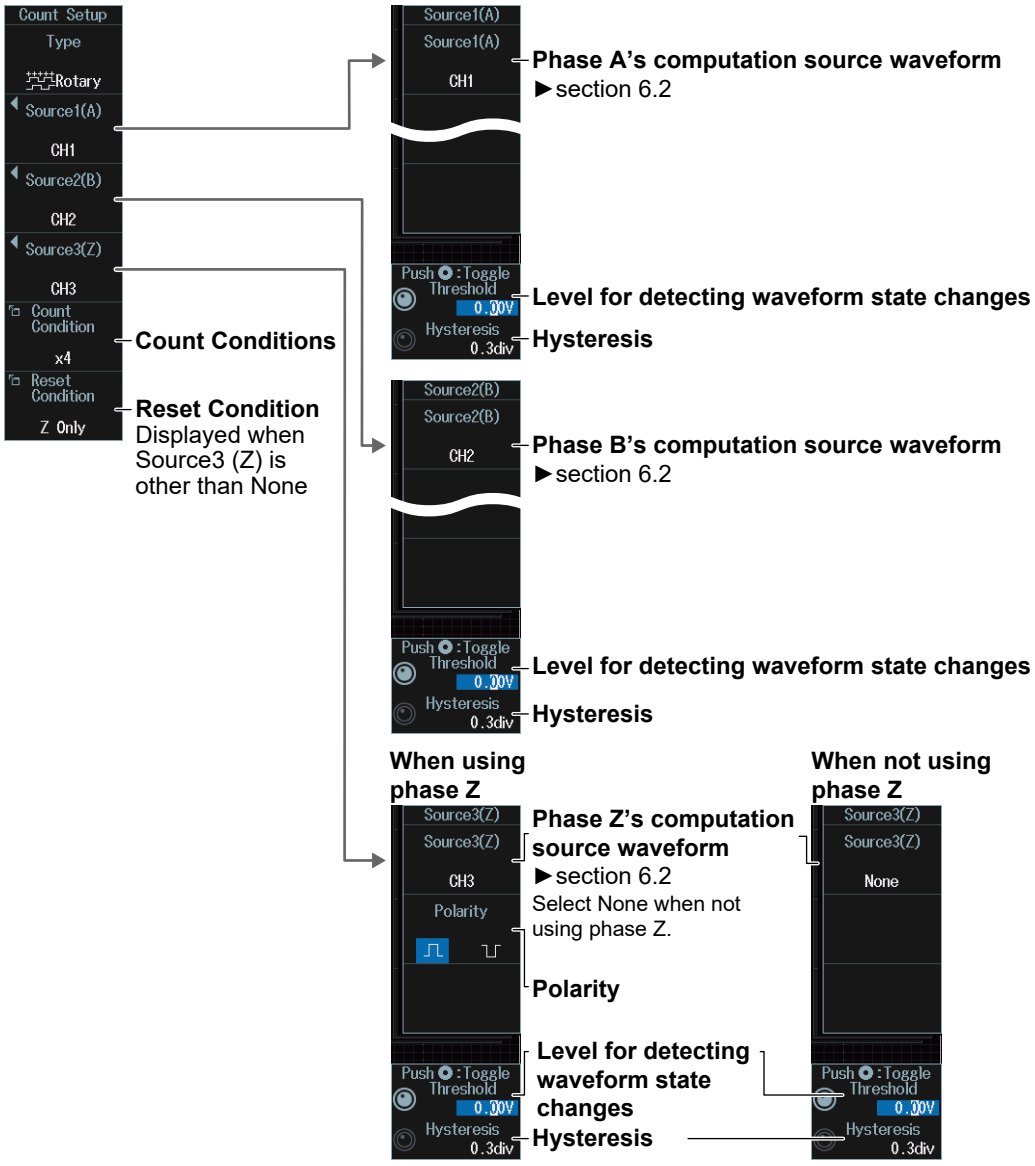
Polarity

Level used to detect edges

Hysteresis

Rotary Count (Rotary)

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



Phase A's computation source waveform
►section 6.2

Level for detecting waveform state changes

Hysteresis

Phase B's computation source waveform
►section 6.2

Level for detecting waveform state changes

Hysteresis

Count Conditions

Reset Condition
Displayed when Source3 (Z) is other than None

When using phase Z

Phase Z's computation source waveform
►section 6.2
Select None when not using phase Z.

Polarity

Level for detecting waveform state changes

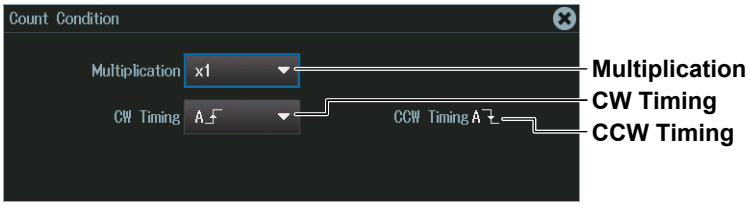
Hysteresis

When not using phase Z

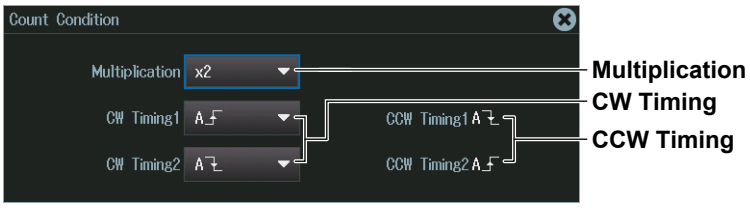
Count Conditions (Count Condition)

Press the **Count Condition** soft key. The following menu items appear.

When multiplication is set to x1



When multiplication is set to x2

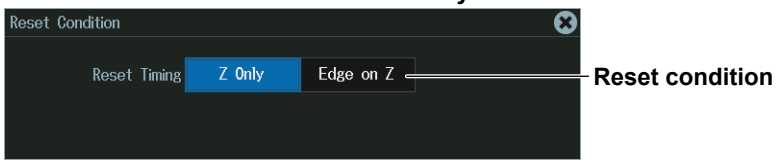


When multiplication is set to x4

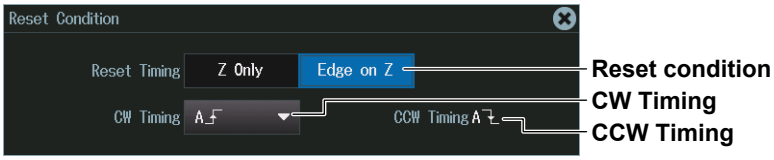
Reset Condition (Reset Condition)

Press the **Reset Condition** soft key. The following menu items appear.

When the reset condition is set to Z Only



When the reset condition is set to Edge on Z



6.6 Setting Labels, Units, and Scaling

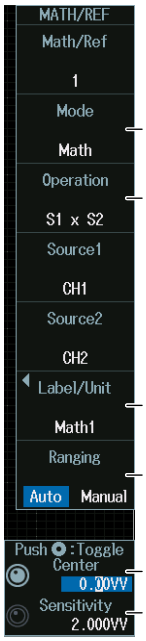
This section explains the following labels, units, and scaling settings:

- Labels and units
- Scaling

► **"Setting Labels and Units (Label/Unit)," "Scaling (Ranging)" in the Features Guide**

MATH/REF Menu

1. Press **MATH/REF** to display the following menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the MATH/REF menu from ANALYSIS on the top menu that is displayed.
2. Press the **Mode** soft key and then the **Math** soft key.
3. Press the **Operation** soft key and then a soft key other than the **User Define** soft key to display the following menu.



Set the computation mode to Math.

Set the operator to other than User Define.

Labels and units

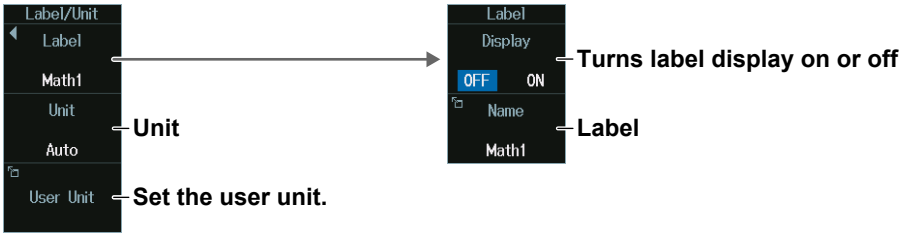
Scaling

Center point and the sensitivity (when scaling is Manual)

- **Center point**
- **Sensitivity**

Labels and Units (Label/Unit)

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



Unit

Set the user unit.

Turns label display on or off

Label

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

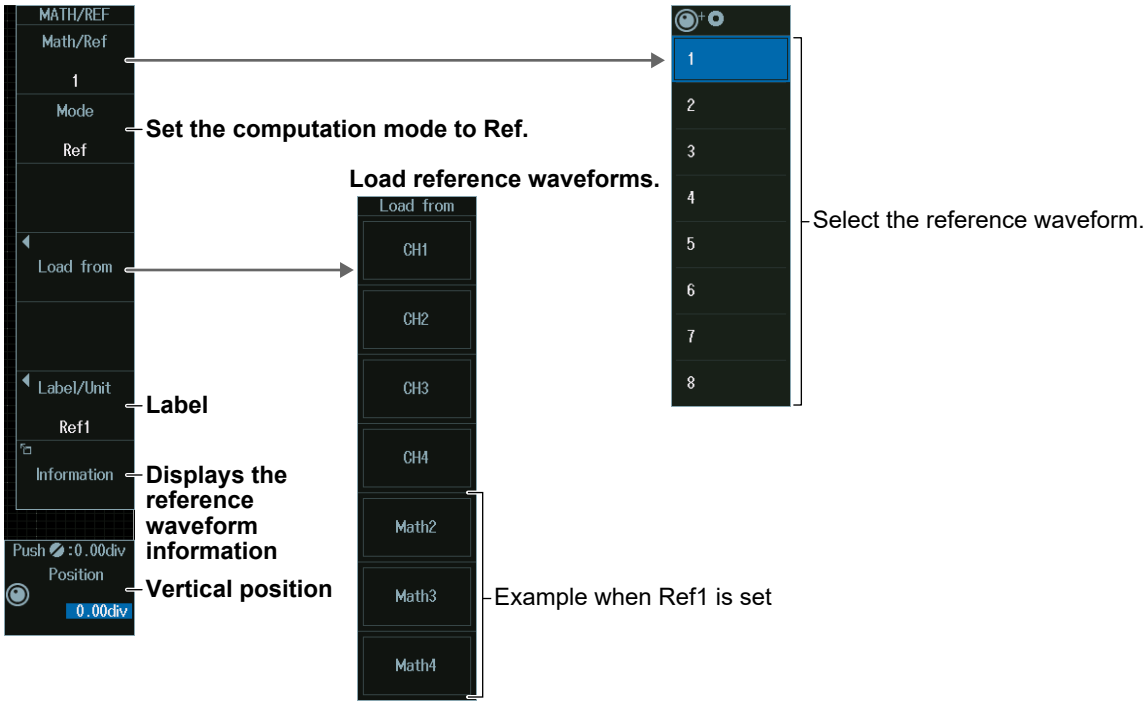
This section explains the following settings for loading reference waveforms:

- Loading reference waveforms
- Label
- Displaying the reference waveform information
- Vertical Position

► “Reference Waveforms” in the Features Guide

MATH/REF Menu

1. Press **MATH/REF**.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the MATH/REF menu from ANALYSIS on the top menu that is displayed.
2. Press the **Mode** soft key and then the **Ref** soft key to display the following menu.



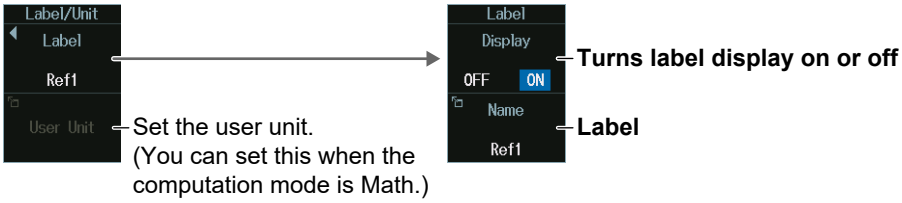
Loading the Reference Waveform (Load from)

Waveforms that can be assigned to (loaded into) the reference waveform are as follows:

Model	Reference waveform	Waveforms that can be assigned to the reference waveform
8ch	Ref1	CH1 to CH4, Math2 to Math4
	Ref2	CH1 to CH4, Math1, Math3, Math4
	Ref3	CH1 to CH4, Math1, Math2, Math4
	Ref4	CH1 to CH4, Math1 to Math3
	Ref5	CH5 to CH8, Math6 to Math8
	Ref6	CH5 to CH8, Math5, Math7, Math8
	Ref7	CH5 to CH8, Math5, Math6, Math8
	Ref8	CH5 to CH8, Math5 to Math7
4ch	Ref1	CH1 to CH4, Math2 to Math4
	Ref2	CH1 to CH4, Math1, Math3, Math4
	Ref3	CH1 to CH4, Math1, Math2, Math4
	Ref4	CH1 to CH4, Math1 to Math3

Label (Label)

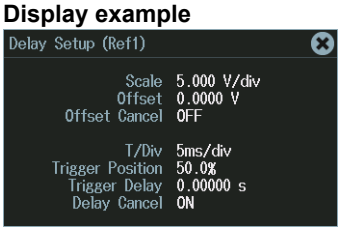
Press the **Label/Unit** soft key to display the following menu.



Reference Waveform Information Display (Information)

Press the **Information** soft key to display the reference waveform information.

Display example



6.8 Performing User-Defined Computations (Optional)

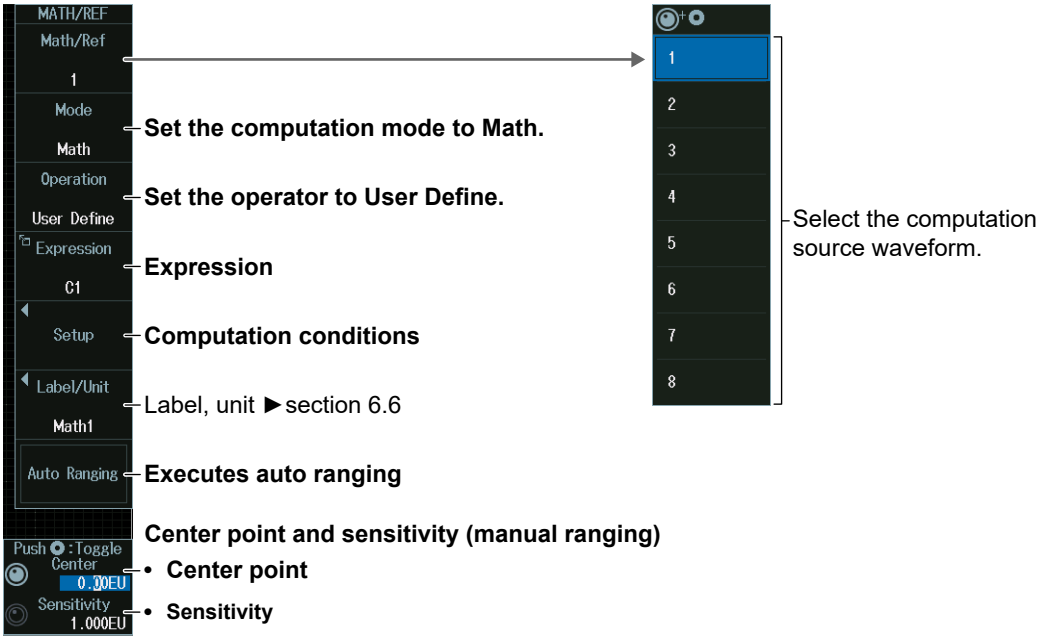
This section explains the following settings for performing user-defined computations:

- Operators
- Expression
- Computation conditions
- Labels and units
- Executing auto ranging

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

MATH/REF Menu

1. Press **MATH/REF** to display the following menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the MATH/REF menu from ANALYSIS on the top menu that is displayed.
2. Press the **Mode** soft key and then the **Math** soft key.
3. Press the **Operation** soft key and then the **User Define** soft key to display the following menu.



Expression (Expression)

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

Define an expression by combining computation source waveforms and operators.

Add the results of automated measurement of waveform parameters to the expression.

Inserts a)

Moves the cursor to the left

Moves the cursor to the right

Deletes the character at the cursor position

Deletes the previous character

Deletes all characters

Enters the expression

Model	Computed waveform	Options
8ch	Math1	None
	Math2	M1
	Math3	M1 to M2
	Math4	M1 to M3
	Math5	M1 to M4
	Math6	M1 to M5
	Math7	M1 to M6
	Math8	M1 to M7

Model	Computed waveform	Options
4ch	Math1	None
	Math2	M1
	Math3	M1 to M2
	Math4	M1 to M3

Computation Conditions (Setup)

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

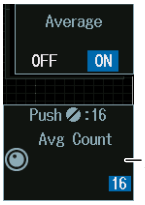
Performs computations on history waveforms.

Constants

Digital filter

Turns averaging on or off
(This setting is shared by computed waveforms.)

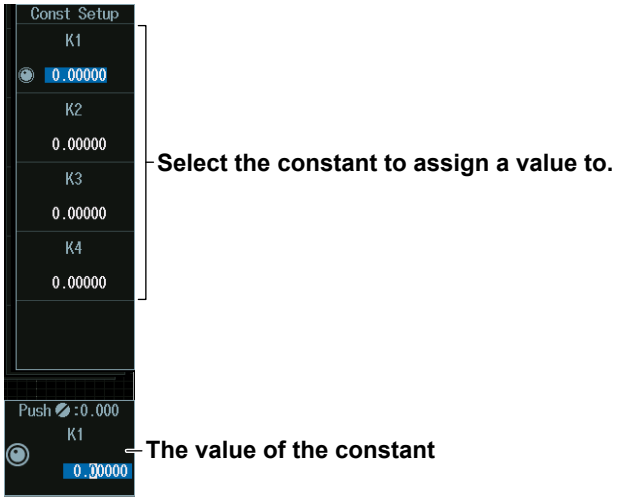
When Averaging Is On



Average count

Constant (Const Setup)

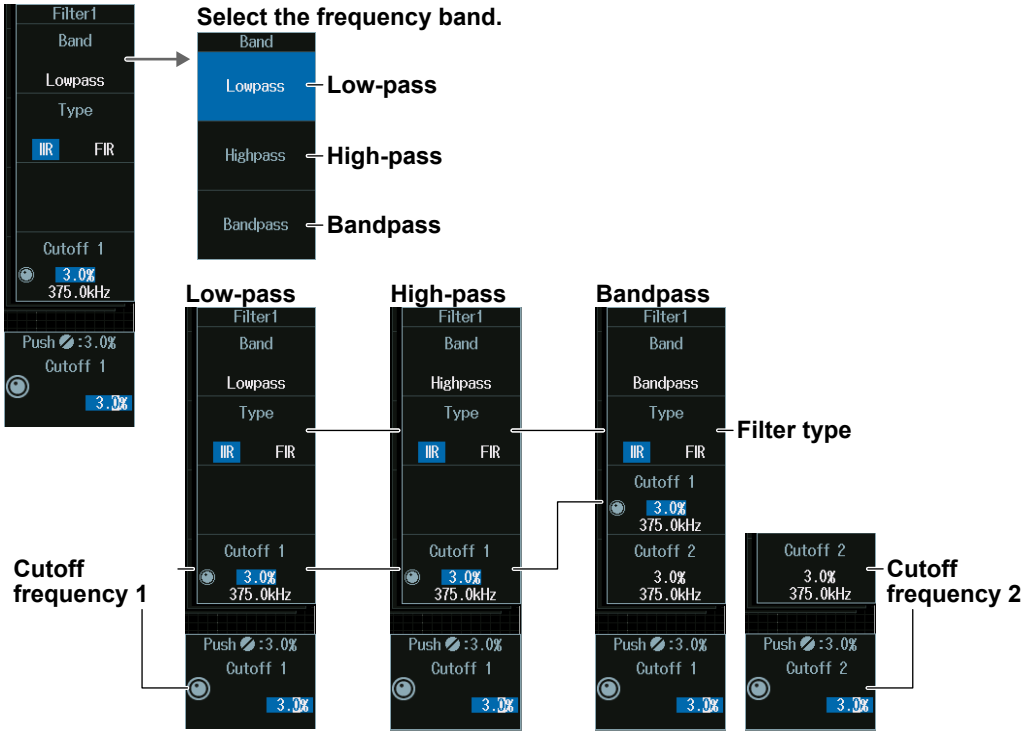
Press the **Const Setup** soft key to display the following menu.



Digital Filter (Filter1/Filter2)

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

Filter1 example



Set **Filter2** in the same manner.

7.1 Displaying FFT Waveforms

This section explains the following settings for performing FFT analysis:

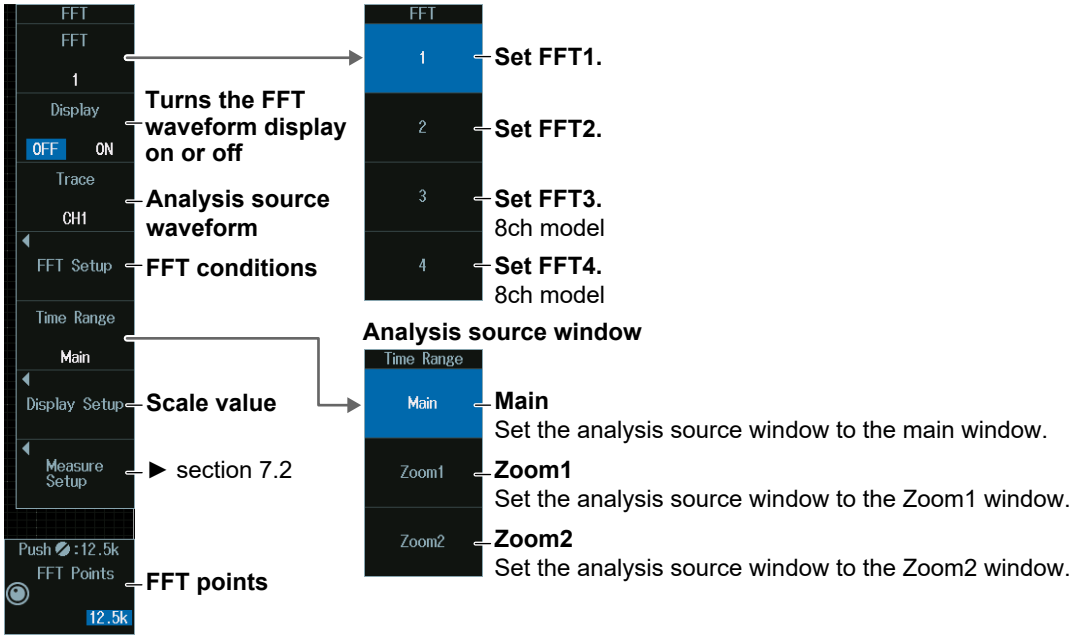
- Turning FFT waveform display on or off
- Analysis source waveform
- FFT conditions
- Analysis range
- Vertical and horizontal scale values
- FFT points

► "FFT" in the Features Guide

FFT Menu

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

- You can also tap **MENU** (MENU) in the upper left of the screen and select the FFT menu from ANALYSIS on the top menu that is displayed.
- Up to four FFT waveforms can be displayed (two on 4ch models). To switch the setup menu, press the **FFT** soft key.



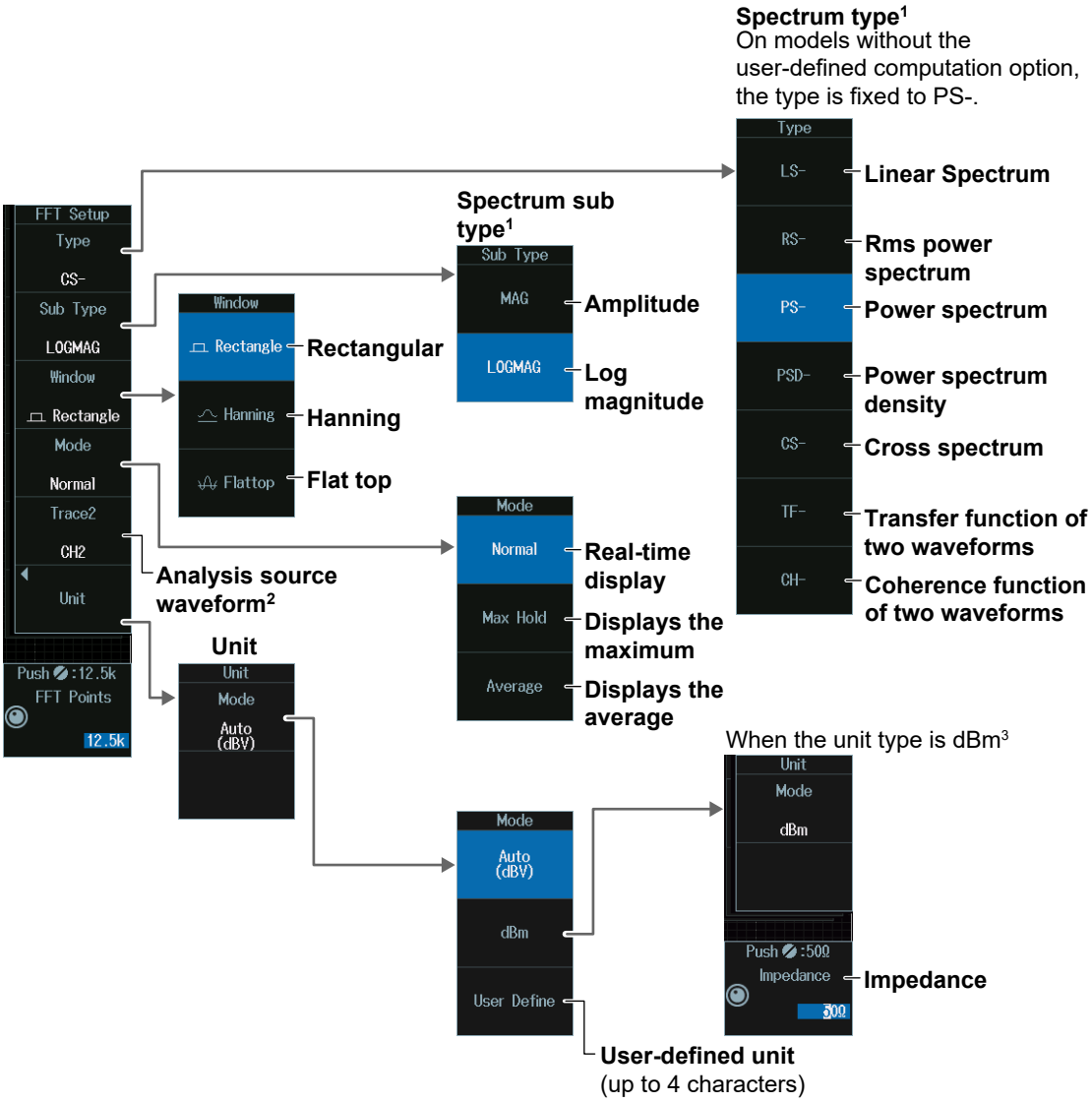
Note

The available analysis source waveform settings vary depending on the model.

- The available settings on 8ch models are as follows:
  CH1 to CH8, Math1 to Math8
- The available settings on 4ch models are as follows:
  CH1 to CH4, Math1 to Math4

FFT Conditions (FFT Setup)

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



1 This is available only on models with the user-defined computation option.

2 Can only be set when Type is CS-, TF-, or CH-.

3 This is available only when Type is set to PS–, Sub Type is set to LOGMAG, and the unit of the analysis source waveform (Trace) is “V.”

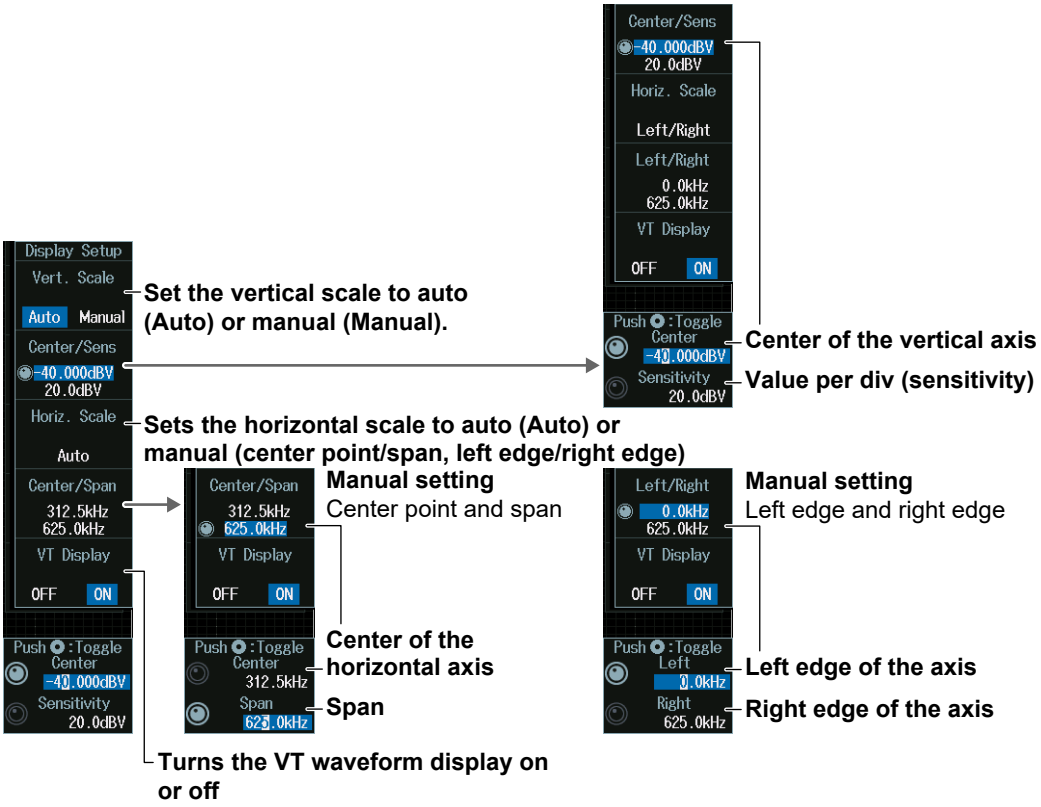
Spectrum Type (Type/Sub Type)

The sub types that you can set are as follows according to type.

Type	Sub Type
LS-, CS-, TF-	MAG, LOGMAG, PHASE, REAL, IMAG
RS-, PS-, SPD-	MAG, LOGMAG
CH-	MAG

Scale Value (Display Setup)

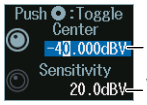
Press the **Display Setup** soft key to display the following menu.



Manually Setting the Vertical Scale (Vert. Scale)

1. Press the **Vert. Scale** soft key to select Manual.
2. Press the **Center/Sens** soft key.
3. Turn the **jog shuttle** to set the center point (Center) of the vertical scale or the value per division (Sensitivity).
   - Press **SET** (upper right on the front panel) to switch between the center point of the vertical scale and the value per division.
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu



Manually Setting the Horizontal Scale (Horiz. Scale)

1. Press the **Horiz. Scale** soft key to select Center/Span or Left/Right.
2. Press the **Center/Span** or **Left/Right** soft key.
3. Turn the **jog shuttle** to set the center point (Center) of the horizontal scale or the left edge of the scale (Left), or the span (Span) or the right edge of the scale (Right).
   - Press **SET** (upper right on the front panel) to switch between the center point (Center) of the horizontal scale or the left edge of the scale (Left) and the span (Span) or the right edge of the scale (Right).
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

When horizontal scale is set to Center/Span

Center of the horizontal axis

Span

When horizontal scale is set to Left/Right

Left edge of the axis

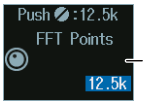
Right edge of the axis

Number of FFT Points (FFT Points)

Turn the **jog shuttle** to set the number of FFT Points (FFT Points).

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu



FFT points

Note

Relationship between the Number of FFT Points and Number of Displayed Points (Display Record Length)

Depending on the number of displayed points in the window that you select using the analysis range (Time Range) setting, the actual number of FFT points may be different from the number of FFT points that you selected.

- Number of FFT points < number of display points
  Display points are decimated to match the number of FFT points. The FFT may not cover the entire display range.
- Number of FFT points > number of display points
  The number of FFT points is adjusted to an appropriate number less than or equal to the number of displayed points.

7.2 Measuring FFT Waveforms

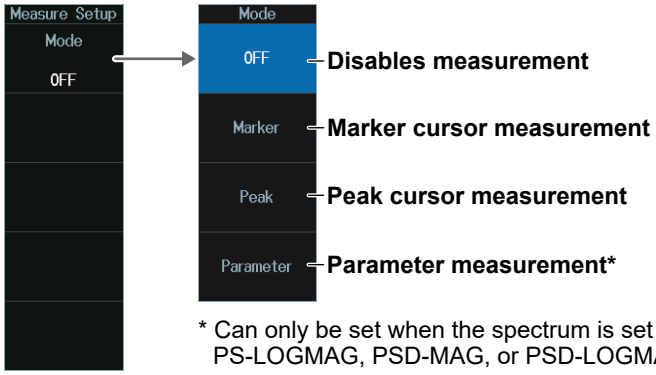
This section explains the following settings for measuring FFT waveforms:

- Measurement mode
- Marker cursor measurement
- Peak cursor measurement
- Parameter measurement

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

FFT Measure Setup Menu

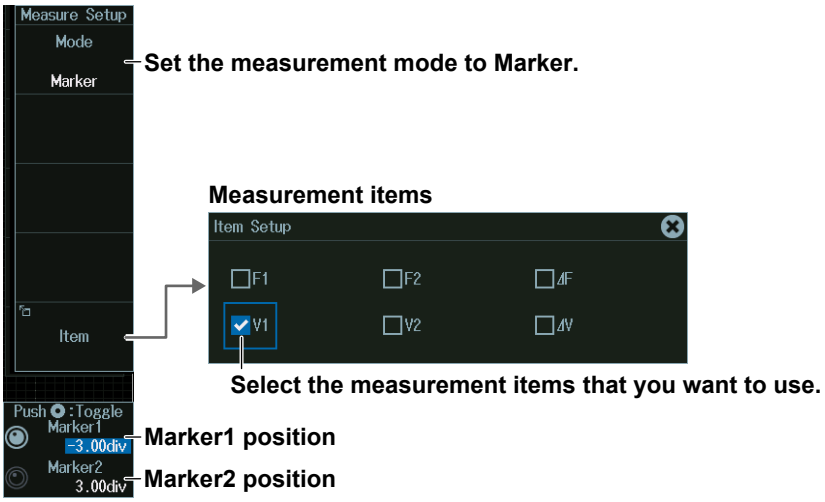
1. Press **SHIFT+MATH/REF (FFT)** to display the FFT menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the FFT menu from ANALYSIS on the top menu that is displayed.
2. Press the **Measure Setup** soft key to display the following menu.



* Can only be set when the spectrum is set to PS-MAG, PS-LOGMAG, PSD-MAG, or PSD-LOGMAG.

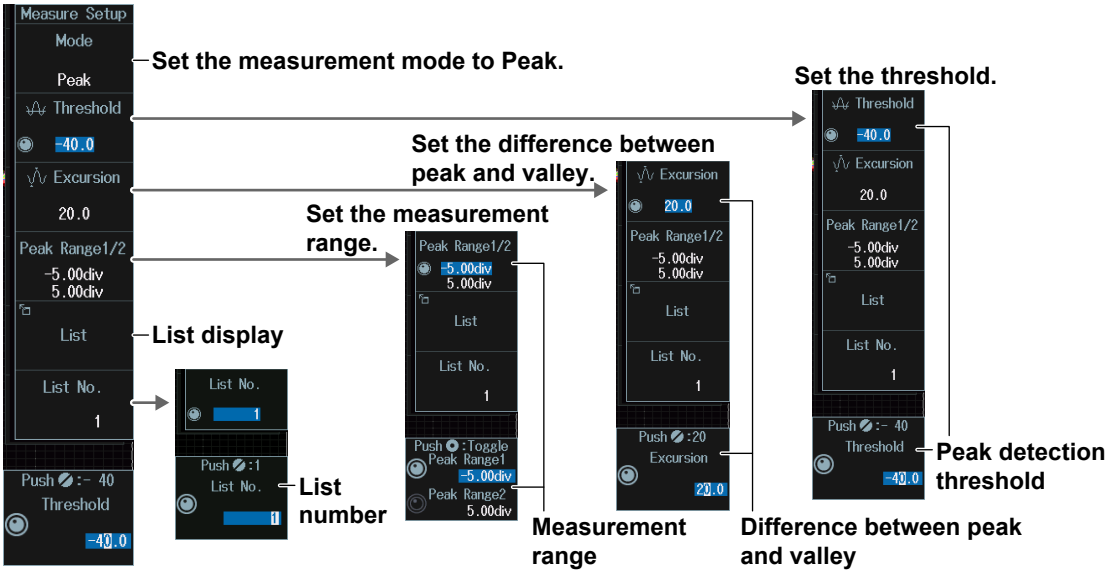
Marker Cursor Measurement (Marker)

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



Peak Cursor Measurement (Peak)

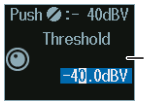
Press the **Mode** soft key and then the **Peak** soft key to display the following menu.



Peak Detection Threshold (Threshold)

1. Press the **Threshold** soft key.
2. Turn the **jog shuttle** to set the peak detection threshold (Threshold).
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu



Difference between Peak and Valley (Excursion)

1. Press the **Excursion** soft key.
2. Turn the **jog shuttle** to set the difference between peak and valley (excursion).
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Measurement Range (Peak Range1/2)

1. Press the **Peak Range1/2** soft key.
2. Turn the **jog shuttle** to set the start point (Peak Range1) and the end point (Peak Range2) of the measurement range.

   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Start point of the measurement range

End point of the measurement range

List Number (List No.)

1. Press the **List No.** soft key.
2. Turn the **jog shuttle** to set the list number (List No.).
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

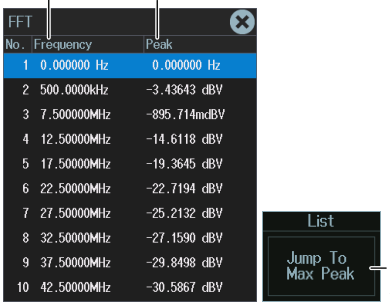
List number

List Display (List)

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

Frequency of each spectrum

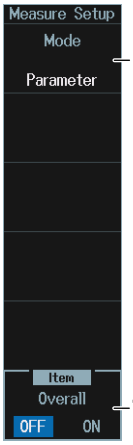
Peak value of each spectrum



Displays the spectrum at the maximum peak value with a cursor

Parameter Measurement (Parameter)

Press the **Mode** soft key and then the **Parameter** soft key. The following menu items appear.



Set the measurement mode to Parameter.

Turns the overall value on and off

8.1 Measuring with ΔT Cursors

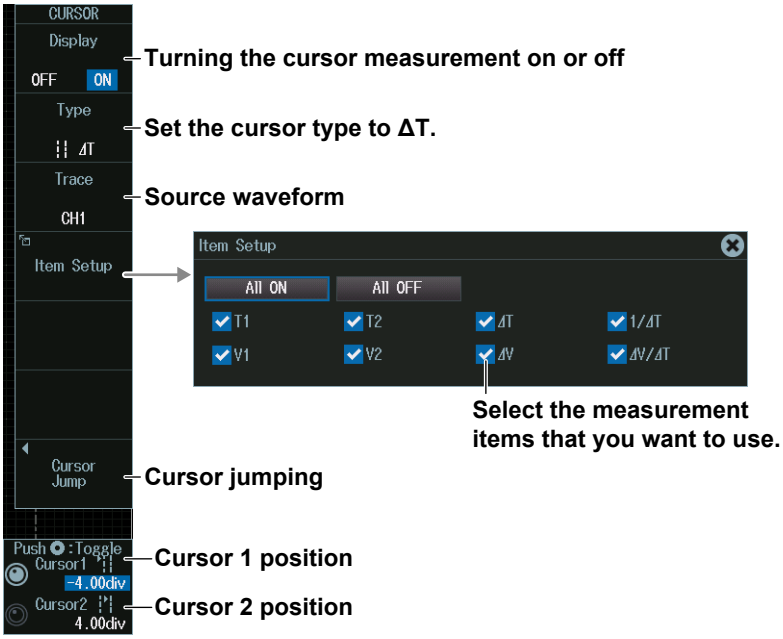
This section explains the following settings for measuring with ΔT cursors:

- Turning cursor measurement on or off
- Cursor type
- Source waveform
- Measurement items
- Cursor jumping
- Cursor position

► "ΔT Cursors (ΔT)" in the Features Guide

CURSOR Menu

1. Press **CURSOR** to display the CURSOR menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the CURSOR menu from MEASURE on the top menu that is displayed.
2. Press the **Type** soft key and then the **ΔT** soft key to display the following menu.



Note

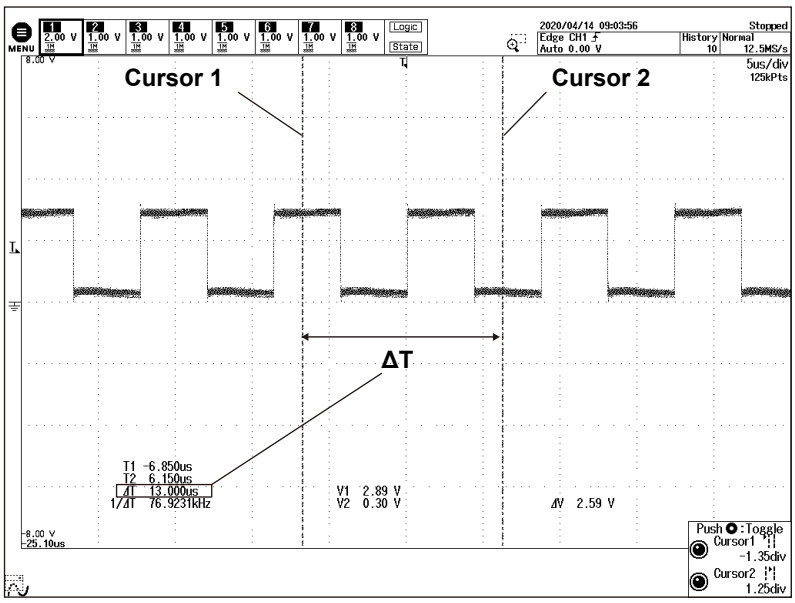
Measurement Source Waveform (Trace)

The available channel settings vary depending on the model and options.

- The available channel settings on 8ch models are as follows:
  All, CH1 to CH8, Logic, Math1 to Math8, LOGIC
- The available channel settings on 4ch models are as follows:
  All, CH1 to CH4, Logic, Math1 to Math4, LOGIC

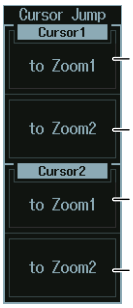
ΔT Cursor Measurement

You can measure time values using two ΔT cursors.



Cursor Jumping (Cursor Jump)

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

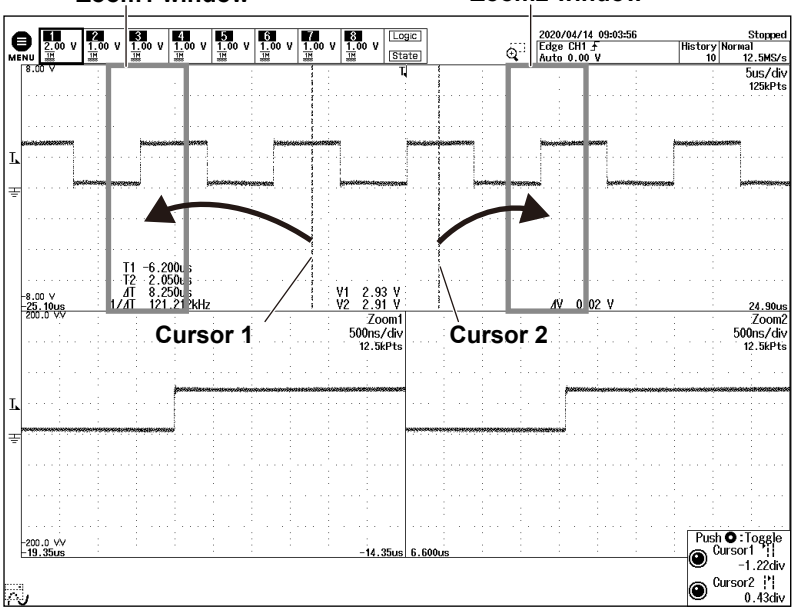


- **Moves cursor 1 into the Zoom1 window**
- **Moves cursor 1 into the Zoom2 window**
- **Moves cursor 2 into the Zoom1 window**
- **Moves cursor 2 into the Zoom2 window**

Cursor Jumping

Display range of the Zoom1 window

Display range of the Zoom2 window



Cursor Positions (Cursor1/Cursor2)

Turn the **jog shuttle** to set cursor 1 (Cursor1) or cursor 2 (Cursor2).

- Press **SET** (upper right on the front panel) to switch between cursor 1 and cursor 2.
- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Cursor 1 position

Cursor 2 position

Note

Setting the Cursor Positions

If you press SET several times and make the jog shuttle control both cursor 1 and cursor 2, you can move them together.

When you move the two cursors together, the cursors no longer move when one of the cursors reaches the edge of the screen. Therefore, if you link cursor 1 and cursor 2 and make the cursor jump, the cursor may not jump properly.

8.2 Measuring with ΔV Cursors

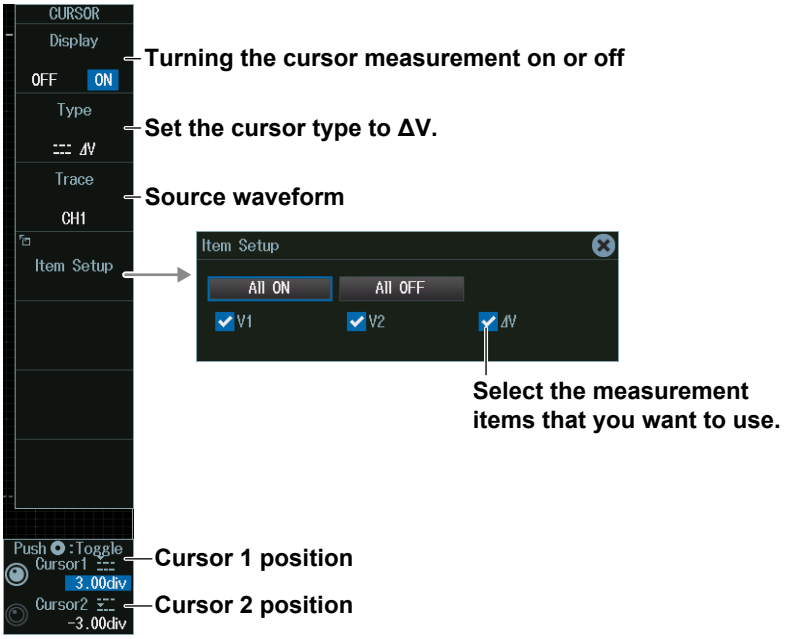
This section explains the following settings for measuring with ΔV cursors:

- Turning cursor measurement on or off
- Cursor type
- Source waveform
- Measurement items
- Cursor position

► "ΔV Cursors (ΔV)" in the Features Guide

CURSOR Menu

1. Press **CURSOR** to display the CURSOR menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the CURSOR menu from MEASURE on the top menu that is displayed.
2. Press the **Type** soft key and then the **ΔV** soft key to display the following menu.



Note

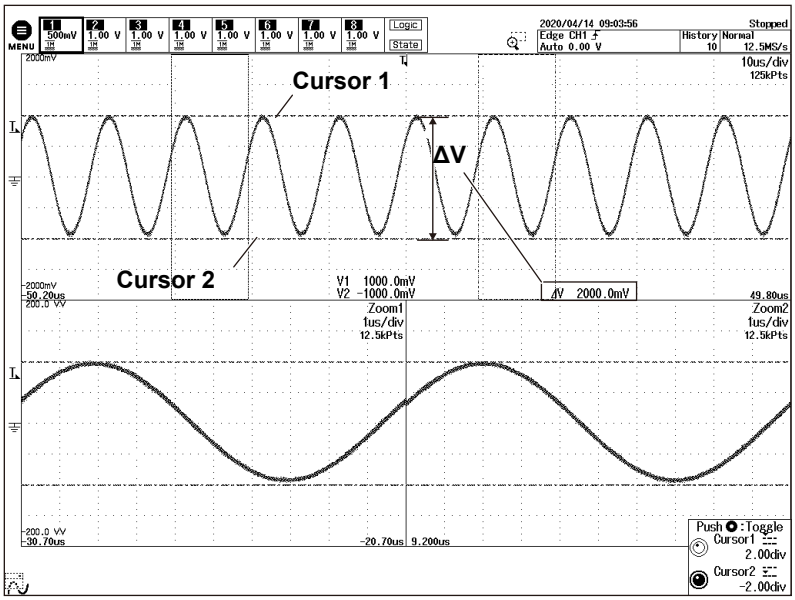
Measurement Source Waveform (Trace)

The available channel settings vary depending on the model and options.

- The available channel settings on 8ch models are as follows:
  CH1 to CH8, Math1 to Math8
- The available channel settings on 4ch models are as follows:
  CH1 to CH4, Math1 to Math4

ΔV Cursor Measurement

You can measure vertical values using two ΔV cursors.



Cursor Positions (Cursor1/Cursor2)

Turn the **jog shuttle** to set cursor 1 (Cursor1) or cursor 2 (Cursor2).

- Press **SET** (upper right on the front panel) to switch between cursor 1 and cursor 2.
- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Cursor 1 position

Cursor 2 position

Note

Setting the Cursor Positions

If you press SET several times and make the jog shuttle control both cursor 1 and cursor 2, you can move them together.

When you move the two cursors together, the cursors no longer move when one of the cursors reaches the edge of the screen.

8.3 Measuring with ΔT and ΔV Cursors

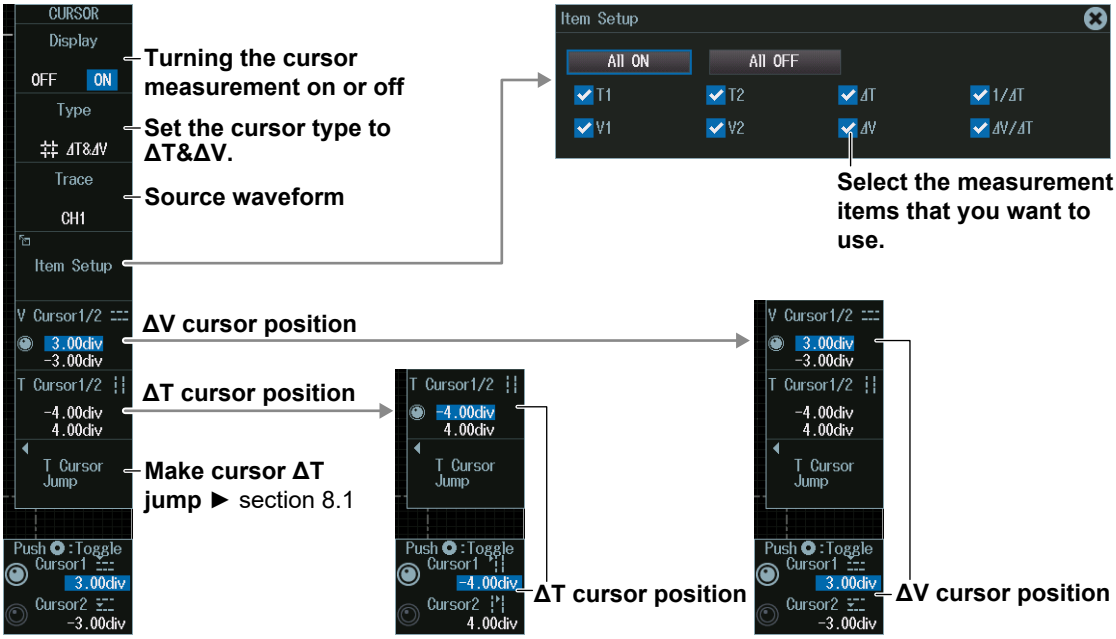
This section explains the following settings for measuring with ΔT and ΔV cursors:

- Turning cursor measurement on or off
- Cursor type
- Source waveform
- Measurement items
- Cursor position
- ΔT Cursor Jumping

► "ΔT&ΔV Cursors (ΔT&ΔV)" in the Features Guide

CURSOR Menu

1. Press **CURSOR** to display the CURSOR menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the CURSOR menu from MEASURE on the top menu that is displayed.
2. Press the **Type** soft key and then the **ΔT&ΔV** soft key to display the following menu.



Note

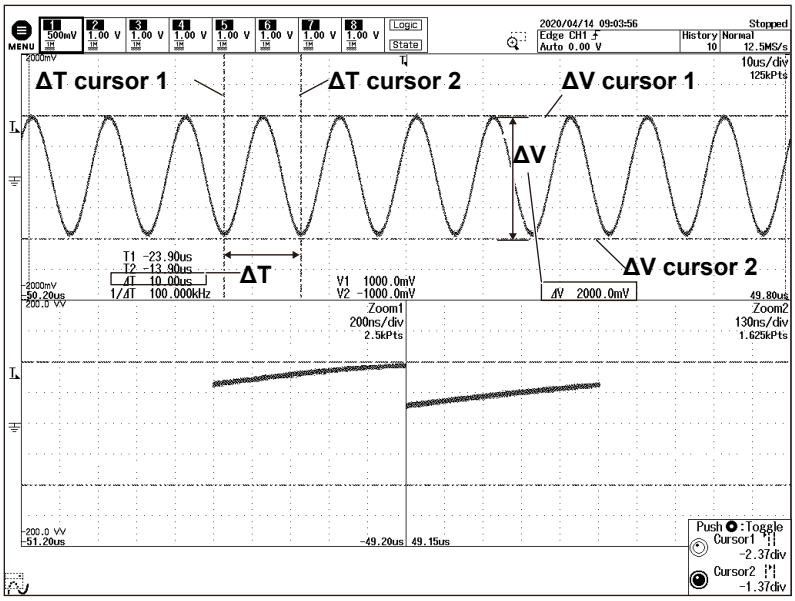
Measurement Source Waveform (Trace)

The available channel settings vary depending on the model and options.

- The available channel settings on 8ch models are as follows:
  CH1 to CH8, Math1 to Math8
- The available channel settings on 4ch models are as follows:
  CH1 to CH4, Math1 to Math4

ΔT and ΔV Cursor Measurement

You can measure time values and vertical values by displaying two ΔT cursors and two ΔV cursors at the same time.



ΔT Cursor Position (Cursor1/Cursor2)

1. Press the **T Cursor 1/2** soft key.
2. Turn the **jog shuttle** to set cursor 1 (Cursor1) or cursor 2 (Cursor2).
   - Press **SET** (upper right on the front panel) to switch between search start point or search end point.
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Cursor 1 position

Cursor 2 position

Note

Setting the Cursor Positions

If you press SET several times and make the jog shuttle control both cursor 1 and cursor 2, you can move them together.

When you move the two cursors together, the cursors no longer move when one of the cursors reaches the edge of the screen. Therefore, if you link cursor 1 and cursor 2 and make the cursor jump, the cursor may not jump properly.

ΔV Cursor Position (Cursor1/Cursor2)

1. Press the **V Cursor 1/2** soft key.
2. Turn the **jog shuttle** to set cursor 1 (Cursor1) or cursor 2 (Cursor2).
   - Press **SET** (upper right on the front panel) to switch between search start point or search end point.
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Cursor 1 position

Cursor 2 position

Note

Setting the Cursor Positions

If you press SET several times and make the jog shuttle control both cursor 1 and cursor 2, you can move them together.

When you move the two cursors together, the cursors no longer move when one of the cursors reaches the edge of the screen.

8.4 Measuring with Marker Cursors (Marker)

This section explains the following settings for measuring with marker cursors:

- Turning cursor measurement on or off
- 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

1. Press **CURSOR** to display the CURSOR menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the CURSOR menu from MEASURE on the top menu that is displayed.
2. Press the **Type** soft key and then the **Marker** soft key to display the following menu.

Turning the cursor measurement on or off

Set the cursor type to Marker.

Marker display format

Marker1 cursor's source waveform and measurement items

Marker2 cursor's source waveform and measurement items

Marker3 cursor's source waveform and measurement items

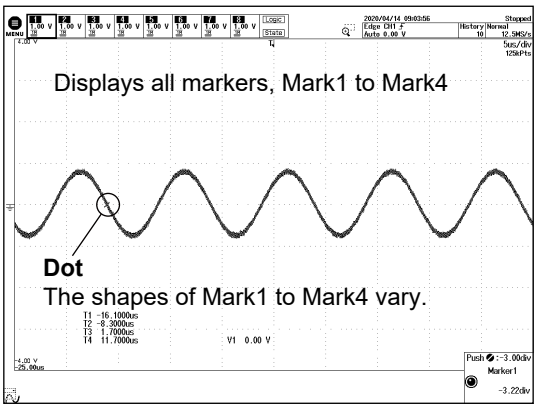
Marker4 cursor's source waveform and measurement items

Position of the selected marker1 to marker4 cursor

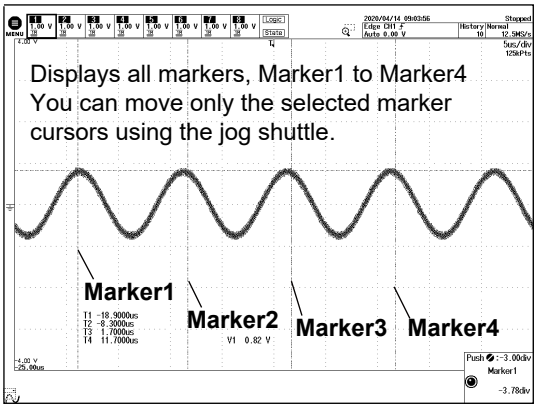
Marker Display Format

Press the **Marker Form** soft key to select the marker display format.

Mark (dot)

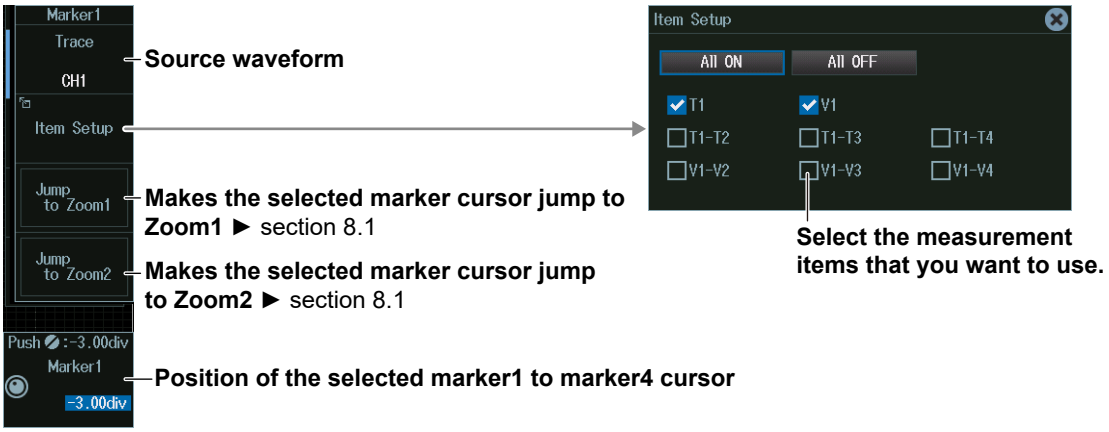


Line (crosshair)



Cursor Source Waveform and Measurement Items (Marker1, Marker2, Marker3, and Marker4)

Press a soft key from **Marker1** to **Marker4** to display the following menu.



Note

Measurement Source Waveform (Trace)

The available channel settings vary depending on the model and options.

- The available channel settings on 8ch models are as follows:
  OFF, CH1 to CH8, Math1 to Math8
- The available channel settings on 4ch models are as follows:
  OFF, CH1 to CH4, Math1 to Math4

Position of the Selected Marker1 to Marker4 Cursor

1. Press a soft key from **Marker1** to **Marker4**.
2. Turn the **jog shuttle** to set the the marker cursor (Marker1 to Marker4).
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

8.5 Measuring with Angle Cursors (Degree)

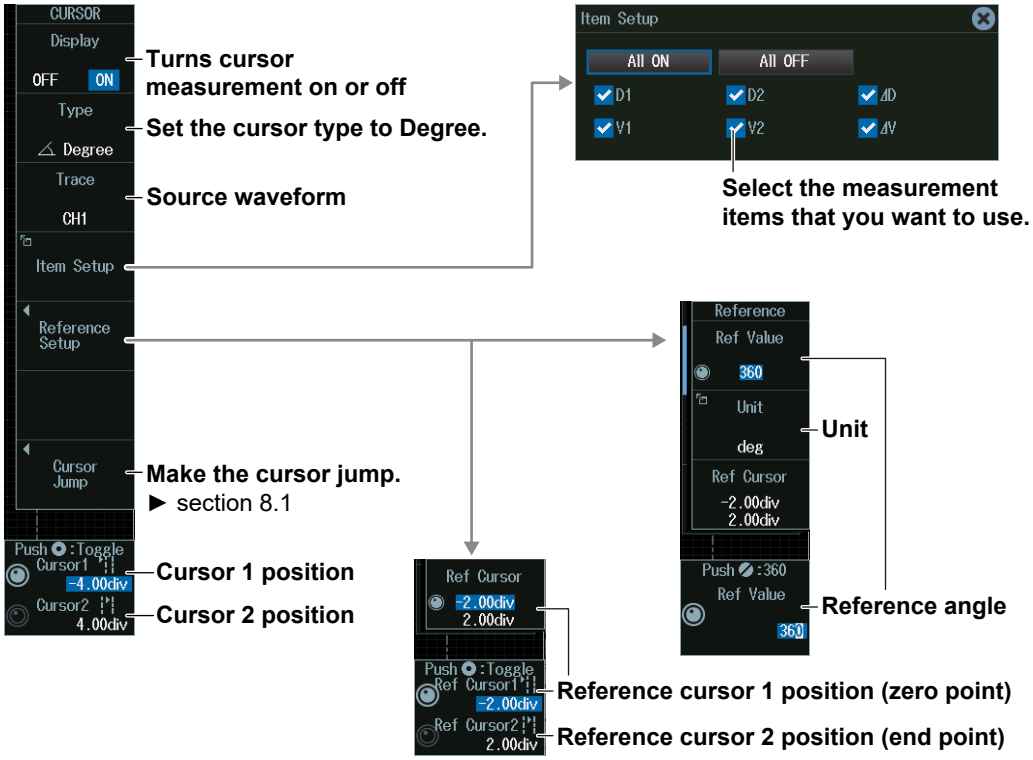
This section explains the following settings for measuring with angle cursors:

- Turning cursor measurement on or off
- Cursor type
- Source waveform
- Measurement items
- Reference setup
- Cursor jumping
- Cursor position

► "Angle Cursors (Degree)" in the Features Guide

CURSOR Menu

1. Press **CURSOR** to display the CURSOR menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the CURSOR menu from MEASURE on the top menu that is displayed.
2. Press the **Type** soft key and then the **Degree** soft key to display the following menu.



Note

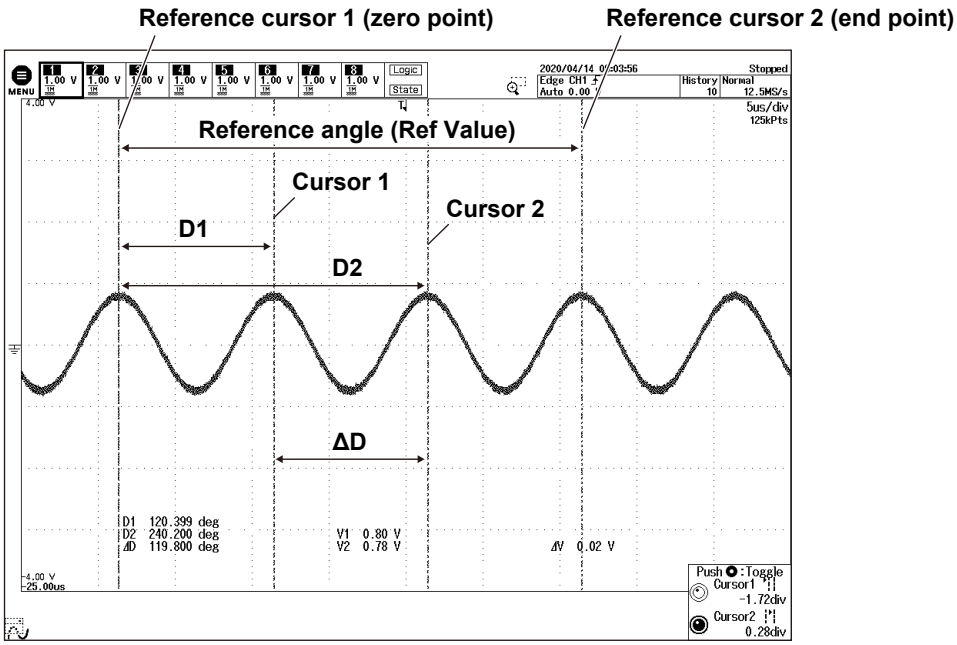
Measurement Source Waveform (Trace)

The available channel settings vary depending on the model and options.

- The available channel settings on 8ch models are as follows:
  All, CH1 to CH8, Math1 to Math8, Logic
- The available channel settings on 4ch models are as follows:
  All, CH1 to CH4, Math1 to Math4, Logic

Angle Cursor Measurement

On the time axis, set the zero point (Ref Cursor1 position), which will be the angle measurement reference, the end point (Ref Cursor2 position), and the reference angle that you want to assign to the difference between Ref Cursor1 and Ref Cursor2. Based on this reference angle, you can measure the angle between two angle cursors (Cursor1 and Cursor2).

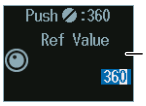


Setting the Reference (Reference Setup)

Setting the Reference Angle (Ref Value)

1. Press the **Reference Setup** soft key and then the **Ref Value** soft key.
2. Turn the **jog shuttle** to set the reference angle.
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

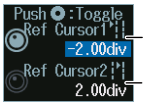


Reference angle

Reference Cursor Positions (Ref Cursor1/Ref Cursor2)

1. Press the **Reference Setup** soft key and then the **Ref Cursor** soft key.
2. Turn the **jog shuttle** to set the reference cursor.
   - Press **SET** (upper right on the front panel) to switch between reference cursor 1 (zero point) and reference cursor 2 (end point).
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu



Reference cursor 1 position (zero point)

Reference cursor 2 position (end point)

Cursor Positions (Cursor1/Cursor2)

Turn the **jog shuttle** to set the cursor position.

- Press **SET** (upper right on the front panel) to switch between cursor 1 and cursor 2.
- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Cursor 1 position

Cursor 2 position

Note

Setting the Cursor Positions

If you press SET several times and make the jog shuttle control both cursor 1 and cursor 2, you can move them together.

When you move the two cursors together, the cursors no longer move when one of the cursors reaches the edge of the screen. Therefore, if you link cursor 1 and cursor 2 and make the cursor jump, the cursor may not jump properly.

9.1 Automatically Measuring Waveform Parameters

This section explains the following settings for automatically measuring waveform parameters:

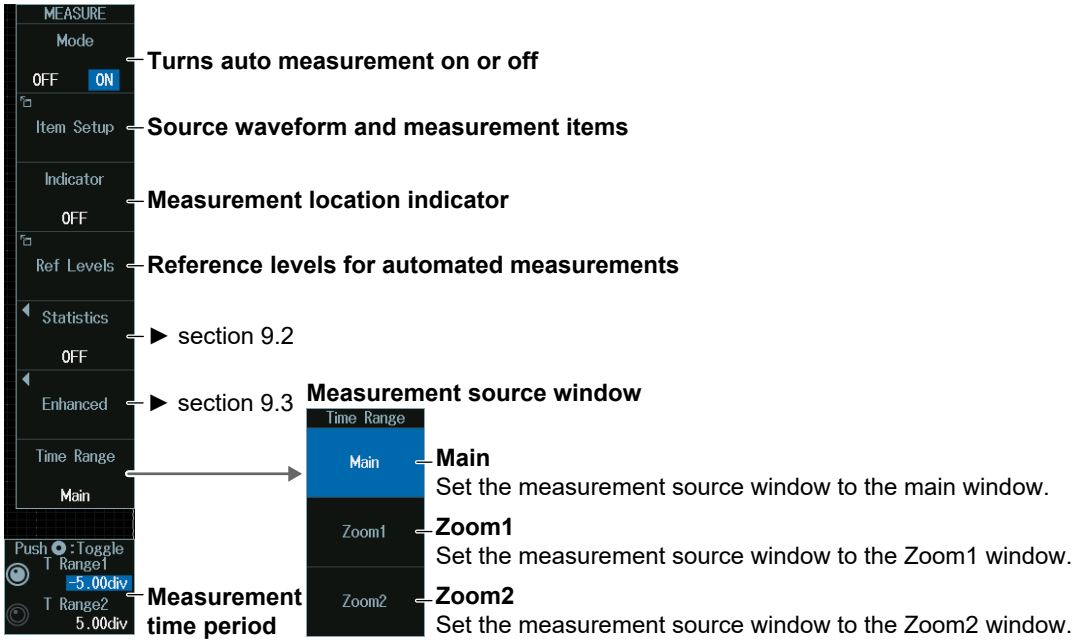
- Turning automated measurement on or off
- Measurement source waveform and measurement items
- Measurement location indicator
- Reference levels for automated measurements
- Measurement source window
- Measurement range

► "Automated Measurement of Waveform Parameters" in the Features Guide

MEASURE Menu

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

You can also tap **MENU** (MENU) in the upper left of the screen and select the MEASURE menu from MEASURE on the top menu that is displayed.

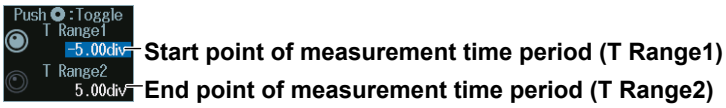


Measurement Time Period (T Range1, T Range2)

Turn the **jog shuttle** to set the measurement time period.

- Press **SET** (upper right on the front panel) to switch between the start point of the measurement time period (T Range1) or the end point of the measurement time period (T Range2).
- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

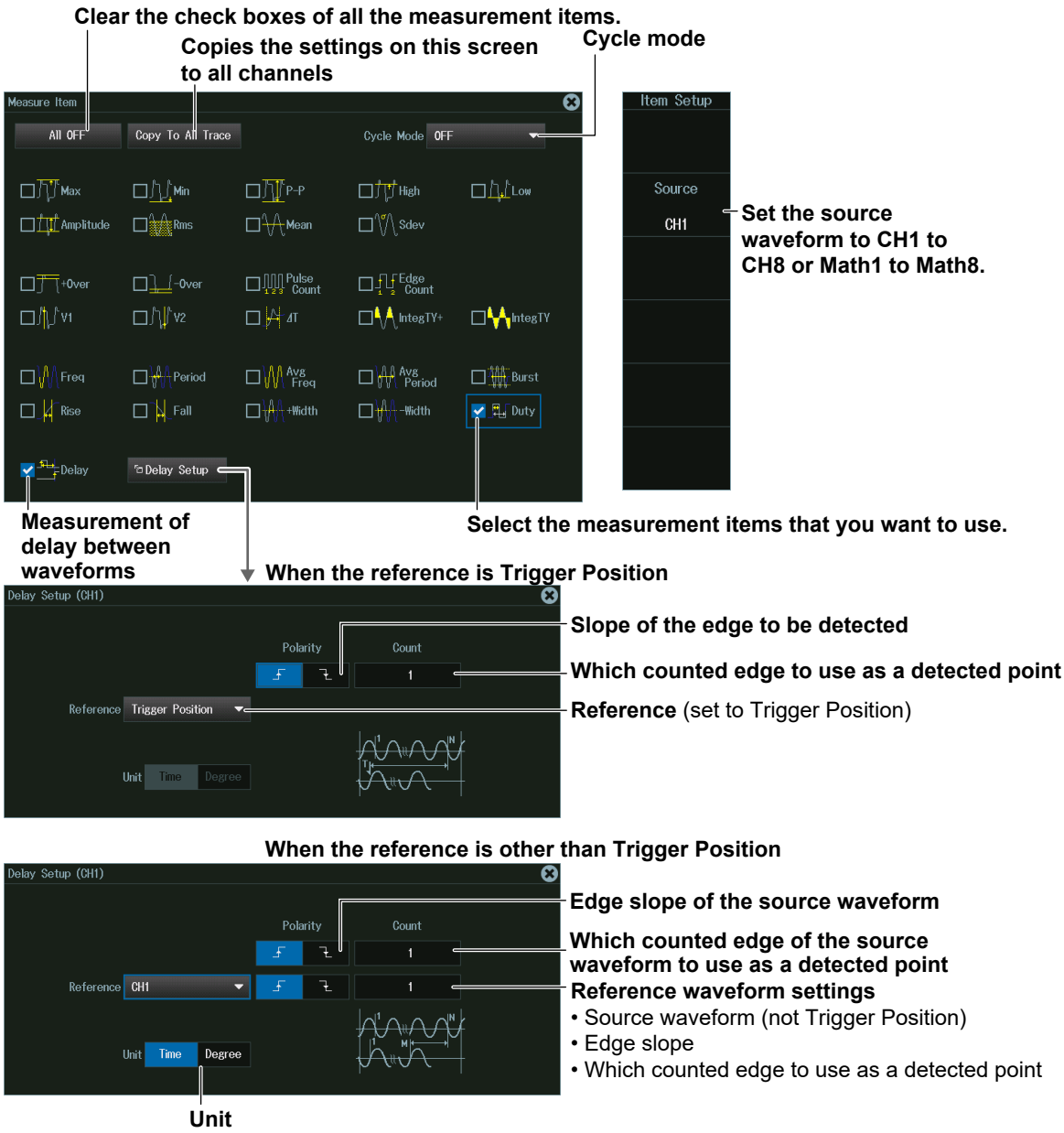
Jog shuttle setting menu



Measurement Source Waveform and Measurement Items (Item Setup)

1. Press the **Item Setup** soft key.
2. Press the **Source** soft key. Select the source waveform from the setup menu that is displayed. A menu appears according to the measurement source waveform you specified.

When the Measurement Source Waveform Is CH1 to CH8 or Math1 to Math8



Note

Cycle Mode

- When the power analysis type is switching loss, the cycle mode is fixed to SW Loss.
- When power measurement is ON, the cycle mode changes according to the setting of the cycle mode of power measurement.

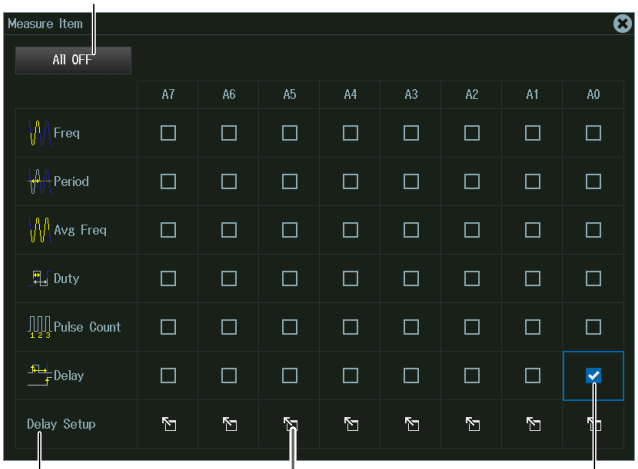
Measurement Source Waveform

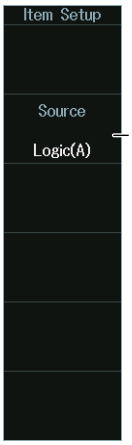
The available channel settings vary depending on the model.

- The available settings are CH1 to CH8 and Math1 to Math8 on 8ch models.
- The available settings are CH1 to CH4 and Math1 to Math4 on 4ch models.

When the Search Source Waveform Is Logic

Clear the check boxes of all the measurement items.



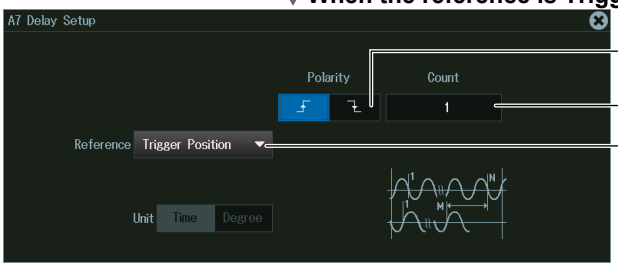


Set the measurement source waveform to Logic(A) to Logic(D).

Measurement of delay between waveforms

Select the measurement items that you want to use.

When the reference is Trigger Position

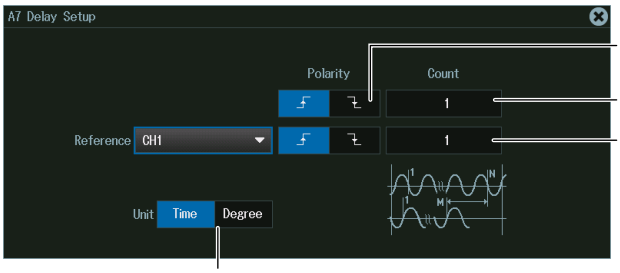


Slope of the edge to be detected

Which counted edge to use as a detected point

Reference (set to Trigger Position)

When the reference is other than Trigger Position/Logic



Edge slope of the source waveform

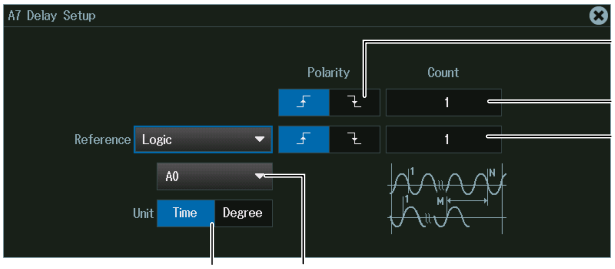
Which counted edge of the source waveform to use as a detected point

Reference waveform settings

- Source waveform (not Trigger Position/Logic)
- Edge slope
- Which counted edge to use as a detected point

Unit

When Reference is set to Logic



Edge slope of the source waveform

Which counted edge of the source waveform to use as a detected point

Reference waveform settings

- Source waveform (set to Logic)
- Edge slope
- Which counted edge to use as a detected point

Unit **Source bit**

Note

Measurement Source Waveform

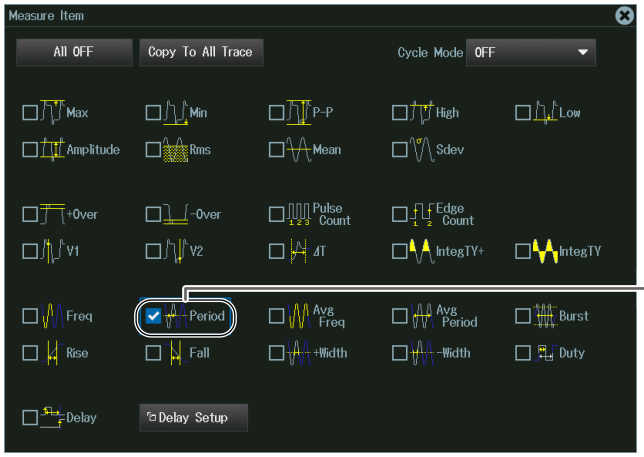
The following source bit display applies to models with the /L32 option.

- C0 to C7 (LOGIC port C), D0 to D7 (LOGIC port D)

Measurement Location Indicator (Indicator)

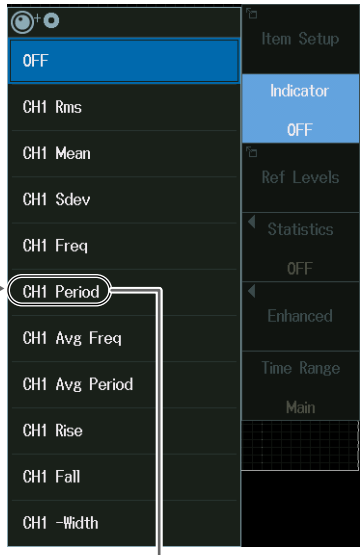
1. Press the **Indicator** soft key.
   A portion of the items selected in “Measurement Source Waveform and Measurement Items (Item Setup)” is listed in the setup menu (see Note).
2. Use the **jog shuttle** or the **SET** key to select the item whose measurement location you want to indicate.
3. Press **SET** to confirm your selection.
   The measurement location of the item you specify is indicated by a cursor.

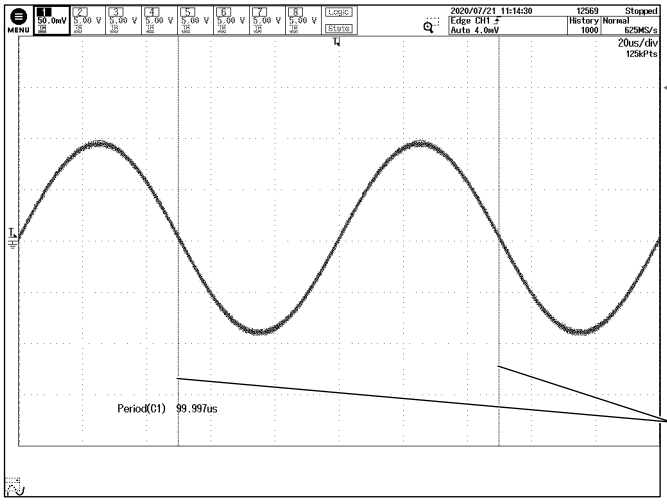
Measurement Items (Measure Item)



The selected measurement items appear in the setup menu.

Setup menu





Displays the measurement location (e.g., Period) with the cursor

Note

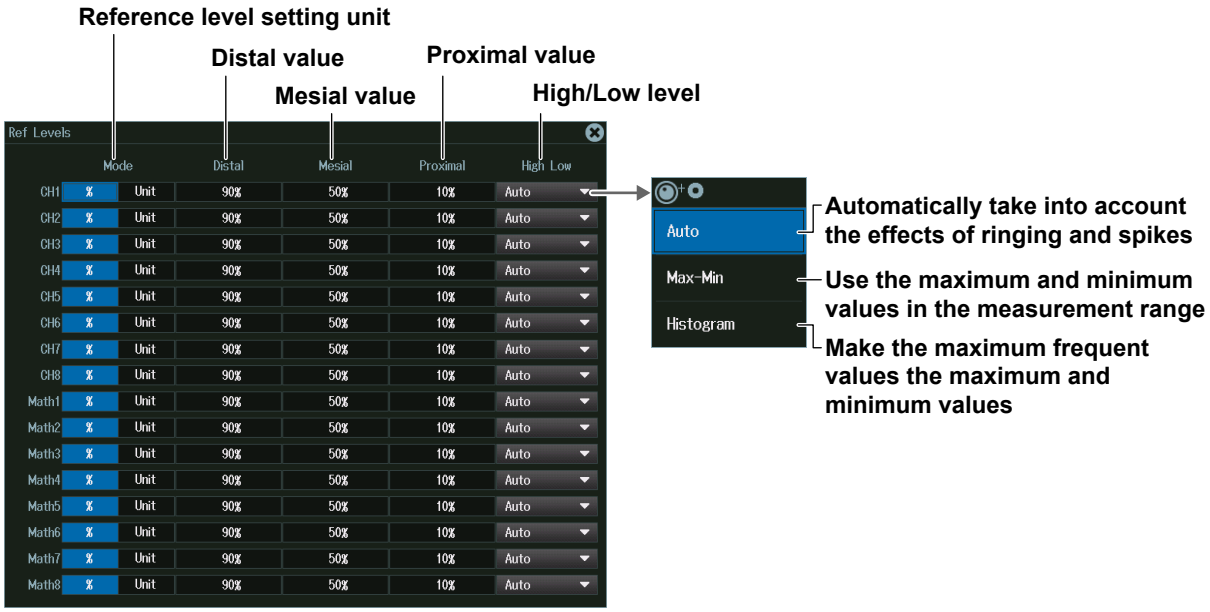
The measurement locations of the following items can be indicated.

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

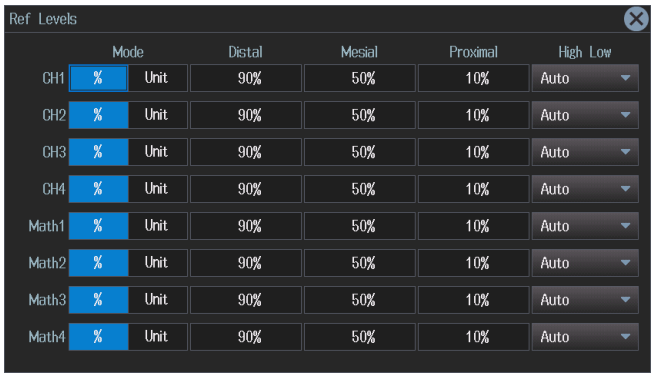
Reference Level for Automated Measurement (Ref Levels)

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

8ch model



4ch model



Note

About the Roll-Mode Display

- The instrument will not display computed waveforms that have been generated through user-defined computation while it is acquiring waveforms in roll mode. The instrument will display the computed waveforms after it stops acquiring waveforms.
- If normal statistical processing (Continuous), serial bus analysis, waveform histogram display, or harmonic analysis is being executed, automatically measured parameter values are not displayed when waveforms are being acquired in roll mode. The instrument will display the computed waveforms after it stops acquiring waveforms.
- If the record length is set such that waveform acquisition operates in single mode,* neither computed waveforms (Math waveforms) nor automated measurement values of waveform parameters are shown while waveform acquisition in roll mode is in progress. The instrument will display the computed waveforms and automatically measured values after it stops acquiring waveforms.

  * The record length that causes waveform acquisition to operate in single mode varies depending on whether a memory expansion option (/M1, /M2, /M1S, /M2S) is available. For details, see chapter 6, “Waveform Acquisition,” in the Features Guide (IM DLM5058-01EN).

9.2 Processing Statistics on Automatically Measured Values

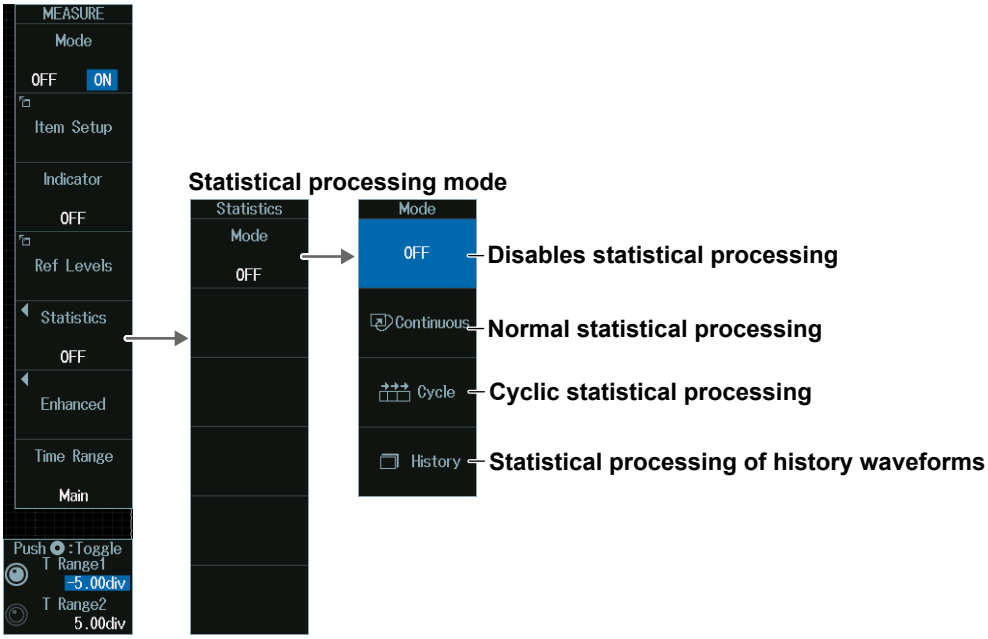
This section explains the following settings for processing statistics on automatically measured waveform parameters:

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

► "Statistics (Statistics)" in the Features Guide

MEASURE Statistics Menu

1. Press **MEASURE** to display the MEASURE menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the MEASURE menu from MEASURE on the top menu that is displayed.
2. Press the **Statistics** soft key to display the following menu.

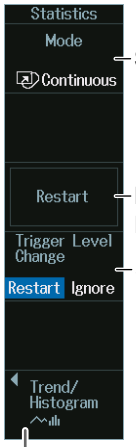


Note

If you change the statistical processing type (Statistics), the statistical processing type (Statistics) of Measure Setup for power measurement (Power Measurement menu) too changes in sync.

Normal statistical processing (Continuous)

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



Set the statistical processing type to Continuous.

Restarts statistical processing
Restarts also when CLEAR TRACE key is pressed

Set the action to take when the trigger level changes.

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.

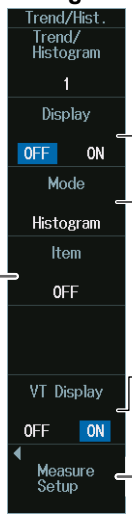
Ignore: If the trigger level is changed during waveform acquisition, waveform acquisition and statistical processing continue without statistical processing being reset.

Trend display settings

Turns the graph display on or off

Set the mode to Trend.

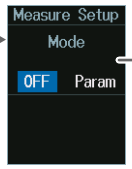
Histogram display settings



Turns the graph display on or off

Set the mode to Histogram.

Turns VT waveform display window on or off



When the measurement mode is Param

Cursor1 position

Cursor2 position

Turns cursor measurement on or off

The measurement items selected using the “Measurement Location Indicator” procedure in section 9.1 appear on the setup menu.

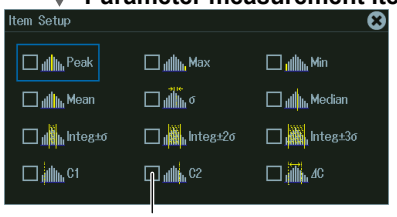
Executes auto scaling

Vertical scale value

Horizontal scale value

Turns VT waveform display window on or off

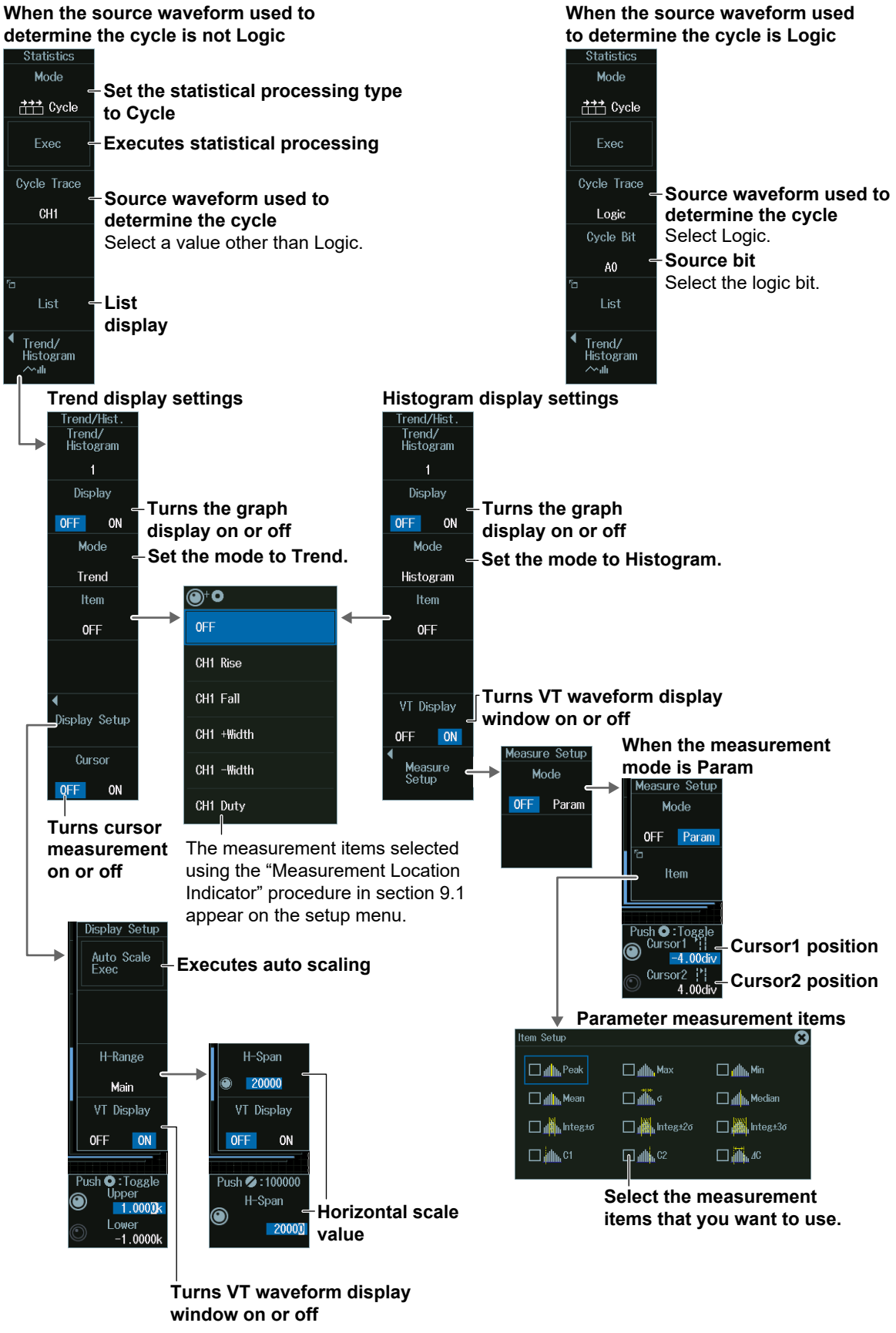
Parameter measurement items



Select the measurement items that you want to use.

Cyclic Statistical Processing (Cycle)

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



Note

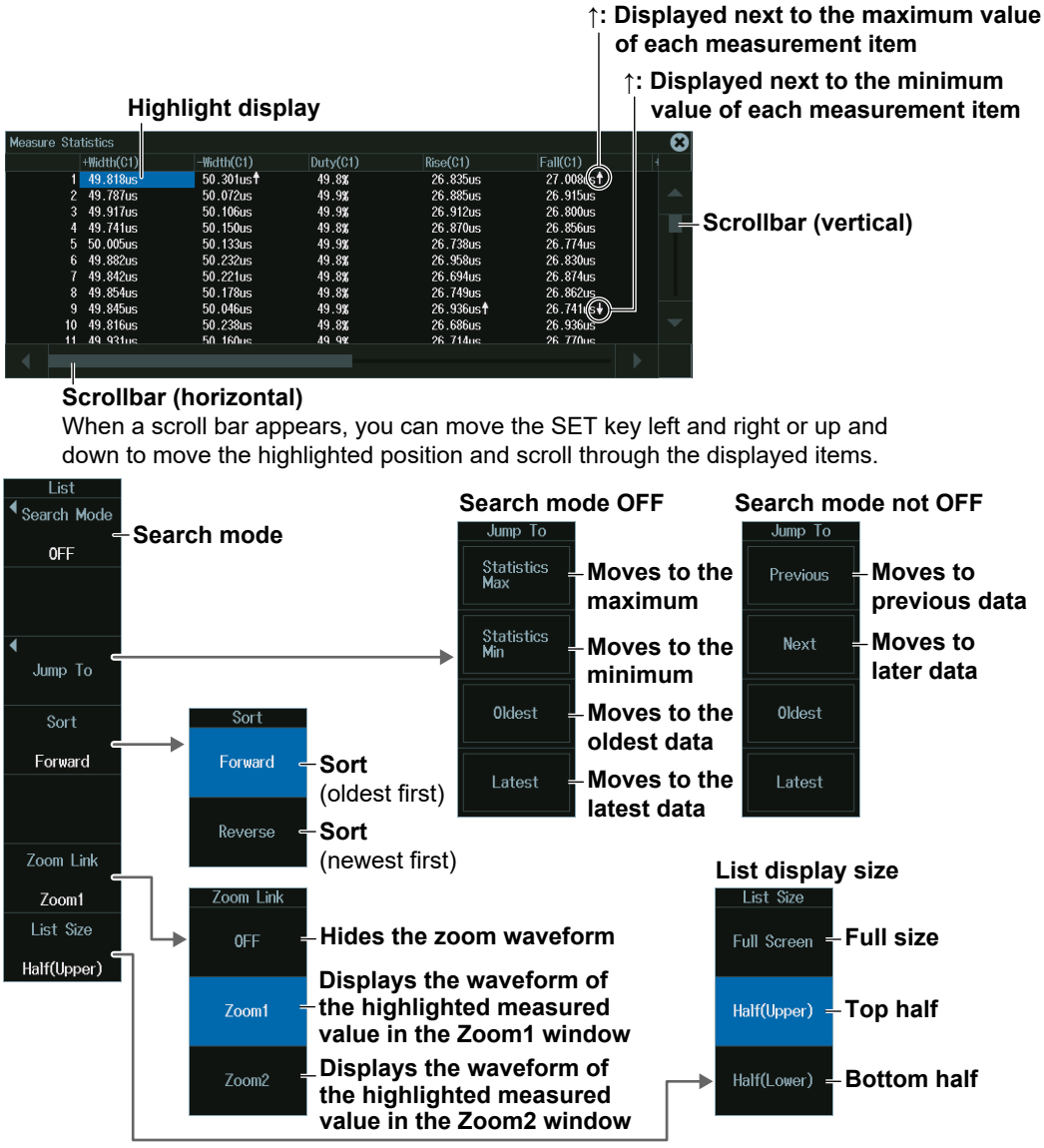
The available source waveforms used to determine the cycle vary depending on the model.

- The available settings on 8ch models are as follows:
  CH1 to CH8, Math1 to Math8, Logic
- The available settings on 4ch models are as follows:
  CH1 to CH4, Math1 to Math4, Logic

The following source bit display applies to models with the /L32 option.
C0 to C7 (LOGIC port C), D0 to D7 (LOGIC port D)

List Display (List)

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

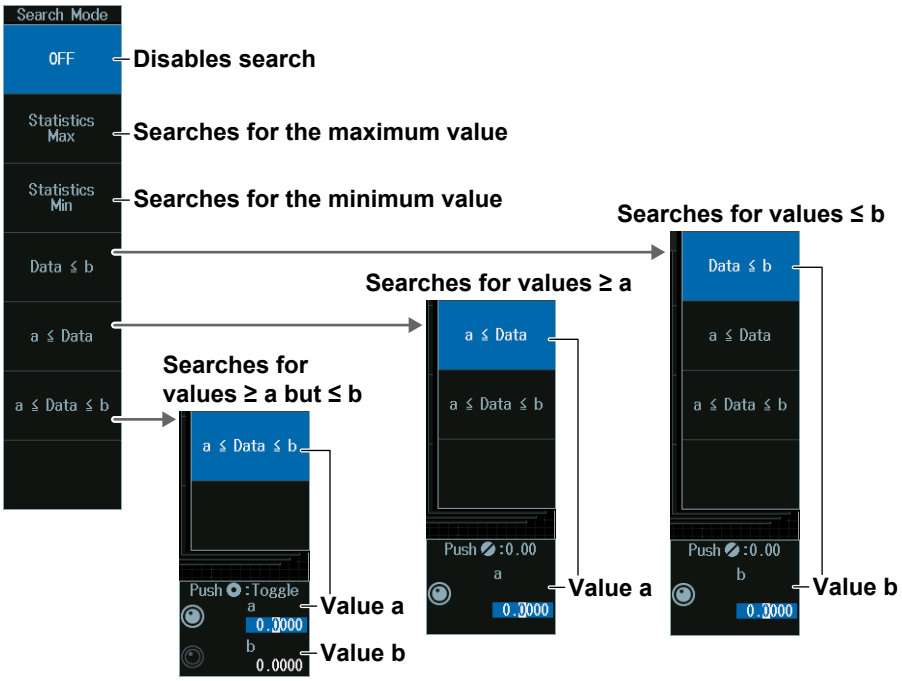


Note

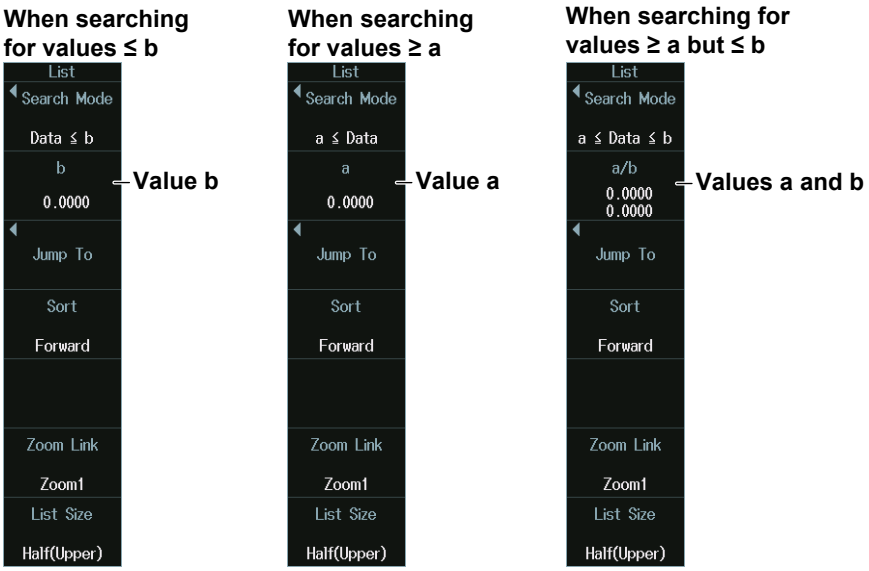
If you move the highlight display for the measured values up and down, the zoom position moves to the corresponding position of the waveform.

Search Item (Search Mode)

1. Press the **Search Mode** soft key to display the following menu.
If you select “Data ≤ b”, “a ≤ Data,” or “a ≤ Data ≤ b”, set the value of a or b with the **jog shuttle**.

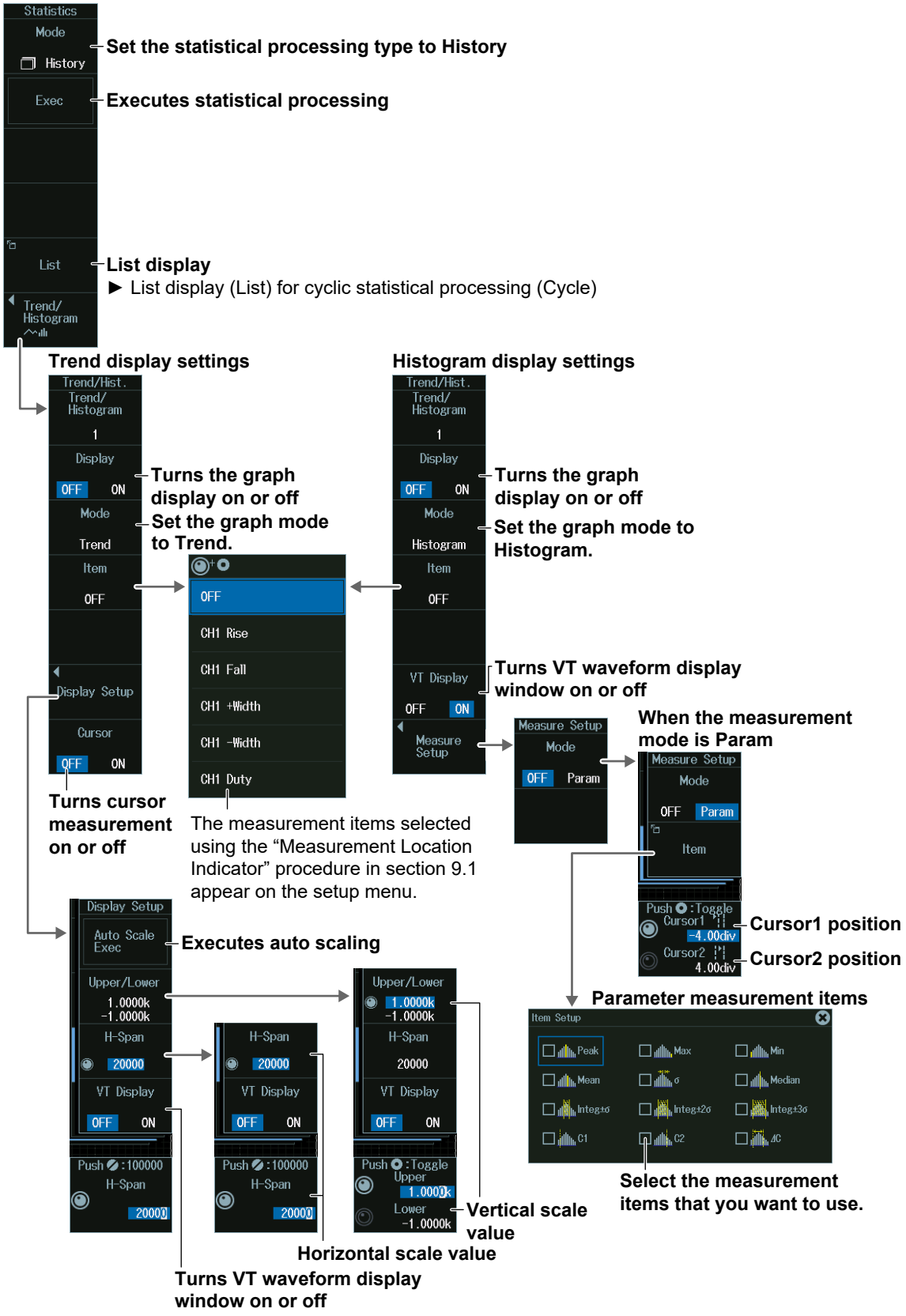


2. Select the search item, and then press **ESC**.
The menu returns to the list display menu.



Statistical Processing of History Waveforms (History)

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



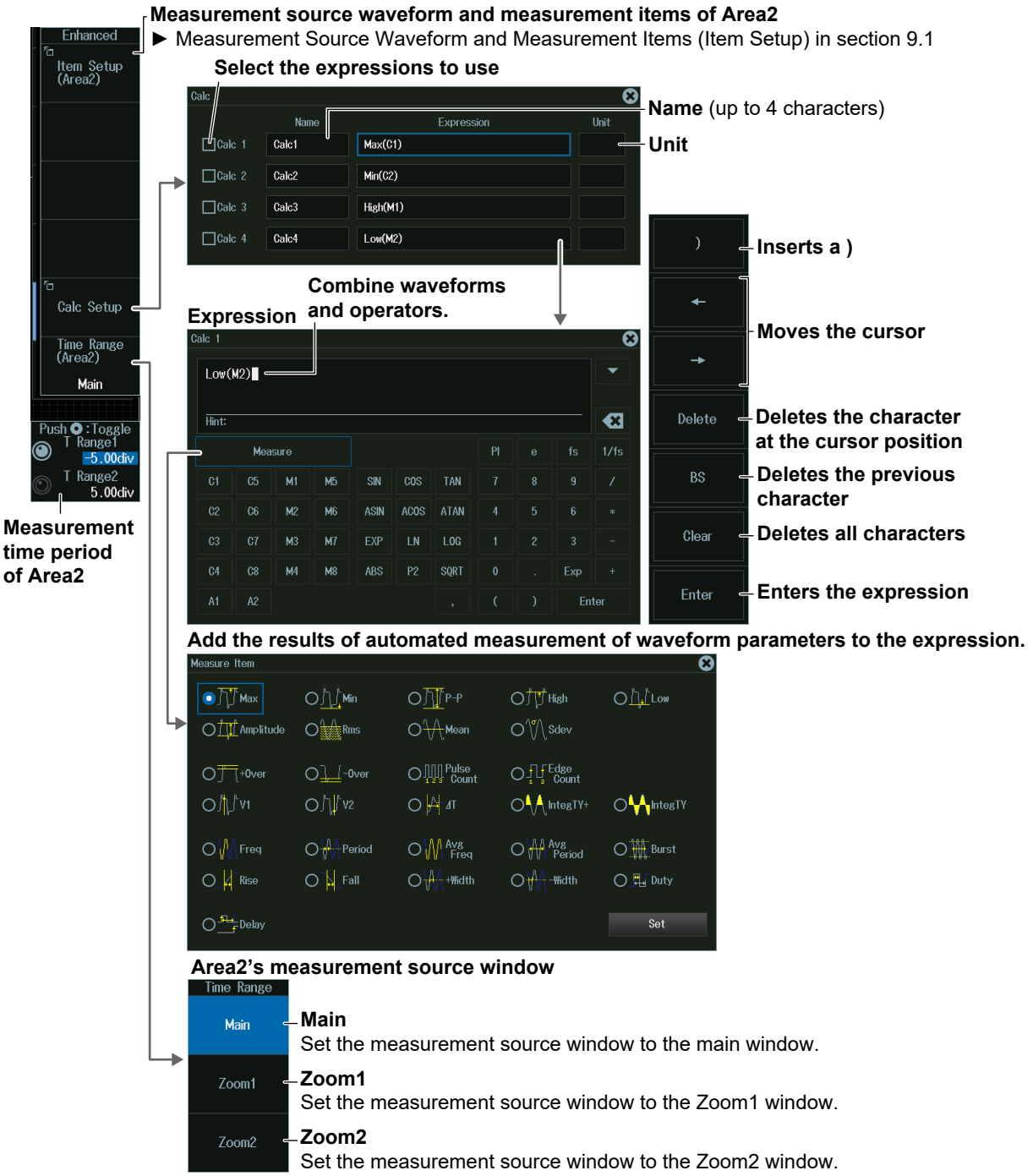
9.3 Measuring Enhanced Parameters

This section explains the settings for performing automated measurement of the waveform parameters on two areas and the settings used when performing calculations using waveform parameters.

► "Enhanced Parameter Measurement (ENHANCED)" in the Features Guide

MEASURE Enhanced Menu

1. Press **MEASURE** to display the MEASURE menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the MEASURE menu from MEASURE on the top menu that is displayed.
2. Press the **Enhanced** soft key to display the following menu.



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.

Measurement Source Waveform and Measurement Items of Area2 (Item Setup (Area2))

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

Setting the Equation (Calc Setup)

Press the Calc Setup soft key to display a screen for setting an equation using the waveform parameters of Area2.

Note

The measurement time period (T Range1, T Range2) in the MEASURE Enhanced menu is that of Area2.

On the Calc Setup screen, you can also set an equation using the waveform parameters of the MEASURE menu (Area1). But, even in this case, the measurement time period of Area1 is the measurement time period (T Range1, T Range2) in the MEASURE menu.

10.1 Zooming In on or Out of Waveforms

This section explains the following settings for zooming in on or out of waveforms:

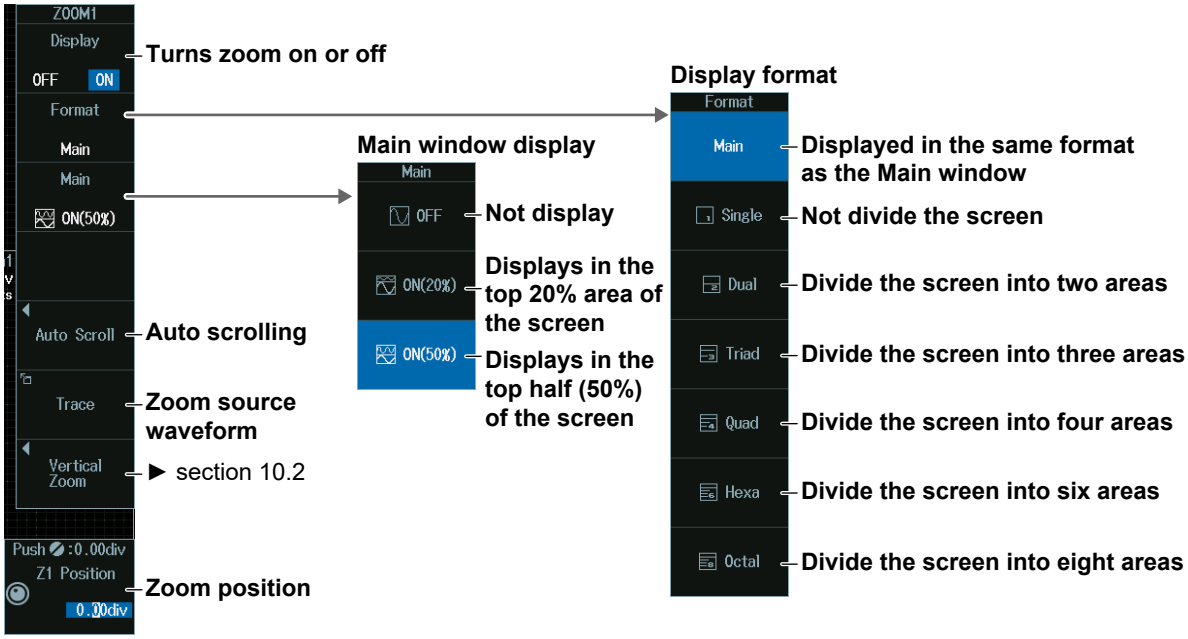
- Turning zoom on or off
- Display format
- Main window display
- Auto scrolling
- Zoom source waveform
- Zoom position
- Zoom factor

► "Zooming in on Waveforms" in the Features Guide

ZOOM Menu

Press **ZOOM1** or **ZOOM2** to display the following menu.

- You can also tap **MENU** (MENU) in the upper left of the screen and select the ZOOM1 menu or the ZOOM2 menu from ZOOM on the top menu.
- The zoomed waveform of up to two locations can be displayed. To switch the setup menu, press ZOOM1 or ZOOM2.



Note

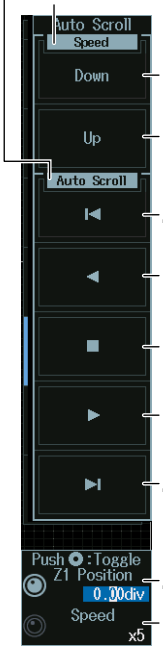
- If the main window (which displays normal waveforms) and the Zoom1 or Zoom2 window are displayed at the same time, a zoom box appears in the Main window so that you can check the zoom position.
- The ZOOM1 and ZOOM2 keys illuminate when the zoom feature is on. When both are illuminated, the ZOOM knob controls the waveform in the window corresponding to the brighter key.
- When both ZOOM1 and ZOOM2 are illuminated, if you press SET several times and make the jog shuttle control both Z1 Position and Z2 Position, you can move them together.

Auto Scrolling (Auto Scroll)

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

Scroll control

Scroll speed (six settings)



Decreases the speed by one level

Increases the speed by one level

Zoom in on the left edge of the Main window

Scroll left

Stop auto scrolling

Scroll right

Zoom in on the right edge of the Main window

Zoom position

Scroll speed

Zoom Position and Scroll Speed (Z1/Z2Position/Speed)

Turn the **jog shuttle** to set the zoom position (Z1/Z2 Position) or scroll speed (Speed).

- You can also set the zoom position by tapping the jog shuttle setting menu in the lower right of the screen and using the numeric keypad that appears on the screen.
- You can also set the scroll speed by tapping the setup menu in the lower right of the screen and using pop-up menu menu that appears on the screen.

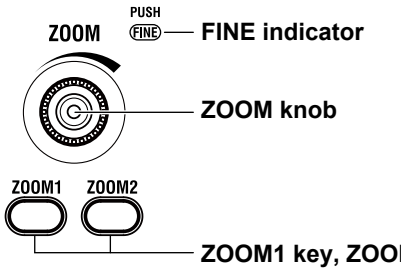
Jog shuttle setting menu

Zoom position (Z1, Z2 Position)

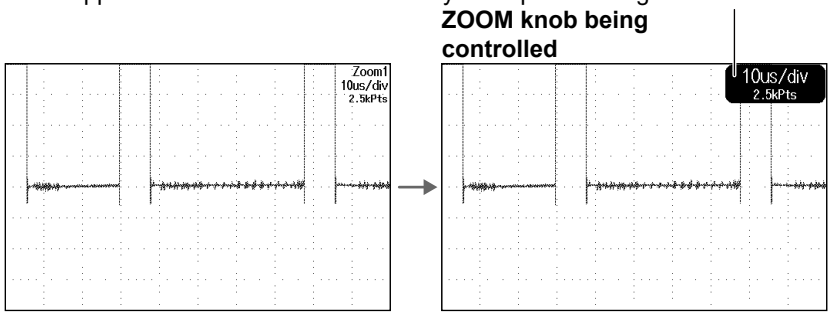
Scroll speed (Speed)

Zoom Factor (ZOOM knob)

1. Press **ZOOM1** or **ZOOM2** to select which the ZOOM knob will control.
   When both Zoom1 and Zoom2 windows are displayed, the ZOOM knob controls the waveform in the window corresponding to the brighter key.
2. Use the **ZOOM** knob to set the zoom factor.
   - If you push the ZOOM knob, the FINE indicator illuminates, and you can set the zoom factor with higher resolution. If the FINE indicator is not illuminated, the zoom time scale will be set to 1-2-5 steps.
   - To adjust the zoom position, turn the jog shuttle.



While you control the knob, the zoom value and display record length are displayed in the upper right of the zoom window. The display disappears after a few seconds when you stop controlling the knob.



Zoom Position (Z1, Z2 Position)

Turn the **jog shuttle** to set the zoom position.

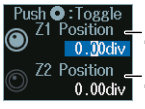
You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

When ZOOM1 or ZOOM2 is on

Zoom position (Z1, Z2 Position)
You can control Z1 Position or Z2 Position.

When both ZOOM1 and ZOOM2 are on



ZOOM1 zoom position (Z1 Position)
ZOOM2 zoom position (Z2 Position)

Press SET (upper right on the front panel) to switch between ZOOM1 and ZOOM2.

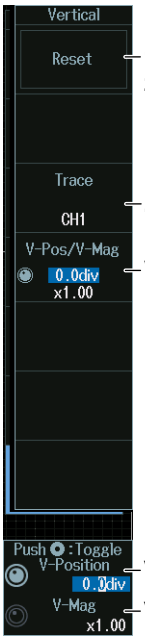
10.2 Zooming in on or out from Waveforms in the Vertical Direction

This section explains the following settings for zooming in on or out from waveforms in the vertical direction:

► “Vertical Zoom (Vertical Zoom)” in the Features Guide

ZOOM Vertical Zoom Menu

1. Press **ZOOM1** or **ZOOM2** to display the ZOOM menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the ZOOM1 menu or the ZOOM2 menu from ZOOM on the top menu.
2. Press the **Vertical Zoom** soft key to display the following menu.



Collectively initializes the zoom position and zoom factor of all waveforms

Zoom source waveform

Vertical zoom position, vertical zoom factor

Vertical zoom position

Vertical zoom factor

Note

- You can initialize the zoom position and zoom factor of the target waveform by pressing RESET on the front panel.
- You can initialize the zoom position and zoom factor of all waveforms by pressing the Reset soft key.

Vertical Zoom Position and Vertical Zoom Factor (V-Position/V-Mag)

Turn the **jog shuttle** to set the vertical zoom position (V-Position) or vertical zoom factor (V-Mag).

- Press **SET** (upper right on the front panel) to switch between vertical zoom position and vertical zoom factor.
- You can also set the vertical zoom position by tapping the jog shuttle setting menu in the lower right of the screen and using the numeric keypad that appears on the screen.
- You can also set the vertical zoom factor by tapping the setup menu in the lower right of the screen and using pop-up menu menu that appears on the screen.

Jog shuttle setting menu

Vertical zoom position (V-Position)

Vertical zoom factor (V-Mag)

11.1 Basic Waveform Search Operation

This section explains the following settings for searching waveforms: For details on the different search types (edge, pattern, pulse width, timeout period), see sections 11.2 to 11.5.

- Search range
- Search skipping
- Displaying detected waveforms
- Detected waveform display
- Executing searches

Note

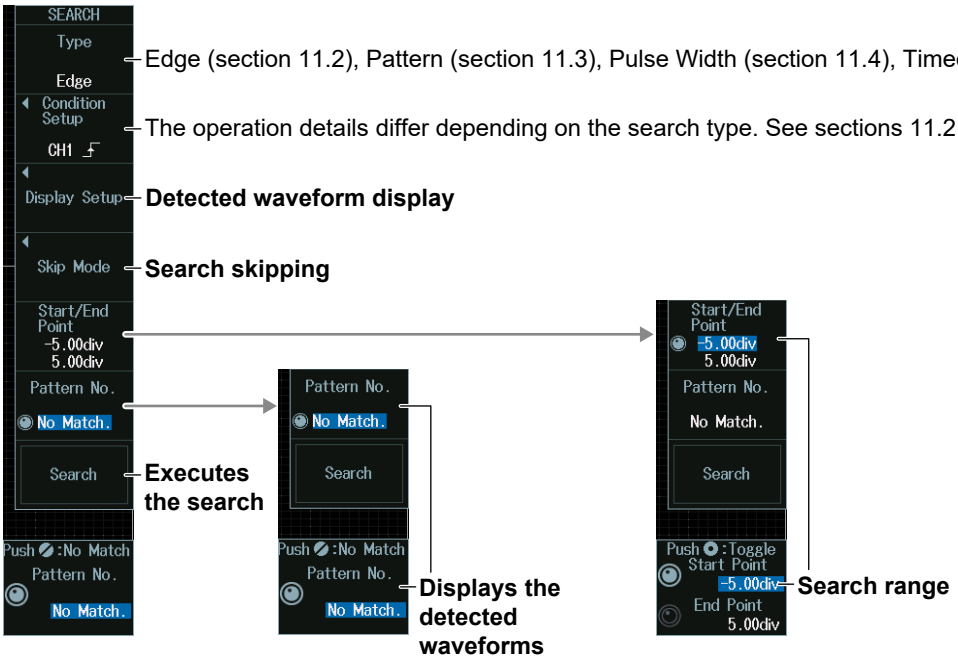
When you press SEARCH to display the SEARCH menu, the display configuration will change.
Locations (detected points) that match the search conditions are displayed in the zoom window.
The display configuration of the SEARCH menu is same as that of the ZOOM menu (waveform zoom).
For setting the display configuration, see section 10.1.

► **"Search Range (Start/End Point)," "Displaying Detected Waveforms (Display Setup)," "Search Skip (Skip Mode)," "Executing a Search (Search)," "Detected Point number (Pattern No.)," "Zooming in on Waveforms" in the Features Guide**

SEARCH Menu

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

You can also tap **MENU** (MENU) in the upper left of the screen and select the SEARCH menu from ANALYSIS on the top menu that is displayed.



Search Range (Start/End Point)

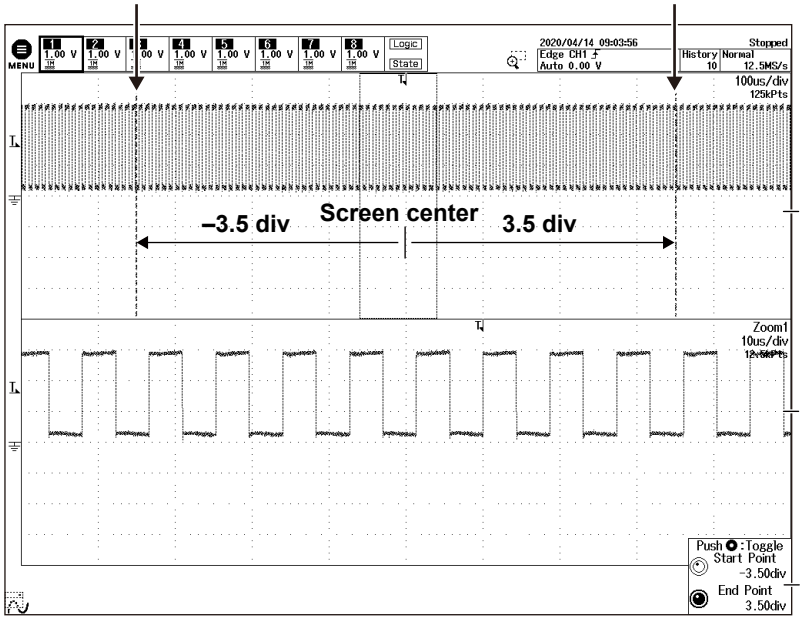
1. Press the **Start/End Point** soft key.
2. Turn the **jog shuttle** to set the search start point (Start Point) or Search End Point (End Point).
   - Press **SET** (upper right on the front panel) to switch between search start point or search end point.
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Search start point

Search end point

Search Range (Setting Example)



Main window
► section 10.1

Result window
Displays Zoom1 to Zoom2 windows
► section 10.1

Search range setting example
Search start point –3.50 div
Search end point 3.50 div

Detected Waveform Display (Display Setup)

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

Turns the detected point mark display on or off
Displayed in the Result window being controlled

Select the Result window to control.
When both the Zoom1 and Zoom2 displays are turned on, two Result windows are displayed.
► section 10.1
You can change the zoom position and zoom in on the waveform on the selected Result window.

Note

If only Zoom1 or Zoom2 display is turned on, the one that is turned on becomes the Result window. If both the Zoom1 and Zoom2 displays are turned off, Zoom1 becomes the Result window. If you press SEARCH in this condition, the Zoom1 display will be turned on.

2. Turn the **jog shuttle** to set the position to zoom.
You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Set the Result window's zoom position.
Pressing RESET (upper right on the front panel) returns the value to 0.00 div.

Note

The zoom display positions (Z1 Position, Z2 Position) of the detected points can only be controlled when the Display Setup menu is displayed.

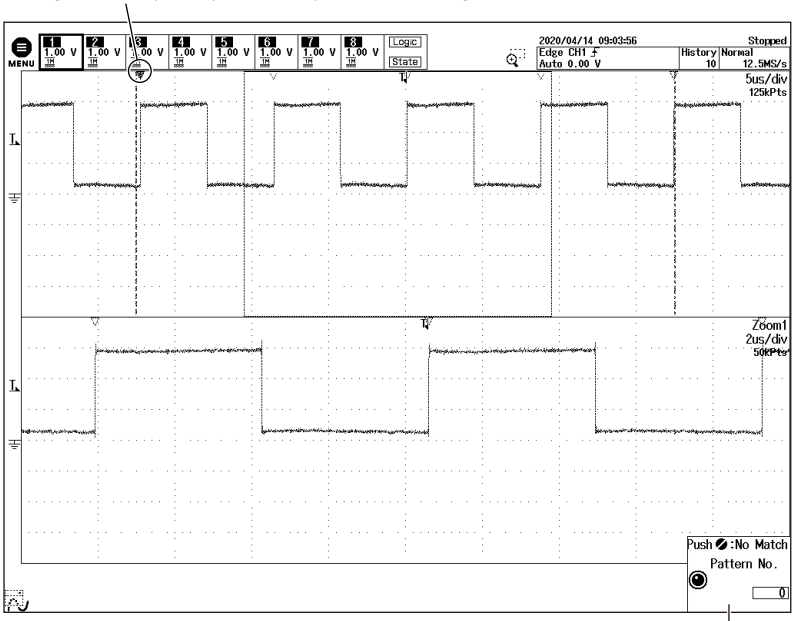
Executing a Search (Search)

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

When you execute a search, the detected point is displayed at the center of the Result window (zoom window).

Search Results

Detected point
When a location (detected point) that matches the search conditions is found, a triangle mark (Mark) is displayed. The triangle mark selected with Pattern No. is filled.



Pattern No.
Numbers 0, 1, 2, and so on are assigned in the detected order from the left of the waveform screen.

Note

- You cannot search while waveform acquisition is in progress (RUN).
- You cannot search accumulated waveforms.

Displaying Detected Waveforms (Pattern No.)

1. Press the **Pattern No.** soft key.
2. Turn the **jog shuttle** to display the waveforms that have been found.
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

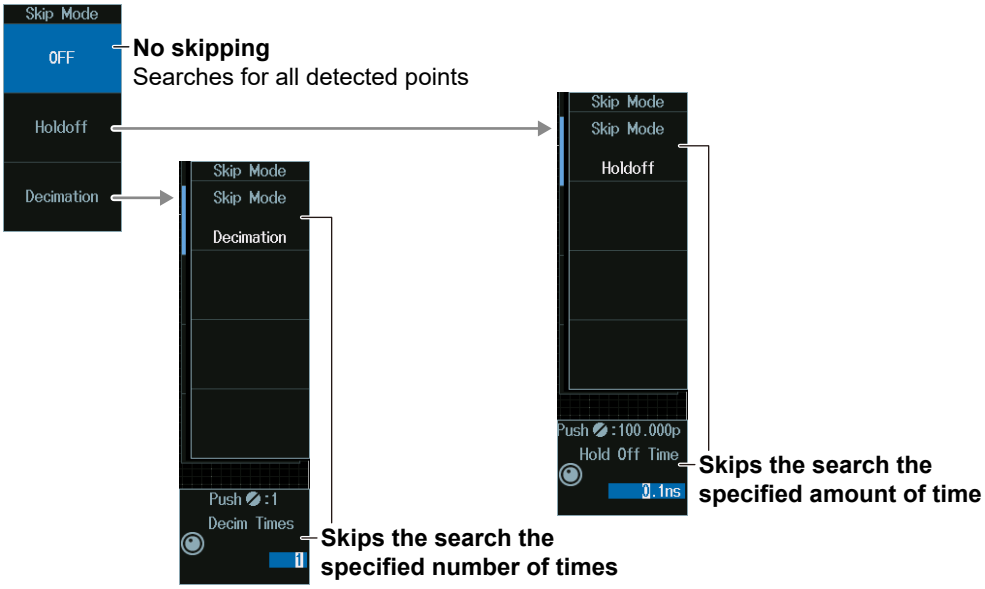
Displays the detected waveforms

Displaying Detected Waveforms

Turning the jog shuttle changes Pattern No. The waveform (detected point) selected by Pattern No. Is displayed with a filled triangle mark (Mark), and the triangle mark location is displayed at the center of the Result window (zoom window).
For details on the triangle mark, see “Search Results” above.

Search Skip Conditions (Skip Mode)

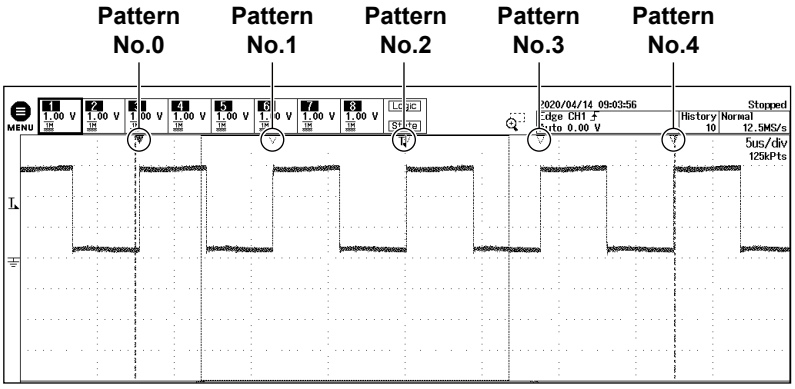
Press the **Skip Mode** soft key to display the following menu.



Skipping Search Conditions

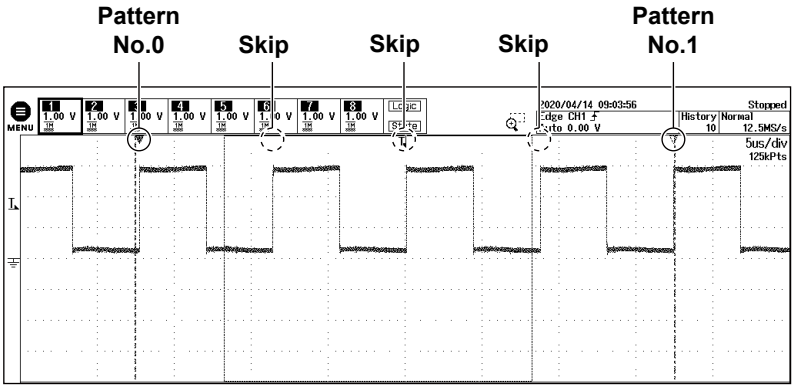
When the skip condition is off

An example of an edge search (see section 11.2). There is a detected point at each rising edge.



When the skip condition is Decimation (Decim Times = 3)

An example of an edge search. Three rising edges are skipped.



Note

The Skip Mode soft key is displayed for Timeout and Pattern.

11.2 Searching for Edges

This section explains the following settings for searching for edges:

- Search type
- Search conditions
  search source waveform, slope, level used to detect source waveform edges, hysteresis

► "Search Type (Type)," "Search Conditions (Condition Setup)" in the Features Guide

SEARCH Edge Menu

1. Press **SEARCH** to display the following menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the SEARCH menu from ANALYSIS on the top menu that is displayed.
2. Press the **Type** soft key and then the **Edge** soft key to display the following menu.

Set the search type to Edge.

Edge search condition

Executes the search
► section 11.1

Search Conditions (Condition Setup)

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

Note

The available channel and source settings vary depending on the model and options.

- The available source displays on 8ch models are as follows:
  CH1 to CH8, Math1 to Math8, Logic
- The available source displays on 4ch models are as follows:
  CH1 to CH4, Math1 to Math4, Logic
- The following source bit display applies to models with the /L32 option.
  C0 to C7 (LOGIC port C), D0 to D7 (LOGIC port D)

When the Search Source Waveform (Source) Is Set to an Analog Channel (CH) or Computation Channel (Math)

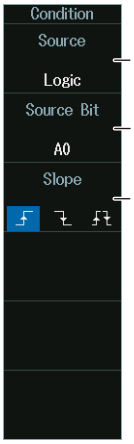
Set the search source waveform to analog channel (CH) and computation channel (Math).

Slope

Level for detecting search source waveform edges

Hysteresis

When the Search Source Waveform (Source) Is Set to a Logic Channel



Set the search source waveform to logic channel (Logic).

Source bit

Slope

Level for Detecting Search Source Waveform Edges (CH LEVEL/ Hysteresis)

Turn the **jog shuttle** to set the level or hysteresis.

- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
- To set the level, you can drag the level display line on the screen.

Jog shuttle setting menu

Level for detecting search source waveform edges

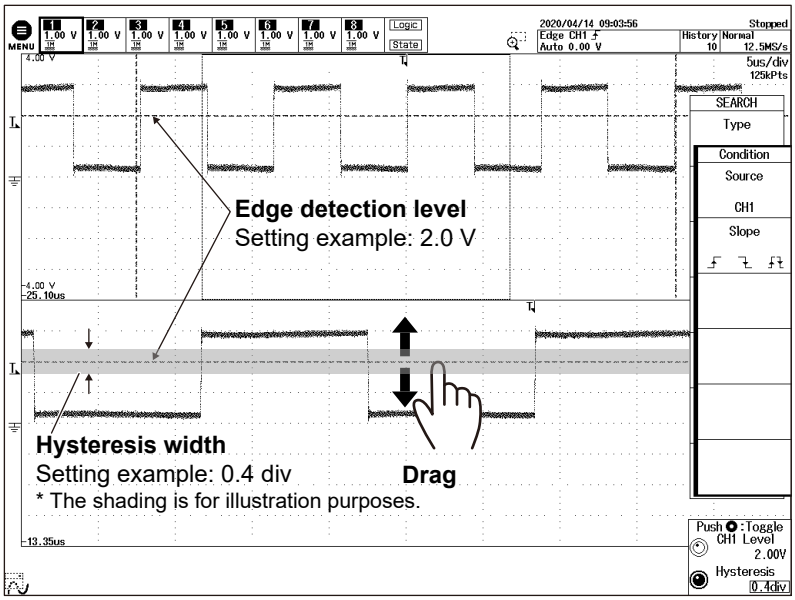
Hysteresis

Press SET (upper right on the front panel) to switch between level and hysteresis.

Note

You can control the level and hysteresis settings when you set the search source waveform to an analog channel (CH) or computation channel (Math).

Edge Detection Level and Hysteresis



11.3 Searching with Multiple Input Patterns

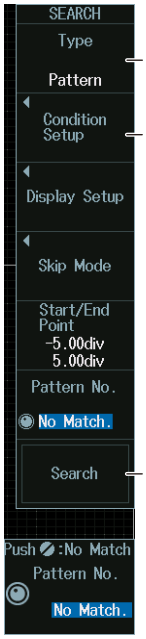
This section explains the following settings for searching with multiple input patterns.

- Search type
- Search conditions

► “Search Type (Type),” “Search Conditions (Condition Setup)” in the Features Guide

SEARCH Pattern Menu

1. Press **SEARCH** to display the following menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the SEARCH menu from ANALYSIS on the top menu that is displayed.
2. Press the **Type** soft key and then the **Pattern** soft key to display the following menu.



Set the search type to Pattern.

Pattern search condition

Executes the search
► section 11.1

Search Conditions (Condition Setup)

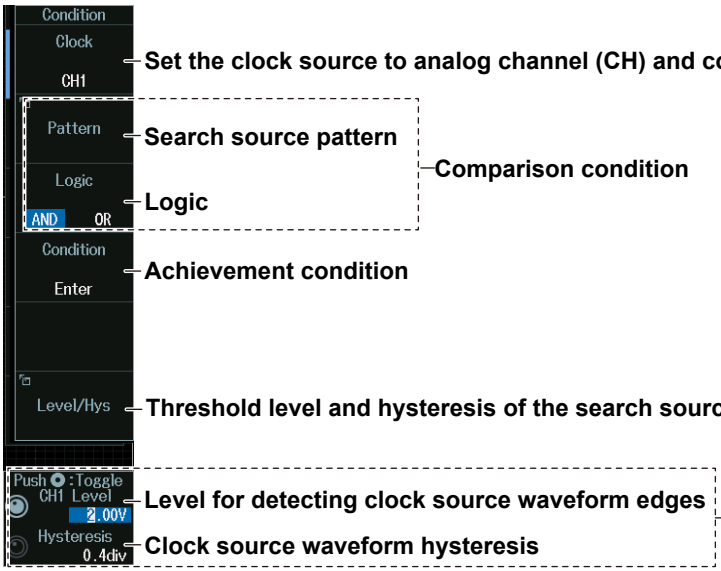
Press the **Condition Setup** soft key. The menu that appears varies depending on the specified source.

Note

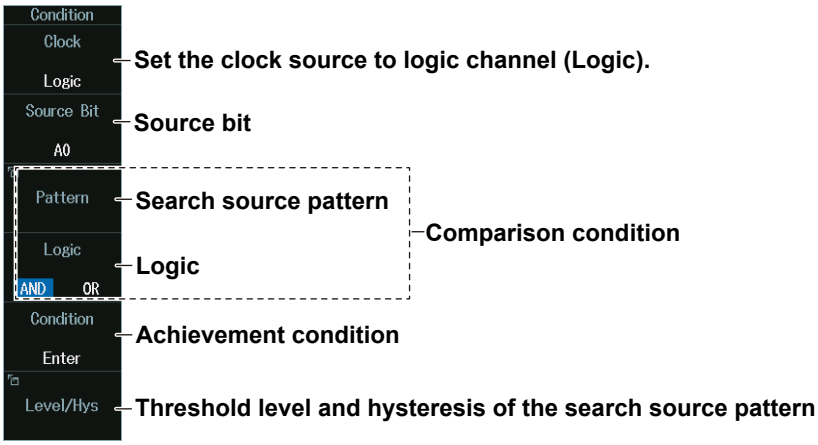
The available clock source settings vary depending on the model and options.

- The available source displays on 8ch models are as follows:
  CH1 to CH8, Math1 to Math8, Logic, None
- The available source displays on 4ch models are as follows:
  CH1 to CH4, Math1 to Math4, Logic, None
- The following source bit display applies to models with the /L32 option.
  C0 to C7 (LOGIC port C), D0 to D7 (LOGIC port D)

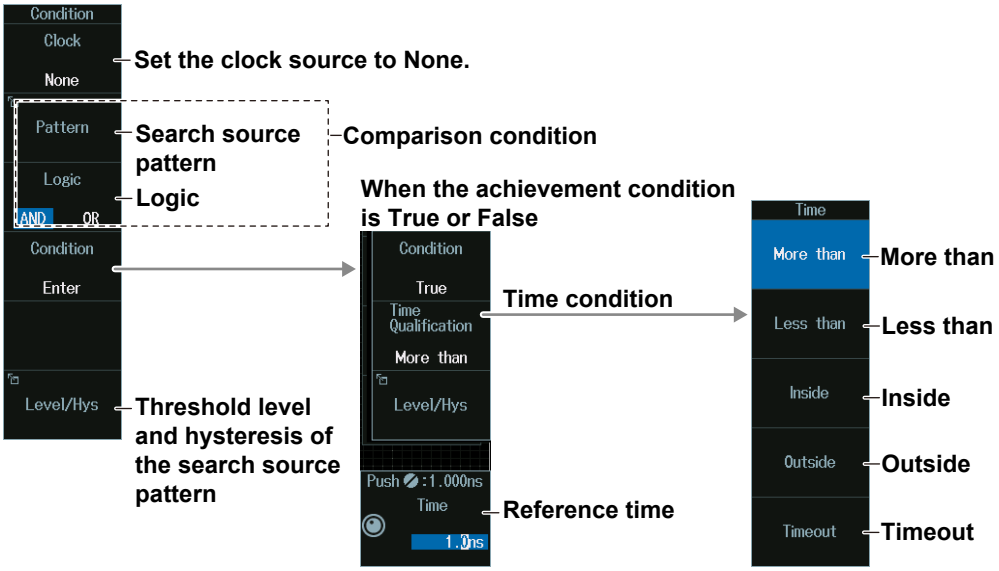
When the Clock Source (Clock) Is Set to an Analog Channel (CH) or Computation Channel (Math)



When the Clock Source (Clock) Is Set to a Logic Channel (Logic)



When a Clock Source (Clock) Is Not Available (None)



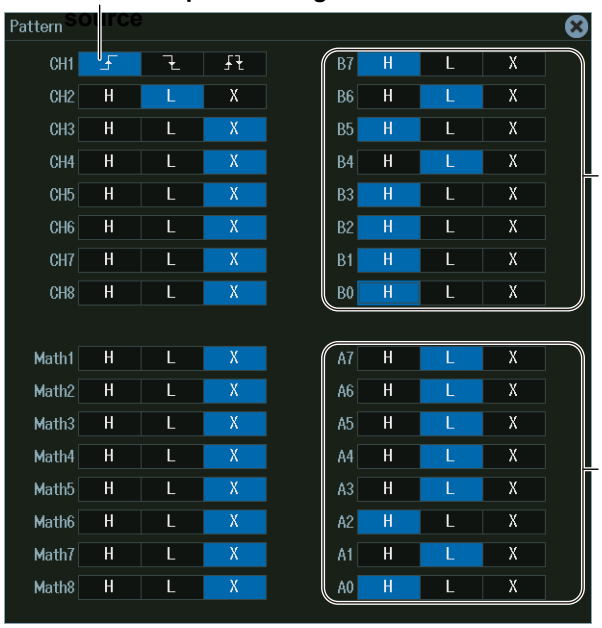
Search Source Pattern (Pattern)

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

- **When There Is a Clock Source**
  Set the clock source slope and pattern.

8ch model example

Set the slope of the signal set as the clock source

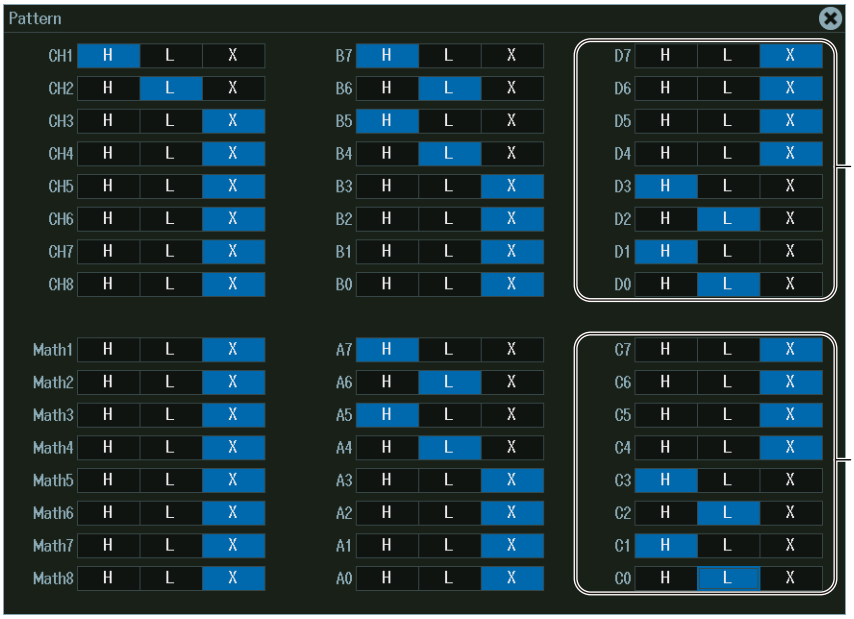


Logic port B
Setting example: 10101111 (MSB;B7)
H: High level
L: Low level
X: Don't care

Logic port A
Setting example: 00000101 (MSB;A7)

- **No Clock Source**
  The settings are the same as the pattern settings explained in "When the Clock Source Is a Channel from CH1 to CH8 or Logic" above.
  Set the pattern of the source channels (all CH1 to CH8 and Logic signals) to search for.

8ch model example (a model with the /L32 option)



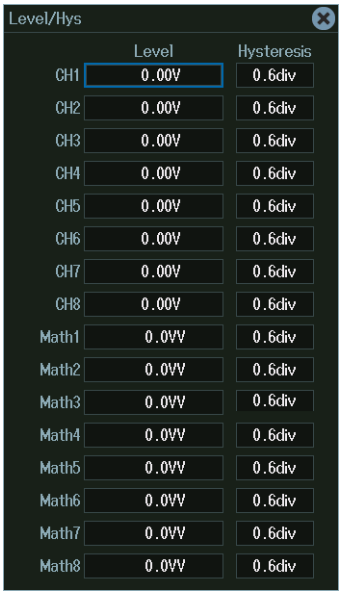
Logic port D
Setting example: xxxx1010 (MSB;D7)
H: High level
L: Low level
X: Don't care

Logic port C
Setting example: xxxx1010 (MSB;C7)

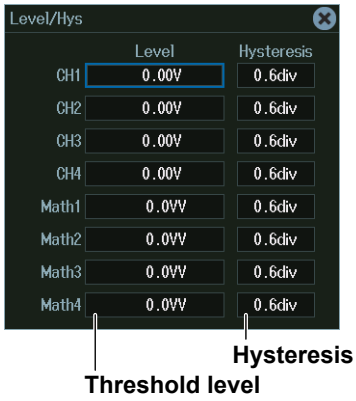
Threshold Level and Hysteresis Of The Search Source Pattern (Level/Hys)

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

8ch model



4ch model



Time Conditions (Time Qualification) and Reference Times(Time) (Procedure When a Clock Source (Clock) Is Not Available (None))

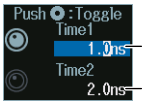
1. Press the **Condition** soft key to set the achievement condition to True or False.
2. Press the **Time Qualification** soft key to set the time conditions.
3. Turn the **jog shuttle** to set the reference times.
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

When the time condition is More than, Less than, or Timeout

Reference time

When the time condition is Inside



Reference time 1

Reference time 2

Press SET (upper right on the front panel) to switch between reference time 1 and reference time 2.

Satisfaction of Comparison Conditions

Set what kind of relationship (True or False) must be established between the achievement time of the comparison condition and the specified reference times (Time1 and Time2) for a point to be detected.

More than	When the comparison condition achievement time is longer than the specified reference time (Time)
Less than	When the comparison condition achievement time is shorter than the specified reference time (Time)
Inside	When the comparison condition achievement time is longer than reference time Time1 but shorter than reference time Time2.
Outside	When the comparison condition achievement time is shorter than reference time Time1 or longer than reference time Time2.
Timeout	When the comparison condition achievement time exceeds the specified reference time (Time)

11.4 Searching for Pulse Width

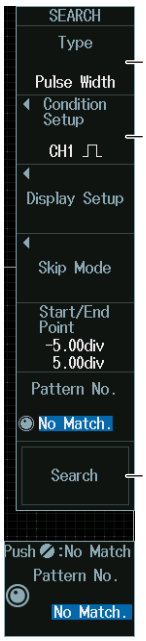
This section explains the following settings for searching for pulse width:

- Search type
- Search conditions

► “Search Type (Type),” “Search Conditions (Condition Setup)” in the Features Guide

SEARCH Pulse Width Menu

1. Press **SEARCH** to display the following menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the SEARCH menu from ANALYSIS on the top menu that is displayed.
2. Press the **Type** soft key and then the **Pulse Width** soft key to display the following menu.



Set the search type to Pulse Width.

Pulse width search condition

Executes the search
► section 11.1

Search Conditions (Condition Setup)

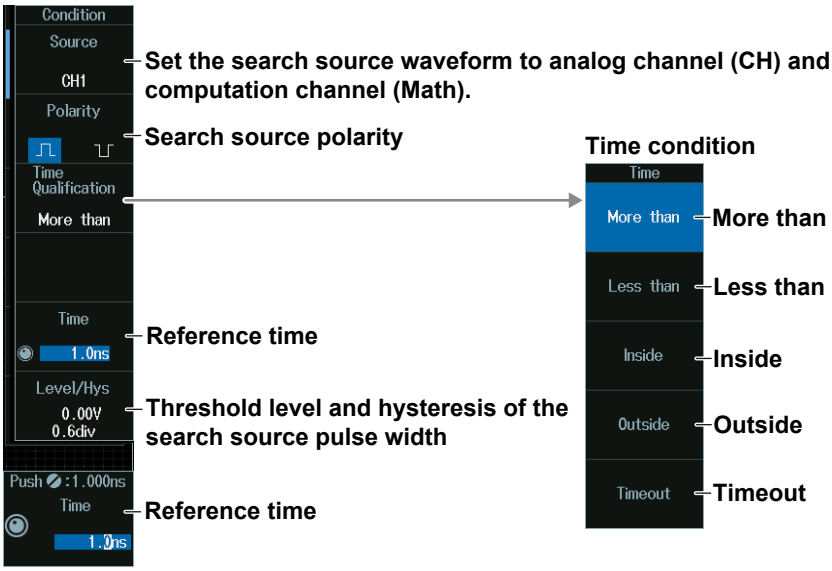
Press the **Condition Setup** soft key. The menu that appears varies depending on the specified source.

Note

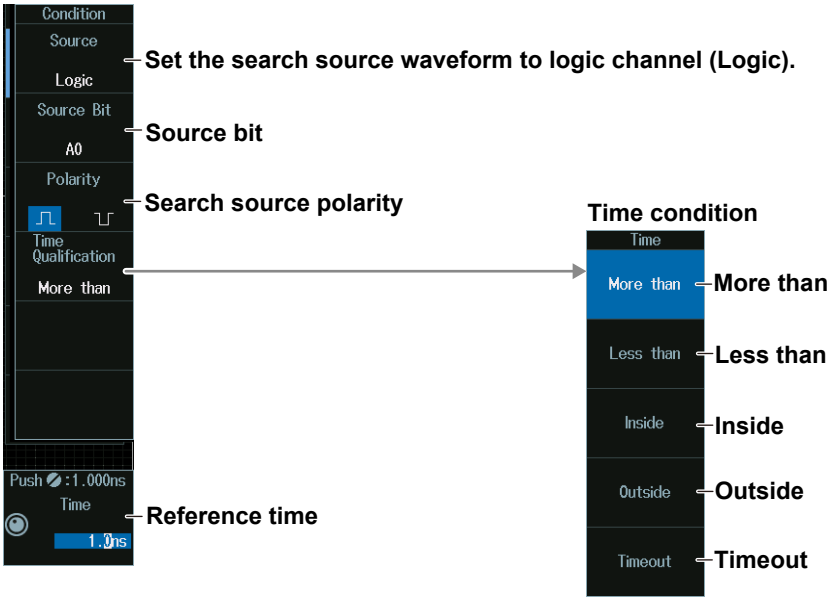
The available source settings vary depending on the model and options.

- The available source displays on 8ch models are as follows:
  CH1 to CH8, Math1 to Math8, Logic
- The available source displays on 4ch models are as follows:
  CH1 to CH4, Math1 to Math4, Logic
- The following source bit display applies to models with the /L32 option.
  C0 to C7 (LOGIC port C), D0 to D7 (LOGIC port D)

When the Search Source Waveform (Source) Is Set to an Analog Channel (CH) or Computation Channel (Math)



When the Search Source Waveform (Source) Is Set to a Logic Channel (Logic)



Threshold Level and Hysteresis of the Search Source Pulse Width (Level/Hys)

When the Search Source Waveform Is an Analog Channel or Competition Channel

1. Press the **Level/Hys** soft key.
2. Turn the **jog shuttle** to set the level or hysteresis.
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
   - To set the level, you can drag the level display line on the screen. For details, see “Edge Detection Level and Hysteresis” in section 11.2.

Jog shuttle setting menu

Threshold level of the search source pulse width

Hysteresis

Press SET (upper right on the front panel) to switch between level and hysteresis.

Time Conditions (Time Qualification) and Reference Times(Time)

When the Search Source Waveform Is an Analog Channel or Competition Channel

1. Press the **Time Qualification** soft key to set the time conditions.
2. Press the **Time** soft key.
3. Turn the **jog shuttle** to set the reference times.
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

When the Search Source Waveform Is a Logic Channel

1. Press the **Time Qualification** soft key to set the time conditions.
2. Turn the **jog shuttle** to set the reference times.
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

When the time condition is More than, Less than, or Timeout

Reference time

When the time condition is Inside

Reference time 1

Reference time 2

Press SET (upper right on the front panel) to switch between reference time 1 and reference time 2.

Satisfaction of Conditions

Set what kind of relationship (True or False) must be established between the achievement time of the comparison condition and the specified reference times (Time1 and Time2) for a point to be detected.

More than	When the comparison condition achievement time is longer than the specified reference time (Time)
Less than	When the comparison condition achievement time is shorter than the specified reference time (Time)
Inside	When the comparison condition achievement time is longer than reference time Time1 but shorter than reference time Time2.
Outside	When the comparison condition achievement time is shorter than reference time Time1 or longer than reference time Time2.
Timeout	When the comparison condition achievement time exceeds the specified reference time (Time)

11.5 Searching for Timeout Periods

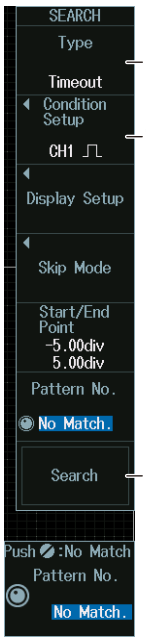
This section explains the following settings for searching for timeouts:

- Search type
- Search conditions

► “Search Type (Type),” “Search Conditions (Condition Setup)” in the Features Guide

SEARCH Timeout Menu

1. Press **SEARCH** to display the following menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the SEARCH menu from ANALYSIS on the top menu that is displayed.
2. Press the **Type** soft key and then the **Timeout** soft key to display the following menu.



Set the search type to Timeout.

Timeout search condition

Executes the search
► section 11.1

Search Conditions (Condition Setup)

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

When the Search Source Waveform (Source) Is Set to an Analog Channel (CH) or Computation Channel (Math)

Set the search source waveform to analog channel (CH) and computation channel (Math).

Search source polarity

Timeout period

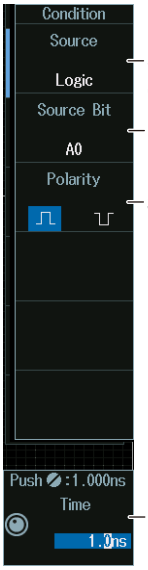
Threshold level and hysteresis of the search source state

Note

The available source settings vary depending on the model and options.

- The available source displays on 8ch models are as follows:
  CH1 to CH8, Math1 to Math8, Logic
- The available source displays on 4ch models are as follows:
  CH1 to CH4, Math1 to Math4, Logic

When the Search Source Waveform (Source) Is Set to a Logic Channel (Logic)



Set the search source waveform to logic channel (Logic).

Source bit

Search source polarity

Timeout period

Note

The following source bit display applies to models with the /L32 option.
C0 to C7 (LOGIC port C), D0 to D7 (LOGIC port D)

Threshold Level and Hysteresis of the Search Source State (Level/Hys)

When the Search Source Waveform Is an Analog Channel or Competition Channel

1. Press the **Level/Hys** soft key.
2. Turn the **jog shuttle** to set the level or hysteresis.
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
   - To set the level, you can drag the level display line on the screen. For details, see “Edge Detection Level and Hysteresis” in section 11.2.

Jog shuttle setting menu

Threshold level of the search source state

Hysteresis

Press SET (upper right on the front panel) to switch between level and hysteresis.

Timeout Period (Timeout)

When the Search Source Waveform Is an Analog Channel or Competition Channel

1. Press the **Time** soft key.
2. Turn the **jog shuttle** to set the timeout period.
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

When the Search Source Waveform Is a Logic Channel

Turn the **jog shuttle** to set the timeout period.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Timeout period

12.1 Analyzing and Searching FlexRay Bus Signals (Option)

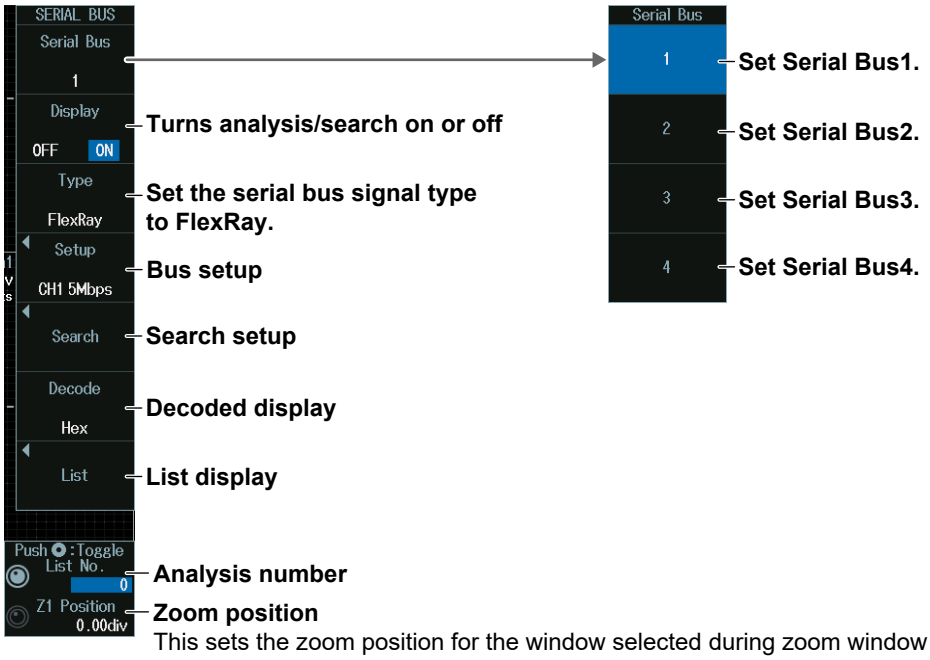
This section explains the following settings for analyzing or searching FlexRay bus signals:

- Turning analysis and search displays on or off
- Serial bus signal types
- Bus setup
  Auto setup, analysis/search source waveform, bit rate, bus channel, level and hysteresis for detecting analysis/search source waveform states
- Decoded display
- List display
  List size, display position, and zoom linking
- Analysis number
- Zoom position
- Search settings
  Jumping to a specified field, zoom window, search type, and search execution

► **"Analyzing and Searching Serial Bus Signals," "Analyzing and Searching FlexRay Bus Signals (Option)" in the Features Guide**

SERIAL BUS FlexRay Menu

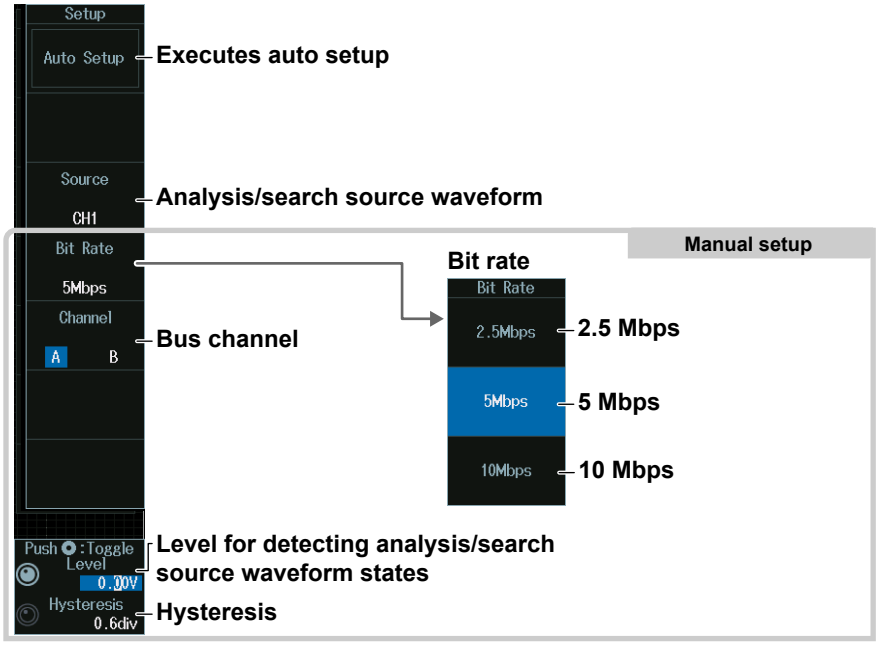
1. Press **SHIFT+SEARCH** (SERIAL BUS) to display the SERIAL BUS menu.
   - You can also tap **MENU** (MENU) in the upper left of the screen and select the SERIAL BUS menu from ANALYSIS on the top menu that is displayed.
   - You can also press **ANALYSIS** and then the **To SERIAL BUS** soft key to display the SERIAL BUS menu.
   - The instrument can analyze and search up to four serial bus signals. To switch to the setup menu, press the **Serial Bus** soft key and select a number from 1 to 4.
2. Press the **Type** soft key. Select **FlexRay** from the setup menu that is displayed. The following menu appears.



Zoom position
This sets the zoom position for the window selected during zoom window configuration (described later).

Bus Setup (Setup)

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



Executing Auto Setup (Auto Setup)

1. Set the analysis/search source waveform.
   Auto setup cannot be performed when the source is set to Math1 to Math8.
2. Press the **Auto Setup** soft key to execute auto setup.
   - The instrument automatically sets the bit rate, bus channel, 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, press the **Abort** soft key.

Note

- The auto setup feature will not work properly on some input signals.
- The available source waveforms vary depending on the model.
  - The available settings on 8ch models are as follows:
    CH1 to CH8, Math1 to Math8
  - The available settings on 4ch models are as follows:
    CH1 to CH4, Math1 to Math4

Manual Setup

After running auto setup, you can change the following settings and display decoded results.

- Bit rate
- Bus channel
- Level for detecting analysis/search source waveform states
- Hysteresis

Level for Detecting Analysis/Search Source Waveform States (Level/Hysteresis)

Turn the **jog shuttle** to set the level or hysteresis.

- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
- To set the level, you can drag the level display line on the screen.

Jog shuttle setting menu

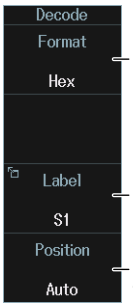
Level for detecting analysis/search source waveform states

Hysteresis

Press SET (upper right on the front panel) to switch between level and hysteresis.

Decoded Display (Decode)

Press the **Decode** soft key. The following menu items appear.



Decode Display Format

Label

Display position
The position is set to Auto when you execute auto setup on the analysis menu of each serial bus signal. The position changes from Auto to Manual when you drag the decode display.

When the display position is set to Manual

Display position

Display Position (Position)

When the display position is set to Manual, turn the **jog shuttle** to set the display position (Position).

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

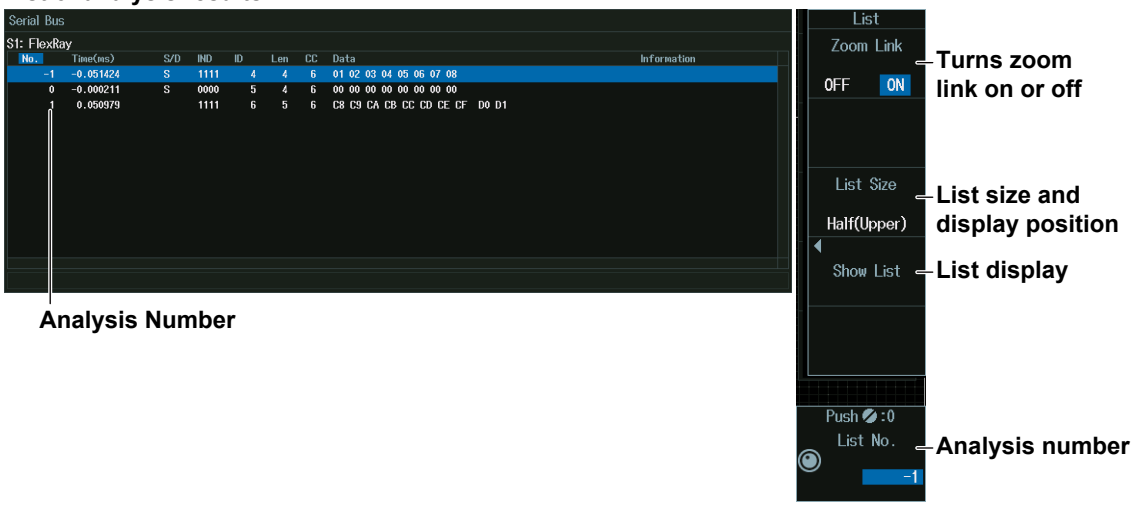
Jog shuttle setting menu

Display position

List Display (List)

1. Press the **Display** soft key, and turn on the analysis and search displays.
2. Press the **List** soft key and then the **Show List** soft key.
   - The list of analysis results and the next menu appear.
   - If several display settings of Serial Bus 1 to 4 are on, all the lists of analysis results of the serial buses whose display setting is on are displayed. For details, see section 12.12.

List of analysis results



Note

Analysis Number

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).

Analysis Number (List No.)

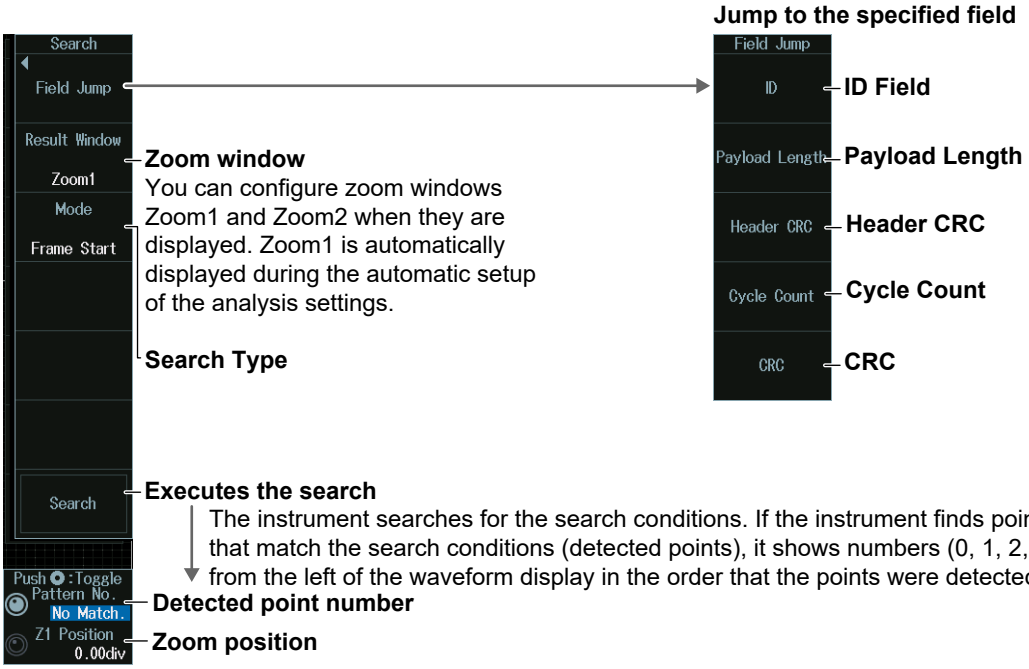
Turn the **jog shuttle** to set the analysis number (List No.).

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Search Setup (Search)

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

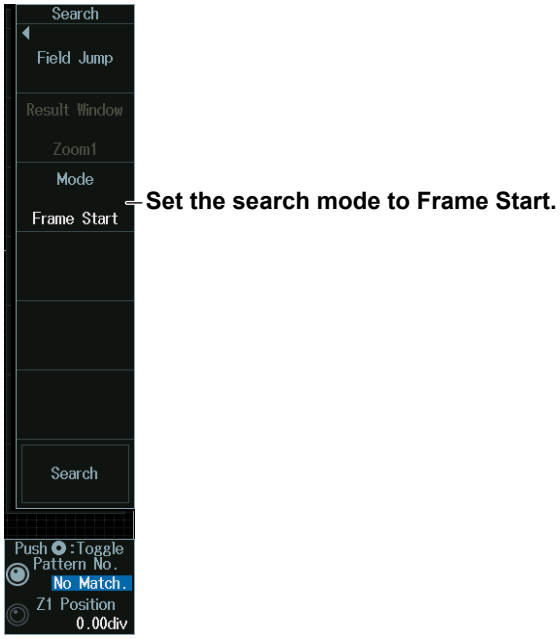


Search Type (Mode)

Frame Start Mode (Frame Start)

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

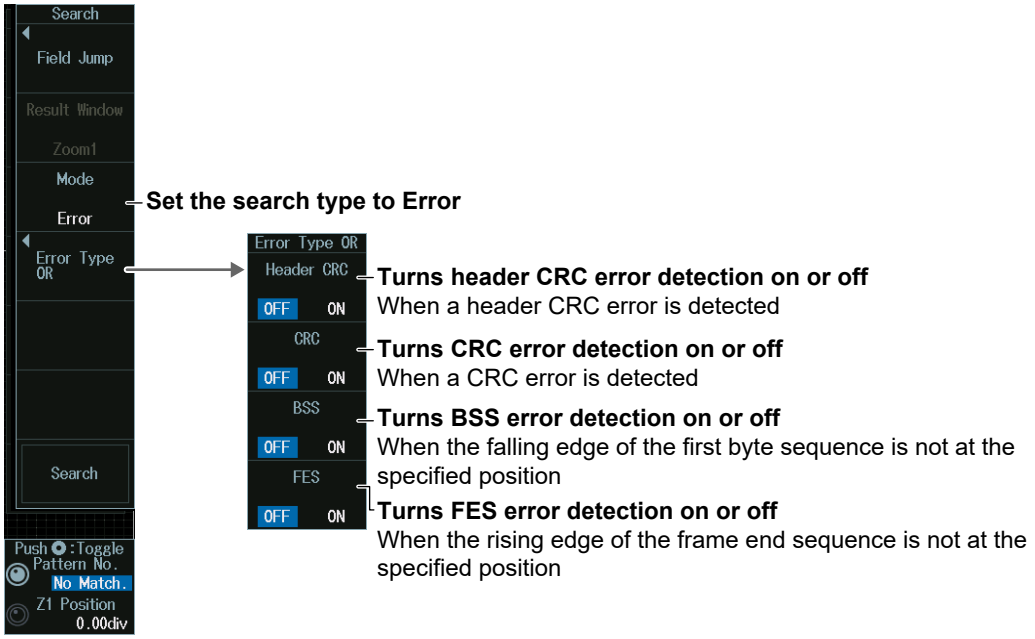
The instrument searches for the start position of FlexRay bus signal frames.



Error Mode (Error)

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

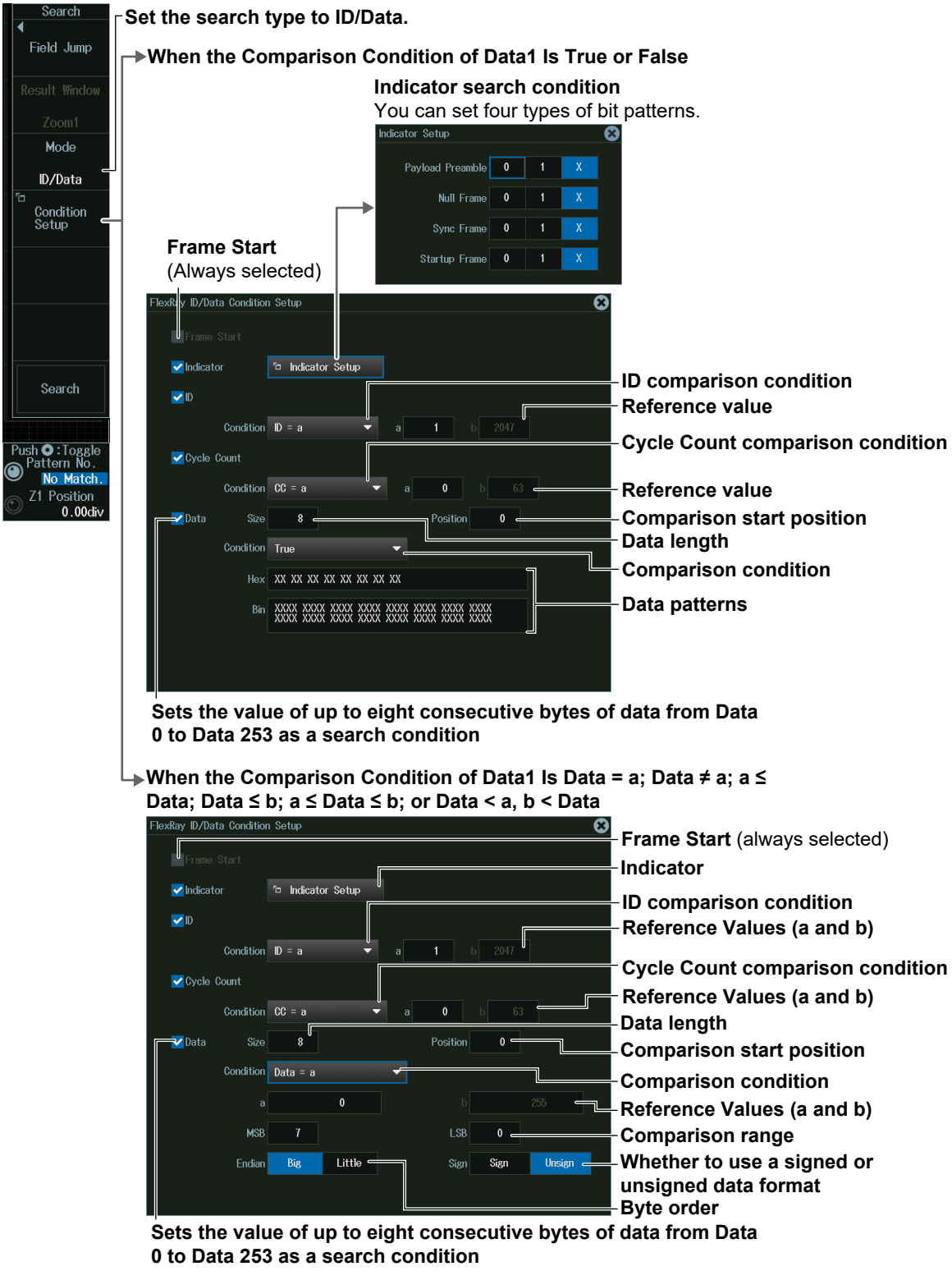
The instrument searches for FlexRay bus signal errors.



ID/Data Mode (ID/Data)

1. Press the **Mode** soft key and then the **ID/Data** soft key.
2. Press the **Condition Setup** soft key. The following menu appears.

   The instrument searches for the position where the AND condition of the Frame Start, Indicator, ID, Cycle Count, and Data is met.



Detected Point Number and Zoom Position (Pattern No. /Z1 Position or Z2 Position)

1. Execute a search. Check that a location matching the search conditions is found.
2. Turn the **jog shuttle** to set the detected point number (Pattern No.) and zoom position (Z1 Position or Z2 Position).
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
   - Press **SET** (upper right on the front panel) to switch between detected point number (Pattern No.) and zoom position (Z1 Position or Z2 Position).

Jog shuttle setting menu

Detected point number

Zoom position

12.2 Analyzing and Searching CAN Bus Signals (Option)

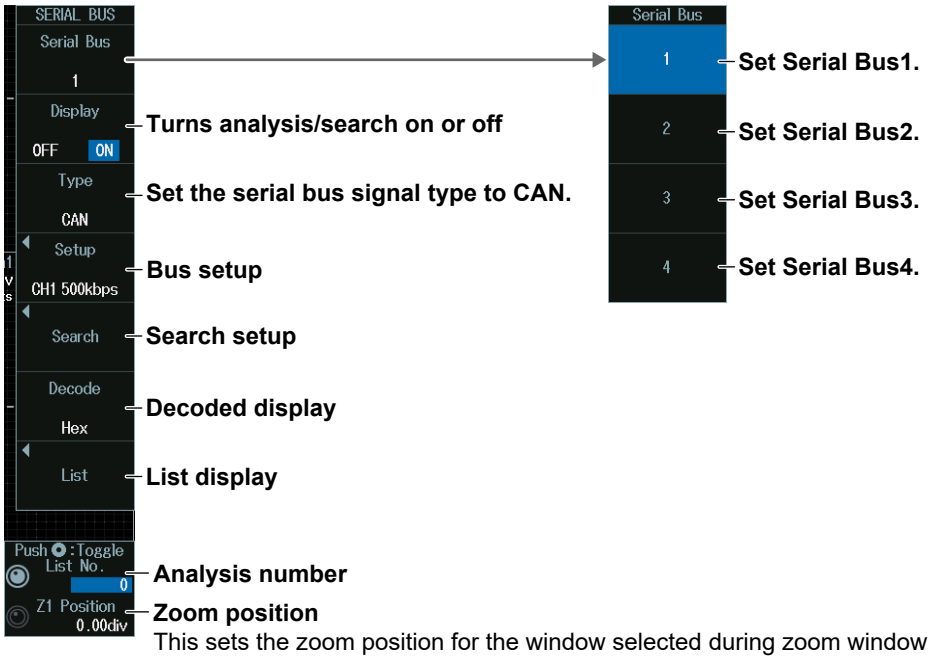
This section explains the following settings for analyzing or searching CAN bus signals:

- Turning analysis and search displays on or off
- Serial bus signal types
- Bus setup
  Auto setup, analysis/search source waveform, bit rate, recessive level, sample point, level and hysteresis for detecting analysis/search source waveform states
- Decoded display
- List display
  List size, display position, zoom linking, filter (list display filtering)
- Analysis number
- Zoom position
- Search settings
  Jumping to a specified field, zoom window, search type, and search execution

► **"Analyzing and Searching Serial Bus Signals," "Analyzing and Searching CAN Bus Signals (Option)" in the Features Guide**

SERIAL BUS CAN Menu

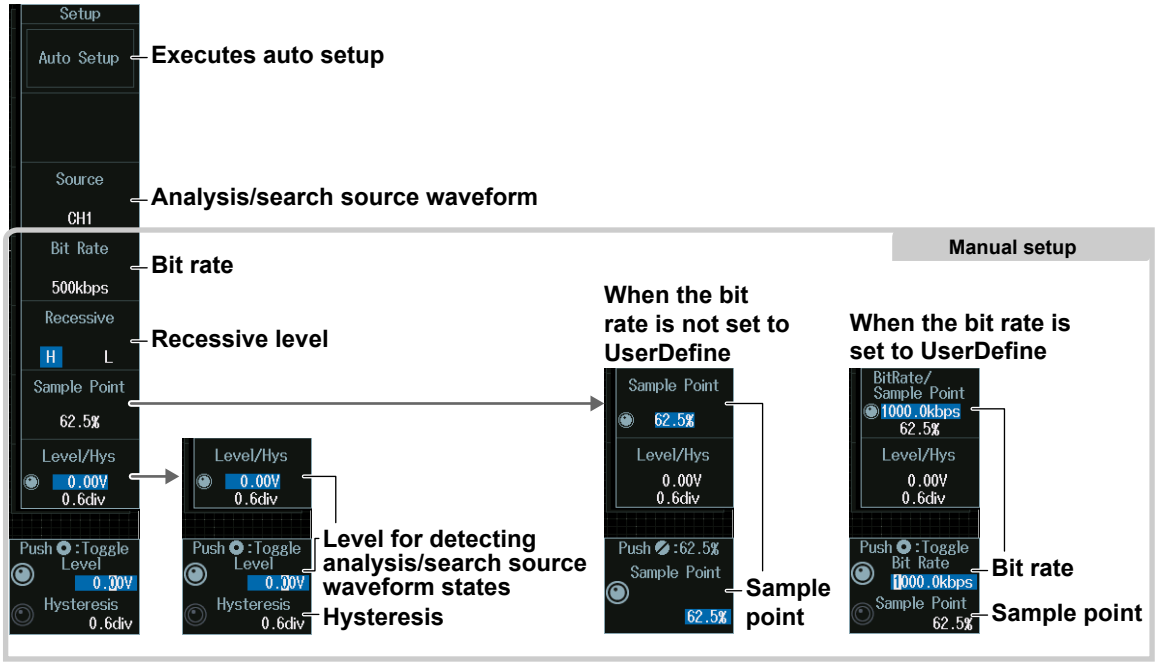
1. Press **SHIFT+SEARCH** (SERIAL BUS) to display the SERIAL BUS menu.
   - You can also tap **MENU** (MENU) in the upper left of the screen and select the SERIAL BUS menu from ANALYSIS on the top menu that is displayed.
   - You can also press **ANALYSIS** and then the **To SERIAL BUS** soft key to display the SERIAL BUS menu.
   - The instrument can analyze and search up to four serial bus signals. To switch to the setup menu, press the Serial Bus soft key and select a number from 1 to 4.
2. Press the **Type** soft key. From the setup menu that appears, select **CAN** to display the following menu.



Zoom position
This sets the zoom position for the window selected during zoom window configuration (described later).

Bus Setup (Setup)

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



Executing Auto Setup (Auto Setup)

1. Set the analysis/search source waveform.
   Auto setup cannot be performed when the source is set to Math1 to Math8.
2. Press the **Auto Setup** soft key to execute auto setup.
   - The instrument 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, press the **Abort** soft key.

Note

- The auto setup feature will not work properly on some input signals.
- The available source waveforms vary depending on the model.
  - The available settings on 8ch models are as follows:
    CH1 to CH8, Math1 to Math8
  - The available settings on 4ch models are as follows:
    CH1 to CH4, Math1 to Math4

Manual Setup

After running auto setup, you can change the following settings and display decoded results.

- Bit rate
- Recessive level
- Sample point
- Level for detecting analysis/search source waveform states
- Hysteresis

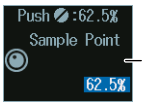
Sample Point (Sample Point) and Bit Rate (Bit Rate)

When the bit rate is not set to User Define

Turn the **jog shuttle** to set the sample point.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the pop-up list that appears on the screen.

Jog shuttle setting menu



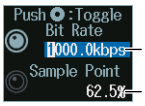
Sample point

When the bit rate is set to User Define

Turn the **jog shuttle** to set the sample point.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the pop-up list that appears on the screen.

Jog shuttle setting menu



Bit rate

Sample point

Press SET (upper right on the front panel) to switch between bit rate and sample point.

Level for Detecting Analysis/Search Source Waveform States (Level/Hysteresis)

Turn the **jog shuttle** to set the level or hysteresis.

- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
- To set the level, you can drag the level display line on the screen.

Jog shuttle setting menu

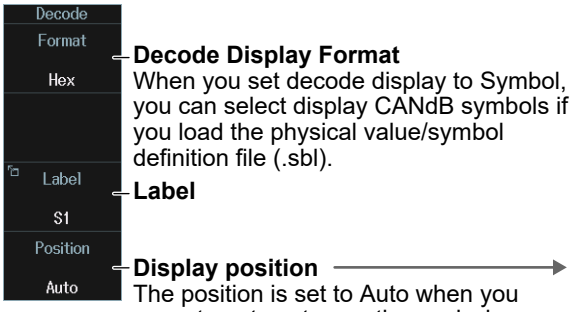
Level for detecting analysis/search source waveform states

Hysteresis

Press SET (upper right on the front panel) to switch between level and hysteresis.

Decoded Display (Decode)

Press the **Decode** soft key. The following menu items appear.



Decode Display Format
When you set decode display to Symbol, you can select display CANdB symbols if you load the physical value/symbol definition file (.sbl).

Label

Display position
The position is set to Auto when you execute auto setup on the analysis menu of each serial bus signal. The position changes from Auto to Manual when you drag the decode display.

When the display position is set to Manual

Display position

Display Position (Position)

When the display position is set to Manual, turn the **jog shuttle** to set the display position (Position).

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

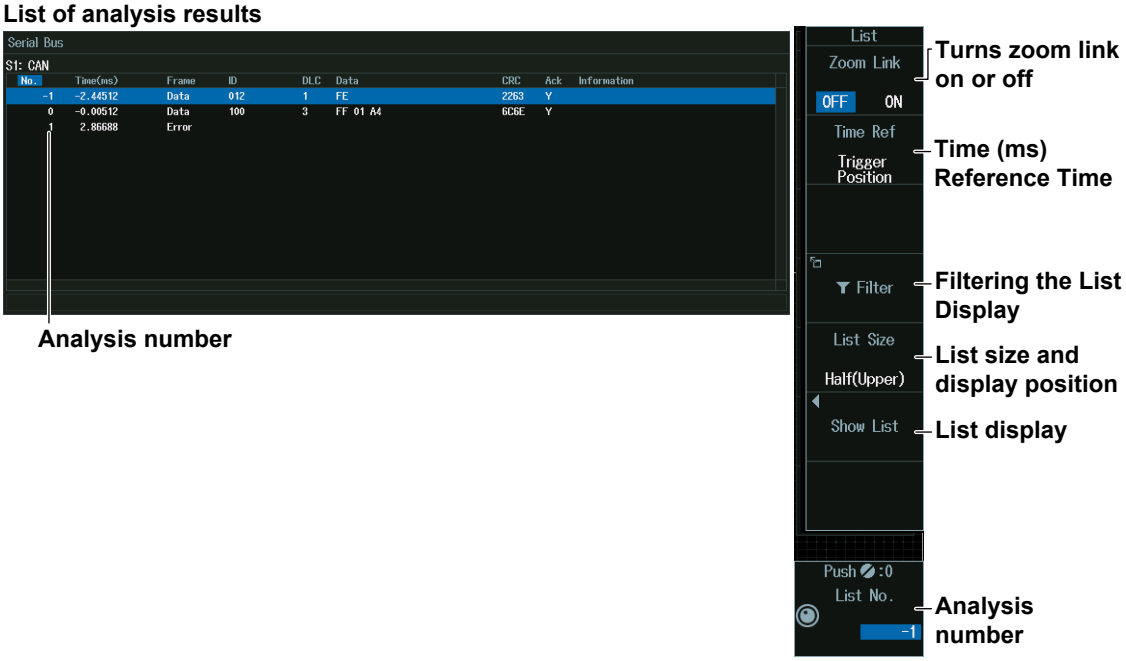
Jog shuttle setting menu

Display position

List Display (List)

1. Press the **Display** soft key, and turn on the analysis and search displays.
2. Press the **List** soft key and then the **Slow List** soft key.
   - The list of analysis results and the next menu appear.
   - If several display settings of Serial Bus 1 to 4 are on, all the lists of analysis results of the serial buses whose display setting is on are displayed. For details, see section 12.12.

List of analysis results



Note

Analysis Number

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).

Time (ms) Reference Time

Press the **Time Ref** soft key to select **Trigger Position** or **Previous Row**.

Time (ms) Reference Time

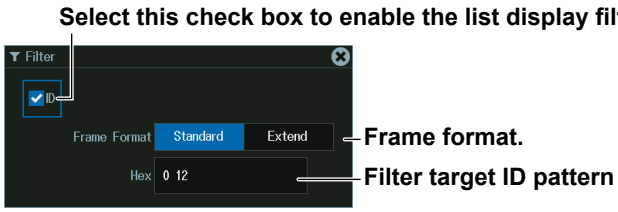
Select the reference for determining the time to the start of the frame to be analyzed.

Trigger Position: The reference time is set to the trigger point.

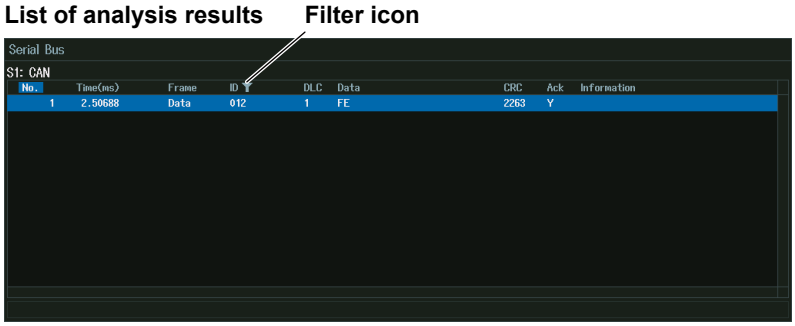
Previous Row: The reference time is set to the start position (SOF) of the frame previous to the frame to be analyzed.

Filtering the List Display

1. Press the **Filter** soft key to display the following screen.



2. Set the hexadecimal value of the ID to search for. Only the frames that contain the filter target ID pattern are listed.



Analysis Number (List No.)

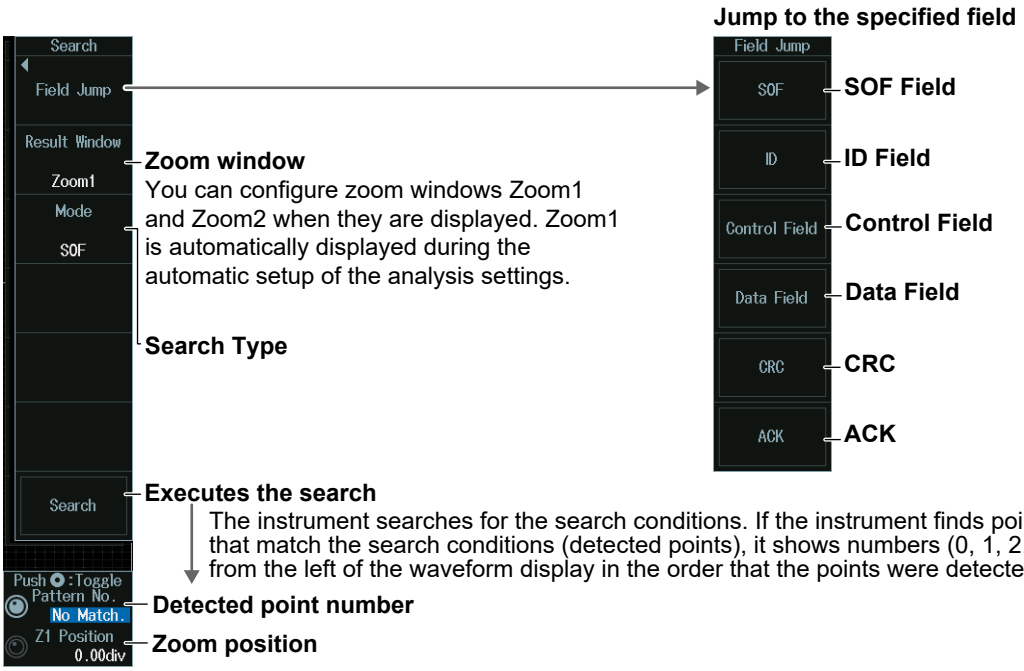
Turn the **jog shuttle** to set the analysis number (List No.).

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Search Setup (Search)

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

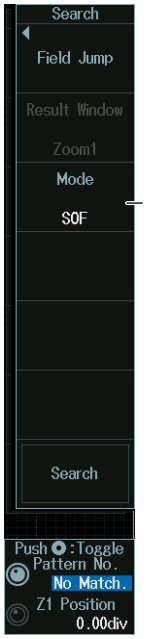


Search Type (Mode)

SOF Mode (Start of Frame)

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

The instrument searches for the start position of CAN bus signal frames.

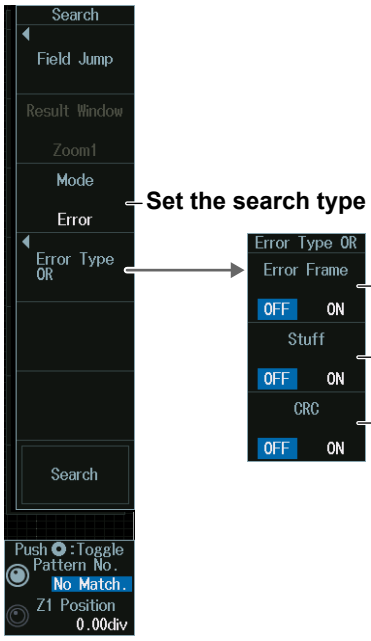


Set the search type to SOF

Error Mode (Error)

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

The instrument searches for error frames (when the error flag is active) or various errors.



Set the search type to Error

Turns error frame detection on or off
When an active error flag is detected

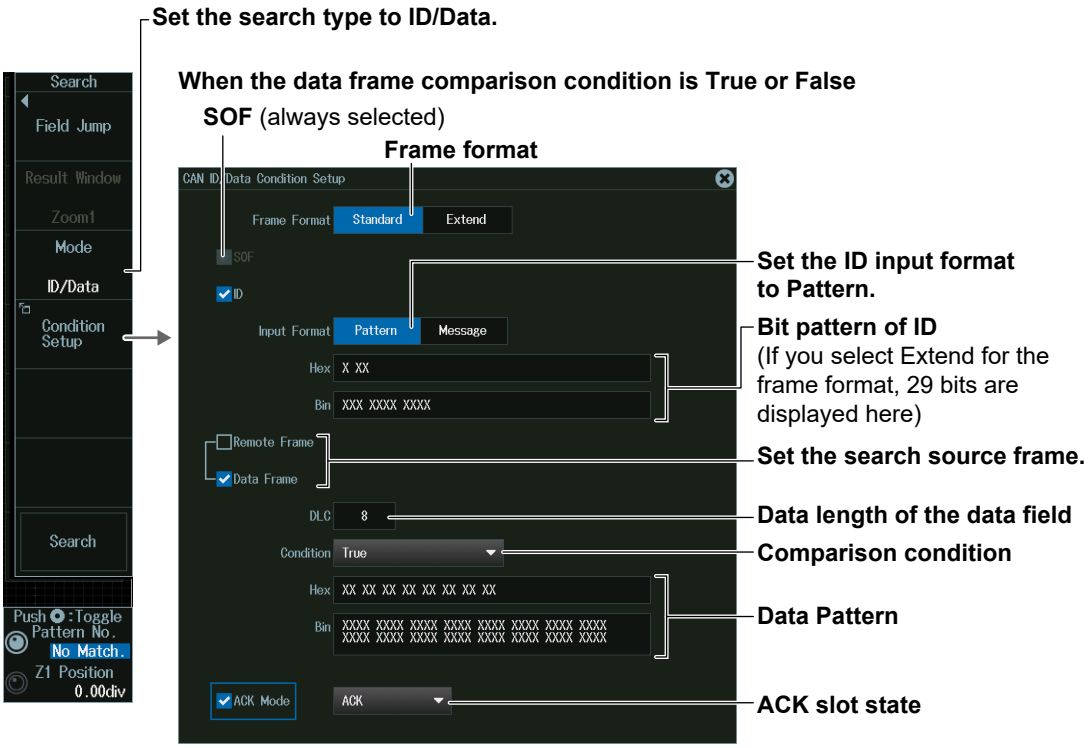
Turns stuff error detection on or off
When stuff bits are not inserted properly

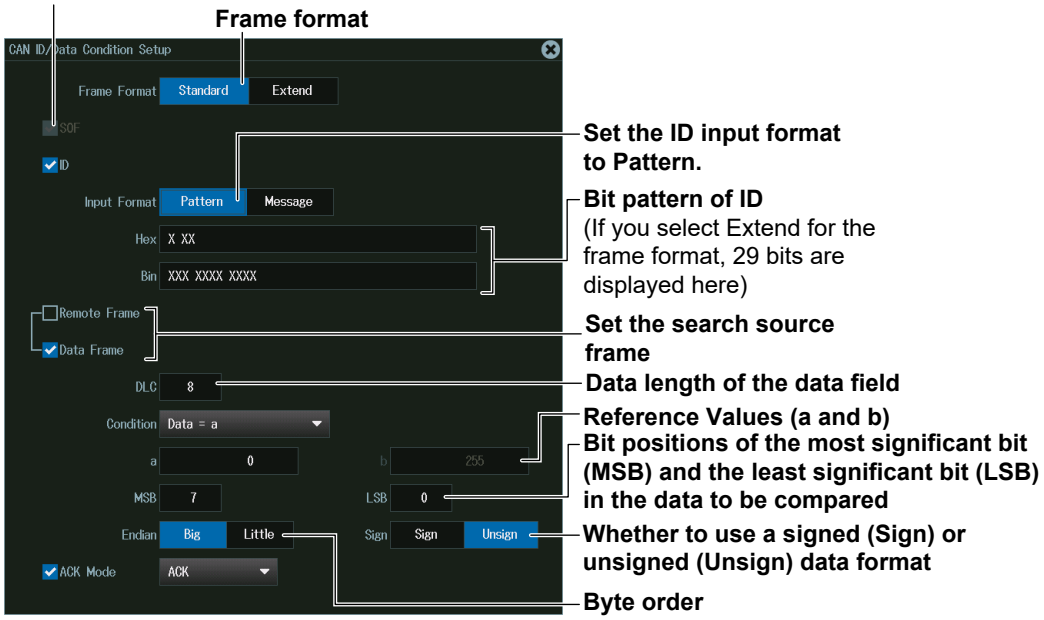
Turns CRC error detection on or off
When a CRC error is detected

ID/Data Mode (ID/Data)

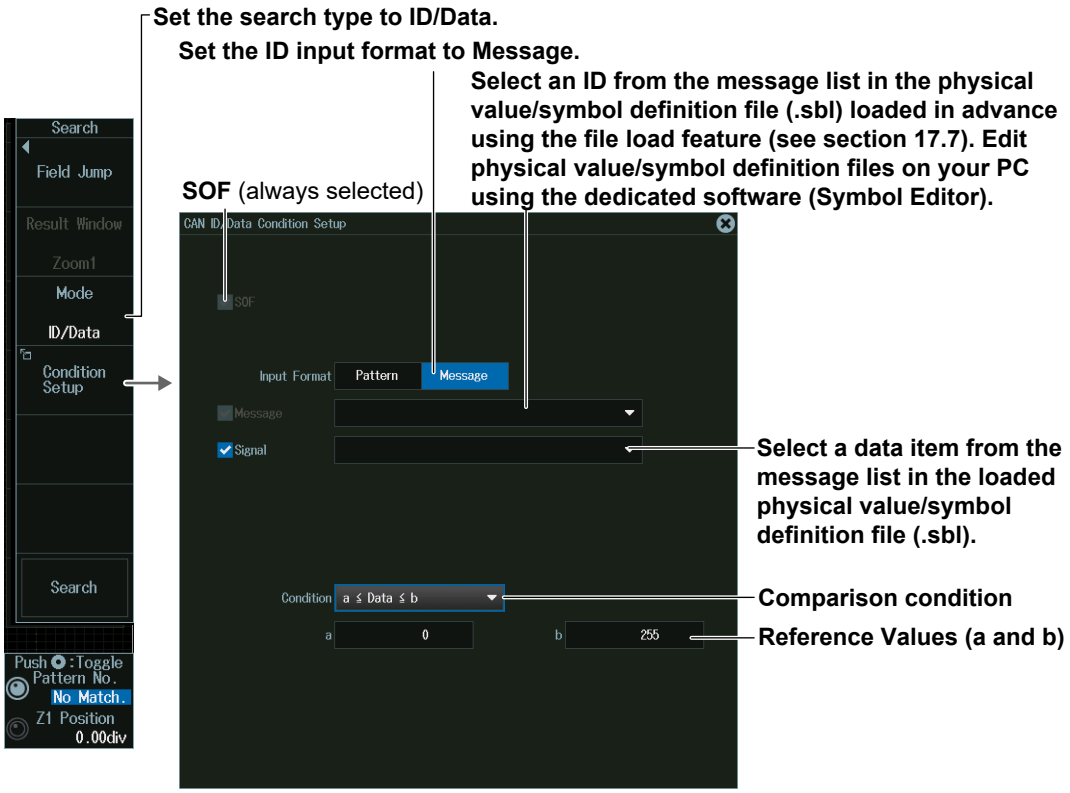
1. Press the **Mode** soft key and then the **ID/Data** soft key.
2. Press the **Condition Setup** soft key to display the following menu.
   The instrument searches for the position where the AND condition of the SOF, ID, Frame type, (Remote Frame/Data Frame), Data and ACK Mode is met.

- **When ID Input Format Is Pattern**





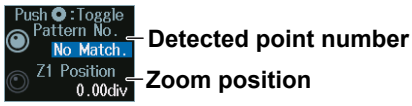
- **When ID Input Format Is Message**



Detected Point Number and Zoom Position (Pattern No. /Z1 Position or Z2 Position)

1. Execute a search. Check that a location matching the search conditions is found.
2. Turn the **jog shuttle** to set the detected point number (Pattern No.) and zoom position (Z1 Position or Z2 Position).
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
   - Press **SET** (upper right on the front panel) to switch between detected point number (Pattern No.) and zoom position (Z1 Position or Z2 Position).

Jog shuttle setting menu



12.3 Analyzing and Searching CAN FD Bus Signals (Option)

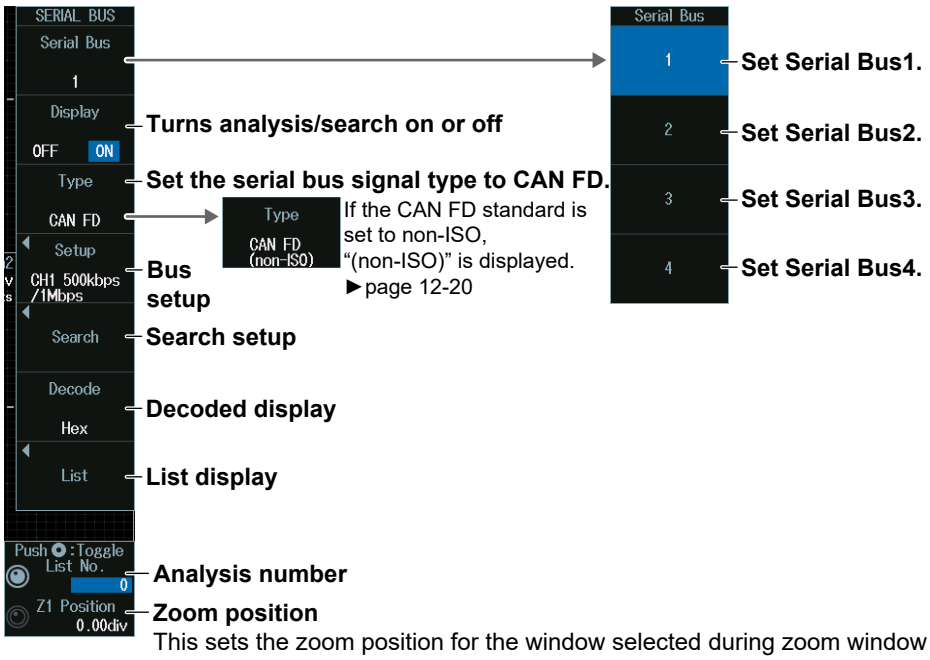
This section explains the following settings for analyzing or searching CAN FD bus signals:

- Turning analysis and search displays on or off
- Serial bus signal types
- Bus setup
  Auto setup, analysis/search source waveform, bit rate, sample point, data phase bit rate, data phase sample point, recessive level, CAN FD standard, level and hysteresis for detecting analysis/search source waveform states
- Decoded display
- List display
  List size, display position, zoom linking, filter (list display filtering)
- Analysis number
- Zoom position
- Search settings
  Jumping to a specified field, zoom window, search type, and search execution

► **"Analyzing and Searching Serial Bus Signals," "Analyzing and Searching CAN FD Bus Signals (Option)" in the Features Guide**

SERIAL BUS CAN FD Menu

1. Press **SHIFT+SEARCH** (SERIAL BUS) to display the SERIAL BUS menu.
   - You can also tap **MENU** (MENU) in the upper left of the screen and select the SERIAL BUS menu from ANALYSIS on the top menu that is displayed.
   - You can also press **ANALYSIS** and then the **To SERIAL BUS** soft key to display the SERIAL BUS menu.
   - The instrument can analyze and search up to four serial bus signals. To switch to the setup menu, press the Serial Bus soft key and select a number from 1 to 4.
2. Press the **Type** soft key. From the setup menu that appears, select **CAN FD** to display the following menu.



Zoom position
This sets the zoom position for the window selected during zoom window configuration (described later).

Bus Setup (Setup)

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

Executing Auto Setup (Auto Setup)

1. Set the analysis/search source waveform and the CAN FD standard.
   Auto setup cannot be performed when the source is set to Math1 to Math8.
2. Press the **Auto Setup** soft key to execute auto setup.
   - The instrument automatically sets the bit rate, sample point, data phase bit rate, data phase sample point, recessive level, 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, press the **Abort** soft key.

Note

- The auto setup feature will not work properly on some input signals.
- The available source waveforms vary depending on the model.
  - The available settings on 8ch models are as follows:
    CH1 to CH8, Math1 to Math8
  - The available settings on 4ch models are as follows:
    CH1 to CH4, Math1 to Math4

Manual Setup

After running auto setup, you can change the following settings and display decoded results.

- Bit rate
- Sample point
- Data phase bit rate
- Data phase sample point
- Recessive level
- CAN FD Standard
- Level for detecting analysis/search source waveform states
- Hysteresis

Level for Detecting Analysis/Search Source Waveform States (Level/Hysteresis)

Turn the **jog shuttle** to set the level or hysteresis.

- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
- To set the level, you can drag the level display line on the screen.

Jog shuttle setting menu

Level for detecting analysis/search source waveform states

Hysteresis

Press SET (upper right on the front panel) to switch between level and hysteresis.

Decoded Display (Decode)

Press the **Decode** soft key. The following menu items appear.

Decode Display Format
When you set decode display to Symbol, you can select display CANdB symbols if you load the physical value/symbol definition file (.sbl).

Label

Display position
The position is set to Auto when you execute auto setup on the analysis menu of each serial bus signal. The position changes from Auto to Manual when you drag the decode display.

When the display position is set to Manual

Display position

Display Position (Position)

When the display position is set to Manual, turn the **jog shuttle** to set the display position (Position).

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

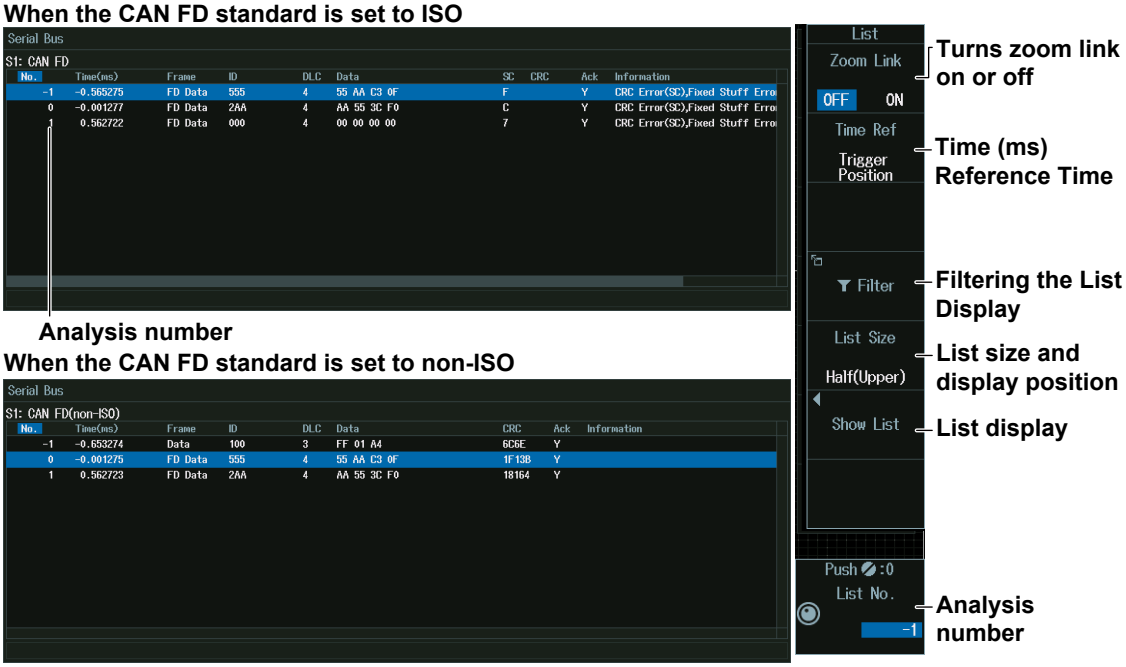
Display position

List Display (List)

1. Press the **Display** soft key, and turn on the analysis and search displays.
2. Press the **List** soft key and then the **Show List** soft key.
   - The list of analysis results and the next menu appear.
   - If several display settings of Serial Bus 1 to 4 are on, all the lists of analysis results of the serial buses whose display setting is on are displayed. For details, see section 12.12.

List of analysis results

When the CAN FD standard is set to ISO



Note

Analysis Number

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).

Time (ms) Reference Time

Press the **Time Ref** soft key to select **Trigger Position** or **Previous Row**.

Time (ms) Reference Time

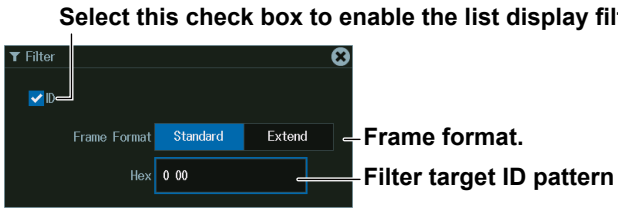
Select the reference for determining the time to the start of the frame to be analyzed.

Trigger Position: The reference time is set to the trigger point.

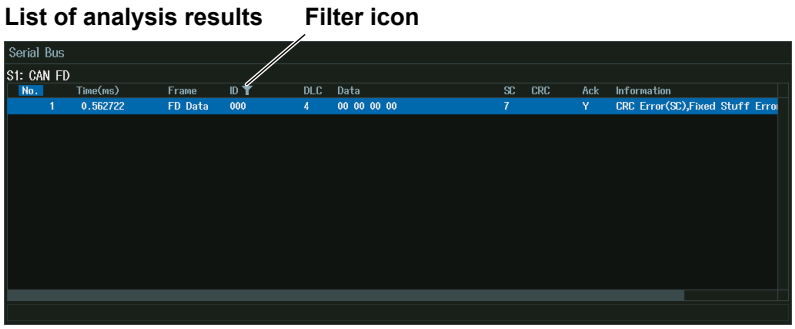
Previous Row: The reference time is set to the start position (SOF) of the frame previous to the frame to be analyzed.

Filtering the List Display

1. Press the **Filter** soft key to display the following screen.



2. Set the hexadecimal value of the ID to search for. Only the frames that contain the filter target ID pattern are listed.



Analysis Number (List No.)

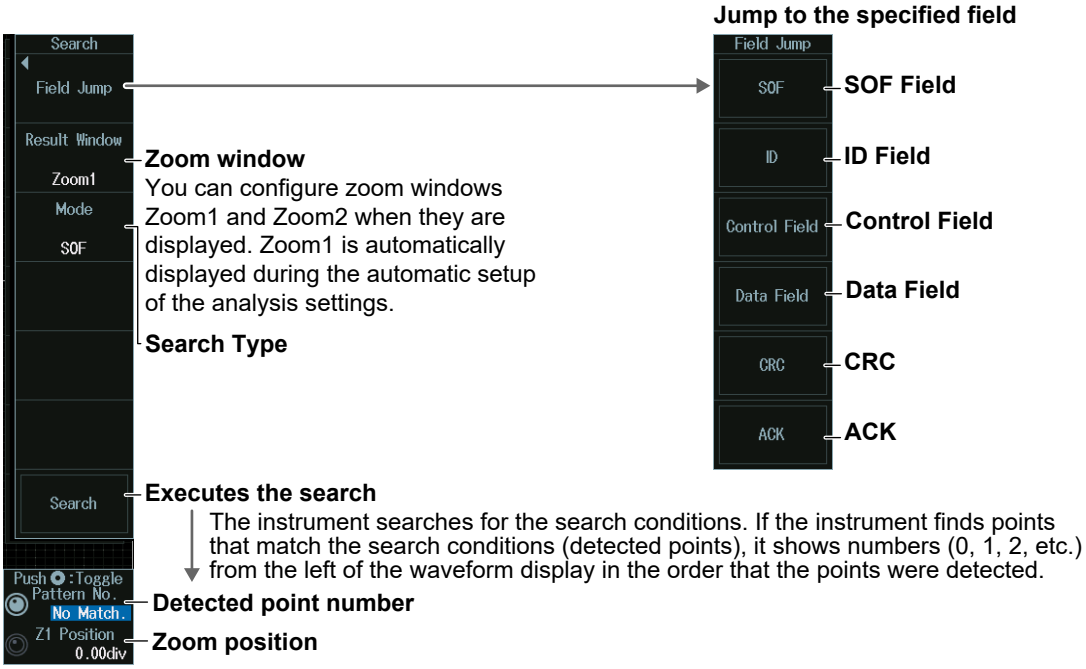
Turn the **jog shuttle** to set the analysis number (List No.).

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Search Setup (Search)

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

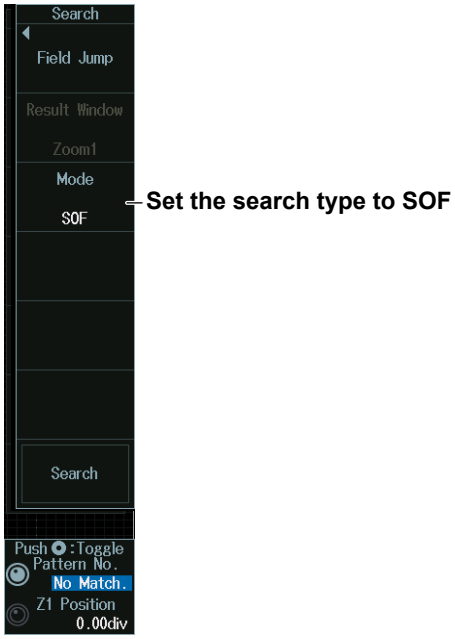


Search Type (Mode)

SOF Mode (Start of Frame)

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

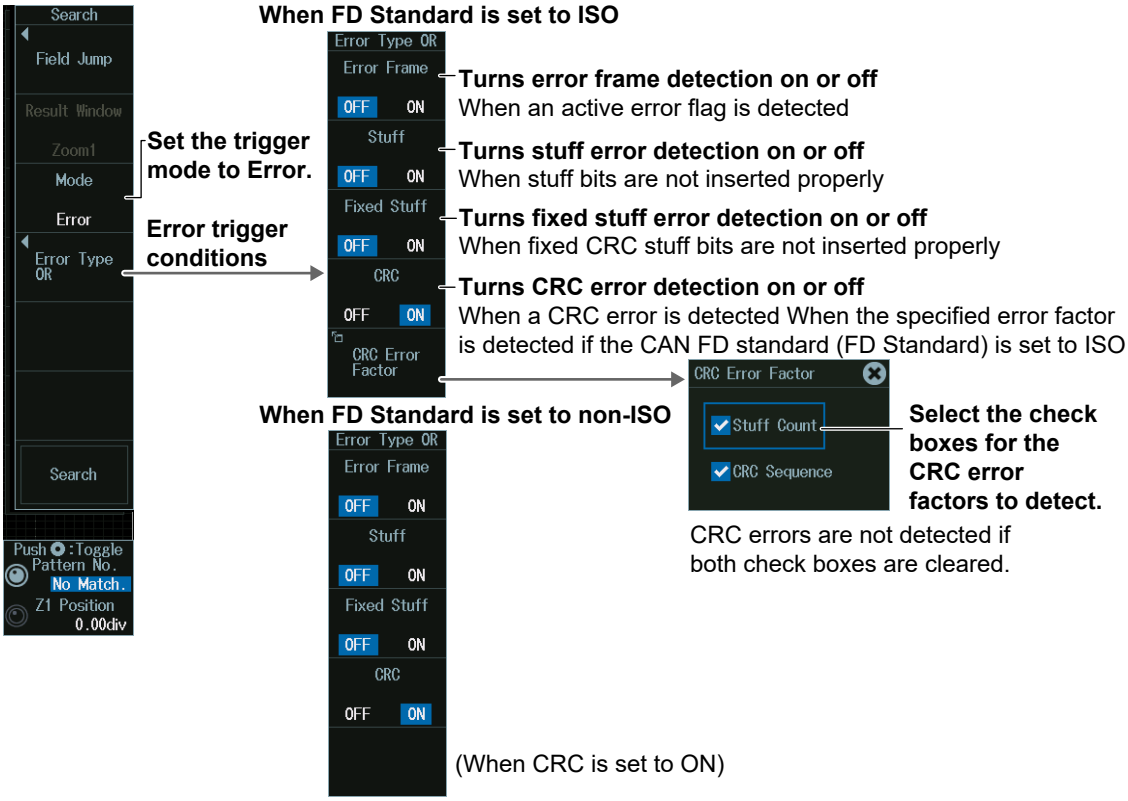
The instrument searches for the start position of CAN FD bus signal frames.



Error Mode (Error)

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

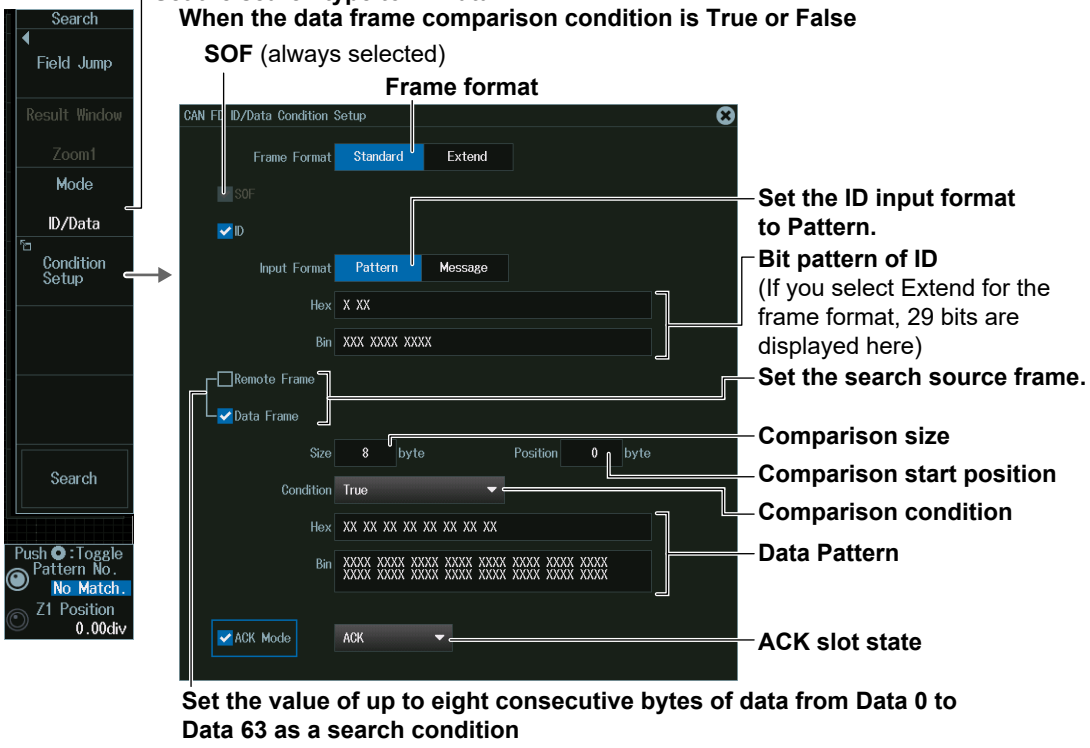
The instrument searches for error frames (when the error flag is active) or various errors.



ID/Data Mode (ID/Data)

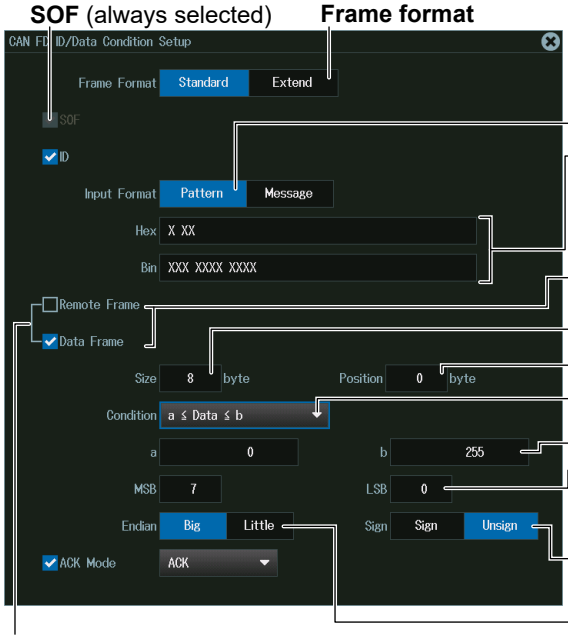
1. Press the **Mode** soft key and then the **ID/Data** soft key.
2. Press the **Condition Setup** soft key to display the following menu.
   The instrument searches for the position where the AND condition of the SOF, ID, Frame type (Remote Frame/Data Frame), Data and ACK Mode is met.

- **When ID Input Format Is Pattern**



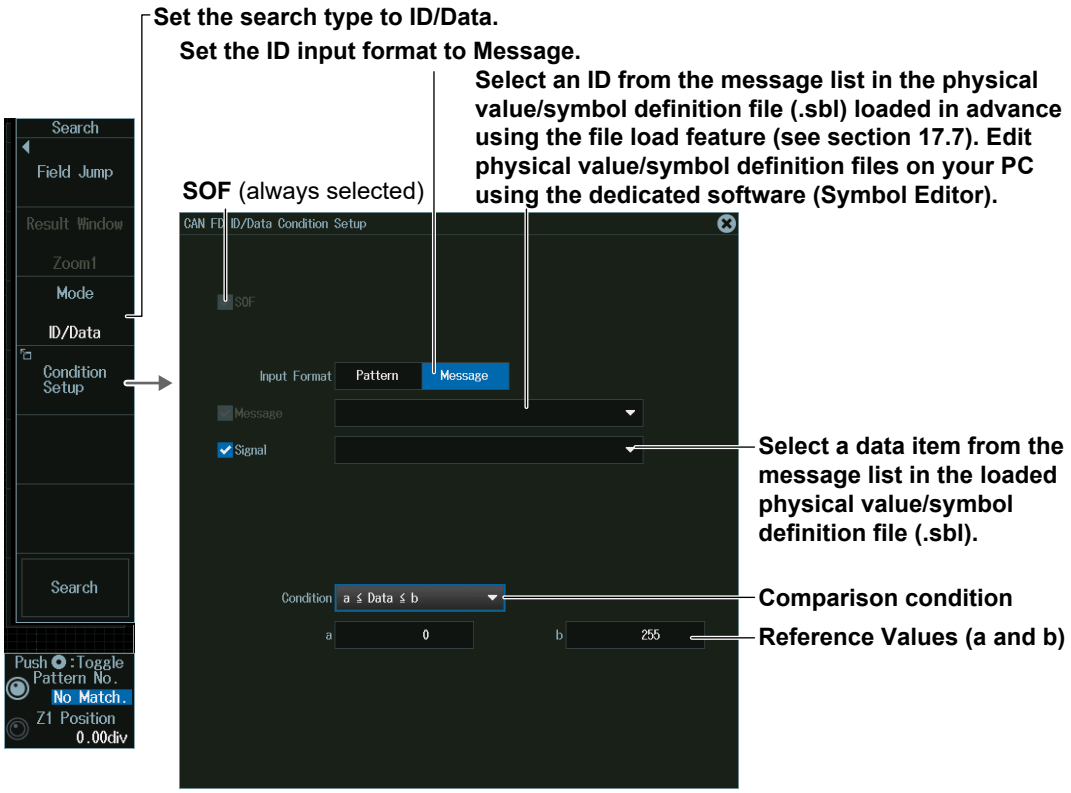
Set the search type to ID/Data.
When the data frame comparison condition is True or False
SOF (always selected)
Frame format
Set the ID input format to Pattern.
Bit pattern of ID
(If you select Extend for the frame format, 29 bits are displayed here)
Set the search source frame.
Comparison size
Comparison start position
Comparison condition
Data Pattern
ACK slot state
Set the value of up to eight consecutive bytes of data from Data 0 to Data 63 as a search condition

When the data frame condition is Data = a; Data ≠ a; a ≤ Data; Data ≤ b; a ≤ Data ≤ b; or Data < a, b < Data



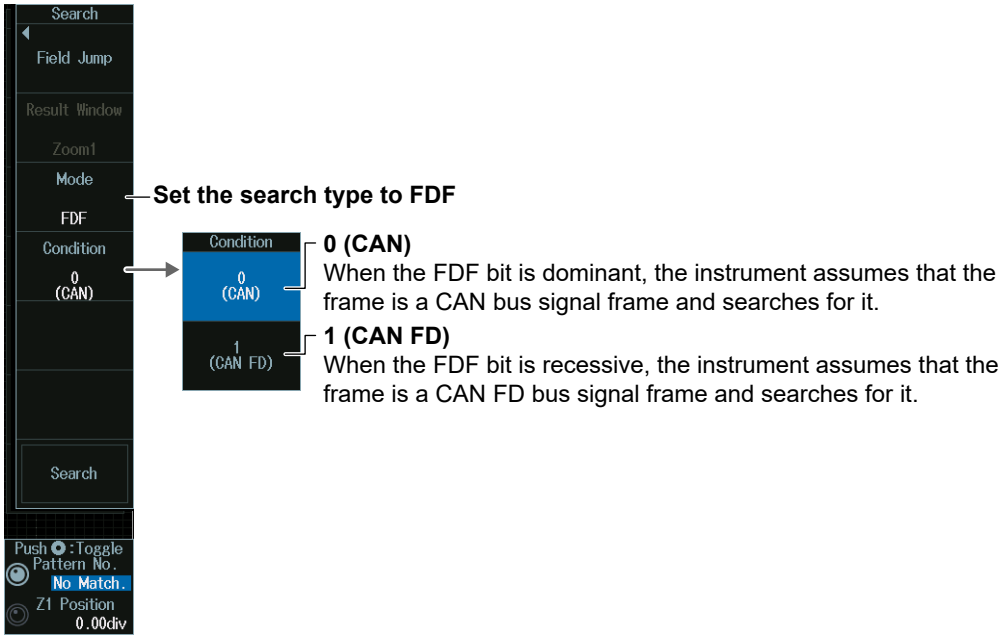
SOF (always selected)
Frame format
Set the ID input format to Pattern.
Bit pattern of ID
(If you select Extend for the frame format, 29 bits are displayed here)
Set the search source frame
Comparison size
Comparison start position
Comparison condition
Reference Values (a and b)
Bit positions of the most significant bit (MSB) and the least significant bit (LSB) in the data to be compared
Whether to use a signed (Sign) or unsigned (Unsign) data format
Byte order
Set the value of up to eight consecutive bytes of data from Data 0 to Data 63 as a search condition

- **When ID Input Format Is Message**



FDF Mode (FDF)

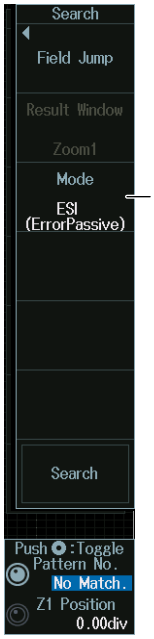
1. Press the **Mode** soft key and then the **FDF** soft key.
2. Press the **Condition Setup** soft key to display the following menu.
   Set the FDF bit state as a search condition.



ESI Mode (ESI (Error Passive))

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

The instrument searches for frames whose ESI bit is recessive (error passive).



Set the search type to ESI (ErrorPassive).

Detected Point Number and Zoom Position (Pattern No. /Z1 Position or Z2 Position)

1. Execute a search. Check that a location matching the search conditions is found.
2. Turn the **jog shuttle** to set the detected point number (Pattern No.) and zoom position (Z1 Position or Z2 Position).
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
   - Press **SET** (upper right on the front panel) to switch between detected point number (Pattern No.) and zoom position (Z1 Position or Z2 Position).

Jog shuttle setting menu

Detected point number

Zoom position

12.4 Analyzing and Searching LIN Bus Signals (Option)

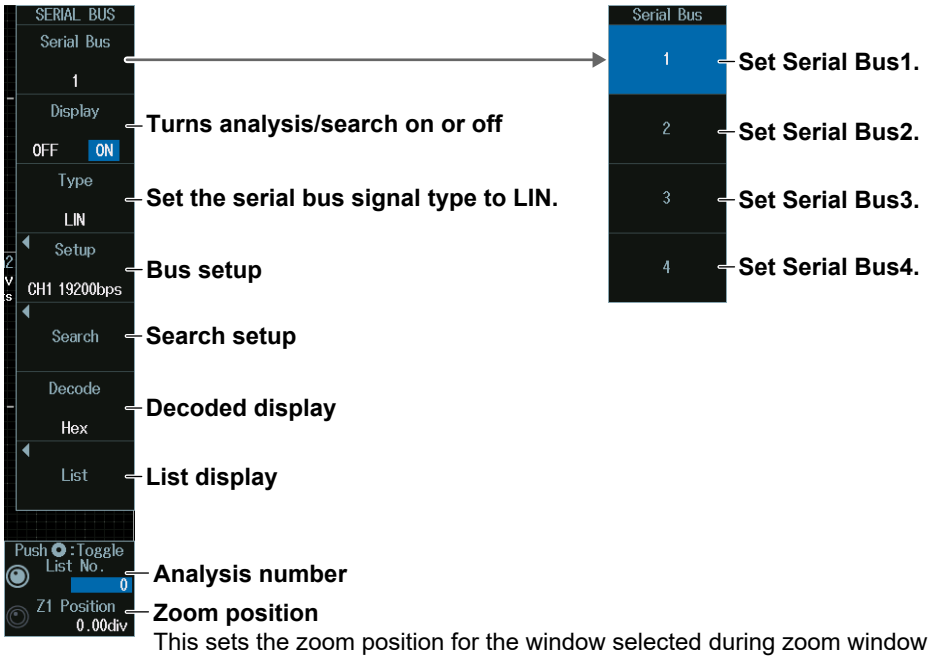
This section explains the following settings for analyzing or searching LIN bus signals:

- Turning analysis and search displays on or off
- Serial bus signal types
- Bus setup
  Auto setup, analysis/search source waveform, bit rate, revision, sample point, level and hysteresis for detecting analysis/search source waveform states
- Decoded display
- List display
  List size, display position, and zoom linking
- Analysis number
- Zoom position
- Search settings
  Jumping to a specified field, zoom window, search type, and search execution

► **"Analyzing and Searching Serial Bus Signals," "Analyzing and Searching LIN Bus Signals (Option)" in the Features Guide**

SERIAL BUS LIN Menu

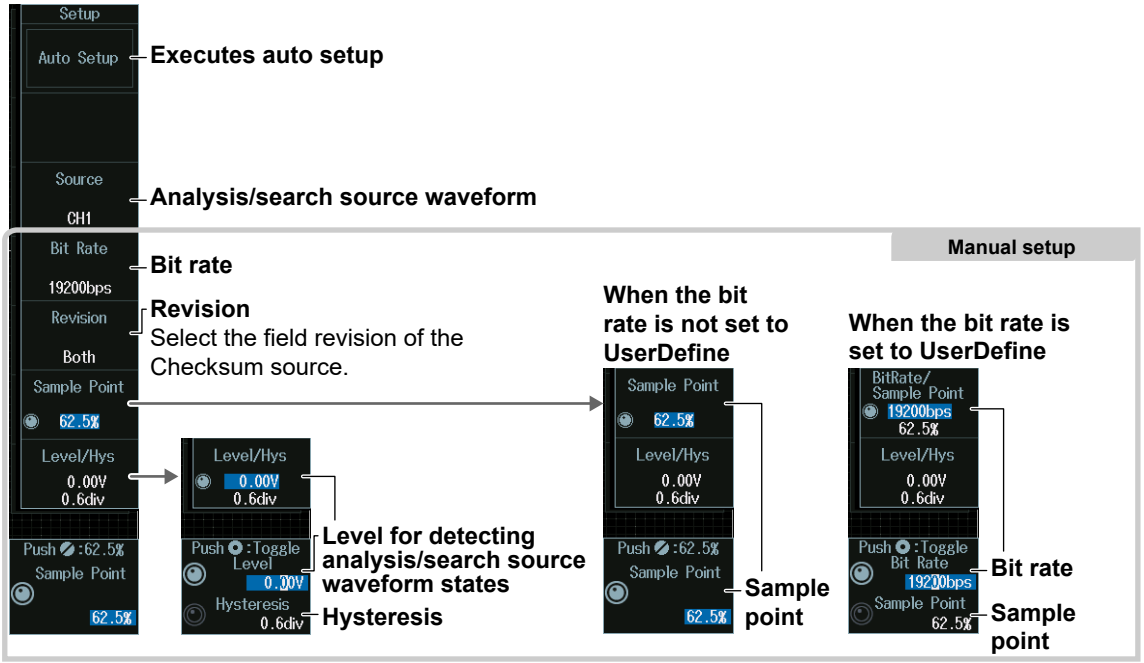
1. Press **SHIFT+SEARCH** (SERIAL BUS) to display the SERIAL BUS menu.
   - You can also tap **MENU** (MENU) in the upper left of the screen and select the SERIAL BUS menu from ANALYSIS on the top menu that is displayed.
   - You can also press **ANALYSIS** and then the **To SERIAL BUS** soft key to display the SERIAL BUS menu.
   - The instrument can analyze and search up to four serial bus signals. To switch to the setup menu, press the Serial Bus soft key and select a number from 1 to 4.
2. Press the **Type** soft key. From the setup menu that appears, select **LIN** to display the following menu.



Zoom position
This sets the zoom position for the window selected during zoom window configuration (described later).

Bus Setup (Setup)

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



Executing Auto Setup (Auto Setup)

1. Set the analysis/search source waveform.
   Auto setup cannot be performed when the source is set to Math1 to Math8.
2. Press the **Auto Setup** soft key to execute auto setup.
   - The Instrument 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, press the **Abort** soft key.

Note

- The auto setup feature will not work properly on some input signals.
- The available source waveforms vary depending on the model.
  - The available settings on 8ch models are as follows:
    CH1 to CH8, Math1 to Math8
  - The available settings on 4ch models are as follows:
    CH1 to CH4, Math1 to Math4

Manual Setup

After running auto setup, you can change the following settings and display decoded results.

- Bit rate
- Revision
- Sample point
- Level for detecting analysis/search source waveform states
- Hysteresis

Level for Detecting Analysis/Search Source Waveform States (Level/Hysteresis)

Turn the **jog shuttle** to set the level or hysteresis.

- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
- To set the level, you can drag the level display line on the screen.

Jog shuttle setting menu

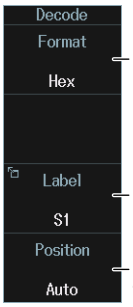
Level for detecting analysis/search source waveform states

Hysteresis

Press SET (upper right on the front panel) to switch between level and hysteresis.

Decoded Display (Decode)

Press the **Decode** soft key. The following menu items appear.



Decode Display Format

Label

Display position

The position is set to Auto when you execute auto setup on the analysis menu of each serial bus signal. The position changes from Auto to Manual when you drag the decode display.

When the display position is set to Manual

Display position

Display Position (Position)

When the display position is set to Manual, turn the **jog shuttle** to set the display position (Position).

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

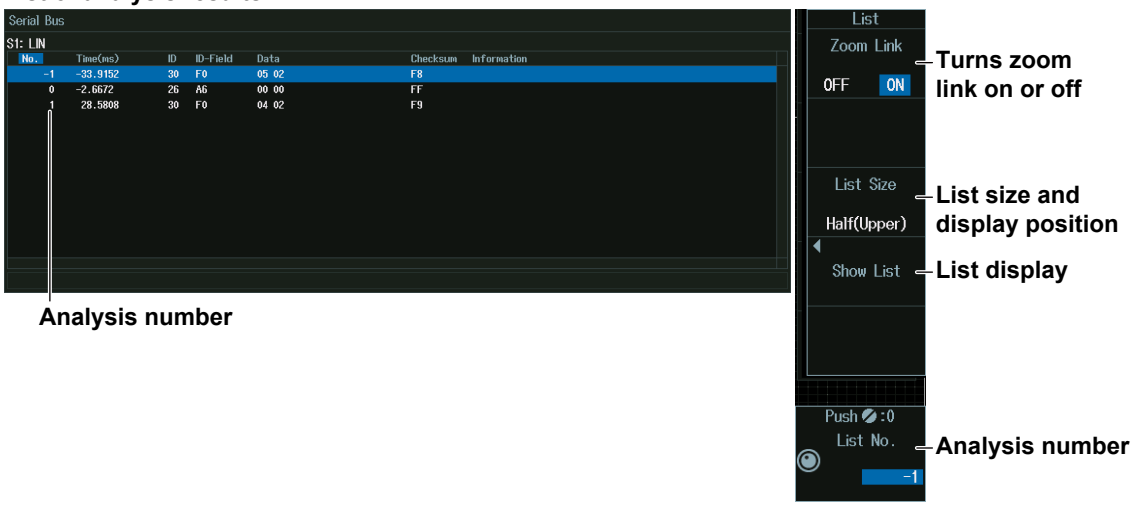
Jog shuttle setting menu

Display position

List Display (List)

1. Press the **Display** soft key, and turn on the analysis and search displays.
2. Press the **List** soft key and then the **Show List** soft key.
   - The list of analysis results and the next menu appear.
   - If several display settings of Serial Bus 1 to 4 are on, all the lists of analysis results of the serial buses whose display setting is on are displayed. For details, see section 12.12.

List of analysis results



Note

Analysis Number

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).

Analysis Number (List No.)

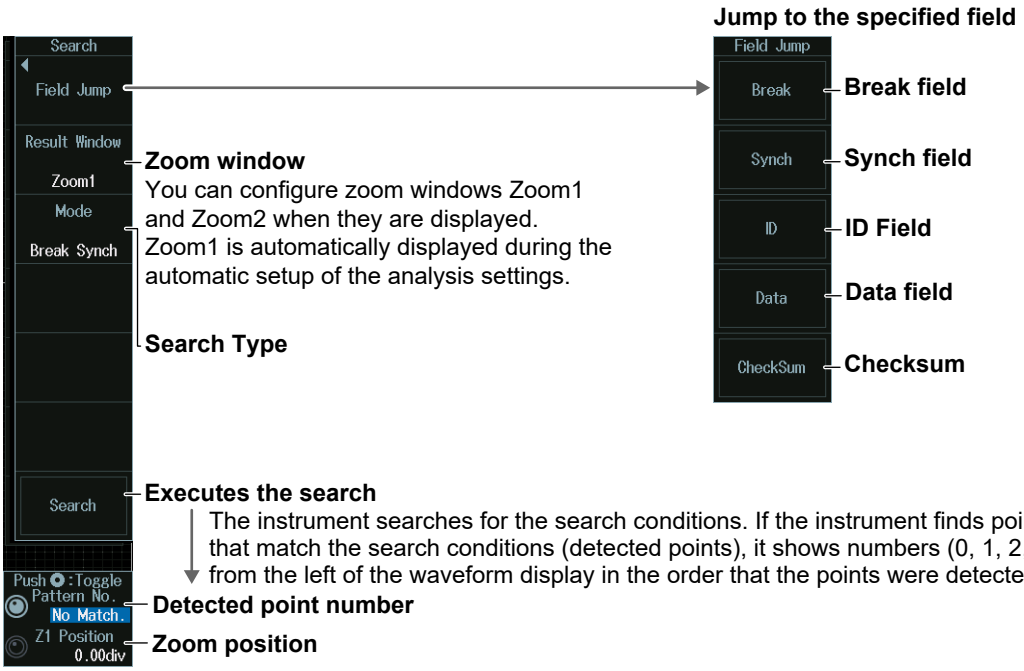
Turn the **jog shuttle** to set the analysis number (List No.).

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Search Setup (Search)

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

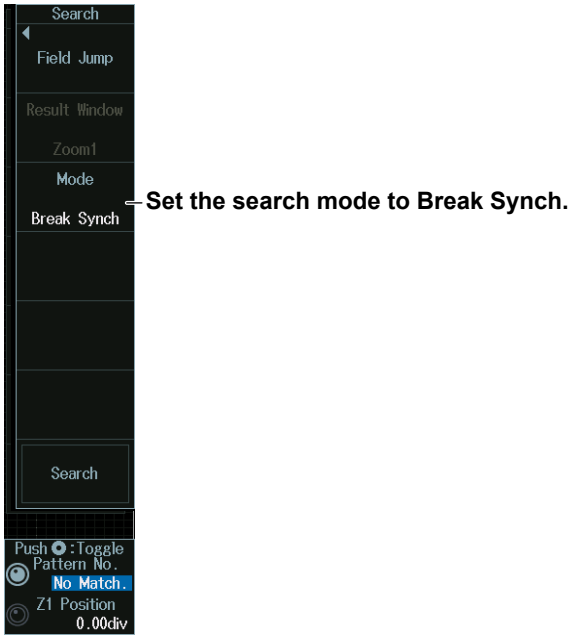


Search Type (Mode)

Break Synch Mode

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

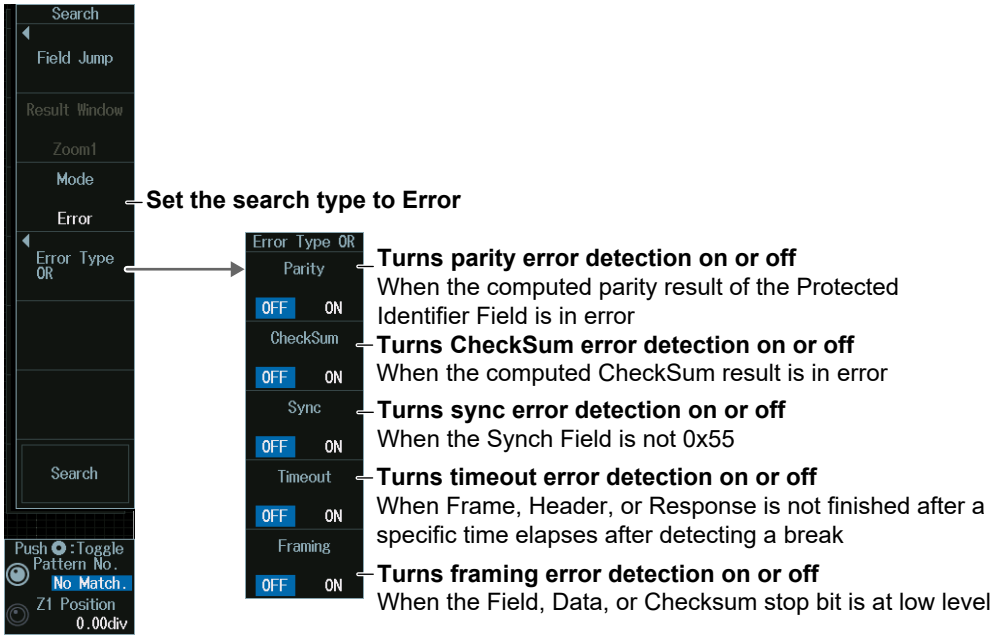
The instrument searches for a position where a break field and then a synch field (Break Field + Synch Field) is detected.



Error Mode

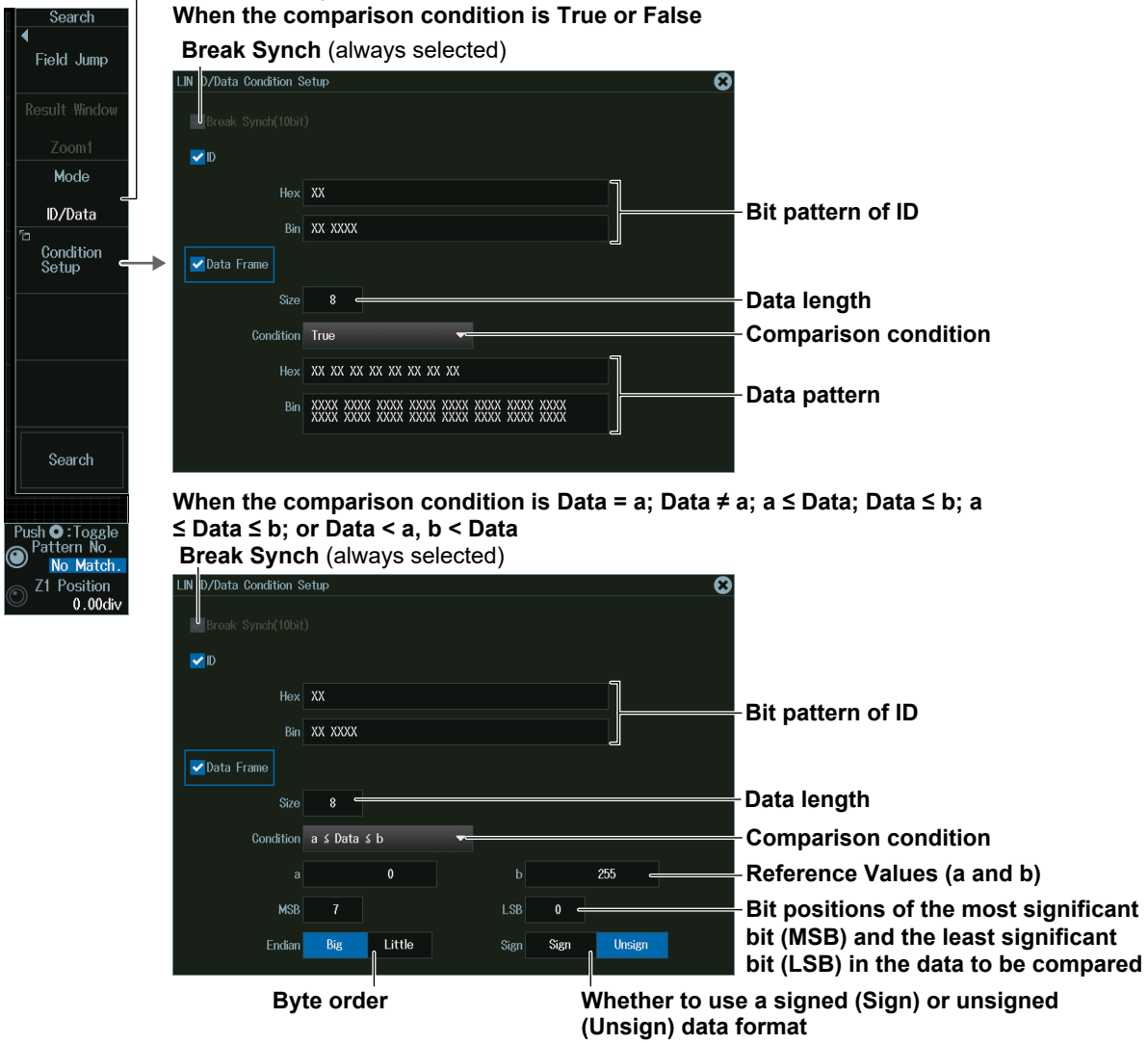
Press the **Mode** soft key and then the **Error** soft key to display the following menu.

The instrument searches for errors.



ID/Data mode

1. Press the **Mode** soft key and then the **ID/Data** soft key.
2. Press the **Condition Setup** soft key to display the following menu.
   The instrument searches for the position where the AND condition of the Break Synch, ID bit pattern and Data pattern is met.



Detected Point Number and Zoom Position (Pattern No. /Z1 Position or Z2 Position)

1. Execute a search. Check that a location matching the search conditions is found.
2. Turn the **jog shuttle** to set the detected point number (Pattern No.) and zoom position (Z1 Position or Z2 Position).
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
   - Press **SET** (upper right on the front panel) to switch between detected point number (Pattern No.) and zoom position (Z1 Position or Z2 Position).

Jog shuttle setting menu

12.5 Analyzing and Searching CXPI Bus Signals (Option)

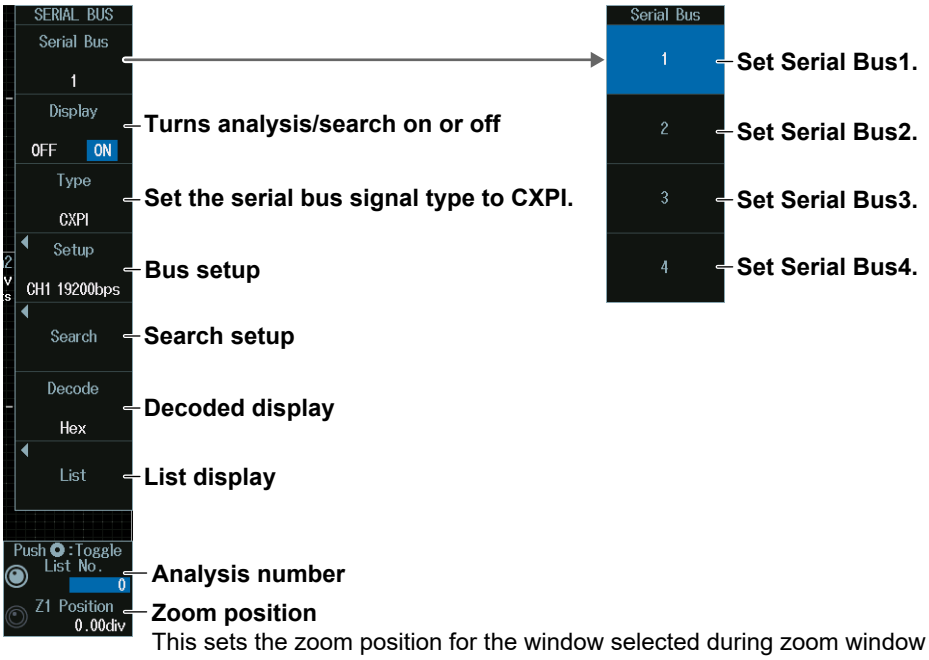
This section explains the following settings for analyzing or searching CXPI bus signals:

- Turning analysis and search displays on or off
- Serial bus signal types
- Bus setup
  Auto setup, analysis/search source waveform, bit rate, T Sample, clock tolerance, counter error detection, level and hysteresis for detecting analysis/search source waveform states
- Decoded display
- List display
  List size, display position, and zoom linking
- Analysis number
- Zoom position
- Search settings
  Jumping to a specified field, zoom window, search type, and search execution

► "Analyzing and Searching Serial Bus Signals,"
"Analyzing and Searching CXPI Bus Signals (Option)" in the Features Guide

SERIAL BUS CXPI Menu

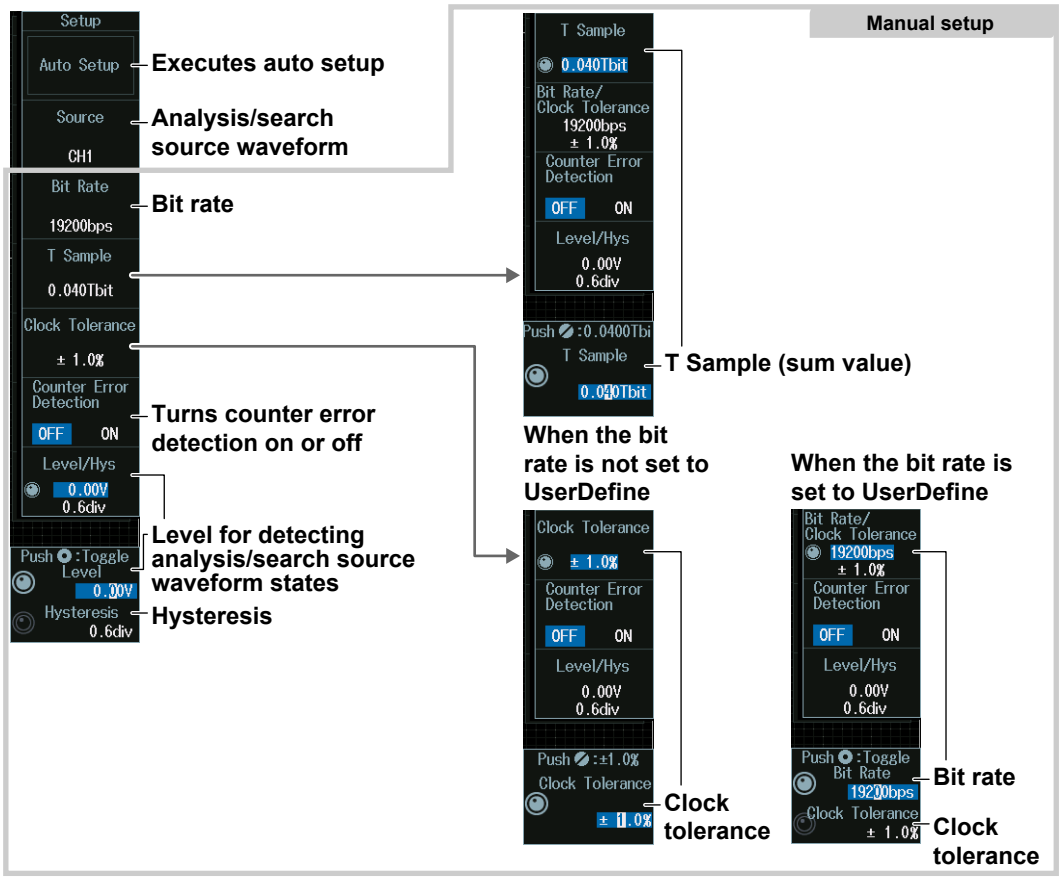
1. Press **SHIFT+SEARCH** (SERIAL BUS) to display the SERIAL BUS menu.
   - You can also tap **MENU** (MENU) in the upper left of the screen and select the SERIAL BUS menu from ANALYSIS on the top menu that is displayed.
   - You can also press **ANALYSIS** and then the **To SERIAL BUS** soft key to display the SERIAL BUS menu.
   - The instrument can analyze and search up to four serial bus signals. To switch to the setup menu, press the Serial Bus soft key and select a number from 1 to 4.
2. Press the **Type** soft key. From the setup menu that appears, select **CXPI** to display the following menu.



Zoom position
This sets the zoom position for the window selected during zoom window configuration (described later).

Bus Setup (Setup)

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



Executing Auto Setup (Auto Setup)

1. Set the analysis/search source waveform.
   Auto setup cannot be performed when the source is set to Math1 to Math8.
2. Press the **Auto Setup** soft key to execute auto setup.
   - The instrument automatically sets the bit rate, level, and hysteresis and triggers on the start position (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.

Note

- The auto setup feature will not work properly on some input signals.
- The available source waveforms vary depending on the model.
  - The available settings on 8ch models are as follows:
    CH1 to CH8, Math1 to Math8
  - The available settings on 4ch models are as follows:
    CH1 to CH4, Math1 to Math4

Manual Setup

After running auto setup, you can change the following settings and display decoded results.

- Bit rate
- T Sample
- Clock tolerance
- Counter error detection
- Level for detecting analysis/search source waveform states
- Hysteresis

Sum Value (T Sample)

Turn the **jog shuttle** to set the sum value.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Sum value

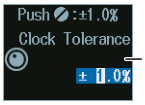
Clock Tolerance (Clock Tolerance) and Bit Rate (Bit Rate)

When the bit rate is not set to User Define

Turn the **jog shuttle** to set the clock tolerance.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu



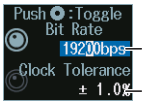
Clock tolerance

When the bit rate is set to User Define

Turn the **jog shuttle** to set the bit rate or clock tolerance.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu



Bit rate

Clock tolerance

Press SET (upper right on the front panel) to switch between bit rate and clock tolerance.

Level for Detecting Analysis/Search Source Waveform States (Level/Hysteresis)

Turn the **jog shuttle** to set the level or hysteresis.

- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
- To set the level, you can drag the level display line on the screen.

Jog shuttle setting menu

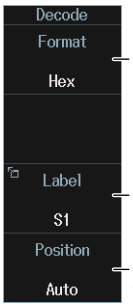
Level for detecting analysis/search source waveform states

Hysteresis

Press SET (upper right on the front panel) to switch between level and hysteresis.

Decoded Display (Decode)

Press the **Decode** soft key. The following menu items appear.



Decode Display Format

Label

Display position

The position is set to Auto when you execute auto setup on the analysis menu of each serial bus signal. The position changes from Auto to Manual when you drag the decode display.

When the display position is set to Manual

Display position

Display Position (Position)

When the display position is set to Manual, turn the **jog shuttle** to set the display position (Position).

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

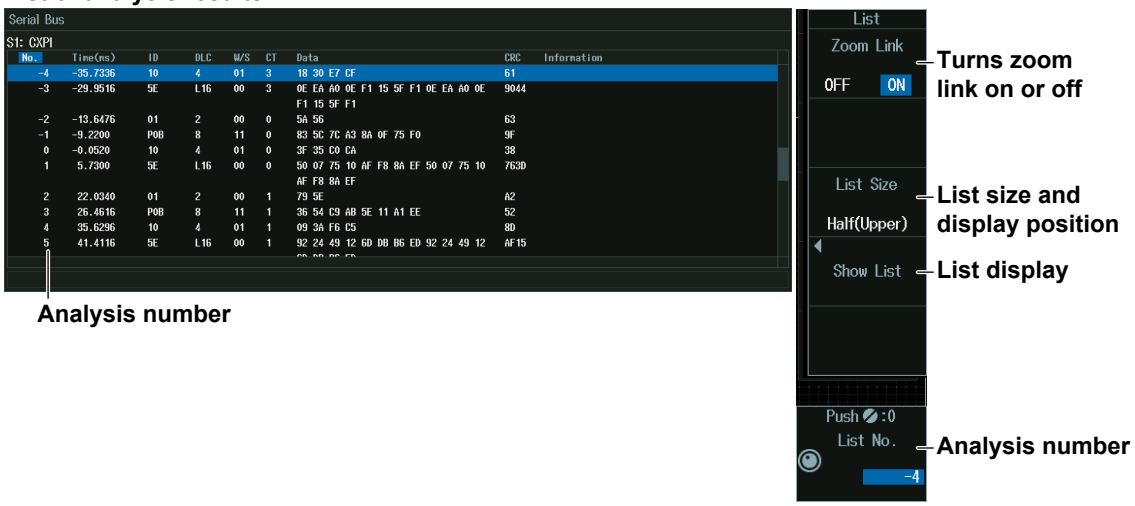
Jog shuttle setting menu

Display position

List Display (List)

1. Press the **Display** soft key, and turn on the analysis and search displays.
2. Press the **List** soft key and then the **Show List** soft key.
   - The list of analysis results and the next menu appear.
   - If several display settings of Serial Bus 1 to 4 are on, all the lists of analysis results of the serial buses whose display setting is on are displayed. For details, see section 12.12.

List of analysis results



Note

Analysis Number

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).

Analysis Number (List No.)

Turn the **jog shuttle** to set the analysis number (List No.).

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Search Setup (Search)

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

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.

Search type

Executes the search
The instrument searches for the search conditions. If the instrument 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.

Detected point number

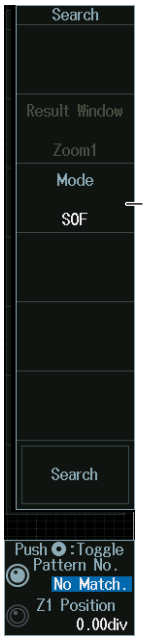
Zoom position

Search Type (Mode)

SOF Mode (Start of Frame)

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

The instrument searches for the start position of CXPI bus signal frames.

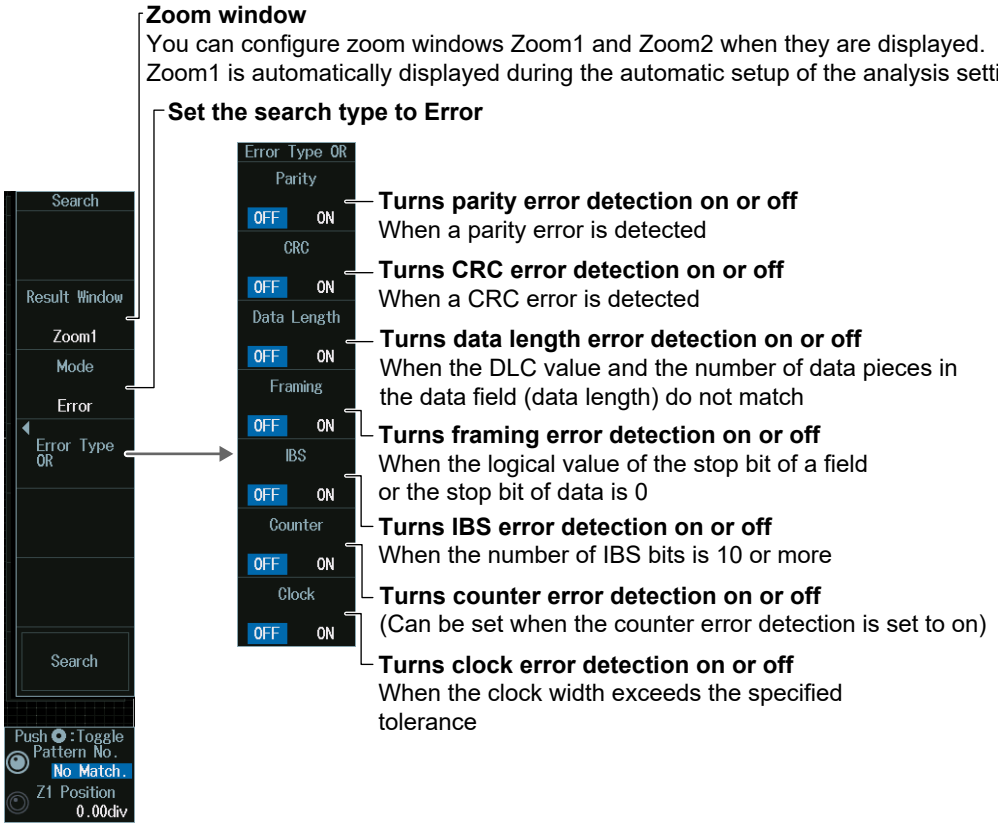


Set the search type to SOF

Error Mode

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

The instrument searches for various errors.



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.

Set the search type to Error

Turns parity error detection on or off
When a parity error is detected

Turns CRC error detection on or off
When a CRC error is detected

Turns data length error detection on or off
When the DLC value and the number of data pieces in the data field (data length) do not match

Turns framing error detection on or off
When the logical value of the stop bit of a field or the stop bit of data is 0

Turns IBS error detection on or off
When the number of IBS bits is 10 or more

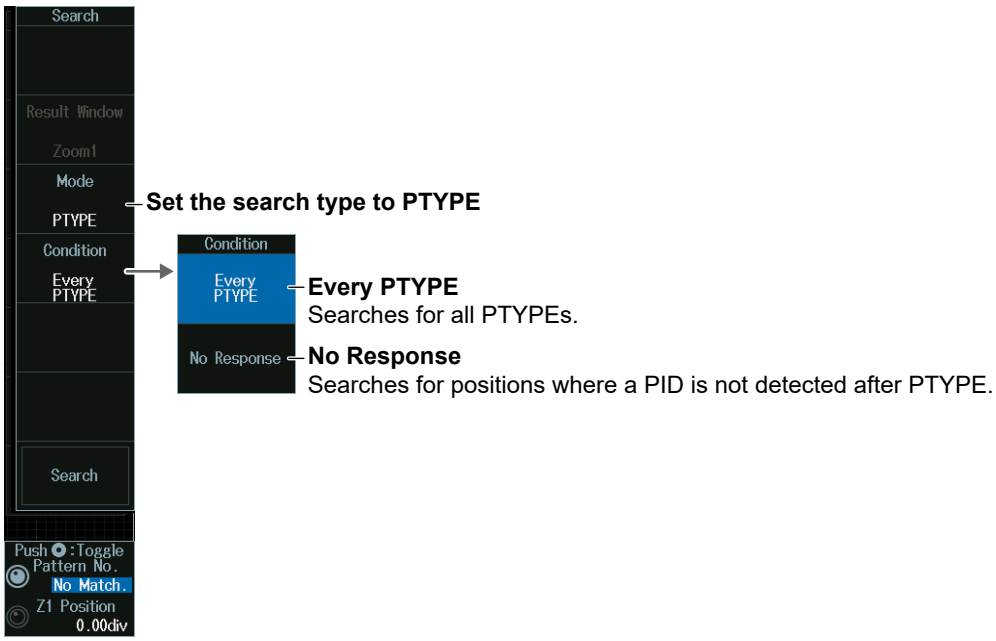
Turns counter error detection on or off
(Can be set when the counter error detection is set to on)

Turns clock error detection on or off
When the clock width exceeds the specified tolerance

PTYPE Mode

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

The instrument searches for the PTYPE of the CXPI bus signal.



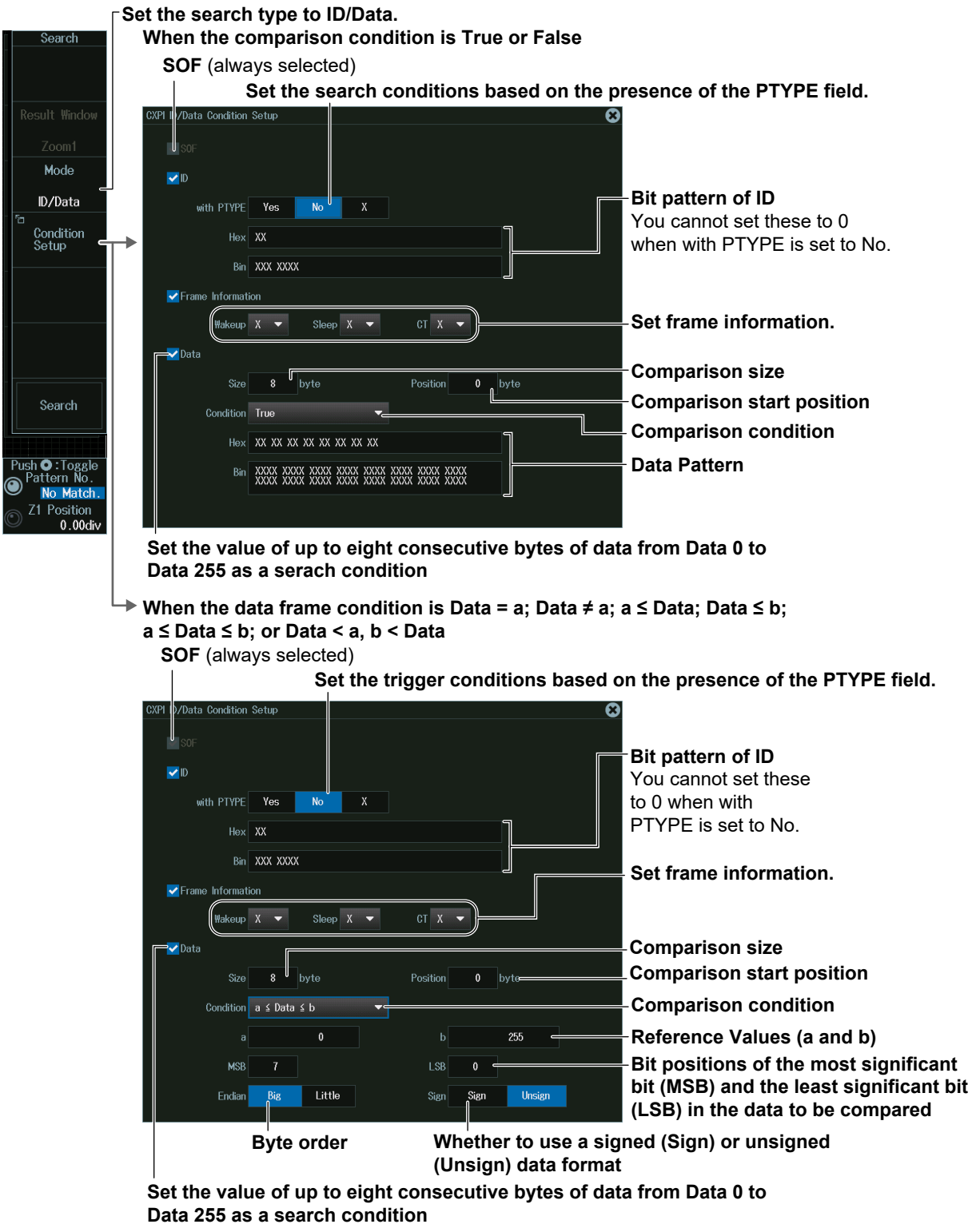
Set the search type to PTYPE

Every PTYPE
Searches for all PTYPEs.

No Response
Searches for positions where a PID is not detected after PTYPE.

ID/Data Mode

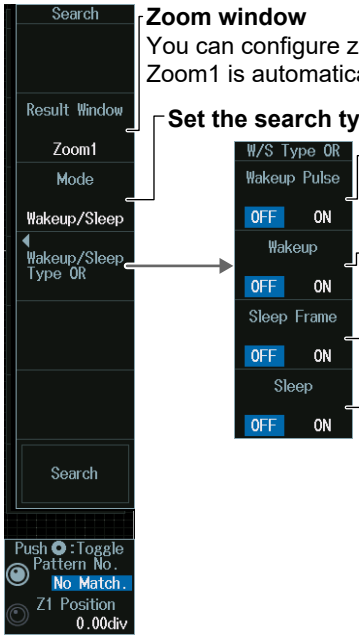
1. Press the **Mode** soft key and then the **ID/Data** soft key.
2. Press the **Condition Setup** soft key to display the following menu.
   The instrument searches for the position where the AND condition of the SOF, ID bit pattern, frame information, and Data pattern is met.



Wakeup/Sleep Mode

Press the **Mode** soft key and then the **Wakeup/Sleep** soft key to display the following menu.

The instrument searches for wakeup pulses, wakeup states, sleep frames, or sleep states.



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.

Set the search type to Wakeup/Sleep

Turns wakeup pulse search on or off
Searches for pulses in the dominant period between 250 µs and 2500 µs

Turns wakeup search on or off
Searches for transitions from a state in which there is no clock after a sleep detection to a state in which there is a clock

Turns sleep frame search on or off
When the sleep frame ID value is 1F (hexadecimal)

Turns sleep search on or off
When 5 ms elapses after a transition is made from a state in which there is a clock to a state in which there is no clock

Detected Point Number and Zoom Position (Pattern No. /Z1 Position or Z2 Position)

1. Execute a search. Check that a location matching the search conditions is found.
2. Turn the **jog shuttle** to set the detected point number (Pattern No.) and zoom position (Z1 Position or Z2 Position).
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
   - Press **SET** (upper right on the front panel) to switch between detected point number (Pattern No.) and zoom position (Z1 Position or Z2 Position).

Jog shuttle setting menu

Detected point number

Zoom position

12.6 Analyzing and Searching SENT Signals (Option)

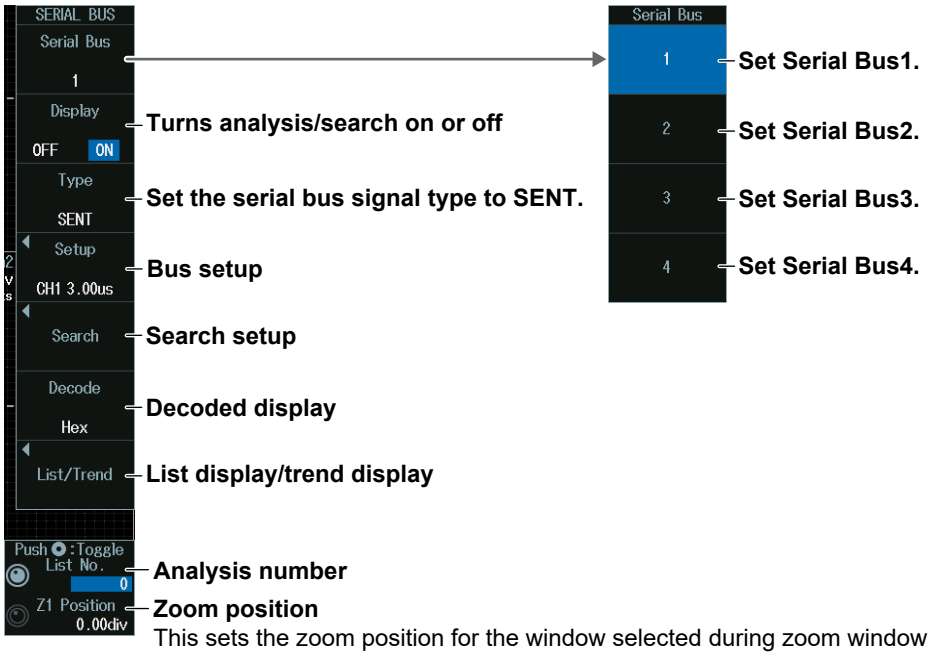
This section explains the following settings for analyzing or searching SENT signals:

- Turning analysis and search displays on or off
- Serial bus signal types
- Bus setup
  Auto setup, analysis/search source waveform, format, display channel, fast channel data type, slow channel message type, level and hysteresis for detecting analysis/search source waveform states
- Decoded display
- List display
  List size, display position, and zoom linking
- Trend Display
  Display source, User Data, display settings, cursor measurement on/off, message ID
- Analysis number
- Zoom position
- Search settings
  Zoom window, search type, and search execution

► **"Analyzing and Searching Serial Bus Signals," "Analyzing and Searching SENT Signals (Option)" in the Features Guide**

SERIAL BUS SENT Menu

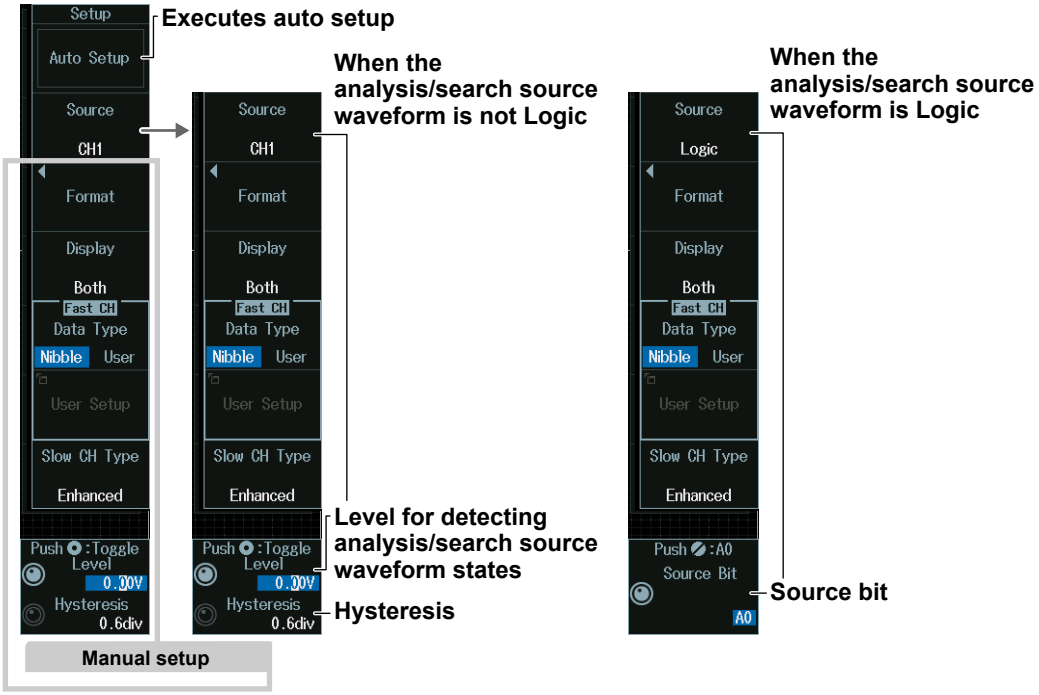
1. Press **SHIFT+SEARCH** (SERIAL BUS) to display the SERIAL BUS menu.
   - You can also tap **MENU** (MENU) in the upper left of the screen and select the SERIAL BUS menu from ANALYSIS on the top menu that is displayed.
   - You can also press **ANALYSIS** and then the **To SERIAL BUS** soft key to display the SERIAL BUS menu.
   - The instrument can analyze and search up to four serial bus signals. To switch to the setup menu, press the Serial Bus soft key and select a number from 1 to 4.
2. Press the **Type** soft key. From the setup menu that appears, select **SENT** to display the following menu.



Zoom position
This sets the zoom position for the window selected during zoom window configuration (described later).

Bus Setup (Setup)

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



Executing Auto Setup (Auto Setup)

1. Set the analysis/search source waveform.
2. If you set the trigger source to Logic, set the source bit.
3. Press the **Auto Setup** soft key to execute auto setup.
   - The instrument automatically sets 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, press the **Abort** soft key.

Note

- The auto setup feature will not work properly on some input signals.
- You cannot use auto setup under the following circumstances.
  - When the Analysis/Search Source Waveform Is Math1 to Math8
  - When state display is applied to a LOGIC bit that is set as the analysis/search source waveform.
- The available source waveforms vary depending on the model.
  - The available settings on 8ch models are as follows:
    CH1 to CH8, Logic, Math1 to Math8
  - The available settings on 4ch models are as follows:
    CH1 to CH4, Logic, Math1 to Math4

Source Bit

The following source bit display applies to models with the /L32 option.
C0 to C7 (LOGIC port C), D0 to D7 (LOGIC port D)

Level for Detecting Analysis/Search Source Waveform States (Level/Hysteresis)

Turn the **jog shuttle** to set the level or hysteresis.

- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
- To set the level, you can drag the level display line on the screen.

Jog shuttle setting menu

Level for detecting analysis/search source waveform states

Hysteresis

Press SET (upper right on the front panel) to switch between level and hysteresis.

Source Bit (Source Bit)

Turn the **jog shuttle** to set the source bit.

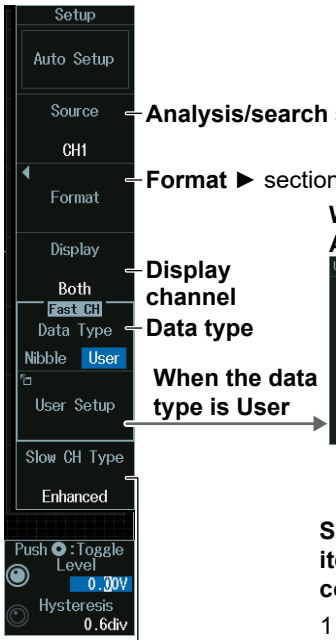
You can also tap the jog shuttle setting menu in the lower right of the screen and use the pop-up menu that appears on the screen.

Jog shuttle setting menu

Source bit

Manual Setup

Manually set the format, data type, and so on.



Analysis/search source waveform

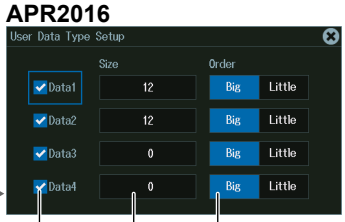
Format ► section 2.18

Display channel

Data type

When the data type is User

When the version is other than APR2016

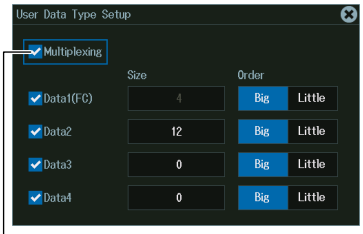


Nibble order

Data size [1]

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

When the version is APR2016



Select this check box in the case of a multiplexed signal [2]

1 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.

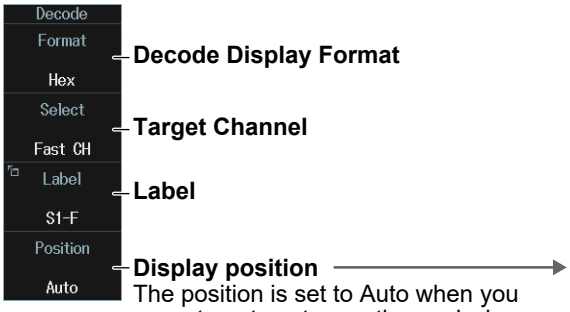
2 When the check box for Multiplexing is selected, the Size of Data1 is fixed to 4 to correspond to FC.

Slow channel message type

(Can be set when the format version is APR2016 or JAN2010 ► section 2.18)

Decoded Display (Decode)

Press the **Decode** soft key. The following menu items appear.



Decode Display Format

Target Channel

Label

Display position

The position is set to Auto when you execute auto setup on the analysis menu of each serial bus signal. The position changes from Auto to Manual when you drag the decode display.

When the display position is set to Manual

Display position

Display Position (Position)

When the display position is set to Manual, turn the **jog shuttle** to set the display position (Position).

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

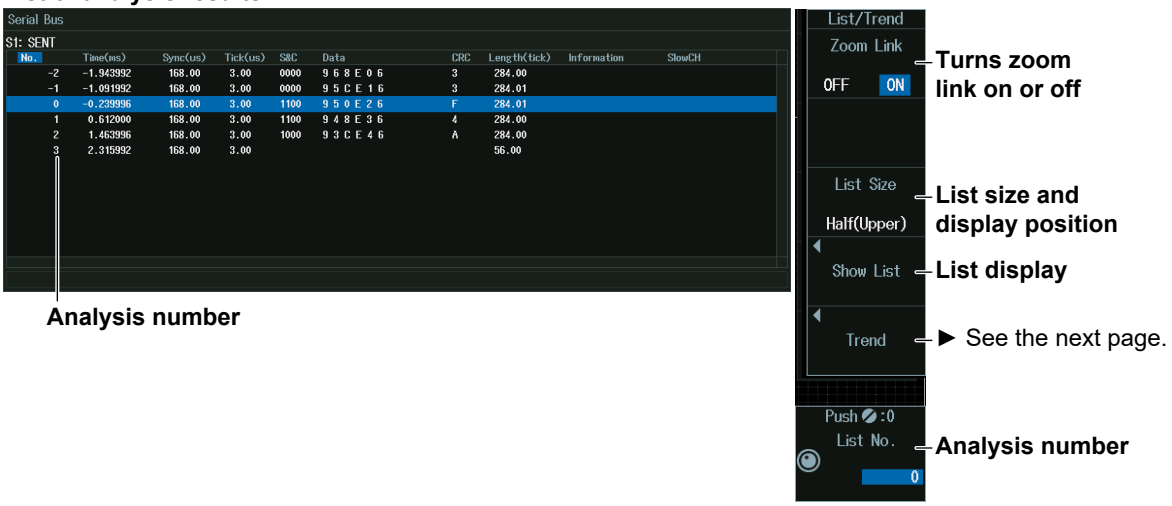
Jog shuttle setting menu

Display position

List Display (List/Trend_List)

1. Press the **Display** soft key, and turn on the analysis and search displays.
2. Press the **List/Trend** soft key and then the **Show List** soft key.
   - The list of analysis results and the next menu appear.
   - If several display settings of Serial Bus 1 to 4 are on, all the lists of analysis results of the serial buses whose display setting is on are displayed. For details, see section 12.12.

List of analysis results



Note

Analysis Number

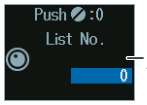
Data before the trigger position (on the left side of the waveform display) is assigned analysis numbers in descending order (–1, –2, and so on). Data after the trigger position (on the right side of the waveform display) is assigned analysis numbers in ascending order (0, 1, 2, and so on).

Analysis Number (List No.)

Turn the **jog shuttle** to set the analysis number (List No.).

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu



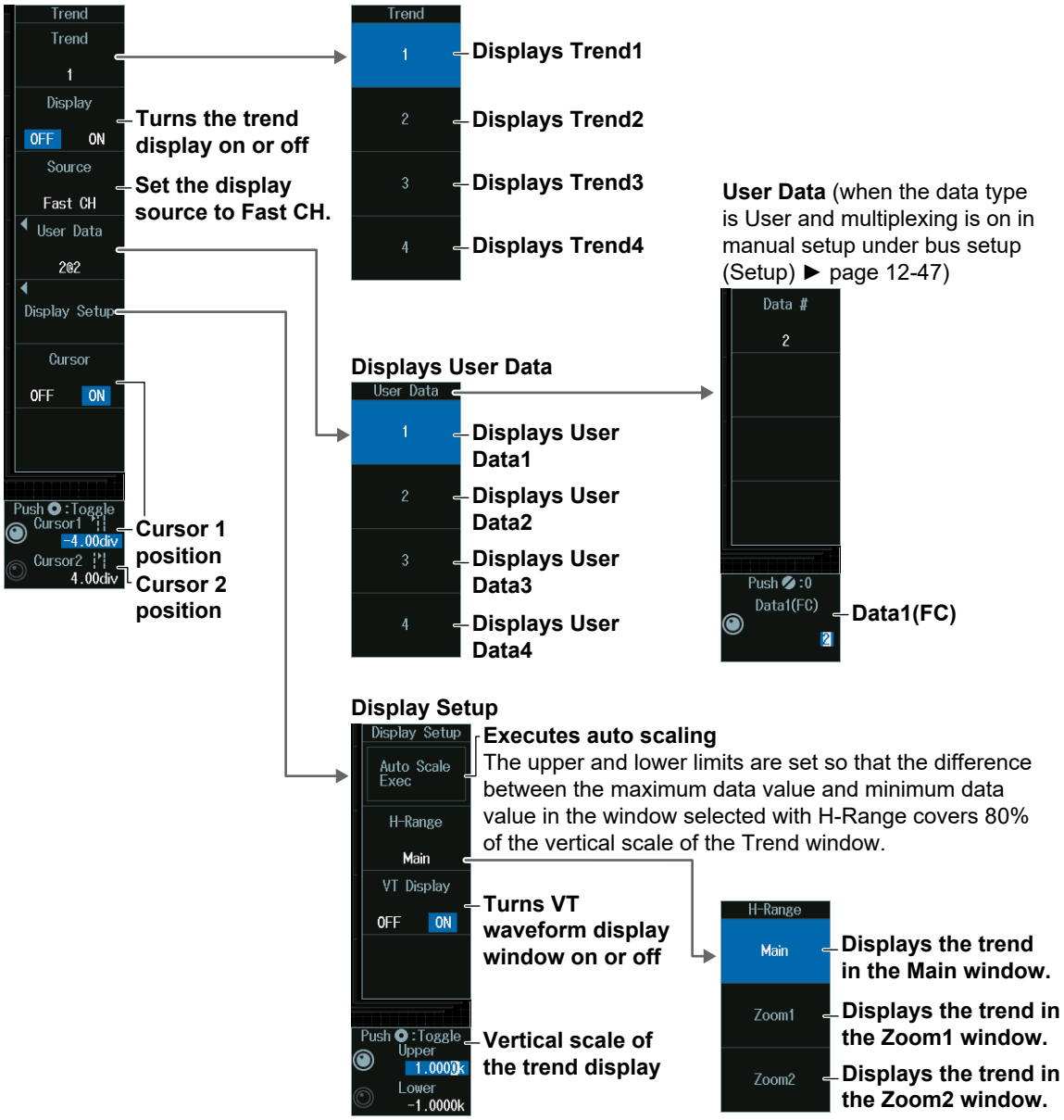
Trend Display (List/Trend_Trend)

1. Press the **Display** soft key, and turn on the analysis and search displays.
2. Press the **List/Trend** soft key and then the **Trend** soft key.
   - Up to four trends can be displayed. To switch to the setup menu, press the **Trend** soft key and select a number from 1 to 4.

When the Display Source Is Set to Fast Channel

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

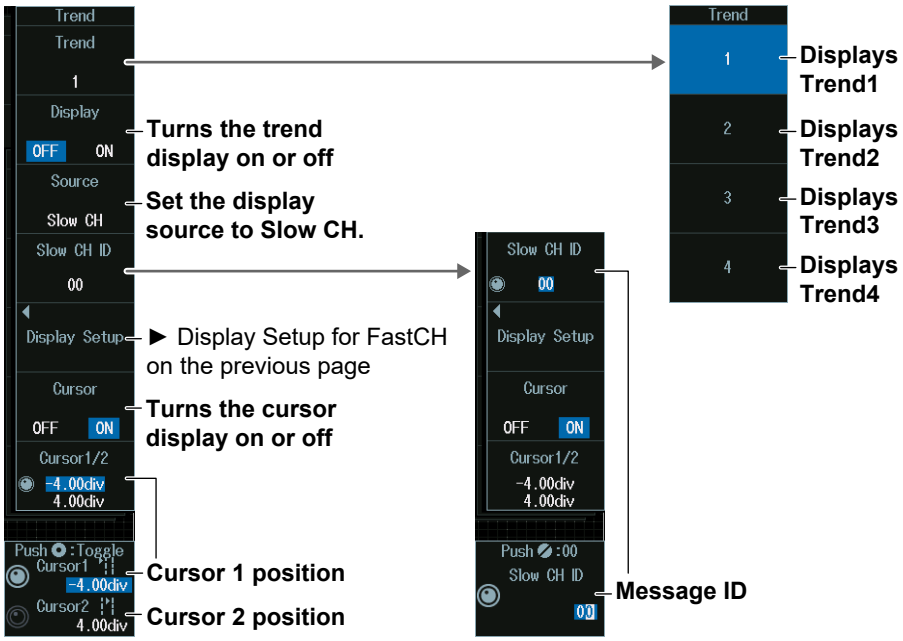
Up to four trends can be displayed. To switch to the setup menu, press the **Trend** soft key and select a number from 1 to 4.



When the Display Source Is Set to Slow Channel

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

Up to four trends can be displayed. To switch to the setup menu, press the **Trend** soft key and select a number from 1 to 4.



Message ID (Slow CH ID)

1. Press the **Slow CH ID** soft key.
2. Turn the **jog shuttle** to set the message ID (Slow CH ID).
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Message ID (Slow CH ID)

Set the message ID of the data you want to display the trend of. The selectable ID range varies depending on the decode display setting in the SERIAL BUS_SENT Menu (page 12-45), format version in the bus setup (Setup) (page 12-46), and the slow channel message type.

Version	FEB2008 and older		—	
	APR2016, JAN2010			
Slow channel message type	Short		Enhanced	
Decode display setting	Hex	Dec	Hex	Dec
Range	0 to F	0 to 15	00 to FF	0 to 255

Cursor Positions (Cursor1/Cursor2)

1. Press the **Cursor1/2** soft key.
2. Turn the **jog shuttle** to set cursor 1 (Cursor1) or cursor 2 (Cursor2).
   - Press **SET** (upper right on the front panel) to switch between cursor 1 and cursor 2.
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Cursor 1 position

Cursor 2 position

Note

Setting the Cursor Positions

If you press SET several times and make the jog shuttle control both cursor 1 and cursor 2, you can move them together.

When you move the two cursors together, the cursors no longer move when one of the cursors reaches the edge of the screen.

Search Setup (Search)

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

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.

Search type

Executes the search

The instrument searches for the search conditions. If the instrument 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.

Detected point number

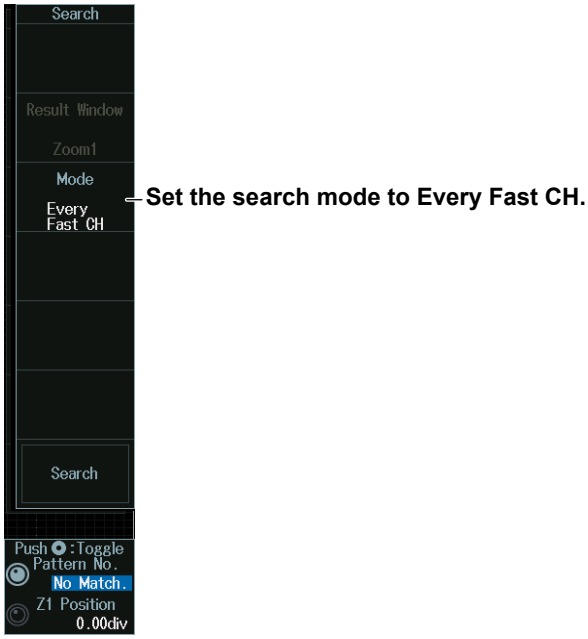
Zoom position

Search Type (Mode)

Every Fast CH mode

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

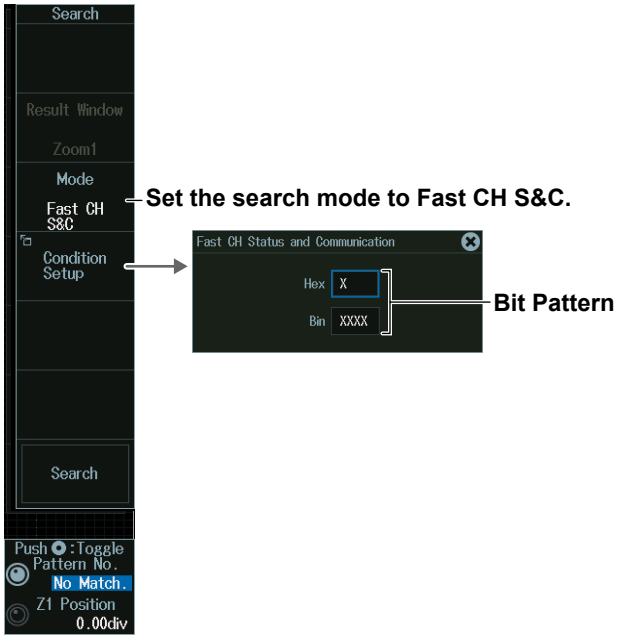
The instrument searches when it detects a fast channel message.



Fast CH S&C mode

Press the **Mode** soft key and then the **Fast CH S&C** soft key to display the following menu.

The instrument searches on the status and communication bit pattern.

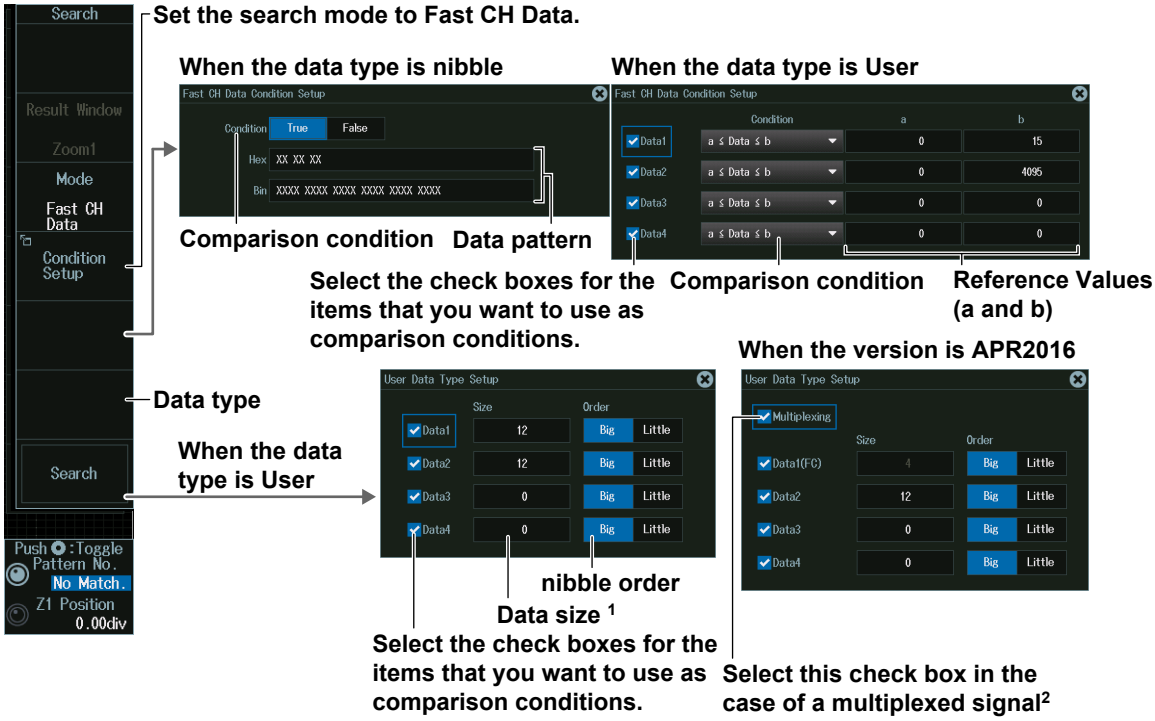


Fast CH Data mode

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

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

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



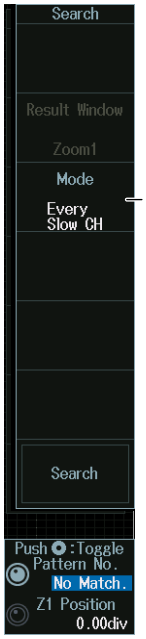
1 The total number of bits for Data1 to Data4 is up to 24. If you try to exceed the total number of bits, the data size of other pieces of Data is reduced.

2 When the check box for Multiplexing is selected, the Size of Data1 is fixed to 4 to correspond to FC.

Every Slow CH mode

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

The instrument searches when it detects an “Every Slow CH” message.



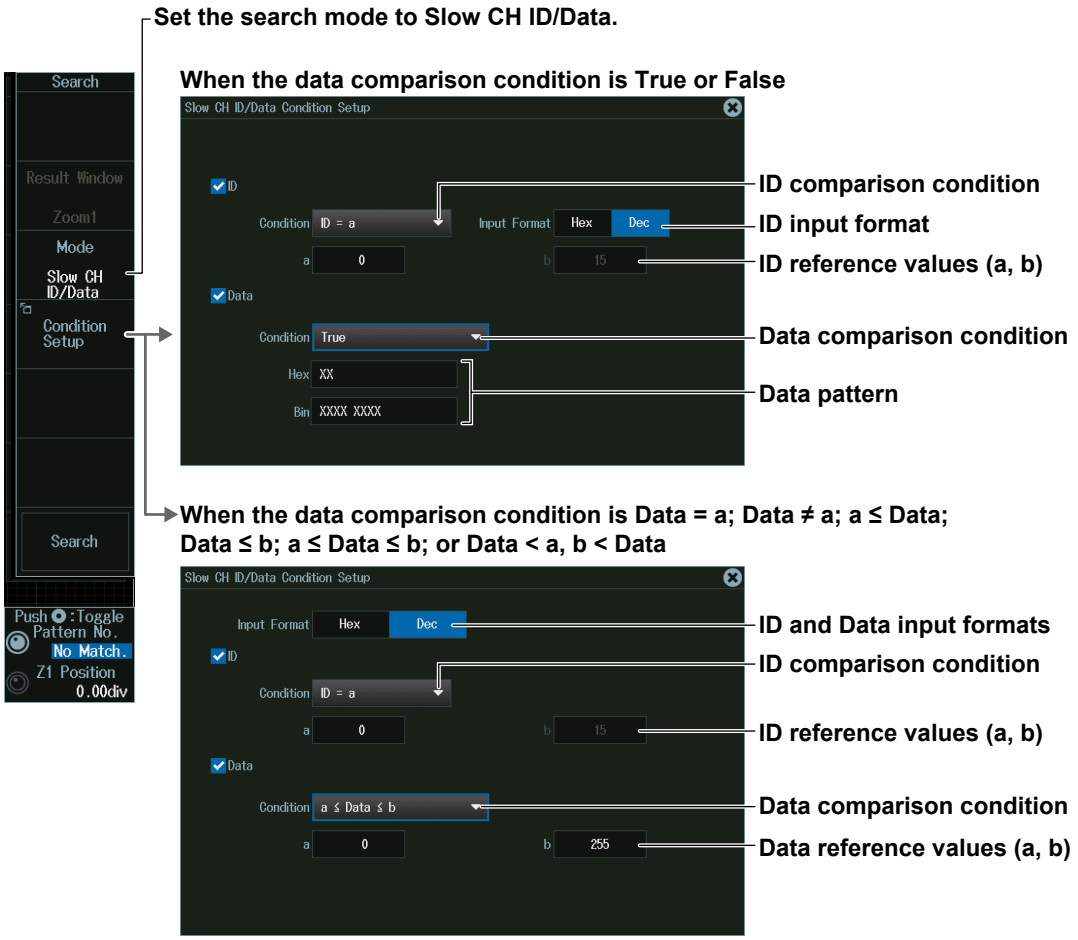
Set the search mode to Every Slow CH.

Slow CH ID/Data mode

1. Press the **Mode** soft key and then the **Slow CH ID/Data** soft key.
2. Press the **Condition Setup** soft key. The menu that appears varies depending on the specified slow channel message type.

   The instrument seraches 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**



Setting ID/Data Reference Values a and b

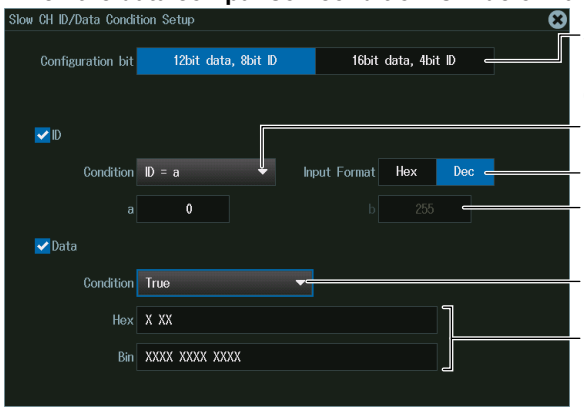
Input format setting		Hex	Dec
Selectable range for reference values a and b	ID	0 to F	0 to 15
	Data	00 to FF	00 to 255

- **When the Message Type Is Enhanced**

  - **When the ID and Data Message Formats Are Set to "12bit data, 8bit ID"**

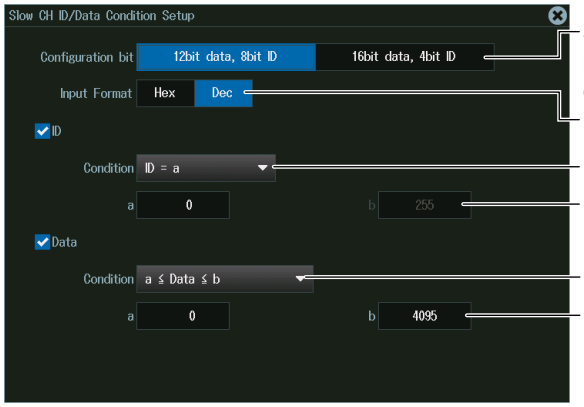
Set the search mode to Slow CH ID/Data.

When the data comparison condition is True or False



Set the ID and data message formats to 12bit data and 8bit ID.
ID comparison condition
ID input format
ID reference values (a, b)
Data comparison condition
Data pattern

When the data comparison condition is Data = a; Data ≠ a; a ≤ Data; Data ≤ b; a ≤ Data ≤ b; or Data < a, b < Data



Set the ID and data message formats to 12bit data and 8bit ID.
ID and Data input formats
ID comparison condition
ID reference values (a, b)
Data comparison condition
Data reference values (a, b)

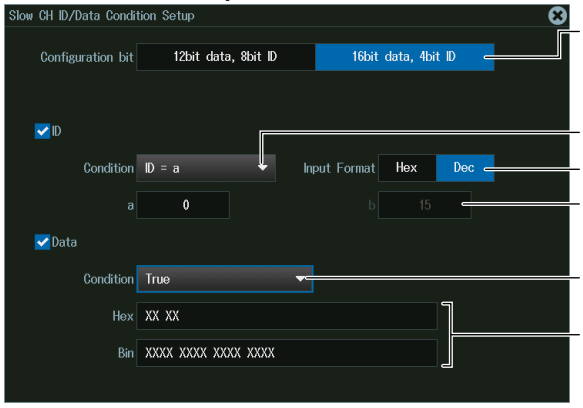
Setting ID/Data Reference Values a and b

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”

Set the search mode to Slow CH ID/Data.

When the data comparison condition is True or False



Set the ID and data message formats to 16bit data and 4bit ID.

ID comparison condition

ID input format

ID reference values (a, b)

Data comparison condition

Data pattern

When the data comparison condition is Data = a; Data ≠ a; a ≤ Data; Data ≤ b; a ≤ Data ≤ b; or Data < a, b < Data

Set the ID and data message formats to 16bit data and 4bit ID.

ID and Data input formats

ID comparison condition

ID reference values (a, b)

Data comparison condition

Data reference values (a, b)

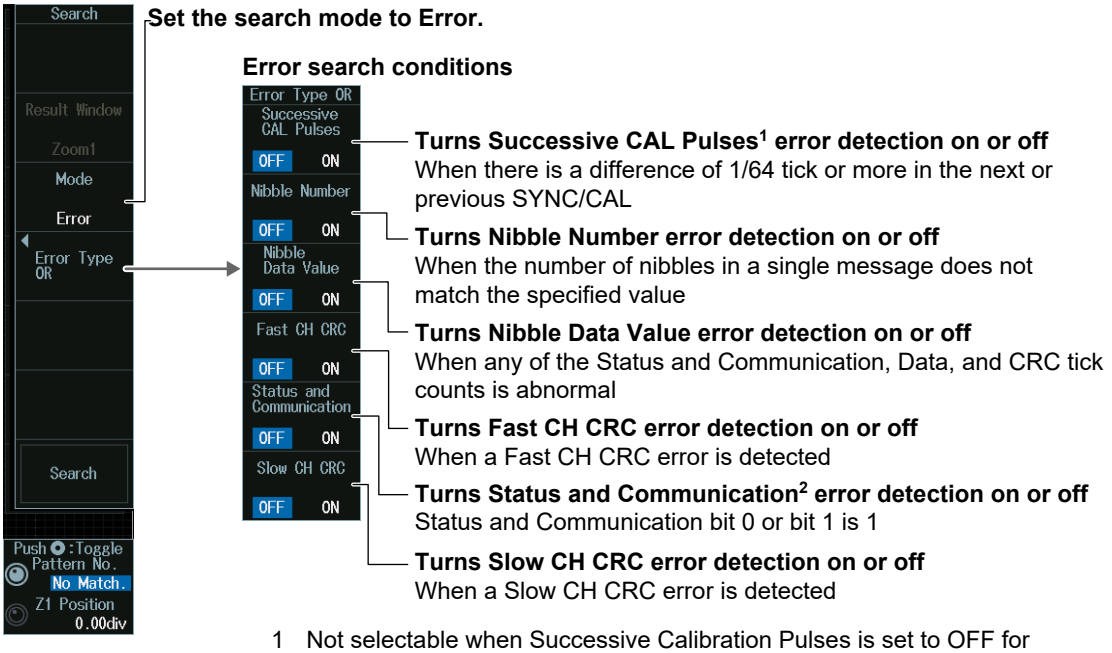
Setting ID/Data Reference Values a and b

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.

The instrument searches when it detects various types of errors.



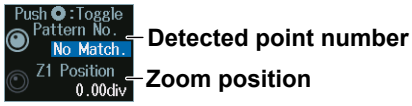
1 Not selectable when Successive Calibration Pulses is set to OFF for Customize Error Factor in “Setting the Format (Format) (page 2-68)

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 2-68)

Detected Point Number and Zoom Position (Pattern No. /Z1 Position or Z2 Position)

1. Execute a search. Check that a location matching the search conditions is found.
2. Turn the **jog shuttle** to set the detected point number (Pattern No.) and zoom position (Z1 Position or Z2 Position).
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
   - Press **SET** (upper right on the front panel) to switch between detected point number (Pattern No.) and zoom position (Z1 Position or Z2 Position).

Jog shuttle setting menu



12.7 Analyzing and Searching PSI5 Airbag Signals (Option)

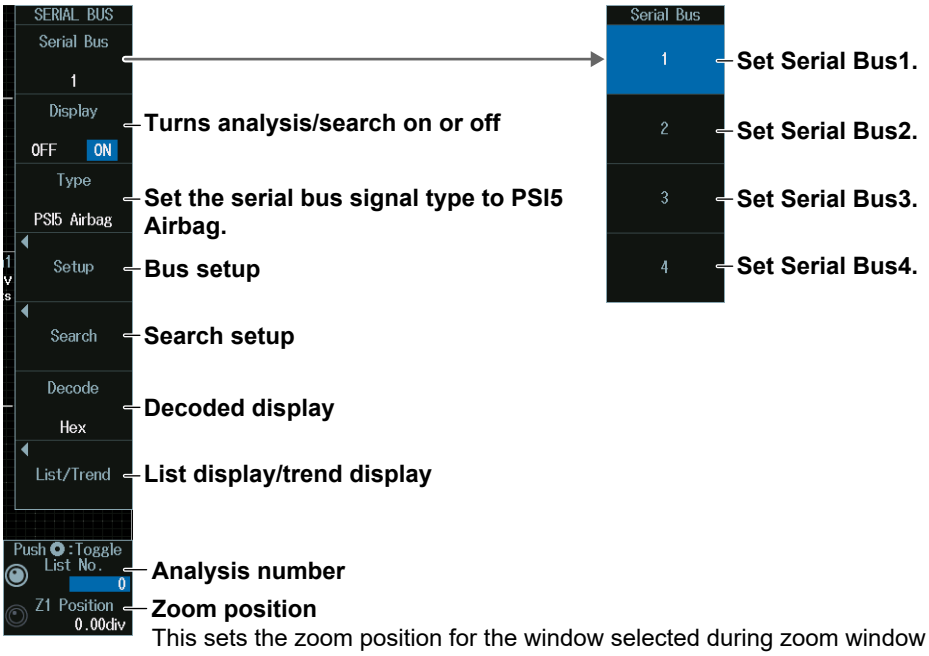
This section explains the following settings for analyzing or searching PSI5 Airbag signals:

- Turning analysis and search displays on or off
- Serial bus signal types
- Bus setup
  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
  Display source, display settings, cursor measurement on/off, auto scale
- Analysis number
- Zoom position
- Search settings
  Zoom window, search type, and search execution

► "Analyzing and Searching Serial Bus Signals,"
"Analyzing and Searching PSI5 Airbag Signals (Option)" in the Features Guide

SERIAL BUS PSI5 Airbag Menu

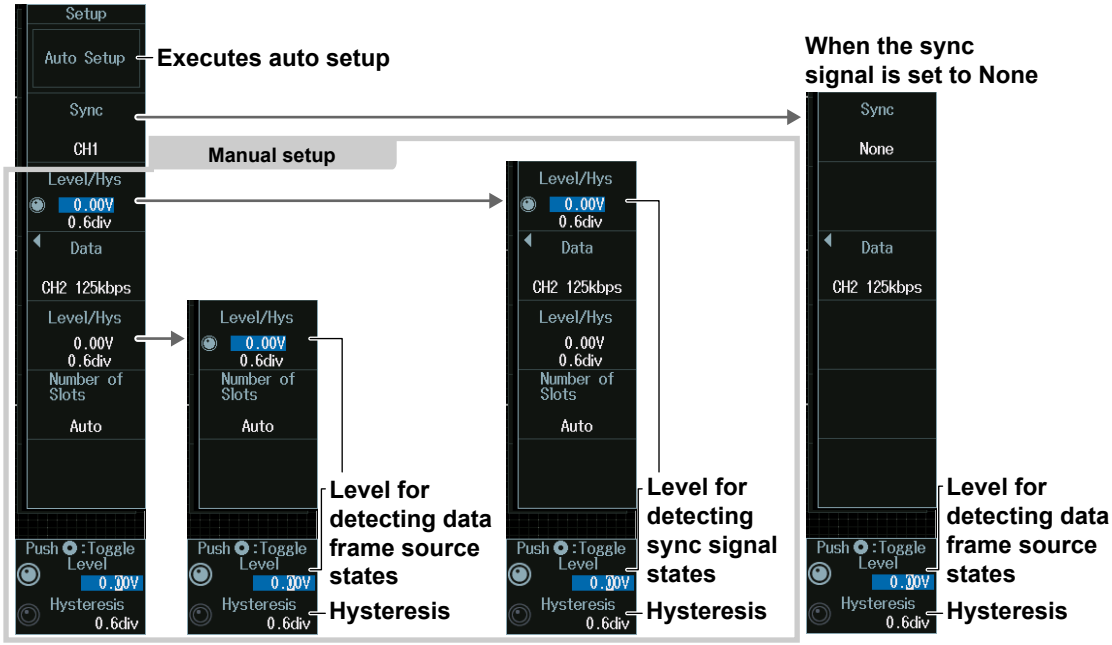
1. Press **SHIFT+SEARCH** (SERIAL BUS) to display the SERIAL BUS menu.
   - You can also tap **MENU** (MENU) in the upper left of the screen and select the SERIAL BUS menu from ANALYSIS on the top menu that is displayed.
   - You can also press **ANALYSIS** and then the **To SERIAL BUS** soft key to display the SERIAL BUS menu.
   - The instrument can analyze and search up to four serial bus signals. To switch to the setup menu, press the Serial Bus soft key and select a number from 1 to 4.
2. Press the **Type** soft key. From the setup menu that appears, select **PSI5 Airbag** to display the following menu.



Zoom position
This sets the zoom position for the window selected during zoom window configuration (described later).

Bus Setup (Setup)

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 Math8.
   - If you select None, sync signal is not detected. Therefore, sync signal 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 Math8.
3. Press the **Auto Setup** soft key to execute auto setup.
   - Bit rate, data length, error detection method, sync signal noise rejection, clock tolerance, number of slots, level, and hysteresis are set automatically.
   - While the serial bus is being configured, Auto Setup changes to Abort. If you want to stop, press the **Abort** soft key.

Note

- When the sync signal (Sync) source is CH1 to CH8, the instrument triggers on the rising edge of the sync pulse.
- When the sync signal source is None, the instrument triggers on the start bit of data frames.
- The auto setup feature will not work properly on some input signals.
- The available sync signal settings vary depending on the model.
  - The available settings on 8ch models are as follows:
    CH1 to CH8, Math1 to Math8, None
  - The available settings on 4ch models are as follows:
    CH1 to CH4, Math1 to Math4, None

Level for Detecting Sync Signal States (Level, Hysteresis)

1. Press the **Level/Hys** soft key.
   This is the soft key displayed under the Sync soft key.
2. Turn the **jog shuttle** to set the level or hysteresis.
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
   - To set the level, you can drag the level display line on the screen.

Jog shuttle setting menu

Level for detecting sync signal states

Hysteresis

Press SET (upper right on the front panel) to switch between level and hysteresis.

Level for Detecting Data Frame Source States (Level, Hysteresis)

- **When the Sync Signal Is Not Set to None**

1. Press the **Level/Hys** soft key.
   This is the soft key displayed under the Data soft key.
2. Turn the **jog shuttle** to set the level or hysteresis.
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
   - To set the level, you can drag the level display line on the screen.

Jog shuttle setting menu

Level for detecting data frame source states

Hysteresis

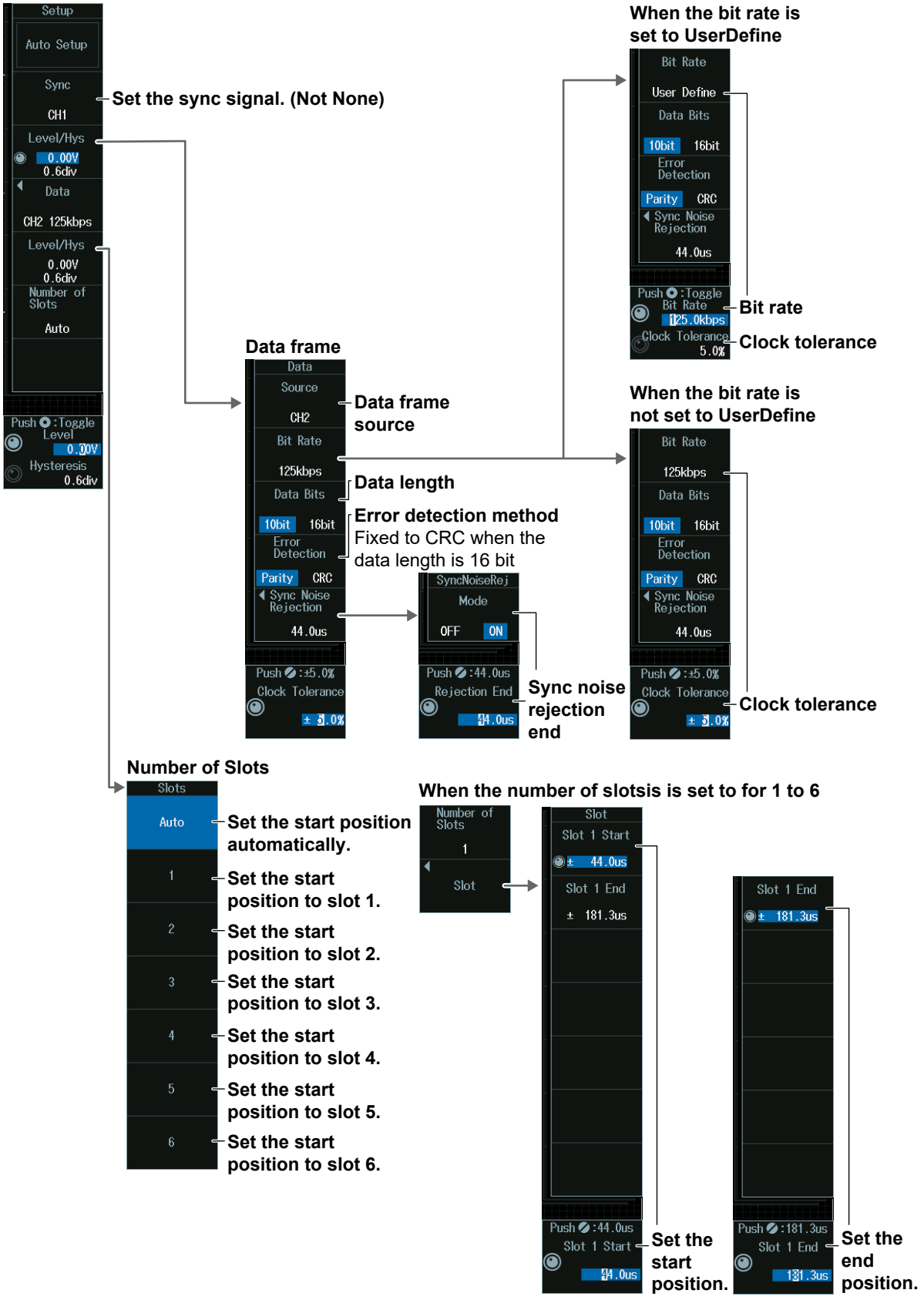
Press SET (upper right on the front panel) to switch between level and hysteresis.

- **When the Sync Signal Is Set to None**

  Turn the **jog shuttle** to set the level or hysteresis.
  - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
  - To set the level, you can drag the level display line on the screen.

Manual Setup

Manually set the data frames and number of slots.



Clock Tolerance (Clock Tolerance) and Bit Rate (Bit Rate)

When the bit rate is not set to User Define

Turn the **jog shuttle** to set the clock tolerance.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

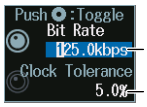
Clock tolerance

When the bit rate is set to User Define

Turn the **jog shuttle** to set the bit rate or clock tolerance.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu



Bit rate

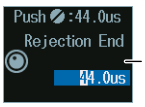
Clock tolerance

Press SET (upper right on the front panel) to switch between bit rate and clock tolerance.

Sync Noise Rejection End (Rejection End)

1. Press the **Sync Noise Rejection** soft key and then the **Mode** soft key to select ON. The Rejection End jog shuttle menu appears.
2. Turn the **jog shuttle** to set the sync noise rejection (Rejection End).
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu



Sync noise rejection end

Set the start position (Start) of each slot and the end position (End) of the last slot.

Setting the Start Position

1. Press the **Slot n Start** soft key to display the Slot n Start jog shuttle menu (where n is the number of slots).
2. Turn the **jog shuttle** to set the start position (Start).
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

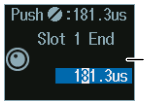
Jog shuttle setting menu

Start position

Setting the End Position

1. Press the **Slot n End** soft key to display the Slot n End jog shuttle menu (where n is the number of slots).
2. Turn the **jog shuttle** to set the end position (End).
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

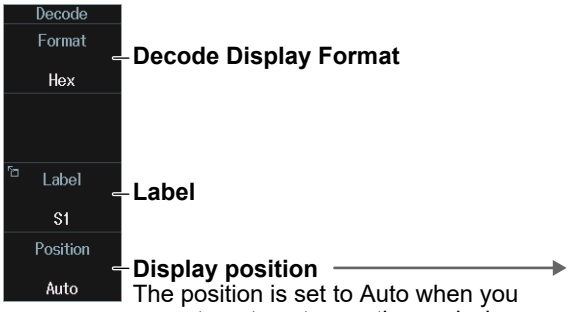
Jog shuttle setting menu



End position

Decoded Display (Decode)

Press the **Decode** soft key. The following menu items appear.



Decode Display Format

Label

Display position
The position is set to Auto when you execute auto setup on the analysis menu of each serial bus signal. The position changes from Auto to Manual when you drag the decode display.

When the display position is set to Manual

Display position

Display Position (Position)

When the display position is set to Manual, turn the **jog shuttle** to set the display position (Position).

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

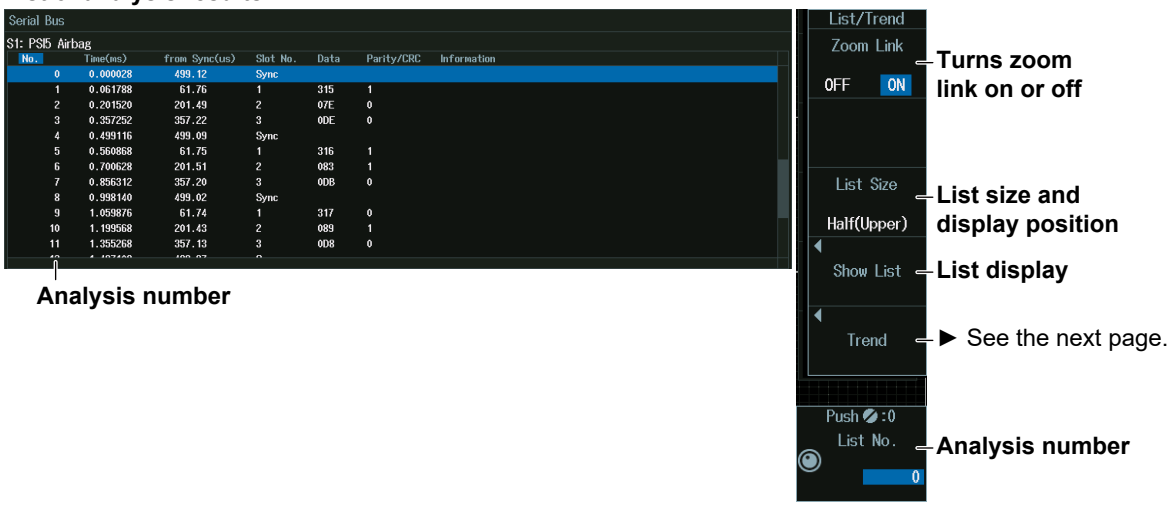
Jog shuttle setting menu

Display position

List Display (List/Trend_List)

1. Press the **Display** soft key, and turn on the analysis and search displays.
2. Press the **List/Trend** soft key and then the **Show List** soft key.
   - The list of analysis results and the next menu appear.
   - If several display settings of Serial Bus 1 to 4 are on, all the lists of analysis results of the serial buses whose display setting is on are displayed. For details, see section 12.12.

List of analysis results



Note

Analysis Number

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).

Analysis Number (List No.)

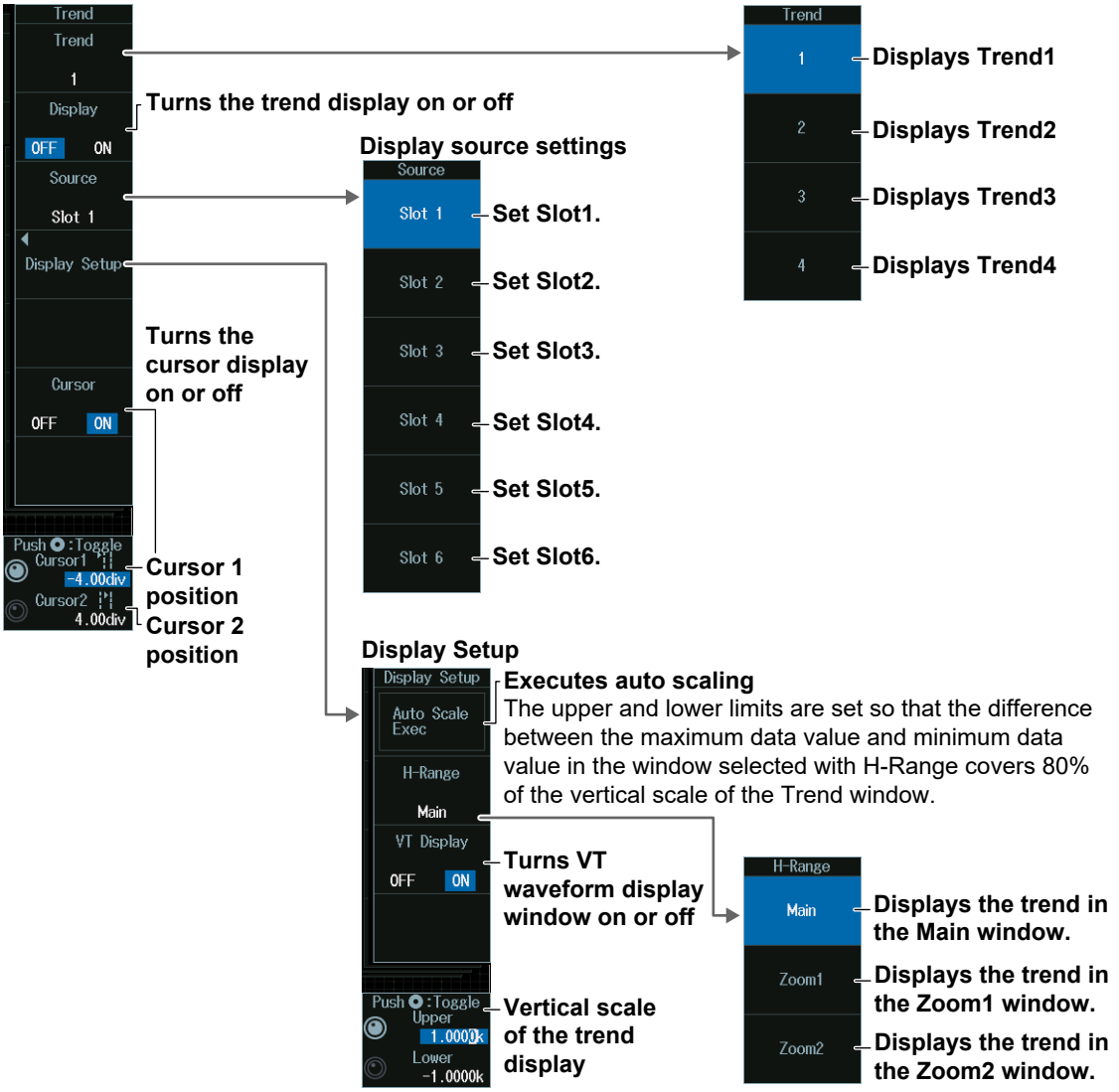
Turn the **jog shuttle** to set the analysis number (List No.).

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Trend Display (List/Trend_Trend)

1. Press the **Display** soft key, and turn on the analysis and search displays.
2. Press the **List/Trend** soft key and then the **Trend** soft key.
   - Up to four trends can be displayed. To switch to the setup menu, press the **Trend** soft key and select a number from 1 to 4.



Cursor Positions (Cursor1/Cursor2)

1. Turn the **Cursor** soft key to select ON.
2. Turn the **jog shuttle** to set cursor 1 (Cursor1) or cursor 2 (Cursor2).
   - Press **SET** (upper right on the front panel) to switch between cursor 1 and cursor 2.
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Cursor 1 position

Cursor 2 position

Note

Setting the Cursor Positions

If you press SET several times and make the jog shuttle control both cursor 1 and cursor 2, you can move them together.

When you move the two cursors together, the cursors no longer move when one of the cursors reaches the edge of the screen.

Vertical Scale of the Trend Display (Upper/Lower)

1. Press the **Display Setup** soft key.
2. Turn the **jog shuttle** to set the upper boundary (Upper) or lower boundary (Lower).
   - Press **SET** (upper right on the front panel) to switch between upper and lower boundaries.
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Up boundary

Down boundary

Search Setup (Search)

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

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.

Search type

Executes the search
The instrument searches for the search conditions. If the instrument 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.

Detected point number

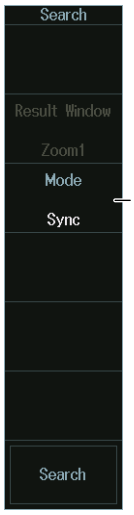
Zoom position

Search Type (Mode)

Sync mode

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

The instrument searches for sync pulses.



Set the search mode to Sync.

Start Bit mode

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

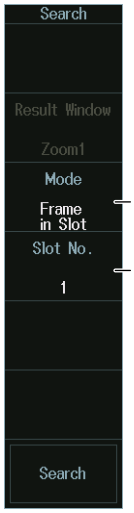
The instrument searches for start bits of data frames.

Set the search mode to Start Bit.

Frame in Slot mode

Press the **Mode** soft key and then the **Frame in Slot** soft key to display the following menu.

The instrument searches for data frames included in the specified slot. Frame in Slot mode will not be available if the sync signal (Sync) is set to None.



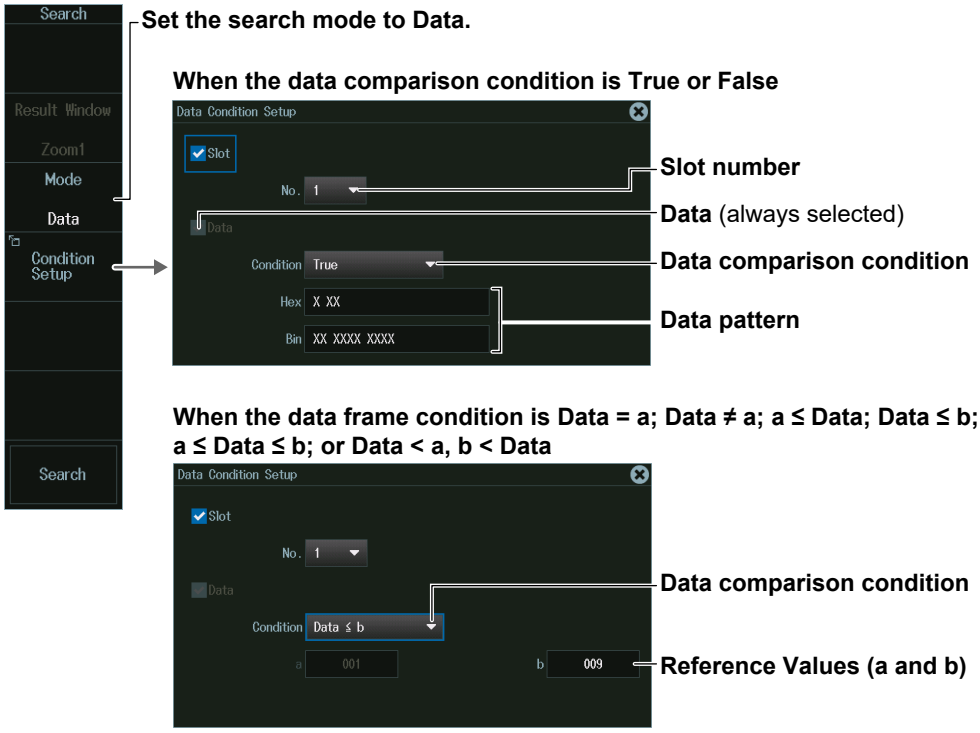
Set the search mode to Frame in Slot.

Set the slot number.

- 1 to N (the number of slots) when the number of slots* on the Setup menu is set to a number from 1 to 6
- 1 to 6 when the number of slots on the Setup menu is set to Auto

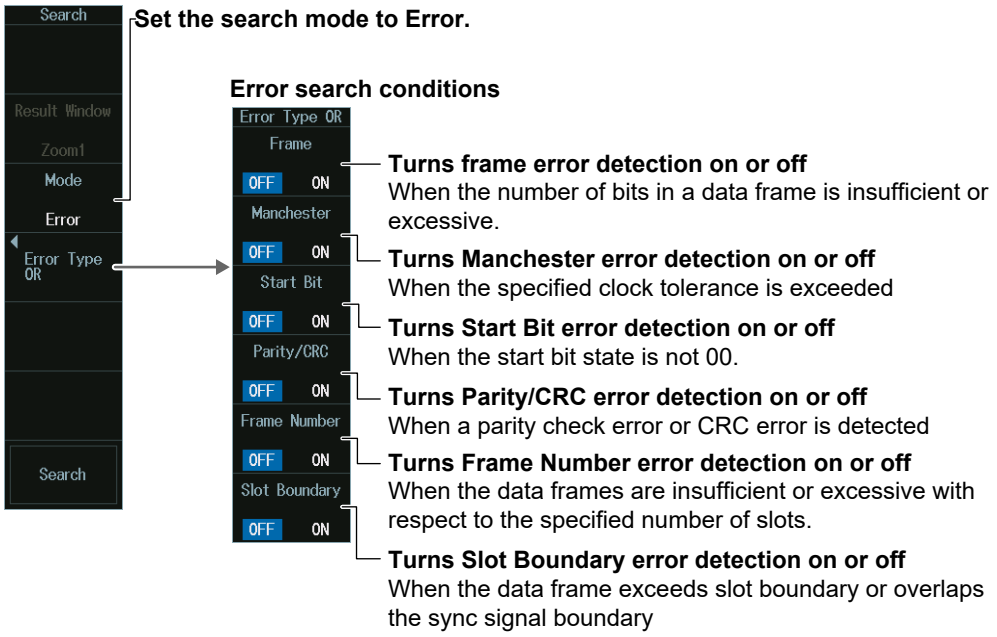
Data mode

1. Press the **Mode** soft key and then the **Data** soft key.
2. Press the **Condition Setup** soft key to display the following menu.
   The instrument searches for a data pattern or a data value. You can also specify a slot number.



Error mode

Press the **Mode** soft key and then the **Error** soft key to display the following menu.
The instrument searches when it detects various types of errors.



Detected Point Number and Zoom Position (Pattern No. /Z1 Position or Z2 Position)

1. Execute a search. Check that a location matching the search conditions is found.
2. Turn the **jog shuttle** to set the detected point number (Pattern No.) and zoom position (Z1 Position or Z2 Position).
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
   - Press **SET** (upper right on the front panel) to switch between detected point number (Pattern No.) and zoom position (Z1 Position or Z2 Position).

Jog shuttle setting menu

Detected point number

Zoom position

12.8 Analyzing and Searching UART Signals (Option)

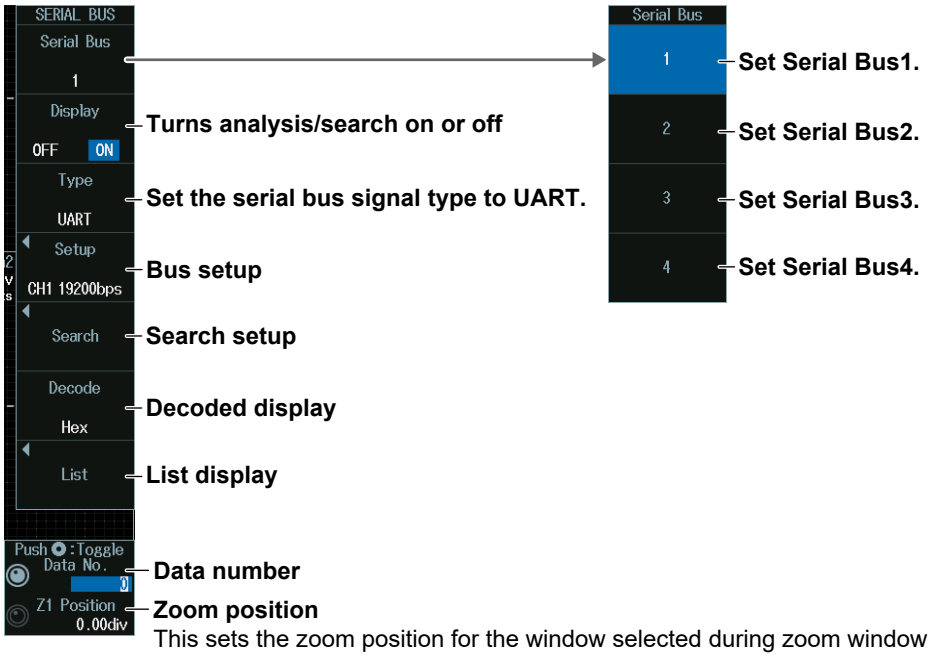
This section explains the following settings for analyzing or searching UART signals:

- Turning analysis and search displays on or off
- Serial bus signal types
- Bus setup
  Auto setup, analysis/search source waveform, data format, parity, grouping, level and hysteresis for detecting analysis/search source waveform states
- Decoded display
- List display
  List size, display position, grouping, detailed display, and zoom linking
- Analysis and data numbers
- Zoom position
- Search settings
  Zoom window, search type, and search execution

► **"Analyzing and Searching Serial Bus Signals," "Analyzing and Searching UART Signals (Option)" in the Features Guide**

SERIAL BUS UART Menu

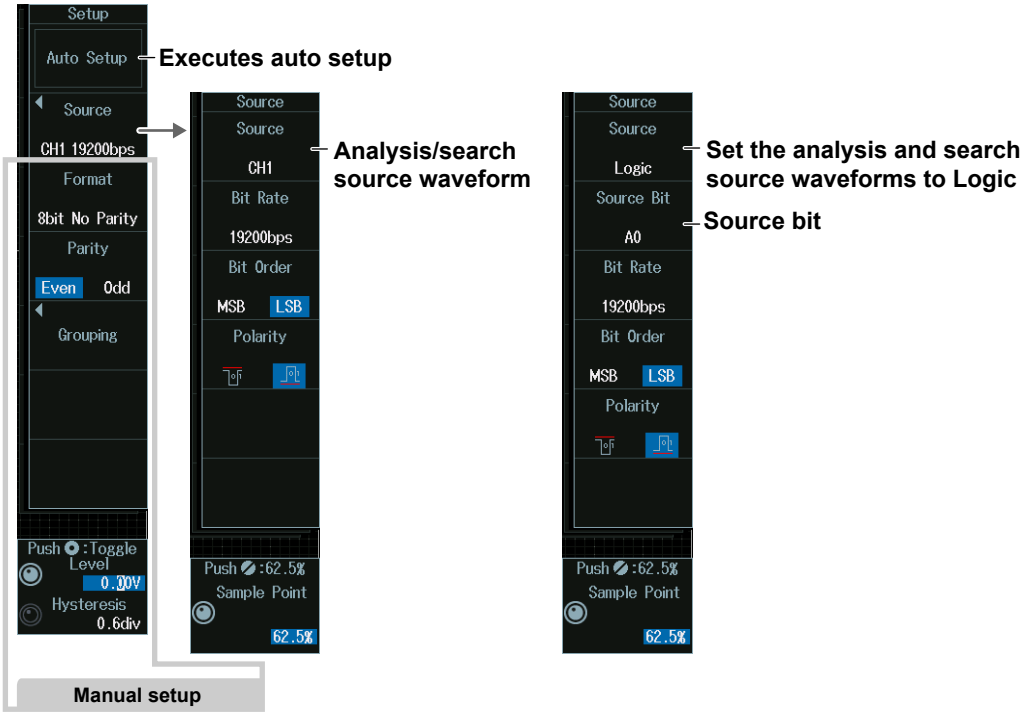
1. Press **SHIFT+SEARCH** (SERIAL BUS) to display the SERIAL BUS menu.
   - You can also tap **MENU** (MENU) in the upper left of the screen and select the SERIAL BUS menu from ANALYSIS on the top menu that is displayed.
   - You can also press **ANALYSIS** and then the **To SERIAL BUS** soft key to display the SERIAL BUS menu.
   - The instrument can analyze and search up to four serial bus signals. To switch to the setup menu, press the Serial Bus soft key and select a number from 1 to 4.
2. Press the **Type** soft key. From the setup menu that appears, select **UART** to display the following menu.



Zoom position
This sets the zoom position for the window selected during zoom window configuration (described later).

Bus Setup (Setup)

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



Executing Auto Setup (Auto Setup)

1. Set the analysis/search source waveform.
2. If you set the trigger source to Logic, set the source bit.
3. Press **ESC**. The menu returns to the bus setup menu.
4. Press the **Auto Setup** soft key to execute auto setup.
   - The Instrument 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, press the **Abort** soft key.

Note

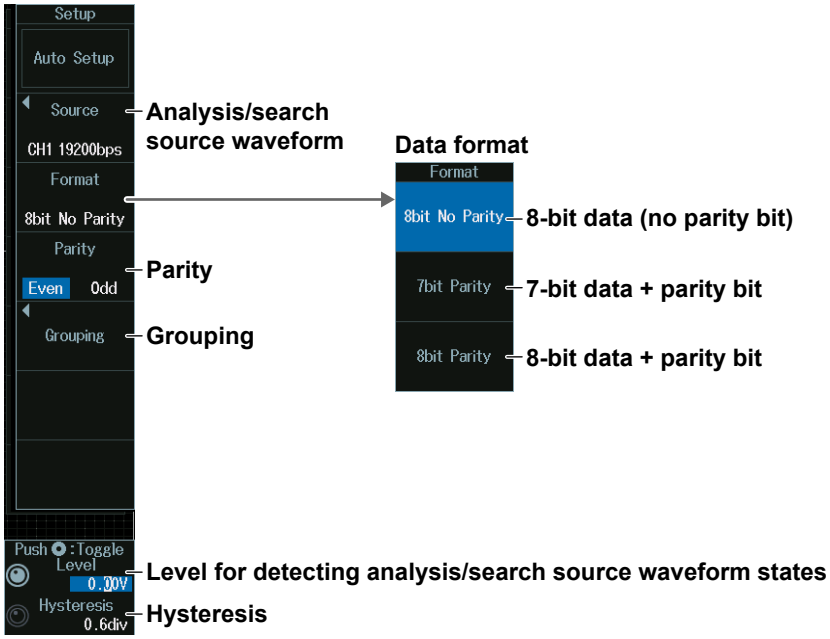
- The auto setup feature will not work properly on some input signals.
- You cannot use auto setup under the following circumstances.
  - When the Analysis/Search Source Waveform Is Math1 to Math8
  - When state display is applied to a Logic bit that is set as the analysis/search source waveform.
- The available source waveforms vary depending on the model.
  - The available settings on 8ch models are as follows:
    CH1 to CH8, Logic, Math1 to Math8
  - The available settings on 4ch models are as follows:
    CH1 to CH4, Logic, Math1 to Math4

Source Bit

The following source bit display applies to models with the /L32 option.
C0 to C7 (LOGIC port C), D0 to D7 (LOGIC port D)

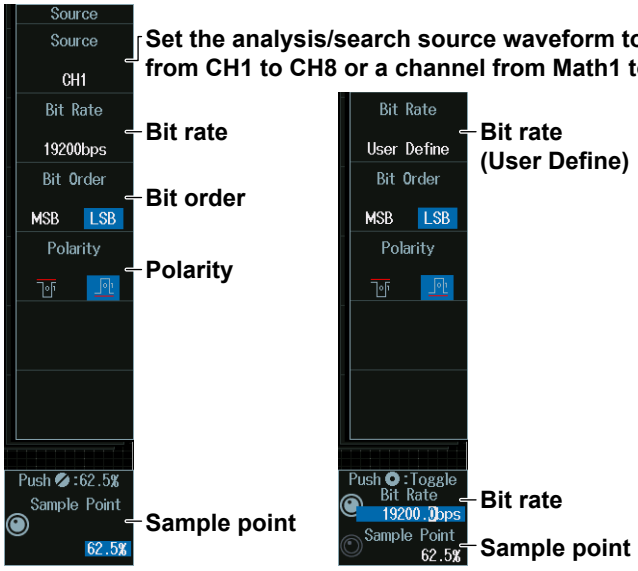
Manual Setup

Manually set the bus format, parity, and so on.



- **Analysis/Search Source Waveform (when the source is CH1 to CH8, Math1 to Math8)**

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

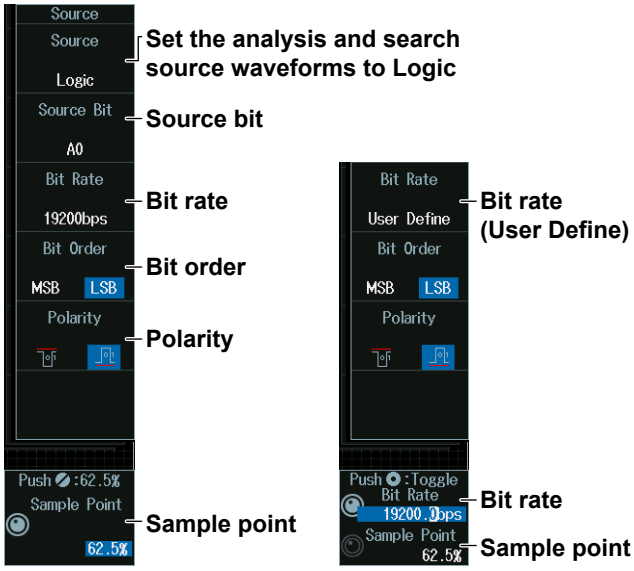


Note

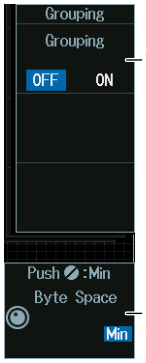
The available source waveforms vary depending on the model.

- The available settings on 8ch models are as follows:
  CH1 to CH8, Logic, Math1 to Math8
- The available settings on 4ch models are as follows:
  CH1 to CH4, Logic, Math1 to Math4

- **Analysis/Search Source Waveform (when Source is Logic)**
  Press the **Source** soft key to display the following menu.



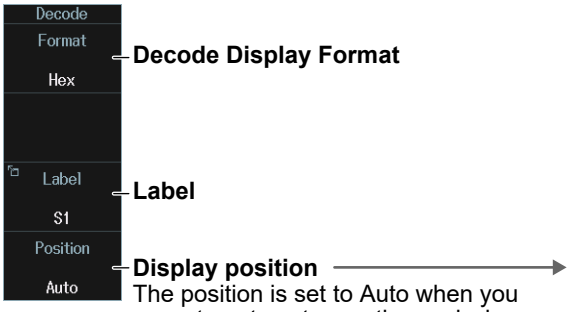
- **Grouping (Grouping)**
  Press the **Grouping** soft key to display the following menu.



When you turn grouping on, data whose time is shorter than the specified byte space (Byte Space) is decoded and displayed in a single group.

Decoded Display (Decode)

Press the **Decode** soft key. The following menu items appear.



Decode Display Format

Label

Display position

The position is set to Auto when you execute auto setup on the analysis menu of each serial bus signal. The position changes from Auto to Manual when you drag the decode display.

When the display position is set to Manual

Display position

Display Position (Position)

When the display position is set to Manual, turn the **jog shuttle** to set the display position (Position).

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

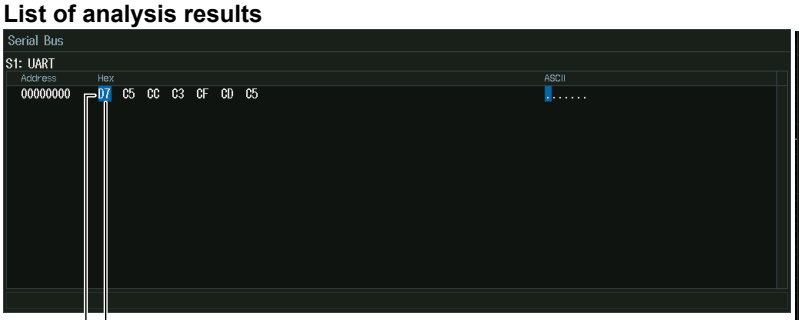
Display position

List Display (List)

1. Press the **Display** soft key, and turn on the analysis and search displays.
2. Press the **List** soft key and then the **Show List** soft key.
   - The list of analysis results and the next menu appear.
   - If several display settings of Serial Bus 1 to 4 are on, all the lists of analysis results of the serial buses whose display setting is on are displayed. For details, see section 12.12.

When Grouping Is Set to OFF

List of analysis results



Turns zoom link on or off

Set Grouping to OFF

List size and display position

List display

Data number

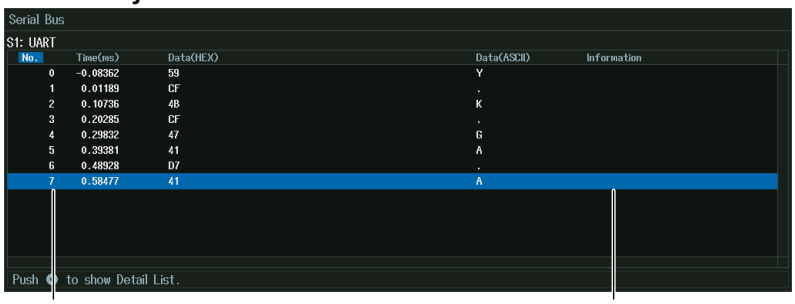
Data number (e.g., Data No.7)
The data that corresponds to the selected data number is highlighted.

- **When a framing error is detected**
  An asterisk is appended to the data number.
- **When a parity error is detected**
  An x mark is appended to the data number.
- **When both a framing error and a parity error are detected**
  The asterisk used for marking framing errors is appended to the data number.

Data from the leftmost side of the waveform display

When Grouping Is Set to ON

List of analysis results



Turns zoom link on or off

Set Grouping to ON

List size and display position

List display

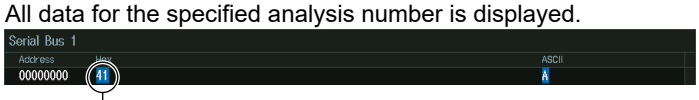
Analysis number

Analysis number

If multiple errors are detected in one piece of data, the instrument only displays the framing error indication.

- Framing Error
- Parity Error

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.

Set the data number.

Note

Analysis number

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).

Analysis Number (List No.), Data Number (Data No.)

Turn the **jog shuttle** to set the analysis number (List No.) or data number (Data No.).

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

When grouping is set to ON

Analysis number

Detail display when grouping is set to OFF or when grouping is set to ON and SET is pressed

Data number

Search Setup (Search)

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

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.

Search type

Executes the search

The instrument searches for the search conditions. If the instrument 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.

Detected point number

Zoom position

Search Type (Mode)

Every Data mode

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

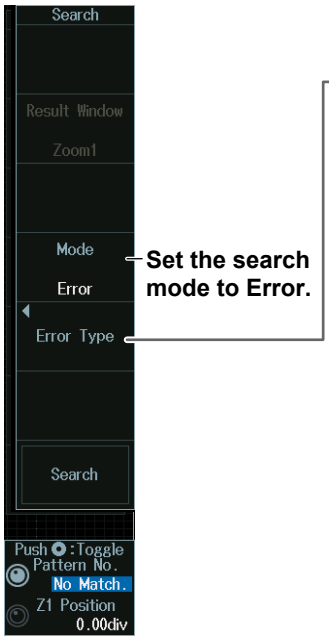
The instrument searches on all data.

Set the search mode to Every Data.

Error Mode

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

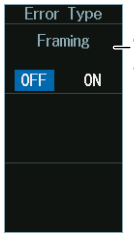
The instrument searches when it detects various types of errors.



Set the search mode to Error.

Error search conditions

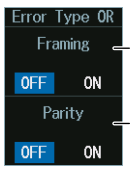
When the format is 8bit No Parity



Turns framing error detection on or off

When the logical value of the stop bit is 0

When the format is 7bit Parity or 8bit Parity



Turns framing error detection on or off

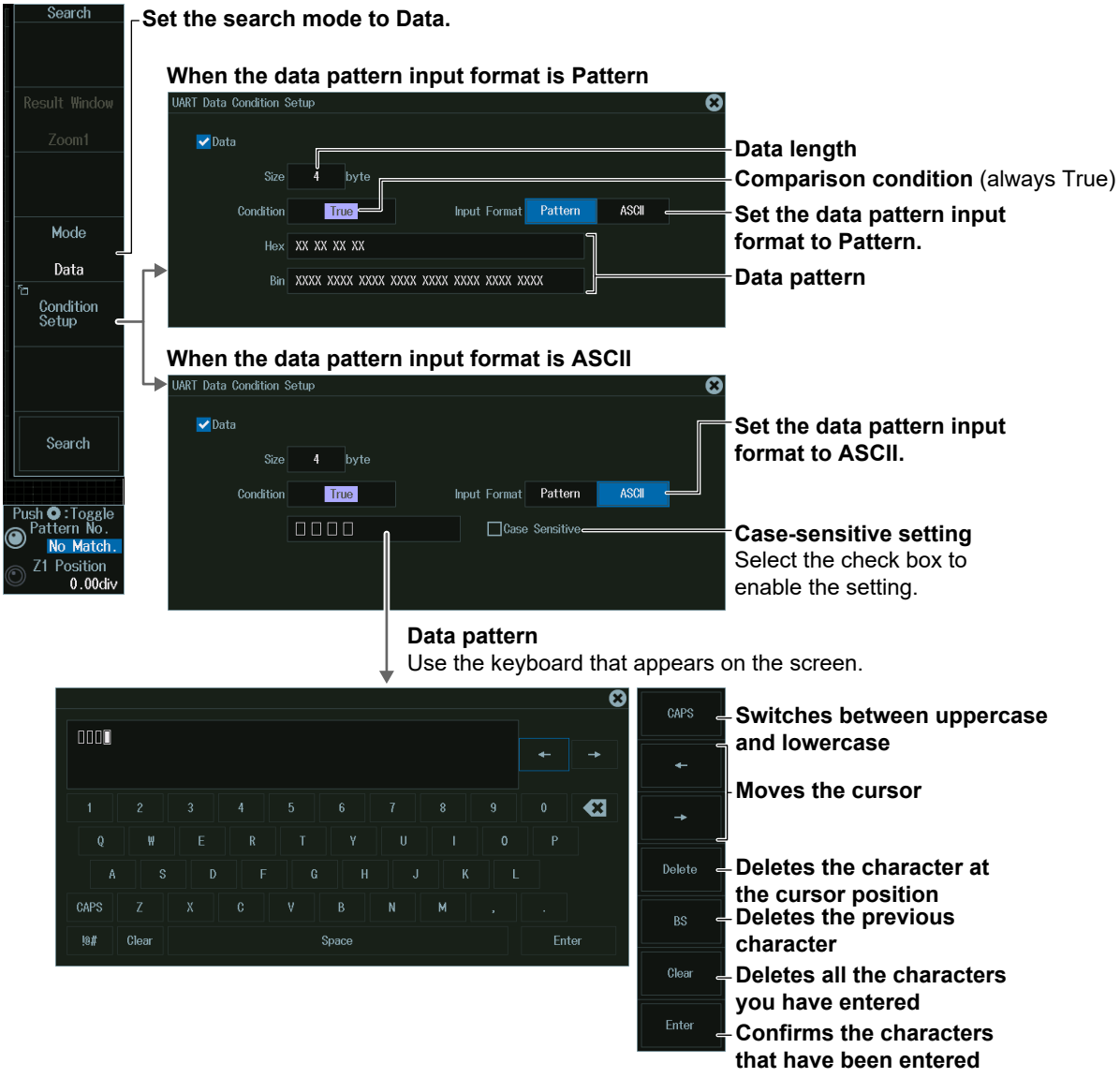
When the logical value of the stop bit is 0

Turns parity error detection on or off

When a parity error is detected in the received character

Data Mode

1. Press the **Mode** soft key and then the **Data** soft key.
2. Press the **Condition Setup** soft key to display the following menu.
   The instrument searches when the data pattern is matched.



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. Example: AB'CR'D (four characters), XY'SP' (three characters), P'NUL'WU (four characters)
- The entered string, including the character codes for the case, 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.

Detected Point Number and Zoom Position (Pattern No. /Z1 Position or Z2 Position)

1. Execute a search. Check that a location matching the search conditions is found.
2. Turn the **jog shuttle** to set the detected point number (Pattern No.) and zoom position (Z1 Position or Z2 Position).
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
   - Press **SET** (upper right on the front panel) to switch between detected point number (Pattern No.) and zoom position (Z1 Position or Z2 Position).

Jog shuttle setting menu

Detected point number

Zoom position

12.9 Analyzing and Searching I²C Bus Signals (Option)

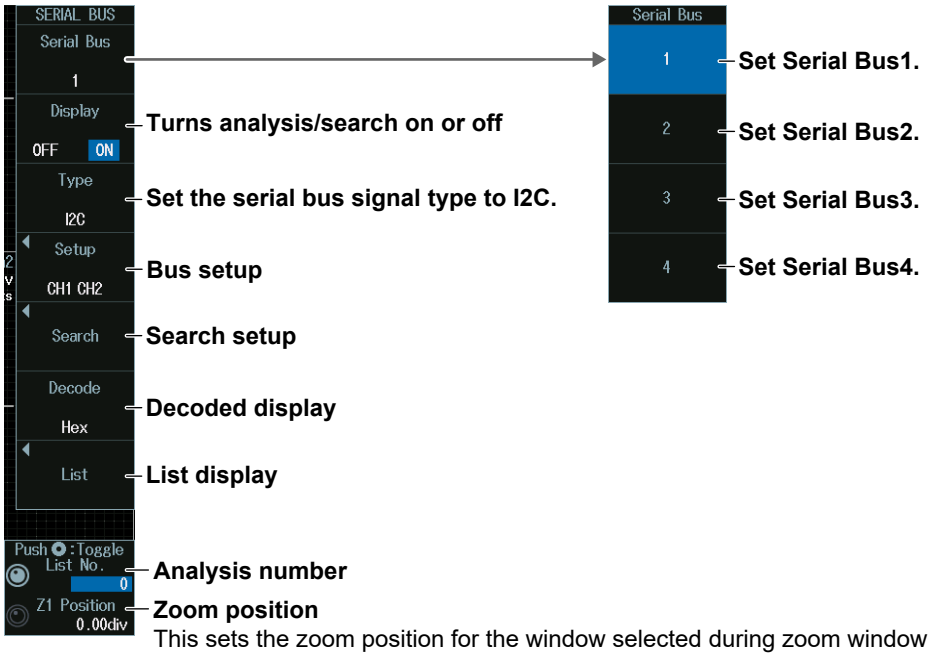
This section explains the following settings for analyzing or searching I²C bus signals:

- Turning analysis and search displays on or off
- Serial bus signal types
- Bus setup
  Auto setup, SCL source, SDA source, level and hysteresis for detecting SCL and SDA source states
- Decoded display
- List display
  List size, display position, detailed display, and zoom linking
- Analysis and data numbers
- Zoom position
- Search settings
  Zoom window, search type, and search execution

► **"Analyzing and Searching Serial Bus Signals," "Analyzing and Searching I²C Bus Signals (Option)" in the Features Guide**

SERIAL BUS I2C Menu

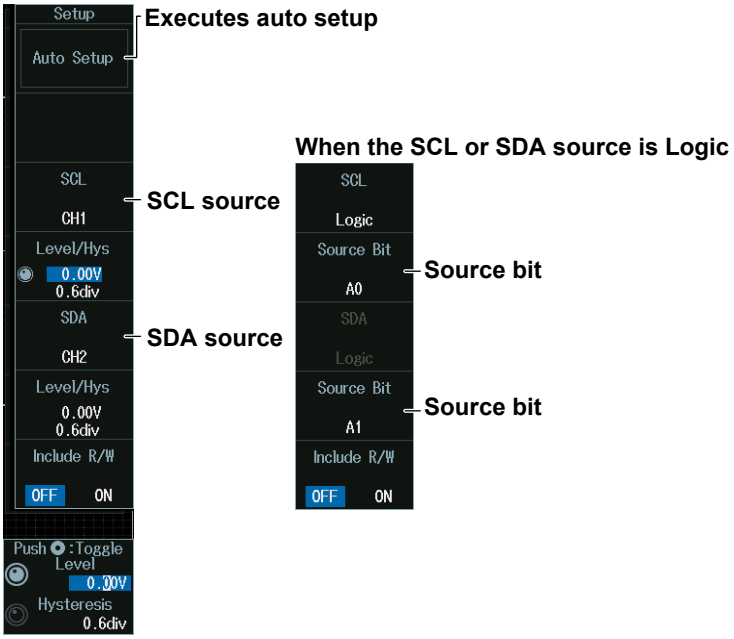
1. Press **SHIFT+SEARCH** (SERIAL BUS) to display the SERIAL BUS menu.
   - You can also tap **MENU** (MENU) in the upper left of the screen and select the SERIAL BUS menu from ANALYSIS on the top menu that is displayed.
   - You can also press **ANALYSIS** and then the **To SERIAL BUS** soft key to display the SERIAL BUS menu.
   - The instrument can analyze and search up to four serial bus signals. To switch to the setup menu, press the Serial Bus soft key and select a number from 1 to 4.
2. Press the **Type** soft key. From the setup menu that appears, select **I2C** to display the following menu.



Zoom position
This sets the zoom position for the window selected during zoom window configuration (described later).

Bus Setup (Setup)

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



Executing Auto Setup (Auto Setup)

1. Set the SCL and SDA sources.
2. If you set the SCL or SDA source to Logic (L), set the source bit.
3. Press the **Auto Setup** soft key to execute auto setup.
   - The instrument automatically configures the level and hysteresis and triggers on the start condition of the I^2C bus signal.
   - While the serial bus is being configured, Auto Setup changes to Abort. If you want to stop, press the **Abort** soft key.

Note

- The auto setup feature will not work properly on some input signals.
- You cannot use auto setup under the following circumstances.
  - When the SCL or SDA source is set to Math1 to Math8
  - When state display is applied to a LOGIC bit that is set as the SCL or SDA source.
- The available source waveforms vary depending on the model.
  - The available settings on 8ch models are as follows:
    CH1 to CH8, Logic, Math1 to Math8
  - The available settings on 4ch models are as follows:
    CH1 to CH4, Logic, Math1 to Math4

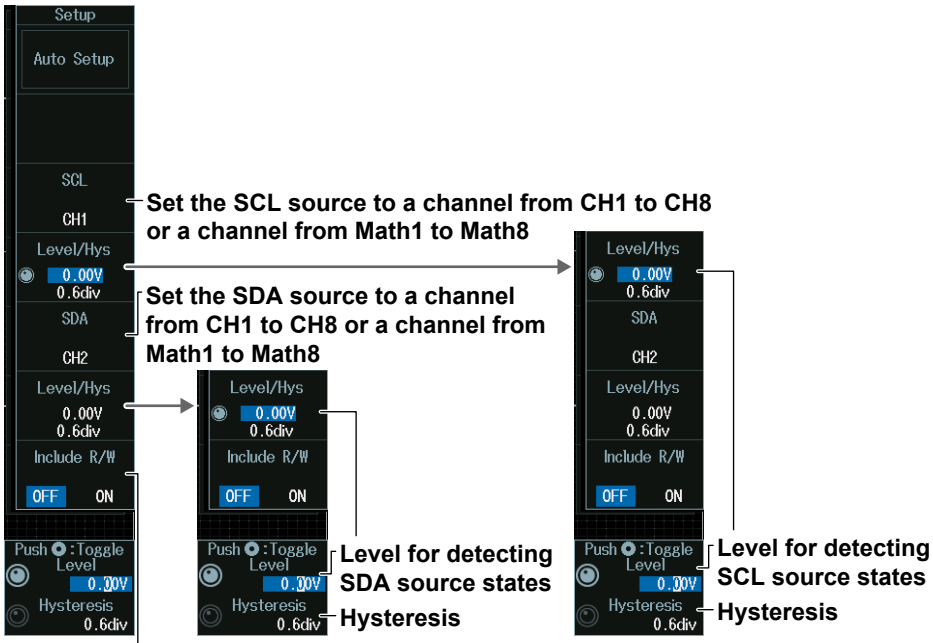
Source Bit

The following source bit display applies to models with the /L32 option.
C0 to C7 (LOGIC port C), D0 to D7 (LOGIC port D)

Manual Setup

Manually set the level and hysteresis.

When the SCL or SDA source is CH1 to CH8, Math1 to Math8

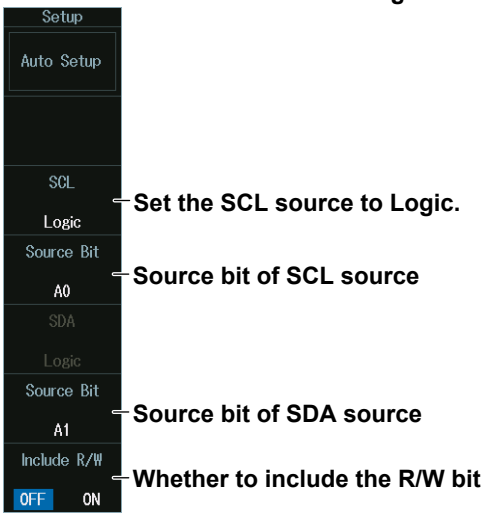


Whether to include the R/W bit

Specify whether to include the R/W bit when setting or displaying the address pattern. This setting affects the configuration or display of the address pattern in the following situations.

- Search condition when the search mode is Address Data (Address in the Condition Setup screen)
- Decoded display
- Address boxes in the list display (1st, 2nd)

When the SCL or SDA source is Logic

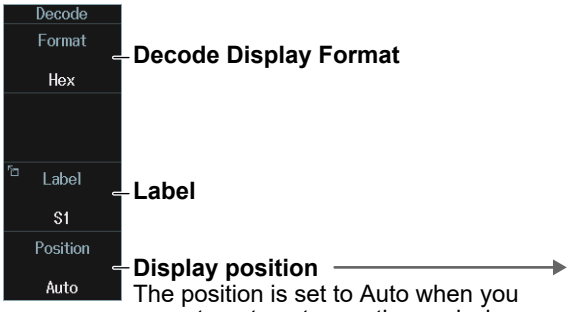


Note

R/W bit inclusion (Include R/W) can also be set by selecting I2C bus signal trigger, Trigger Type, and then Address Data mode. The settings are synchronized. For details on I2C bus signal trigger, see section 2.21.

Decoded Display (Decode)

Press the **Decode** soft key. The following menu items appear.



Decode Display Format

Label

Display position

The position is set to Auto when you execute auto setup on the analysis menu of each serial bus signal. The position changes from Auto to Manual when you drag the decode display.

When the display position is set to Manual

Display position

Display Position (Position)

When the display position is set to Manual, turn the **jog shuttle** to set the display position (Position).

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

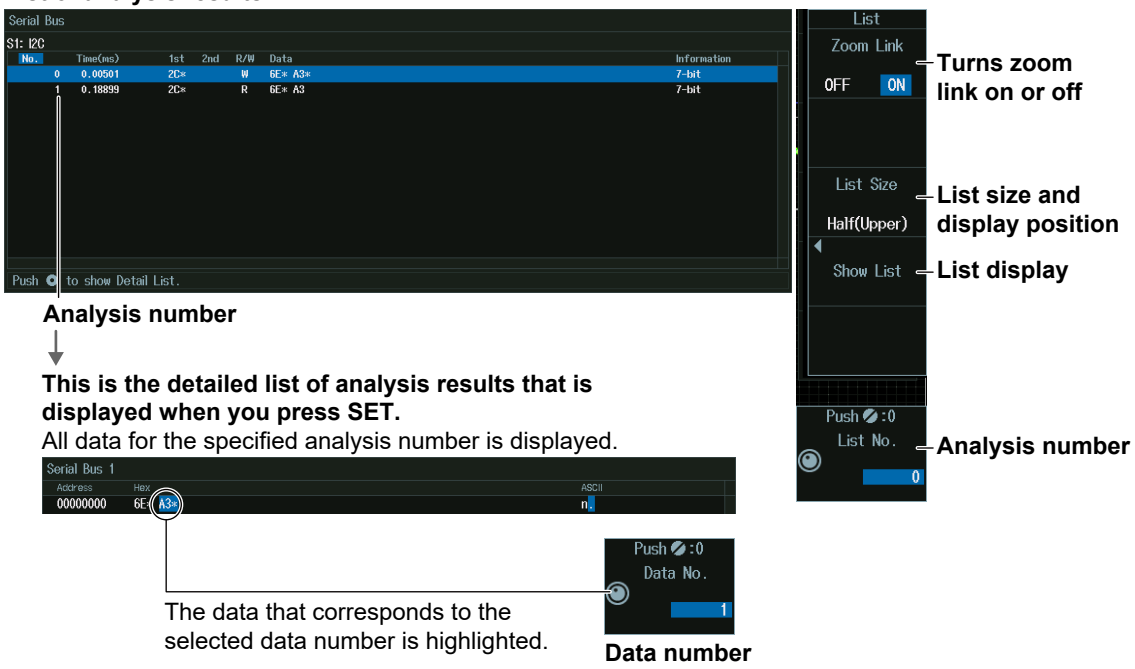
Jog shuttle setting menu

Display position

List Display (List)

1. Press the **Display** soft key, and turn on the analysis and search displays.
2. Press the **List** soft key and then the **Show List** soft key.
   - The list of analysis results and the next menu appear.
   - If several display settings of Serial Bus 1 to 4 are on, all the lists of analysis results of the serial buses whose display setting is on are displayed. For details, see section 12.12.

List of analysis results



Note

Analysis Number

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).

Analysis Number (List No.), Data Number (Data No.)

Turn the **jog shuttle** to set the analysis number (List No.) or data number (Data No.).

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

When selecting from the list of analysis results

When selecting from the detailed display of the analysis results list (when SET is pressed)

Search Setup (Search)

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

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.

Search type

Executes the search
The instrument searches for the search conditions. If the instrument 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.

Detected point number

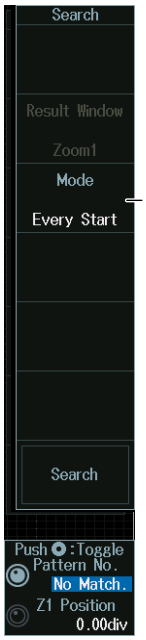
Zoom position

Trigger Mode (Mode)

Every Start Mode

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

The instrument searches when it detects a start condition.

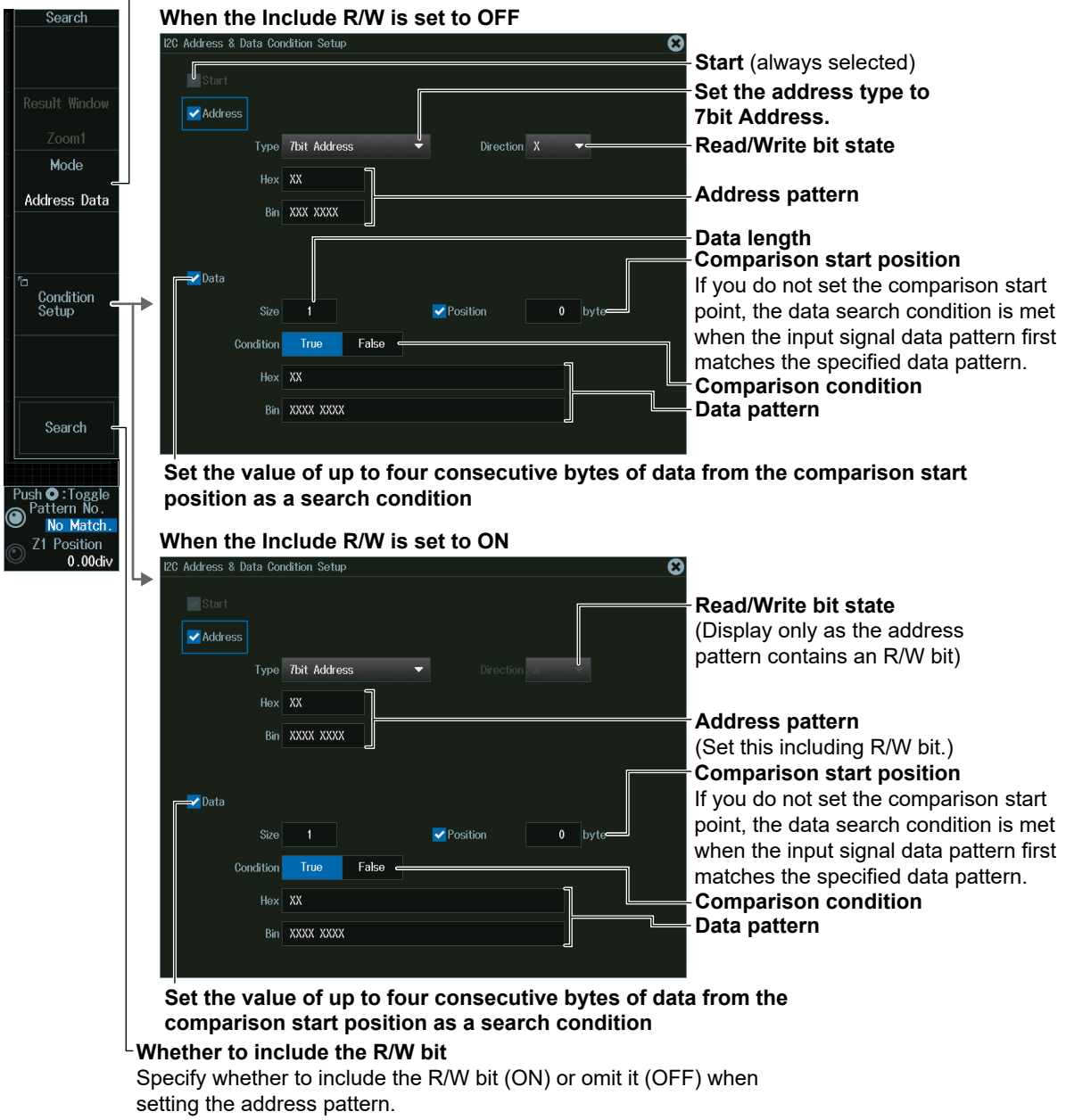


Set the search mode to Every Start.

Address Data mode

1. Press the **Mode** soft key and then the **Address Data** soft key.
2. Press the **Condition Setup** soft key to display the following menu.
   The instrument searches 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**



Set the search mode to AddressData.

When the Include R/W is set to OFF

Start (always selected)

Set the address type to 7bit Address.

Read/Write bit state

Address pattern

Data length

Comparison start position

If you do not set the comparison start point, the data search condition is met when the input signal data pattern first matches the specified data pattern.

Comparison condition

Data pattern

Set the value of up to four consecutive bytes of data from the comparison start position as a search condition

When the Include R/W is set to ON

Read/Write bit state

(Display only as the address pattern contains an R/W bit)

Address pattern

(Set this including R/W bit.)

Comparison start position

If you do not set the comparison start point, the data search condition is met when the input signal data pattern first matches the specified data pattern.

Comparison condition

Data pattern

Set the value of up to four consecutive bytes of data from the comparison start position as a search condition

Whether to include the R/W bit

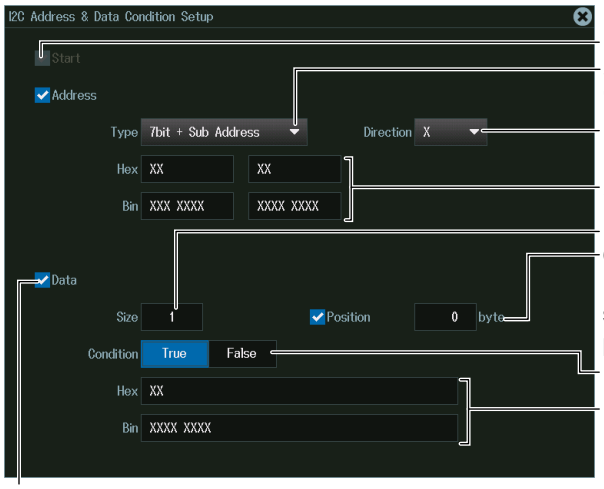
Specify whether to include the R/W bit (ON) or omit it (OFF) when setting the address pattern.

Note

R/W bit inclusion (Include R/W) can also be set by using Analyzing and Searching I^2C Bus Signals and then Bus Setup (Setup). Settings are synchronized. For details on I^2C bus signal analysis, see section 12.9.

- **When Address Type Is 7bit+Sub Address**

When the Include R/W is set to OFF



Start (always selected)

Set the address type to 7bit + Sub Address.

Read/Write bit state

Address pattern

Data length

Comparison start position

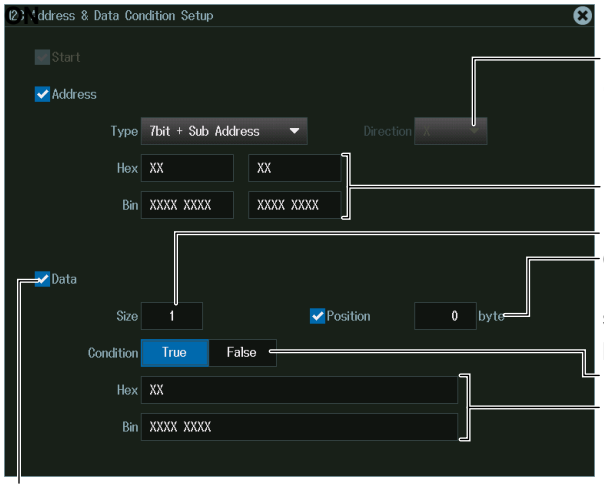
If you do not set the comparison start point, the data search condition is met when the input signal data pattern first matches the specified data pattern.

Comparison condition

Data pattern

Set the value of up to four consecutive bytes of data from the comparison start position as a search condition

When the Include R/W is set to



Read/Write bit state

(Display only as the address pattern contains an R/W bit)

Address pattern

(Set this including R/W bit.)

Data length

Comparison start position

If you do not set the comparison start point, the data search condition is met when the input signal data pattern first matches the specified data pattern.

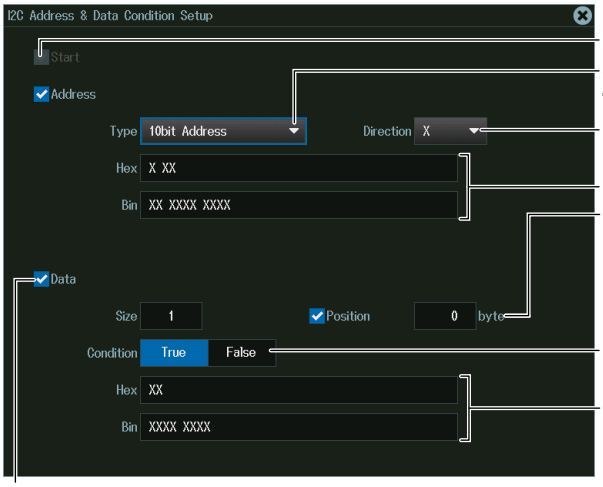
Comparison condition

Data pattern

Set the value of up to four consecutive bytes of data from the comparison start position as a search condition

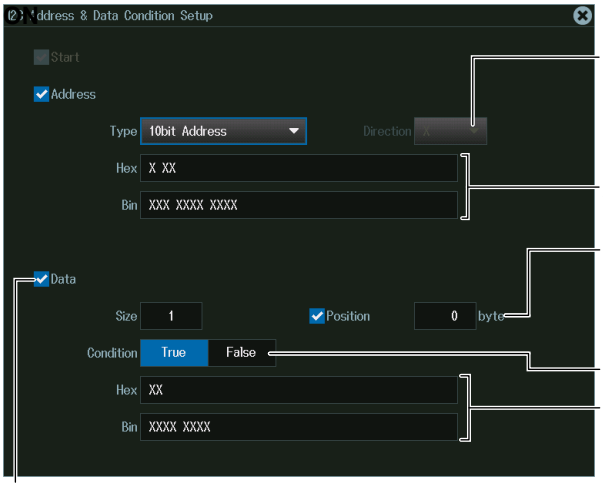
- **When Address Type Is 10bit Address**

When the Include R/W is set to OFF



Start (always selected)
Set the address type to 10bit Address.
Read/Write bit state
Address pattern
Comparison start position
If you do not set the comparison start point, the data search condition is met when the input signal data pattern first matches the specified data pattern.
Comparison condition
Data pattern
Set the value of up to four consecutive bytes of data from the comparison start position as a search condition

When the Include R/W is set to



Read/Write bit state
(Display only as the address pattern contains an R/W bit)
Address pattern
(Set this including R/W bit.)
Comparison start position
If you do not set the comparison start point, the data search condition is met when the input signal data pattern first matches the specified data pattern.
Comparison condition
Data pattern
Set the value of up to four consecutive bytes of data from the comparison start position as a search condition

NON ACK Mode

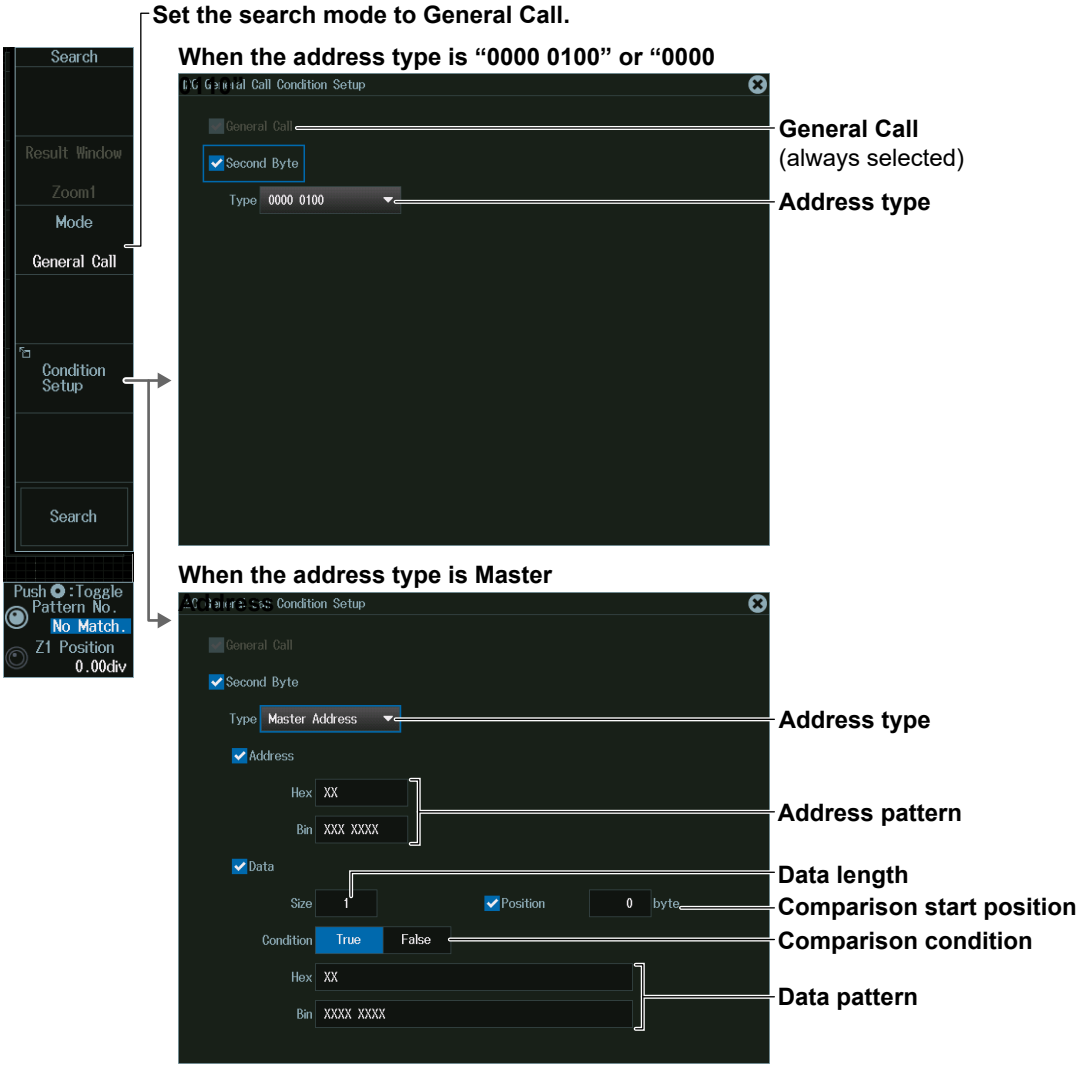
Press the **Mode** soft key and then the **NON ACK** soft key. The following menu appears.

The instrument searches when the acknowledgment bit is Nack.

Set the search mode to NON ACK.

General Call Mode

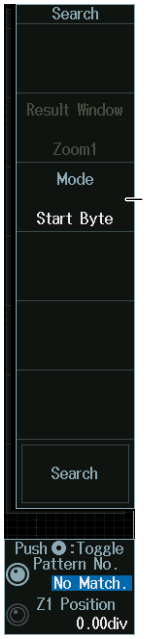
1. Press the **Mode** soft key and then the **General Call** soft key.
2. Press the **Condition Setup** soft key to display the following menu.
   When Second Byte is set to Master Address, the instrument triggers on the AND of the general call address (0000 0000), second byte address pattern, data pattern, and comparison start position conditions.
   Otherwise, the instrument searches on the AND of general call address (0000 0000) and Second Byte address pattern conditions. Items whose check boxes are selected are used as trigger conditions.



Start Byte Mode

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

The instrument searches when it detects the start byte master code.

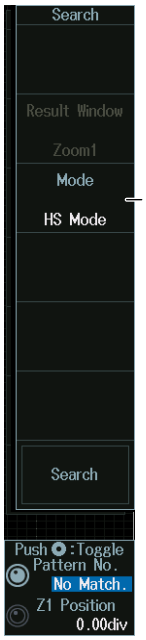


Set the search mode to Start Byte.

HS mode

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

The instrument searches when it detects a high speed mode master code.



Set the search mode to HS Mode.

Detected Point Number and Zoom Position (Pattern No. /Z1 Position or Z2 Position)

1. Execute a search. Check that a location matching the search conditions is found.
2. Turn the **jog shuttle** to set the detected point number (Pattern No.) and zoom position (Z1 Position or Z2 Position).
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
   - Press **SET** (upper right on the front panel) to switch between detected point number (Pattern No.) and zoom position (Z1 Position or Z2 Position).

Jog shuttle setting menu

Detected point number

Zoom position

12.10 Analyzing and Searching SPI Bus Signals (Option)

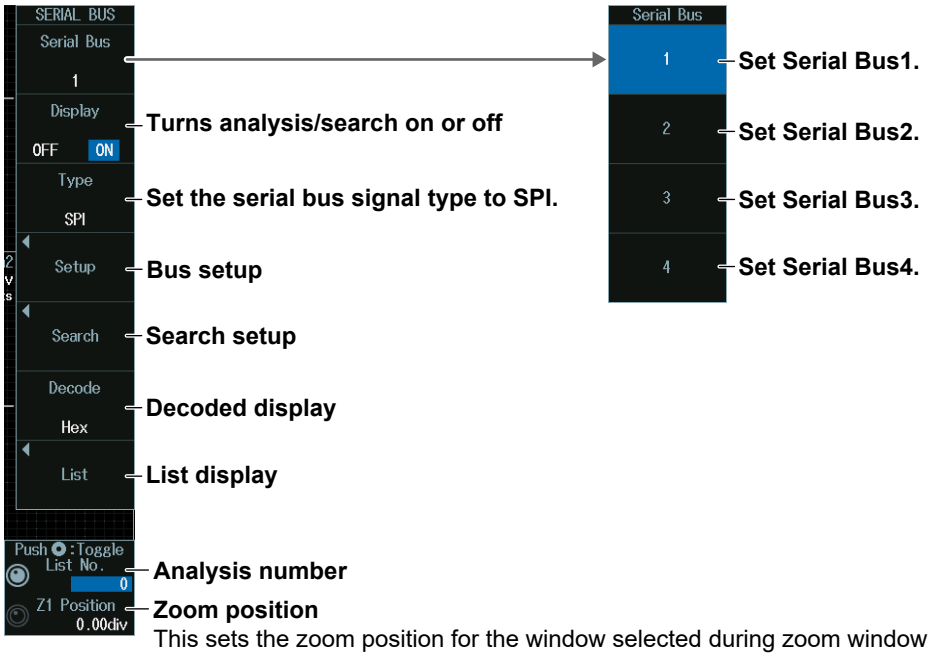
This section explains the following settings for analyzing or searching SPI bus signals:

- Turning analysis and search displays on or off
- Serial bus signal types
- Bus setup
  Auto setup, wiring system, clock source, data source, chip select source, bit order
- Decoded display
- List display
  List size, display position, detailed display, and zoom linking
- Analysis and data numbers
- Zoom position
- Search settings
  Zoom window, search type, and search execution

► **"Analyzing and Searching Serial Bus Signals," "Analyzing and Searching SPI Bus Signals (Option)" in the Features Guide**

SERIAL BUS SPI Menu

1. Press **SHIFT+SEARCH** (SERIAL BUS) to display the SERIAL BUS menu.
   - You can also tap **MENU** (MENU) in the upper left of the screen and select the SERIAL BUS menu from ANALYSIS on the top menu that is displayed.
   - You can also press **ANALYSIS** and then the **To SERIAL BUS** soft key to display the SERIAL BUS menu.
   - The instrument can analyze and search up to four serial bus signals. To switch to the setup menu, press the Serial Bus soft key and select a number from 1 to 4.
2. Press the **Type** soft key. Select **SPI** from the setup menu that is displayed. The following menu appears.



Zoom position
This sets the zoom position for the window selected during zoom window configuration (described later).

Bus Setup (Setup)

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

Executing Auto Setup (Auto Setup)

1. Set the wiring system and the clock, data, and chip select sources.
2. If you set a source to Logic, set the source bit.
3. Press the **Auto Setup** soft key to execute auto setup.
   - The instrument automatically configures the level and hysteresis and then triggers on the SPI bus signal's first data byte.
   - While the serial bus is being configured, Auto Setup changes to Abort. If you want to stop, press the **Abort** soft key.

Note

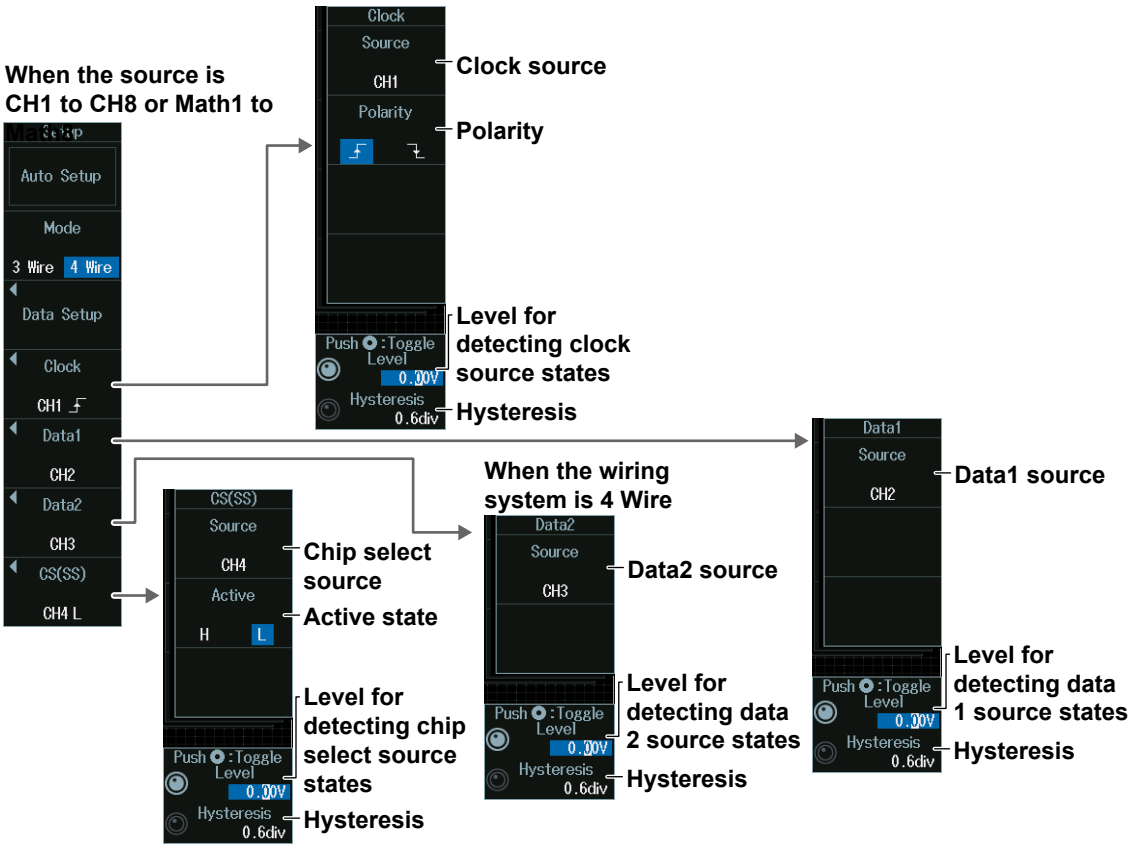
- The auto setup feature will not work properly on some input signals.
- You cannot use auto setup under the following circumstances.
  - When the clock, Data1, Data2, or chip select source is set to Math1 to Math8
  - When state display is applied to any of the Logic bits set as the clock, Data1, Data2, or chip select source
  - When the chip select source is set to None (Ignore)
- The available source waveforms vary depending on the model.
  - The available settings on 8ch models are as follows:
    CH1 to CH8, Logic, Math1 to Math8
  - The available settings on 4ch models are as follows:
    CH1 to CH4, Logic, Math1 to Math4

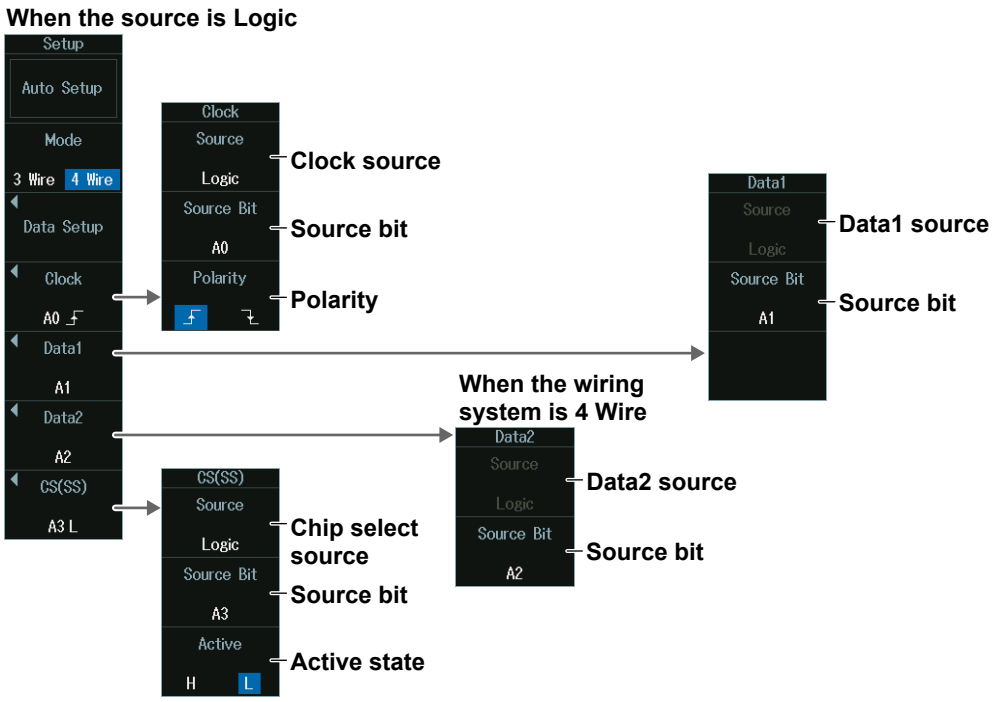
Source Bit

The following source bit display applies to models with the /L32 option.
C0 to C7 (LOGIC port C), D0 to D7 (LOGIC port D)

Manual Setup

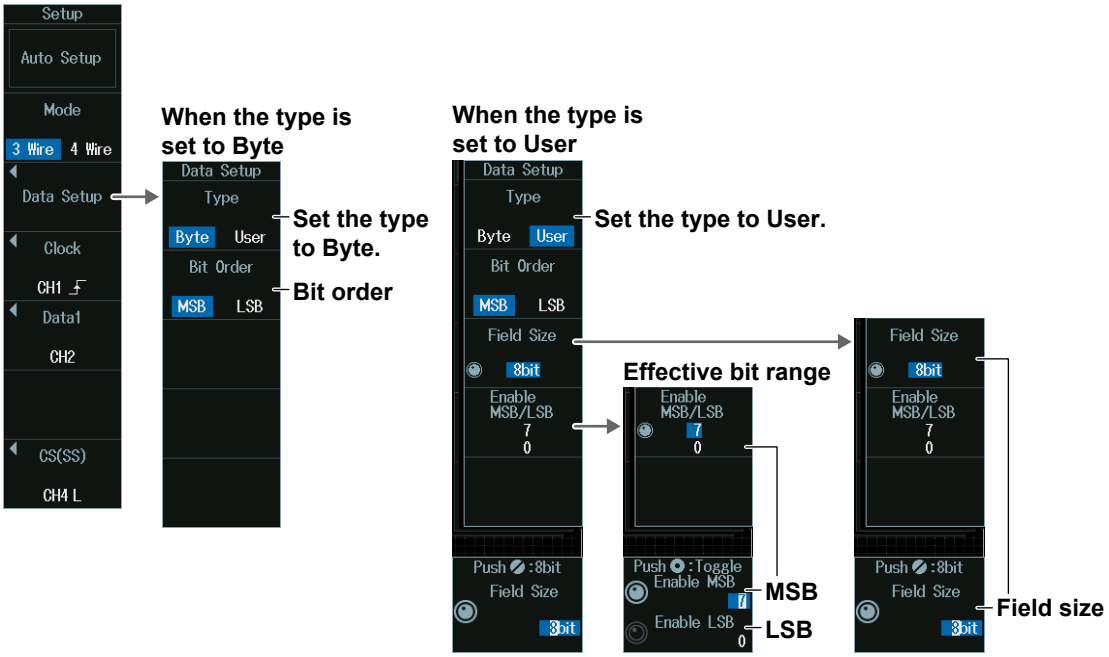
Manually set the level, hysteresis, and bit order.





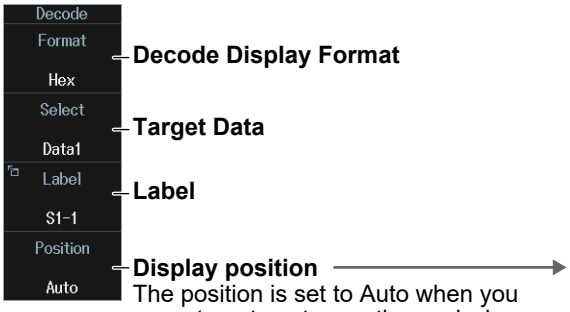
Setting the Data Format (Data Setup)

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



Decoded Display (Decode)

Press the **Decode** soft key. The following menu items appear.



Decode Display Format

Target Data

Label

Display position

The position is set to Auto when you execute auto setup on the analysis menu of each serial bus signal. The position changes from Auto to Manual when you drag the decode display.

When the display position is set to Manual

Display position

Display Position (Position)

When the display position is set to Manual, turn the **jog shuttle** to set the display position (Position).

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

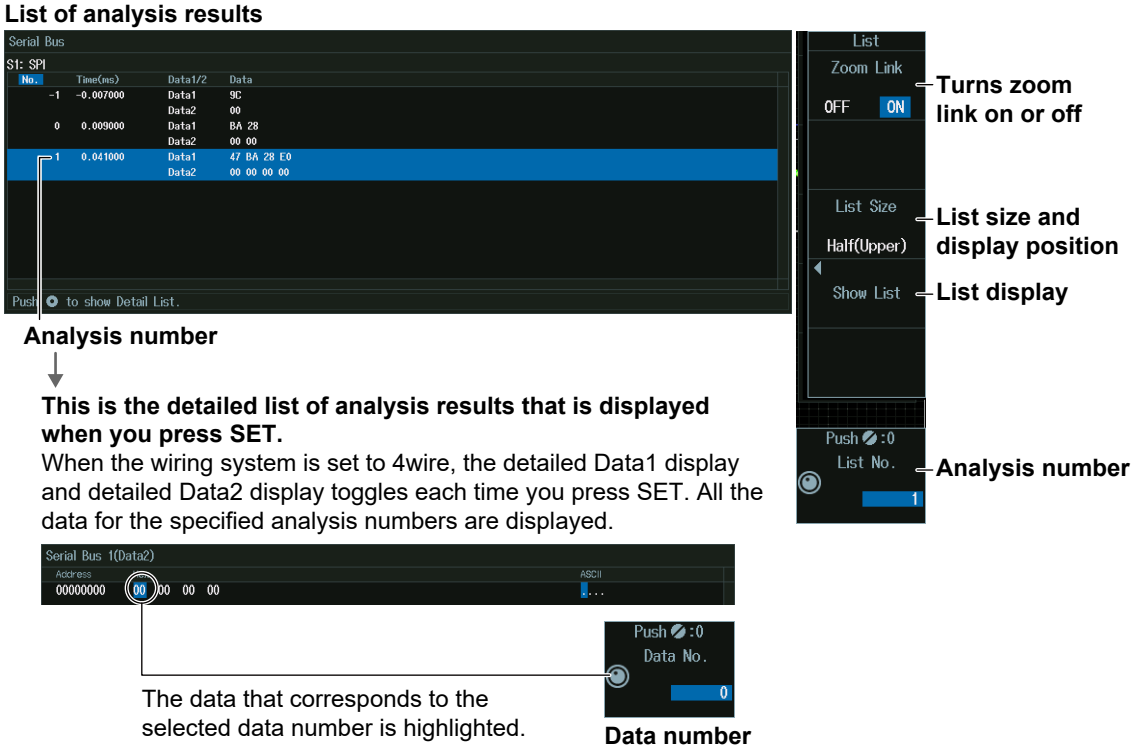
Jog shuttle setting menu

Display position

List Display (List)

1. Press the **Display** soft key, and turn on the analysis and search displays.
2. Press the **List** soft key and then the **Show List** soft key.
   - The list of analysis results and the next menu appear.
   - When the wiring system is set to 3 Wire, the contents of Data 1 are displayed in a list. When the wiring system is set to 4 Wire, the contents of Data 1 and Data 2 are displayed in a list.
   - If several display settings of Serial Bus 1 to 4 are on, all the lists of analysis results of the serial buses whose display setting is on are displayed. For details, see section 12.12.

List of analysis results



This is the detailed list of analysis results that is displayed when you press SET.
When the wiring system is set to 4wire, the detailed Data1 display and detailed Data2 display toggles each time you press SET. All the data for the specified analysis numbers are displayed.

Note

Analysis number

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).

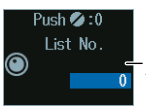
Analysis Number (List No.), Data Number (Data No.)

Turn the **jog shuttle** to set the analysis number (List No.) or data number (Data No.).

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

When selecting from the list of analysis results



When selecting from the detailed display of the analysis results list (when SET is pressed)

Search Setup (Search)

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

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.

Search conditions

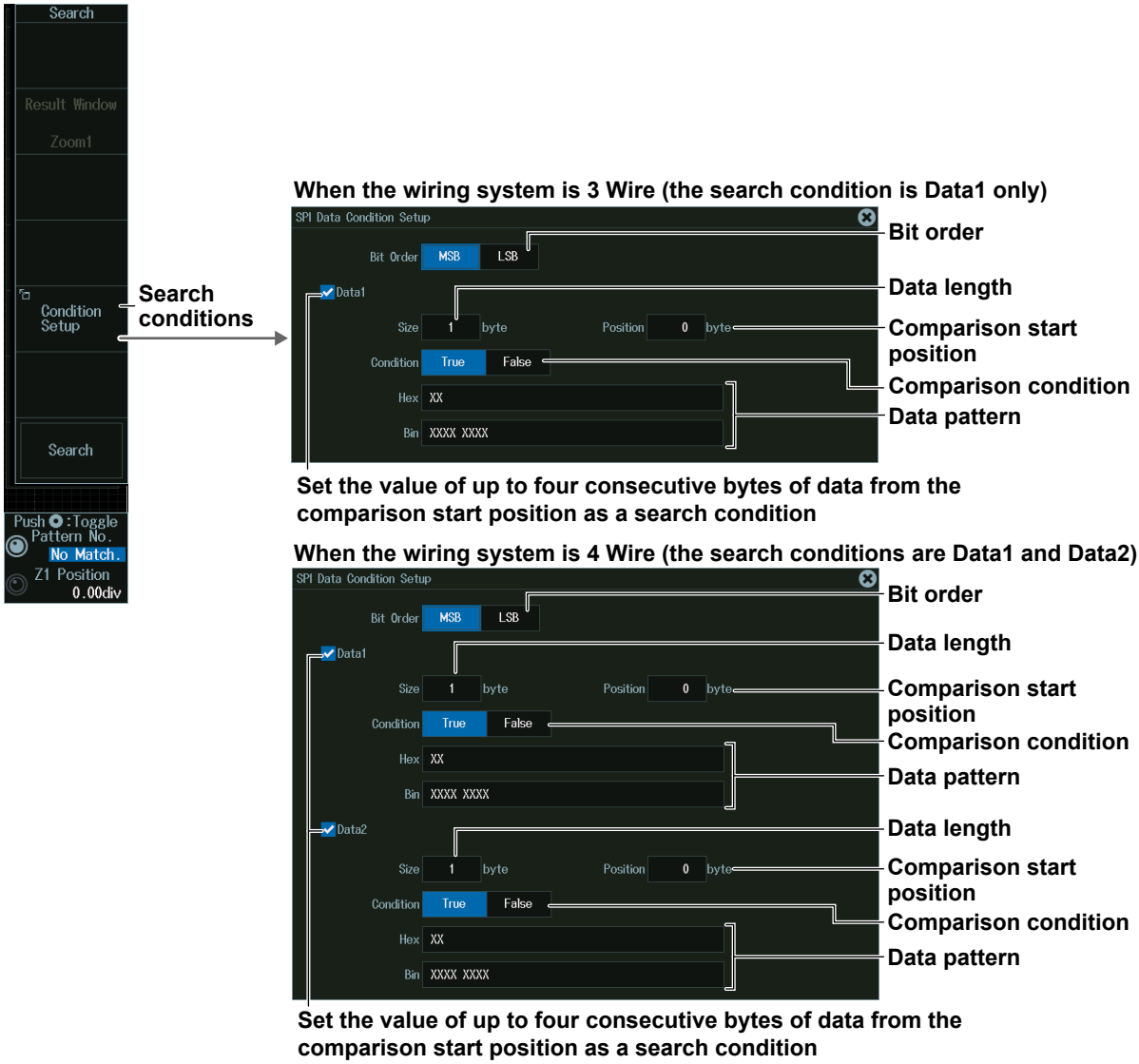
Executes the search
The instrument searches for the search conditions. If the instrument finds points that match the search conditions (detected points), it shows numbers (0, 1, 2, etc.) from the left of the waveform display in the order that the points were detected.

Detected point number

Zoom position

Search Conditions (Condition Setup)

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



Detected Point Number and Zoom Position (Pattern No. /Z1 Position or Z2 Position)

1. Execute a search. Check that a location matching the search conditions is found.
2. Turn the **jog shuttle** to set the detected point number (Pattern No.) and zoom position (Z1 Position or Z2 Position).
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
   - Press **SET** (upper right on the front panel) to switch between detected point number (Pattern No.) and zoom position (Z1 Position or Z2 Position).

Jog shuttle setting menu

12.11 Analyzing and Searching User-Defined Serial Bus Signals

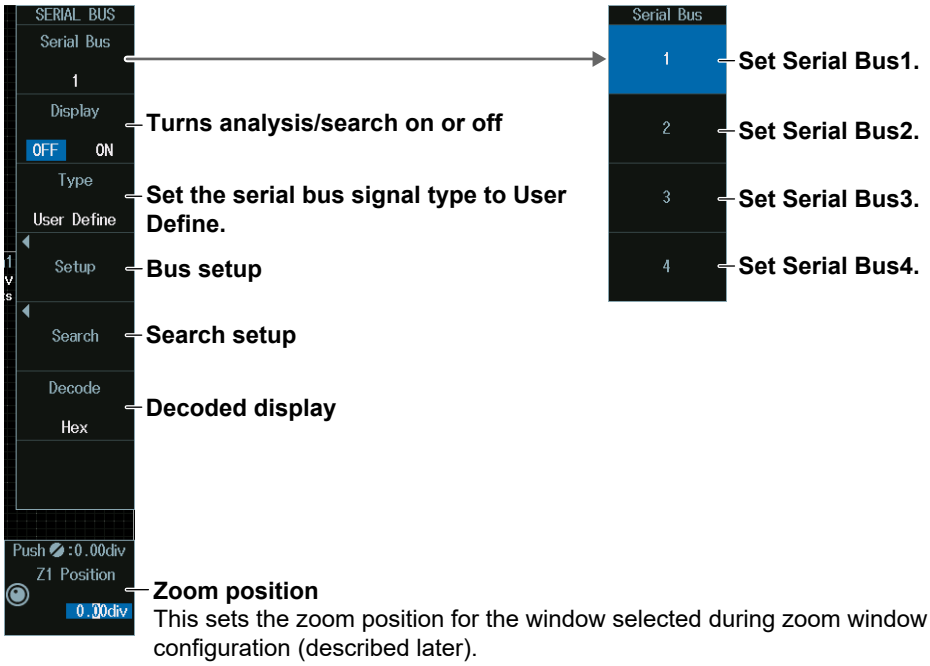
This section explains the following settings for analyzing or searching user-defined serial bus signals:

- Turning analysis and search displays on or off
- Serial bus signal types
- Bus setup
  Data source, bit rate, decoding start point, clock source, enable source, latch source
- Decoded display
- Zoom position
- Search settings
  Zoom window, search type, and search execution

► **"Analyzing and Searching Serial Bus Signals," "Analyzing and Searching User-Defined Serial Bus Signals (User Define)" in the Features Guide**

SERIAL BUS User Define Menu

1. Press **SHIFT+SEARCH** (SERIAL BUS) to display the SERIAL BUS menu.
   - You can also tap **MENU** (MENU) in the upper left of the screen and select the SERIAL BUS menu from ANALYSIS on the top menu that is displayed.
   - You can also press **ANALYSIS** and then the **To SERIAL BUS** soft key to display the SERIAL BUS menu.
   - The instrument can analyze and search up to four serial bus signals. To switch to the setup menu, press the Serial Bus soft key and select a number from 1 to 4.
2. Press the **Type** soft key. From the setup menu that appears, select **User Define** to display the following menu.



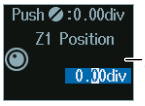
Zoom position
This sets the zoom position for the window selected during zoom window configuration (described later).

Zoom Position (Z1 Position or Z2 Position)

Turn the **jog shuttle** to set the zoom position (Z1 Position or Z2 Position).

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

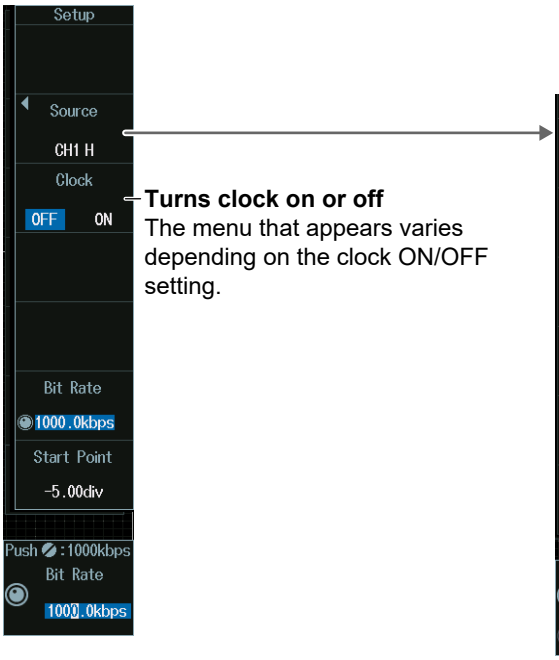
Jog shuttle setting menu



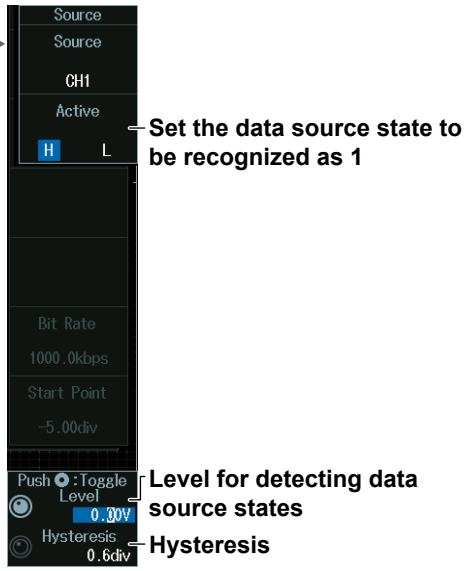
Zoom position

Bus Setup (Setup)

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



Turns clock on or off
The menu that appears varies depending on the clock ON/OFF setting.



Set the data source state to be recognized as 1

Level for detecting data source states

Hysteresis

Level for Detecting Data Source States (Level, Hysteresis)

Turn the **jog shuttle** to set the level or hysteresis.

- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
- To set the level, you can drag the level display line on the screen.

Jog shuttle setting menu

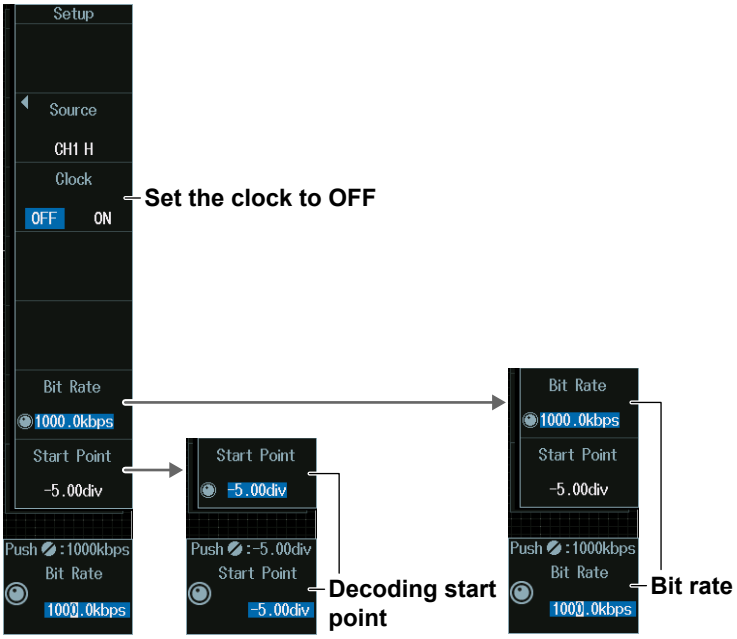
Level for detecting data source states

Hysteresis

Press SET (upper right on the front panel) to switch between level and hysteresis.

When Not Using the Clock (OFF)

Press the **Clock** soft key to select OFF. The following menu appears.



Decoding Start Point (Start Point)

Turn the **jog shuttle** to set the decoding start point.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

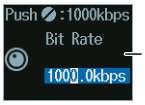
Jog shuttle setting menu

Bit Rate (Bit Rate)

Turn the **jog shuttle** to set the bit rate.

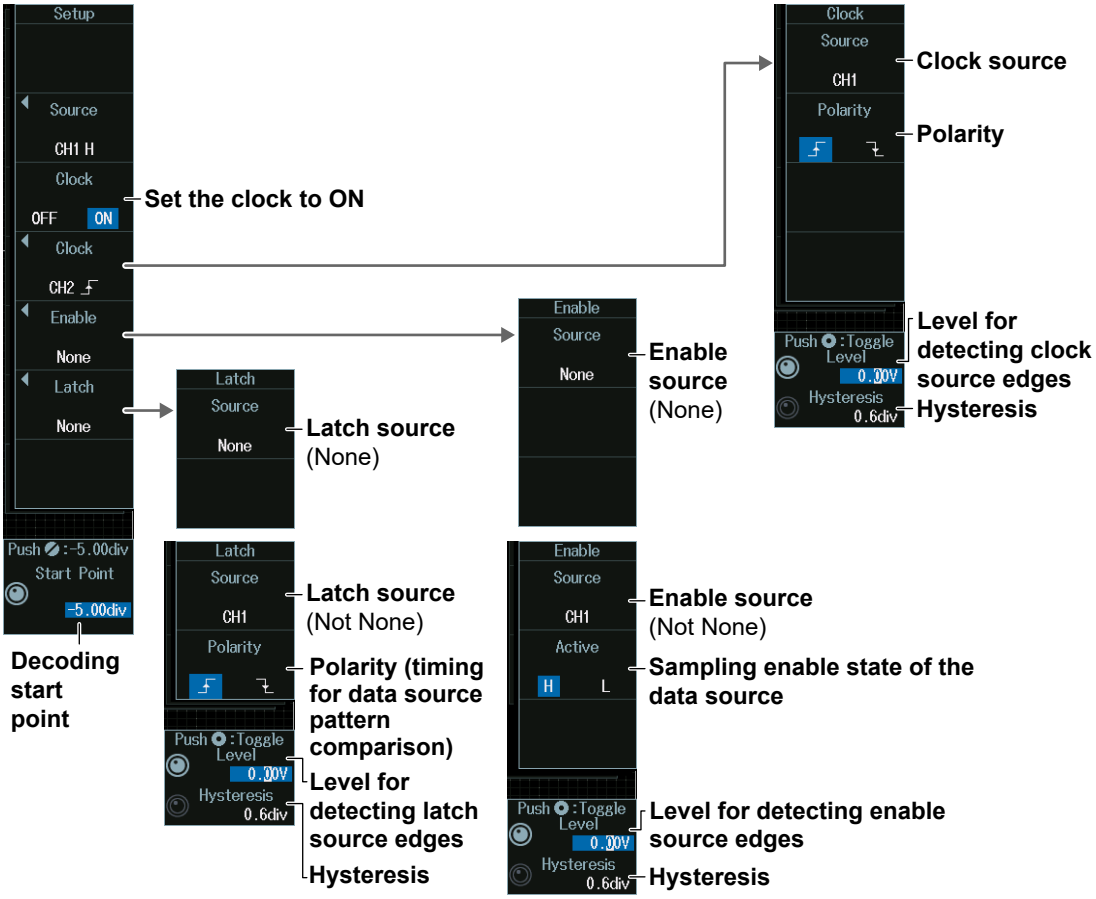
You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu



When Using the Clock (ON)

Press the **Clock** soft key to select ON. The following menu appears.



Level for Detecting Clock Source Edges (Level, Hysteresis)

Turn the **jog shuttle** to set the level or hysteresis.

- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
- To set the level, you can drag the level display line on the screen.

Jog shuttle setting menu

Press SET (upper right on the front panel) to switch between level and hysteresis.

Note

Clock Source Polarity

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

Level for Detecting Enable Source Edges (Level, Hysteresis)

Turn the **jog shuttle** to set the level or hysteresis.

- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
- To set the level, you can drag the level display line on the screen.

Jog shuttle setting menu

Level for detecting enable source edges

Hysteresis

Press SET (upper right on the front panel) to switch between level and hysteresis.

Note

Enable Source State

When the data source is sampled in sync with the clock source, the period for which data source sampling is enabled is controlled using the enable source.

Level for Detecting Latch Source Edges (Level, Hysteresis)

Turn the **jog shuttle** to set the level or hysteresis.

- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
- To set the level, you can drag the level display line on the screen.

Jog shuttle setting menu

Level for detecting latch source edges

Hysteresis

Press SET (upper right on the front panel) to switch between level and hysteresis.

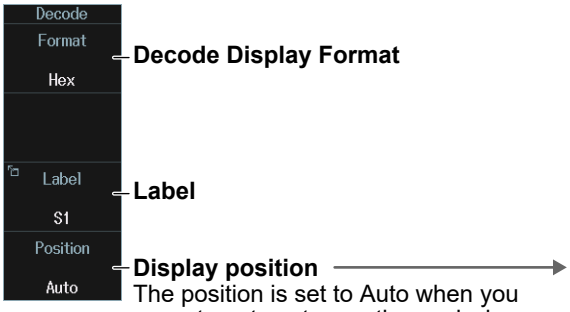
Note

Latch Source Polarity

Specify the timing at which the data source pattern sampled in sync with the clock source is latched. The latched data pattern is compared to the pattern specified for the search condition.

Decoded Display (Decode)

Press the **Decode** soft key. The following menu items appear.



Decode Display Format

Label

Display position

The position is set to Auto when you execute auto setup on the analysis menu of each serial bus signal. The position changes from Auto to Manual when you drag the decode display.

When the display position is set to Manual

Display position

Display Position (Position)

When the display position is set to Manual, turn the **jog shuttle** to set the display position (Position).

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Display position

Search Setup (Search)

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

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.

Search conditions

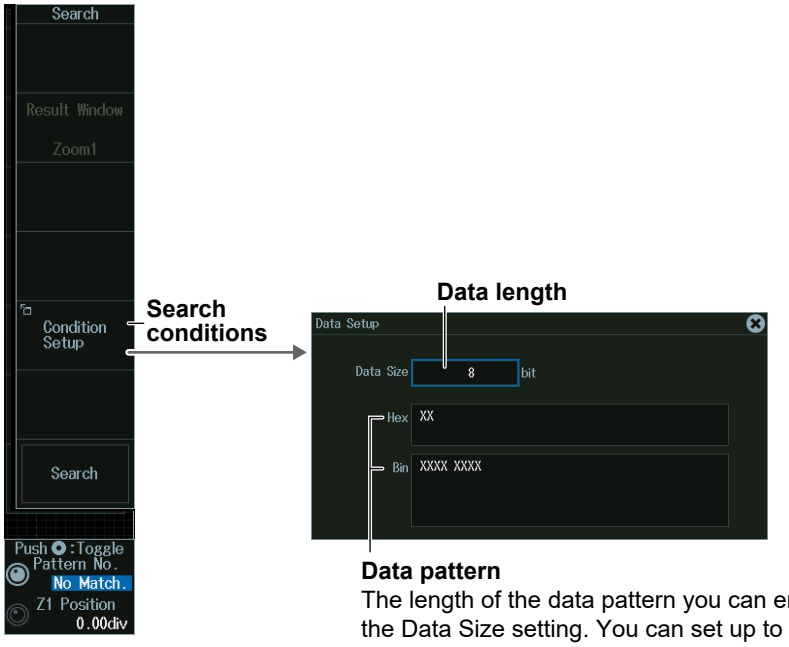
Executes the search
The instrument searches for the search conditions. If the instrument finds points that match the search conditions (detected points), it shows numbers (0, 1, 2, etc.) from the left of the waveform display in the order that the points were detected.

Detected point number

Zoom position

Search Conditions (Condition Setup)

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



Data pattern
The length of the data pattern you can enter is determined by the Data Size setting. You can set up to 128 bits.

Detected Point Number and Zoom Position (Pattern No. /Z1 Position or Z2 Position)

1. Execute a search. Check that a location matching the search conditions is found.
2. Turn the **jog shuttle** to set the detected point number (Pattern No.) and zoom position (Z1 Position or Z2 Position).
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.
   - Press **SET** (upper right on the front panel) to switch between detected point number (Pattern No.) and zoom position (Z1 Position or Z2 Position).

Jog shuttle setting menu

Detected point number

Zoom position

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,” “List Display (List)” in the Features Guide

Selecting Each Serial Bus Signal

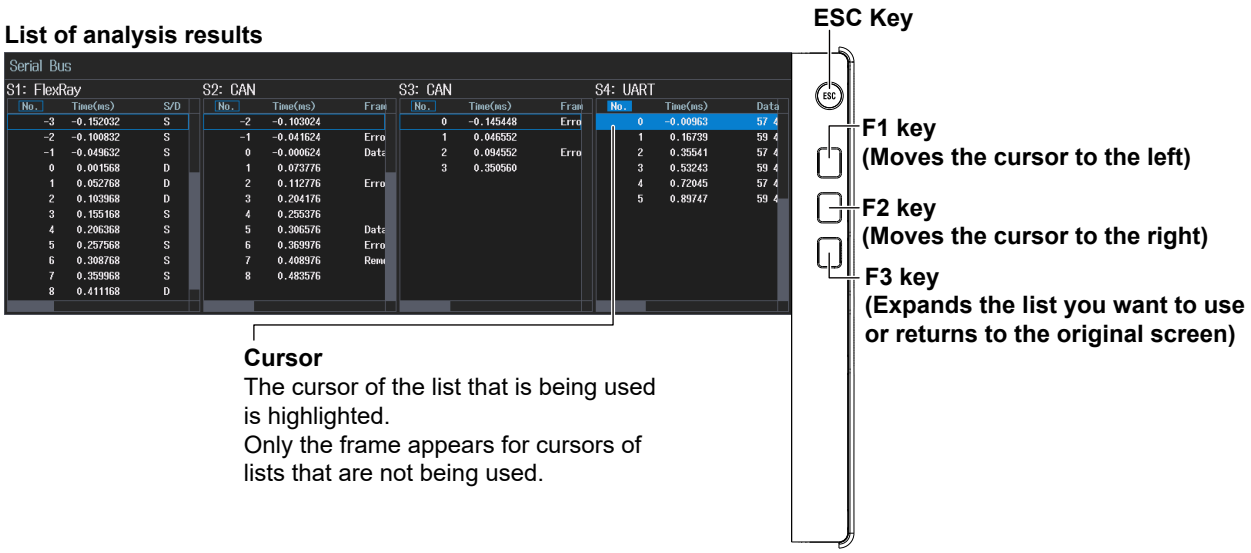
1. Select the serial bus signal number from **Serial Bus1** to **Serial Bus4**.
2. Press the **Type** soft key to select the serial bus signal type.
   For instructions on how to set up serial bus signals, see sections 12.1 to 12.11.
3. Press the **Display** soft key to select ON.
   The analysis results of the serial bus signals that are turned on are displayed in the list at step 4.

Showing the List of Analysis Results (List)

4. Press the **List** or **List/Trend** soft key and then the **Show List** soft key.
   - The soft key names differ depending on the type of serial bus signal.
   - The list of serial bus signals cannot be displayed if the analysis in search display (Display) is turned off.

Example:

When List Size is set to Half(Upper), and the serial bus signal types are set as follows
Serial Bus1 (S1): FlexRay, Serial Bus2 (S2): CAN, Serial Bus3 (S3): CAN, Serial Bus4 (S4): UART



13.1 Displaying Waveform Histograms

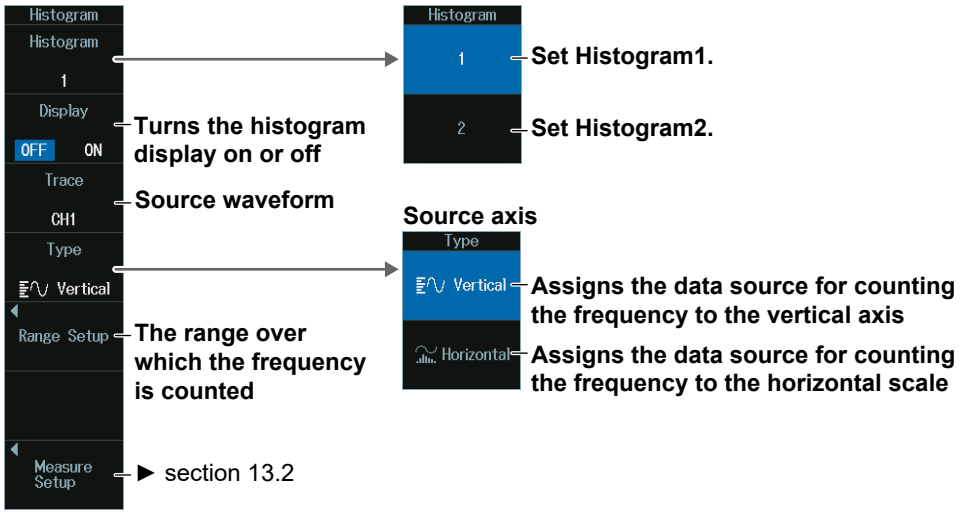
This section explains the following settings for displaying a histogram of the frequency of data occurrence in a specified area:

- Turning the histogram on or off
- Source waveform
- Source axis
- The range over which the frequency is counted

► "Waveform Histogram Display" in the Features Guide

ANALYSIS Histogram Menu

1. Press **ANALYSIS** to display the ANALYSIS menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the ANALYSIS menu from ANALYSIS on the top menu that is displayed.
2. Press the **Histogram** soft key to display the following menu.
   Up to two histograms can be displayed. To switch the setup menu, press the Histogram soft key.



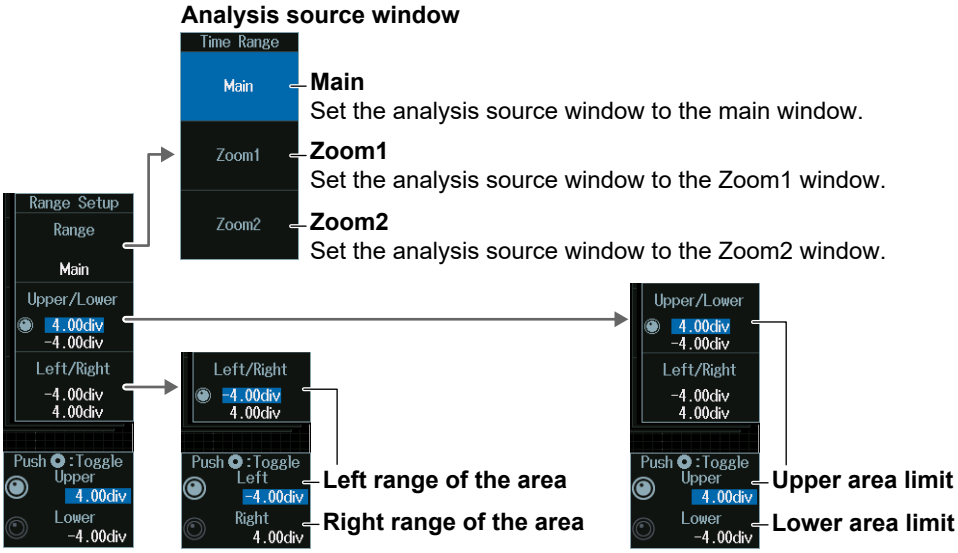
Note

The available display source waveform settings vary depending on the model.

- The available settings on 8ch models are as follows:
  CH1 to CH8, Math1 to Math8
- The available settings on 4ch models are as follows:
  CH1 to CH4, Math1 to Math4

Range over Which to Count the Frequency (Range Setup)

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



Upper and Lower Range Limits (Upper/Lower)

1. Press the **Upper/Lower** soft key.
2. Turn the **jog shuttle** to set the upper range limit (Upper) or lower range limit (Lower).
   - Press **SET** (upper right on the front panel) to switch between upper and lower range limits.
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Left and Right Range Limits (Left/Right)

1. Press the **Left/Right** soft key.
2. Turn the **jog shuttle** to set the left range limit (Left) or right range limit (Right).
   - Press **SET** (upper right on the front panel) to switch between left and right range limits.
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

13.2 Measuring Histogram Parameters

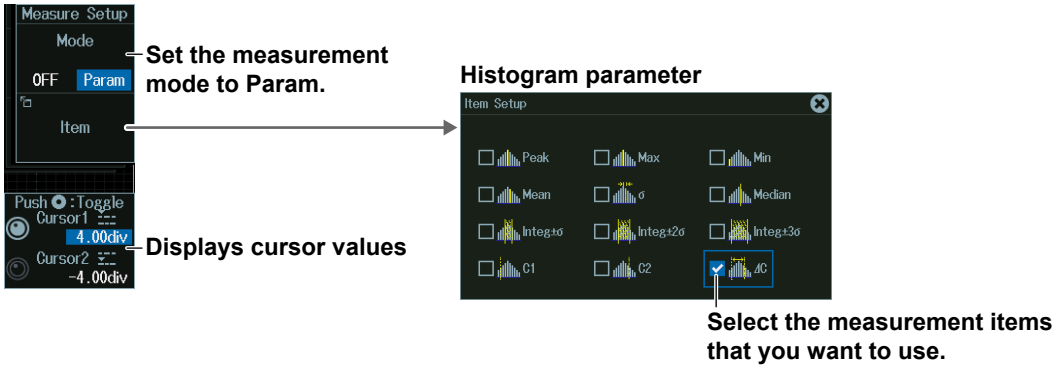
This section explains the following settings for measuring histogram parameters:

- Measurement mode
- Measurement items
- Cursor measurement

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

ANALYSIS Histogram Measure Setup Menu

1. Press **ANALYSIS** to display the ANALYSIS menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the ANALYSIS menu from ANALYSIS on the top menu that is displayed.
2. Press **Histogram** and then the **Measure Setup** soft key to display the following menu.

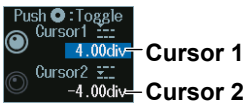


Displaying Cursor Values (Cursor1/Cursor2)

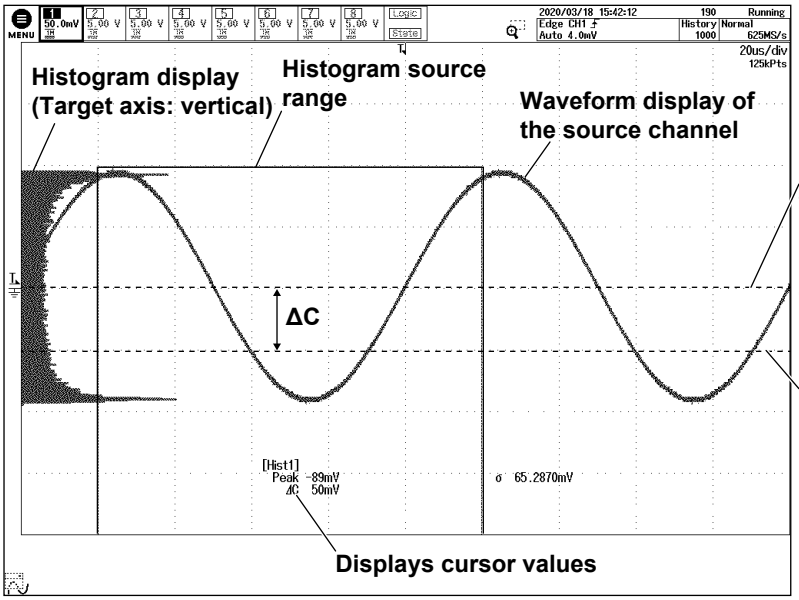
Turn the **jog shuttle** to set cursor 1 (Cursor1) or cursor 2 (Cursor2).

- Press **SET** (upper right on the front panel) to switch between cursor 1 and cursor 2.
- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu



Histogram Parameter Measurement



Cursor 1
The position when the item is set to C1. When the item is set to ΔC, the position is on the C1 side.

Cursor 2
The position when the item is set to C2. When the item is set to ΔC, the position is on the C2 side.

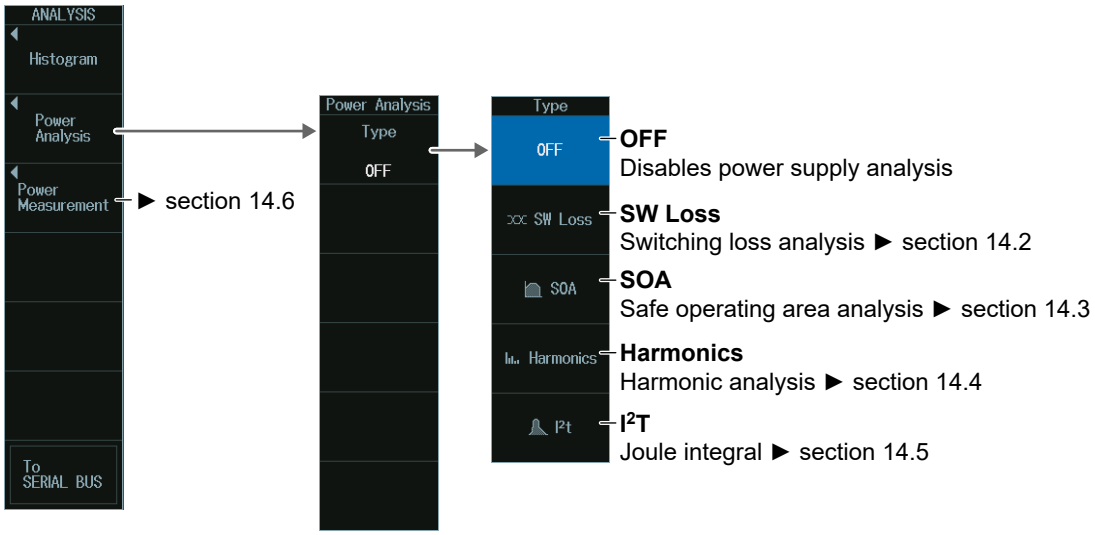
14.1 Power Supply Analysis Types

This section explains how to set the power supply analysis type.

► "Power Supply Analysis" in the Features Guide

ANALYSIS Power Analysis Menu

1. Press **ANALYSIS** to display the ANALYSIS menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the ANALYSIS menu from ANALYSIS on the top menu that is displayed.
2. Press the **Power Analysis** soft key to display the following menu.



Note

Power supply analysis and power measurement of the power supply analysis feature cannot be executed simultaneously.

- On 8ch models, 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.
- On 4ch models, if any of the power measurement items, Power Measurement1 to Power Measurement2, 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 for analyzing switching loss:

- Probe
- Measurement content
  Loss type, level setup, reference levels for voltage channels, measurement items, turning measurement location indicator on or off, statistical processing, measurement source window, measurement range
- Turning power trace display on or off
- Scaling
- Center point and sensitivity

► **"Switching Loss Analysis (SW Loss)" in the Features Guide**

ANALYSIS Power Analysis Menu

1. Press **ANALYSIS** to display the ANALYSIS menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the ANALYSIS menu from ANALYSIS on the top menu that is displayed.
2. Press the **Power Analysis** soft key, the **Type** soft key, and then the **SW Loss** soft key to display the following menu.

Set Type to SW Loss.

Probe

Measurement content

Turns the power waveform display on or off

Scaling ►section 6.6

Center point

Sensitivity

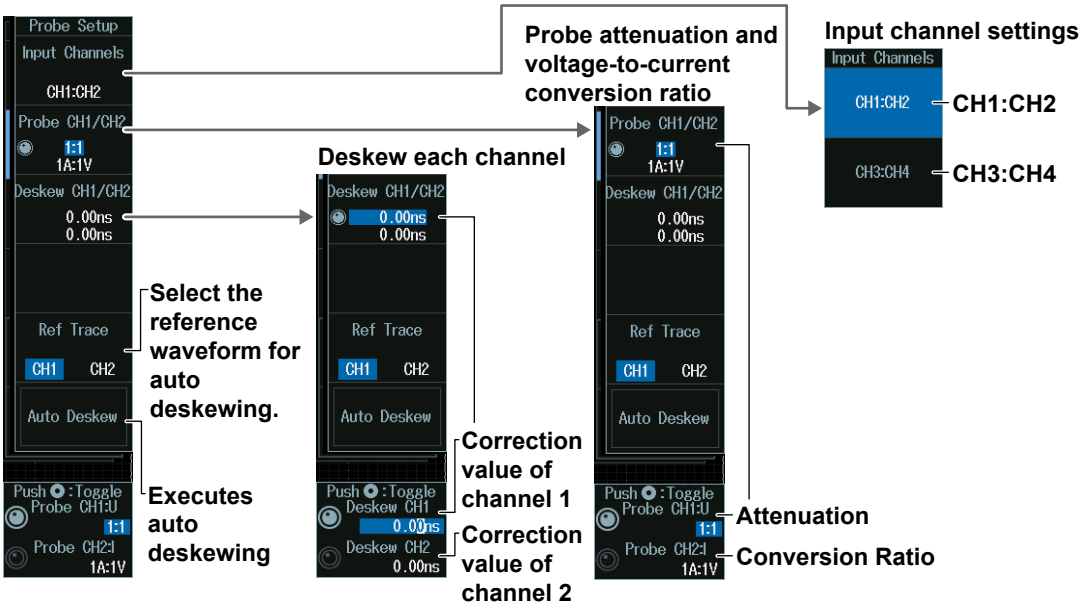
Set this when the scaling mode is Manual.

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 set the power supply analysis type (Type) to SW Loss, the cycle mode (Cycle Mode) on the Item Setup screen (page 9-2) on the MEASURE menu is fixed to SW Loss.
- If the power waveform display is turned on, the operator (Operation) of the computation/reference waveform (MATH/REF menu) is fixed to Power, and other operators cannot be used.

Probe (Probe Setup)

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



Probe Attenuation Ratio and Voltage-to-Current Conversion Ratio (Probe CH1/CH2 or Probe CH3/CH4)

1. Press the **Probe CH1/CH2** or **Probe CH3/CH4** soft key.
2. Turn the **jog shuttle** to set the attenuation ratio (Probe CH1:U, Probe CH3:U) or conversion ratio (Probe CH2:I, Probe CH4:I).

- Press **SET** (upper right on the front panel) to switch between attenuation ratio and conversion ratio.
- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

The channel number display varies depending on the input channel selection.

Deskewing Each Channel (Deskew CH1/CH2)

1. Press the **Deskew CH1/CH2** or **Deskew CH3/CH4** soft key.
2. Turn the **jog shuttle** to set the correction value of channels 1 and 3 (Deskew CH1/CH3) or channels 2 and 4 (Deskew CH2/CH3).

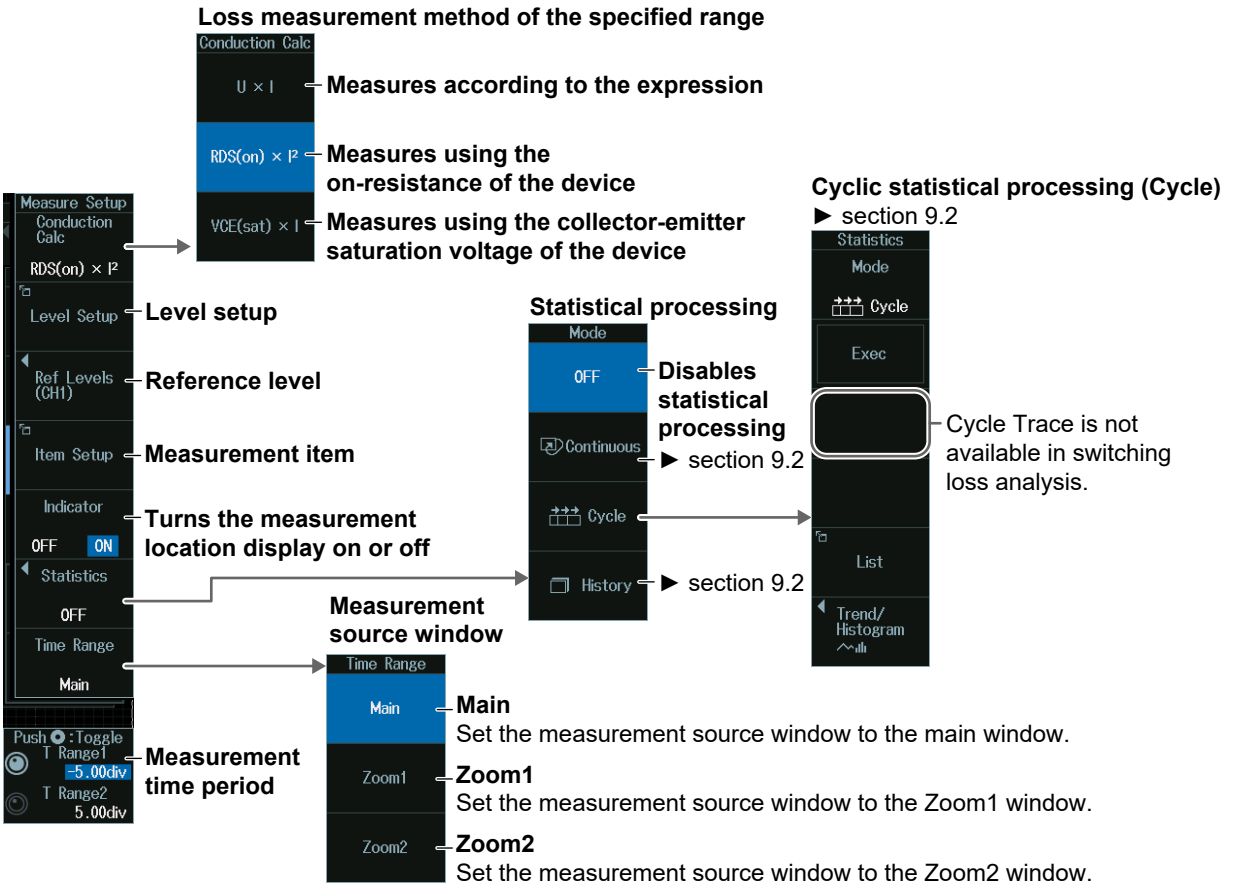
- Press **SET** (upper right on the front panel) to switch between the correction value of channel 1 or channel 2.
- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

The channel number display varies depending on the input channel selection.

Measurement Setup (Measure Setup)

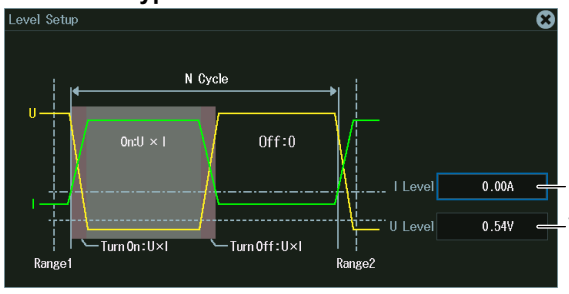
Press the **Measure Setup** soft key to display the following menu.



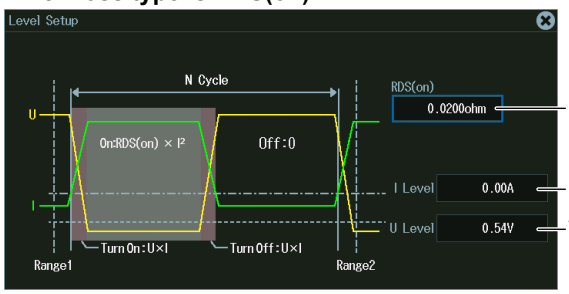
Level Setup (Level Setup)

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

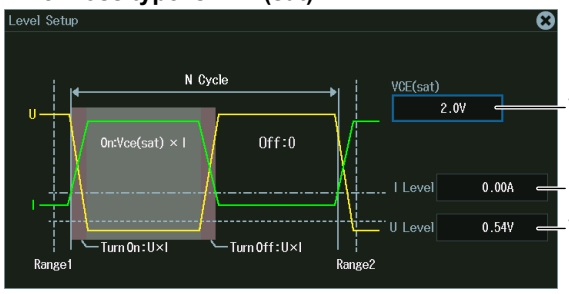
When loss type is U×I



When loss type is RDS(on)×I²



When loss type is VCE(sat)×I



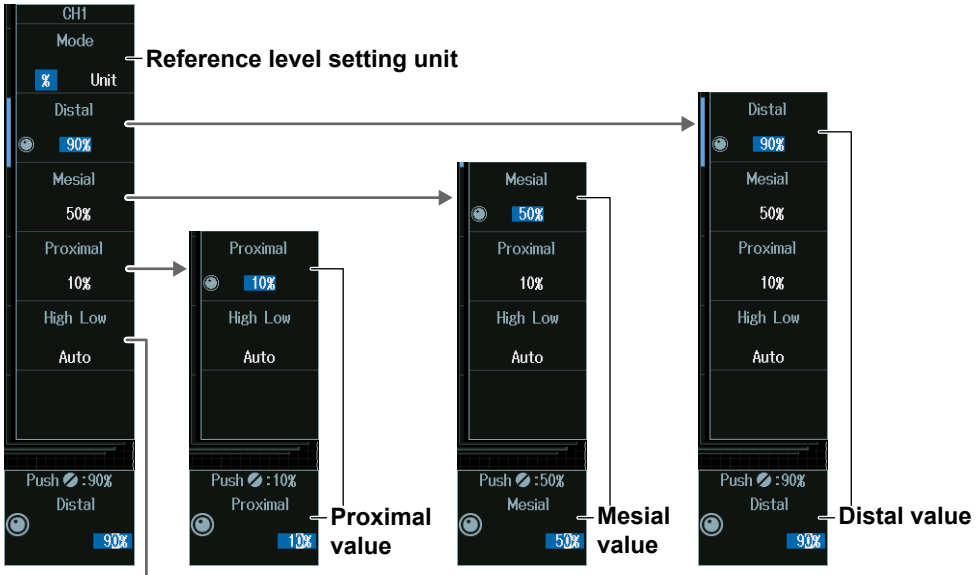
VCE (sat) value

Current level

Voltage level

Reference Levels (Ref Levels)

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



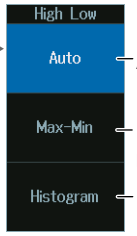
Reference level setting unit

Proximal value

Mesial value

Distal value

How to determine the high and low values



Automatically take into account the effects of ringing and spikes

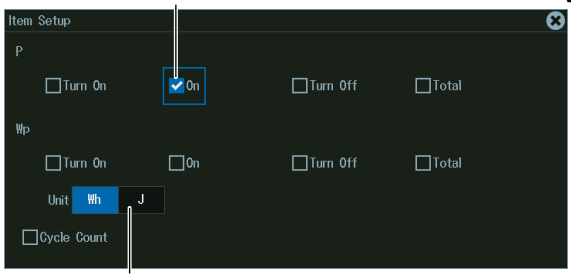
Use the maximum and minimum values in the measurement range

Make the maximum frequent values the maximum and minimum values

Measurement Items (Item Setup)

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

Select the measurement items that you want to use.



Power unit

Measurement Time Period (T Range1/T Range2)

Turn the **jog shuttle** to set the measurement start point (T Range1) or measurement end point (T Range2).

- Press **SET** (upper right on the front panel) to switch between measurement start point or measurement end point.
- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Measurement start point

Measurement end point

14.3 Performing Safe Operating Area Analysis

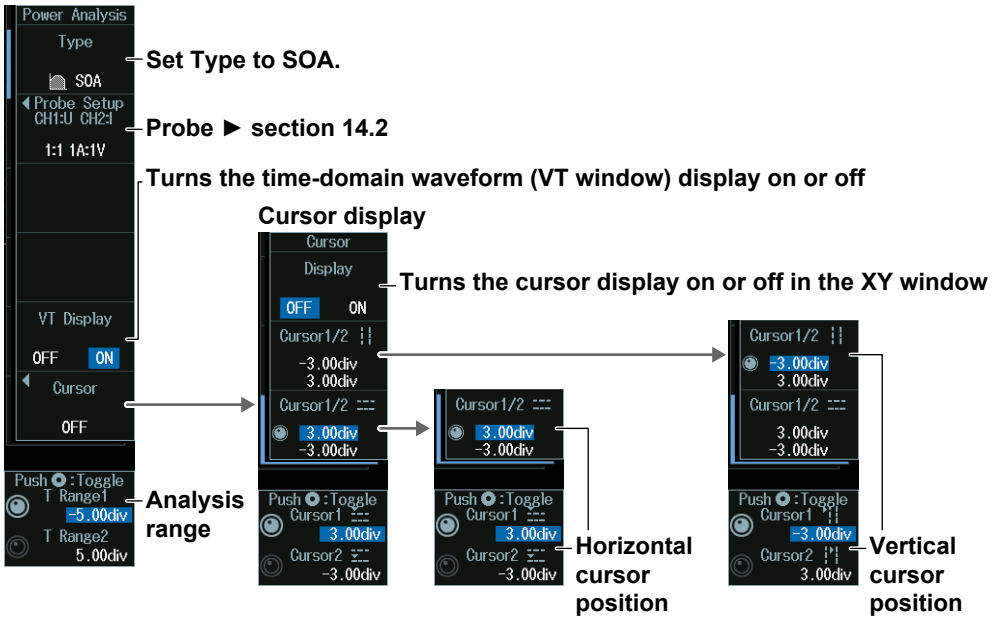
The instrument can display the safe operating area of power by plotting the voltage signal input channel and current input signal channel on the XY waveform display. This section explains the following settings for performing safe operating area analysis:

- Probe
- Turning the VT waveform display on or off
- Cursor display
- Measurement range

► "Safe Operating Area Analysis (SOA)" in the Features Guide

ANALYSIS Power Analysis Menu

1. Press **ANALYSIS** to display the ANALYSIS menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the ANALYSIS menu from ANALYSIS on the top menu that is displayed.
2. Press the **Power Analysis** soft key, the **Type** soft key, and then the **SOA** soft key to display the following menu.



Note

If you set the power supply analysis type to SOA, XY waveforms are automatically displayed on the screen.

Displaying the VT Waveforms (VT Display)

Press the **VT Display** soft key to show or hide time-domain waveforms.

Analysis Range (T Range1/T Range2)

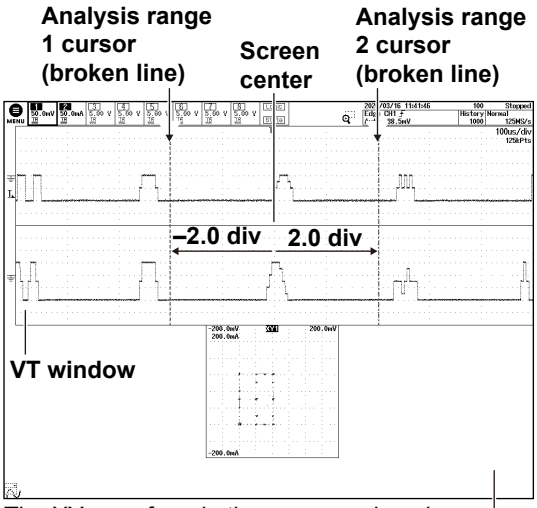
Turn the **jog shuttle** to set the analysis start point (T Range1) or analysis end point (T Range2).

- Press **SET** (upper right on the front panel) to switch between analysis start point or analysis end point.
- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Time-Domain Waveform (VT Window) Display and Analysis Range

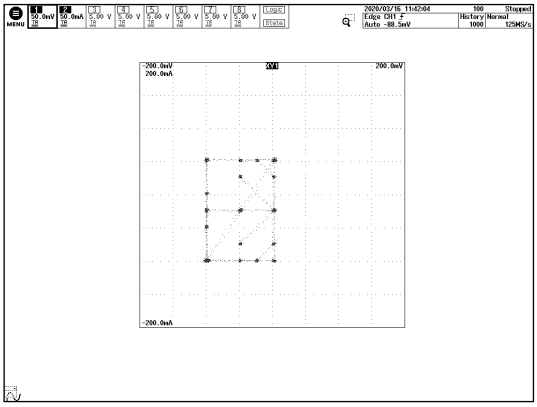
• When the VT window is shown



The XY waveform in the range enclosed by the analysis range cursor on the VT window is displayed.

XY window

• When the VT window is hidden



Vertical Cursor Positions (Cursor1/Cursor2)

1. Press the **Cursor** soft key.
2. Press the **Cursor1/2** soft key.
3. Turn the **jog shuttle** to set vertical cursor 1 (Cursor1) or vertical cursor 2 (Cursor2).
   - Press **SET** (upper right on the front panel) to switch between vertical cursor 1 and vertical cursor 2.
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Vertical cursor 1 position

Vertical cursor 2 position

Note

Setting the Vertical Cursor Positions

If you press SET several times and make the jog shuttle control both vertical cursor 1 and vertical cursor 2, you can move them together.

When you move the two cursors together, the cursors no longer move when one of the cursors reaches the edge of the screen.

Horizontal Cursor Position (Cursor1/Cursor2)

1. Press the **Cursor** soft key.
2. Press the **Cursor1/2** soft key.
3. Turn the **jog shuttle** to set horizontal cursor 1 (Cursor1) or horizontal cursor 2 (Cursor2).
   - Press **SET** (upper right on the front panel) to switch between horizontal cursor 1 and horizontal cursor 2.
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Horizontal cursor 1 position

Horizontal cursor 2 position

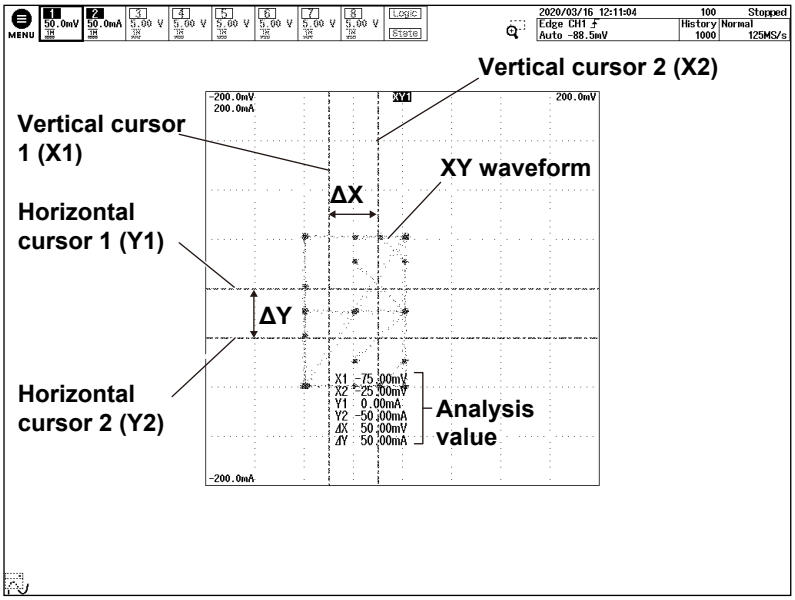
Note

Setting the Horizontal Cursor Positions

If you press SET several times and make the jog shuttle control both horizontal cursor 1 and horizontal cursor 2, you can move them together.

When you move the two cursors together, the cursors no longer move when one of the cursors reaches the edge of the screen.

Safe Operating Area Analysis (Cursor Display)



14.4 Performing Harmonic Analysis

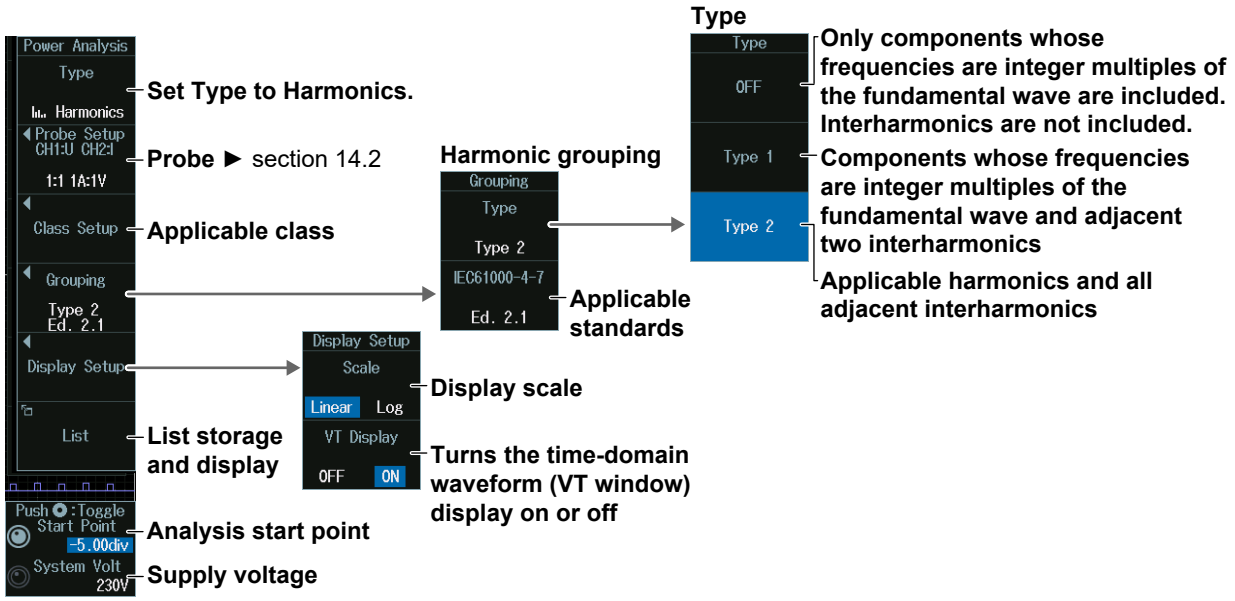
This section explains the following settings for performing harmonic analysis:

- Probe
- Applicable class
- Harmonic grouping
- Display setup
- List storage and display
  List storage, list size, and display position
- Analysis start point
- EUT's power supply voltage

► "Harmonic Analysis (Harmonics)" in the Features Guide

ANALYSIS Power Analysis Menu

1. Press **ANALYSIS** to display the ANALYSIS menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the ANALYSIS menu from ANALYSIS on the top menu that is displayed.
2. Press the **Power Analysis** soft key, the **Type** soft key, and then the **Harmonics** soft key to display the following menu.

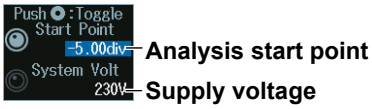


Analysis Start Point and Supply Voltage (Start Point/System Volt)

Turn the **jog shuttle** to set the analysis start point (Start Point) or supply voltage (System Volt).

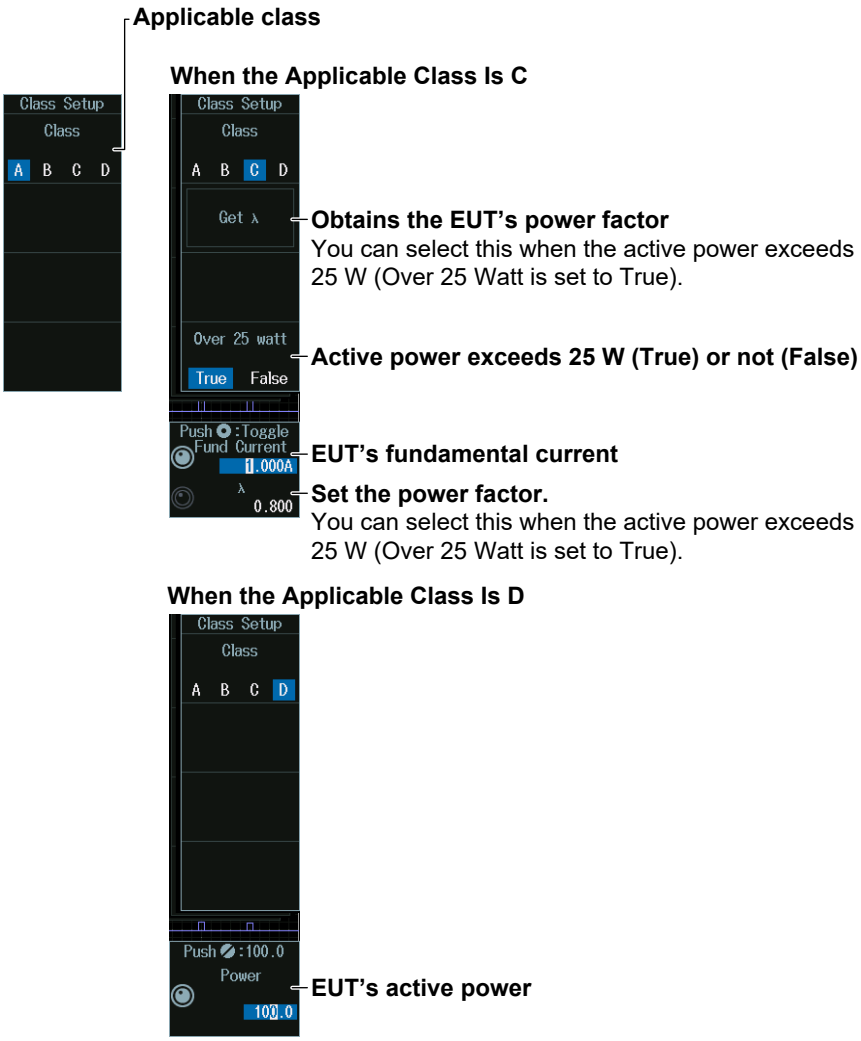
- Press **SET** (upper right on the front panel) to switch between analysis start point or supply voltage.
- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu



Applicable Class (Class Setup)

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



Note

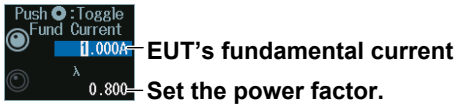
While λ (the power factor) is being obtained, Get λ changes to Abort. It may take time to obtain λ if the record length is long. To stop obtaining λ, press the Abort soft key.

Setting the EUT's Fundamental Current and Power Factor (Fund Current/λ)

Turn the **jog shuttle** to set the EUT's fundamental current (Fund Current) or power factor (λ).

- Press **SET** (upper right on the front panel) to switch between the EUT's fundamental current and power factor.
- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu



EUT's Active Power (Power)

Turn the **jog shuttle** to set the EUT's active power (Power).

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

EUT's active power

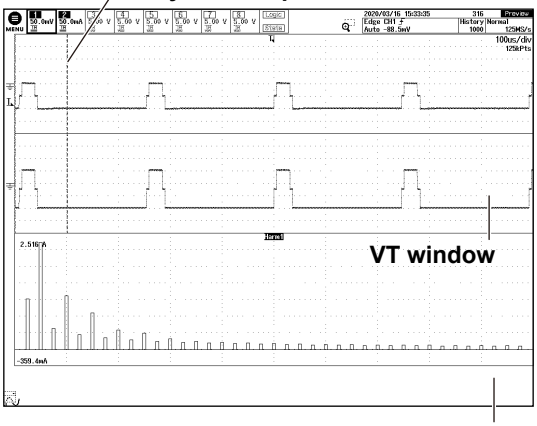
Displaying the VT Waveforms (VT Display)

Press the **Display Setup** soft key and then the **VT Display** soft key to show or hide time-domain waveforms.

Time-Domain Waveform (VT Window) Display

• When the VT window is shown

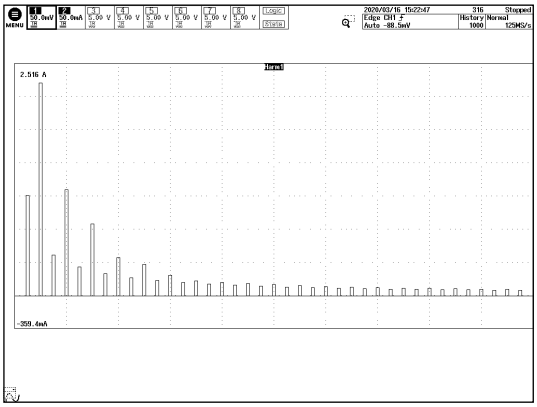
Analysis start point



VT window

Harmonics display window

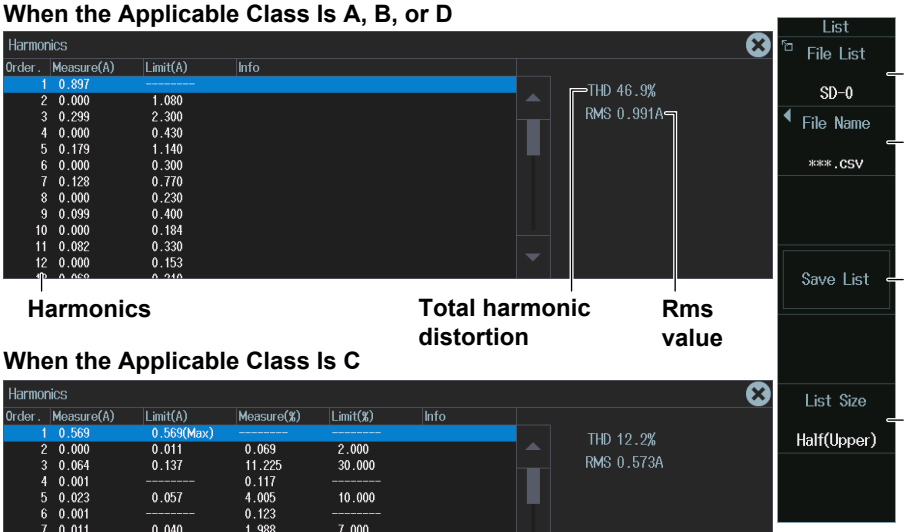
• When the VT window is hidden



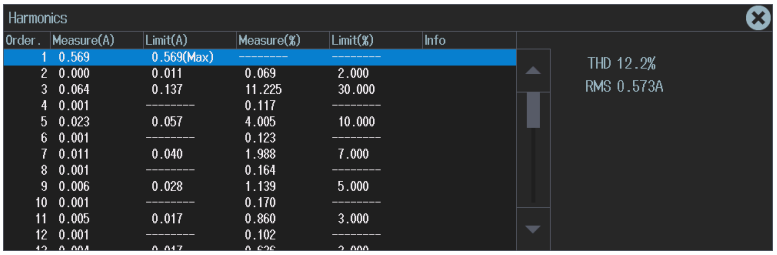
List Storage and Display (List)

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

When the Applicable Class Is A, B, or D



When the Applicable Class Is C



14.5 Measuring the Joule Integral

This section explains the following settings for measuring the Joule integral:

- Probe
- Measurement content
  Turning Joule integral on or off, measurement source window, measurement range
- Turning Joule integral waveform display on or off
- Auto scaling
- Center point and sensitivity

► **"Measuring Inrush Current by Computing the Joule Integral (I2t)" in the Features Guide**

ANALYSIS Power Analysis Menu

1. Press **ANALYSIS** to display the ANALYSIS menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the ANALYSIS menu from ANALYSIS on the top menu that is displayed.
2. Press the **Power Analysis** soft key, the **Type** soft key, and then the **I²T** soft key to display the following menu.

Set the type to I²T.

Probe ► section 14.2

Measurement content

Turns the Joule integral waveform display on or off

Executes auto ranging
Automatically set the vertical display range of the Joule integral waveform.

Center point

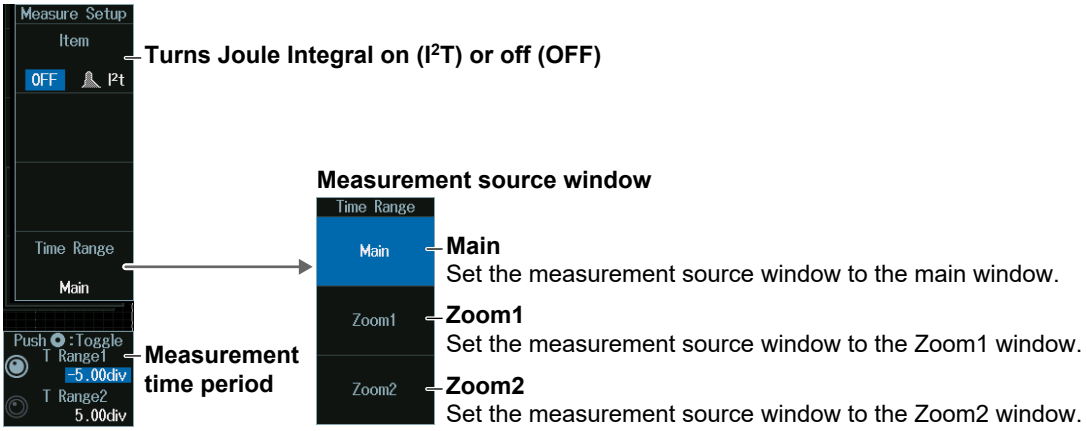
Sensitivity

Note

If the Joule integral waveform display is turned on, the operator (Operation) of the computation/reference waveform (MATH/REF menu) is fixed to I^2T, and other operators cannot be used.

Measurement Setup (Measure Setup)

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

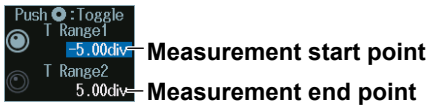


Measurement Time Period (T Range1/T Range2)

Turn the **jog shuttle** to set the measurement start point (T Range1) or measurement end point (T Range2).

- Press **SET** (upper right on the front panel) to switch between measurement start point or measurement end point.
- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

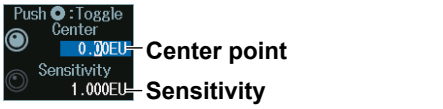


Center Position and Sensitivity (Center/Sensitivity)

Turn the **jog shuttle** to set the center position (Center) or sensitivity (Sensitivity).

- Press **SET** (upper right on the front panel) to switch between center position and sensitivity.
- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu



14.6 Measuring Power

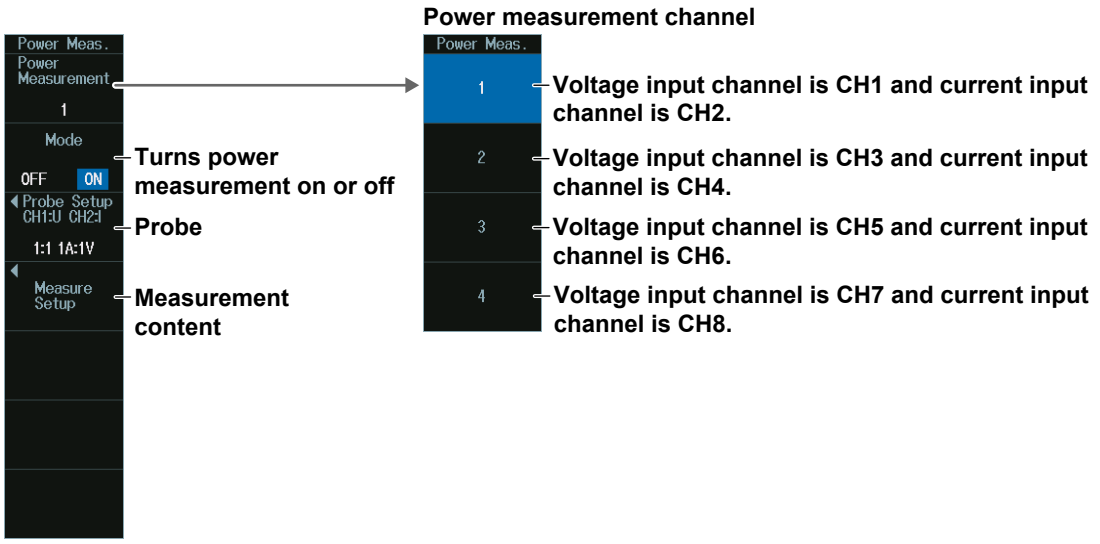
This section explains the following settings for measuring Joule power:

- Turning power measurement on and off
- Probe
- Measurement content
  Measurement items, reference levels for auto measurement, measurement location indicator, cycle mode, calculation that uses automated measurement values, statistical processing, measurement source window, measurement range

► “Power Measurement (Power Measurement)” in the Features Guide

ANALYSIS Power Measurement Menu

1. Press **ANALYSIS** to display the ANALYSIS menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the ANALYSIS menu from ANALYSIS on the top menu that is displayed.
2. Press the **Power Measurement** soft key to display the following menu.

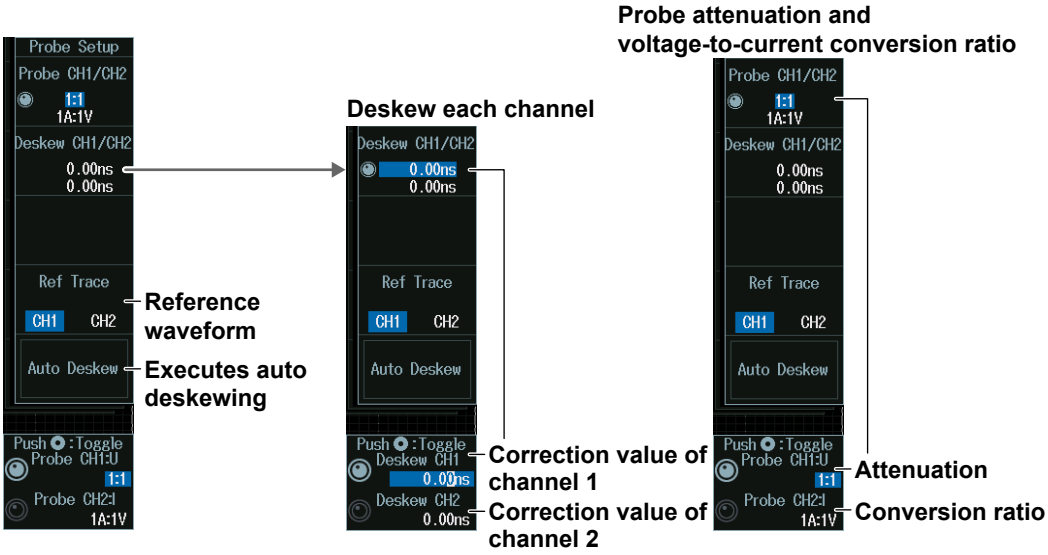


Note

- The available power measurement channel settings vary depending on the model.
  - The available settings on 8ch models are as follows:
    Power Measurement 1 to Power Measurement 4
  - The available settings on 4ch models are as follows:
    Power Measurement 1 and Power Measurement 2
- 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
- The power measurement cycle mode (Cycle Mode) and the cycle mode (Cycle Mode) measurement item (Item Setup) on the MEASURE key menu are also changed in sync.

Probe (Probe Setup)

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



Probe Attenuation Ratio and Voltage-to-Current Conversion Ratio (Probe CH1/CH2, CH3/CH4, CH5/CH6, CH7/CH8)

1. Press the **Probe CH1/CH2**, **Probe CH3/CH4**, **Probe CH5/CH6**, or **Probe CH7/CH8** soft key.
2. Turn the **jog shuttle** to set the attenuation ratio (Probe CH1:U, CH3:U, CH5:U, CH7:U) or conversion ratio (Probe CH2:I, CH4:I, CH6:I, CH8:I).

- Press **SET** (upper right on the front panel) to switch between attenuation ratio and conversion ratio.
- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

The channel number display varies depending on the input channel selection.

Deskewing Channels (Deskew CH1/CH2, CH3/CH4, CH5/CH6, CH7/CH8)

1. Press the **Deskew CH1/CH2**, **Deskew CH3/CH4**, **Deskew CH5/CH6**, or **Deskew CH7/CH8** soft key.
2. Turn the **jog shuttle** to set the channel 1/channel 2, channel 3/channel 4, channel 5/channel 6, or channel 7/channel 8 correction value (Deskew CH1/CH2, CH3/CH4, CH5/CH6, CH7/CH8).

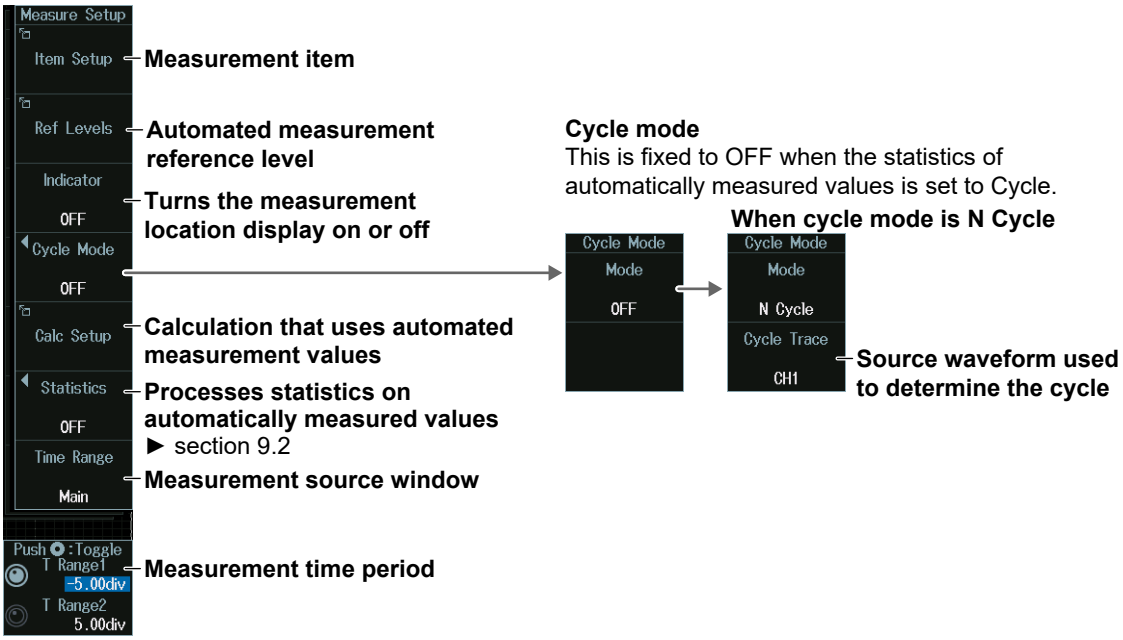
- Press **SET** (upper right on the front panel) to switch between the correction value of channel 1 or channel 2.
- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

The channel number display varies depending on the input channel selection.

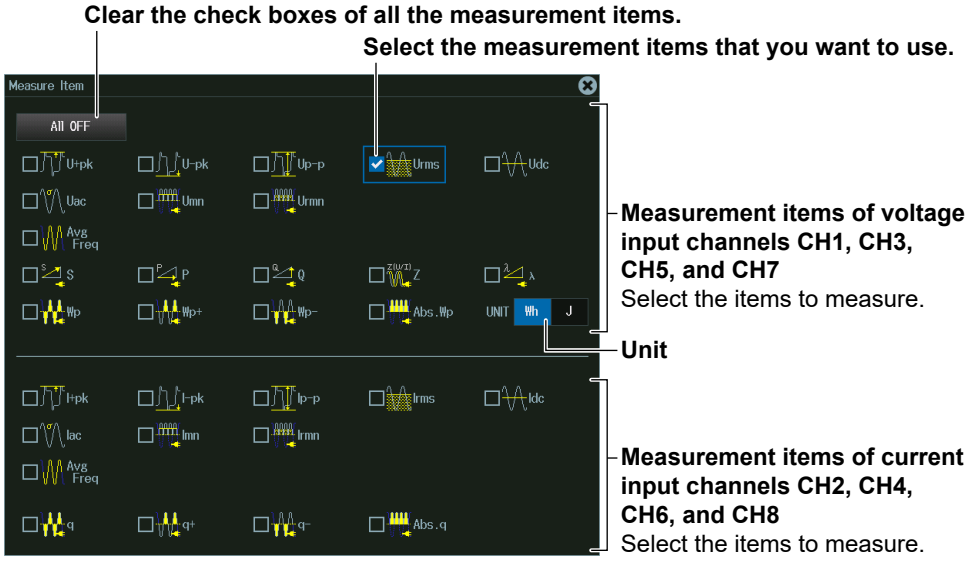
Measurement Setup (Measure Setup)

1. Press the **Mode** soft key to turn power measurement on.
2. Press the **Measure Setup** soft key to display the following menu.



Measurement Items (Item Setup)

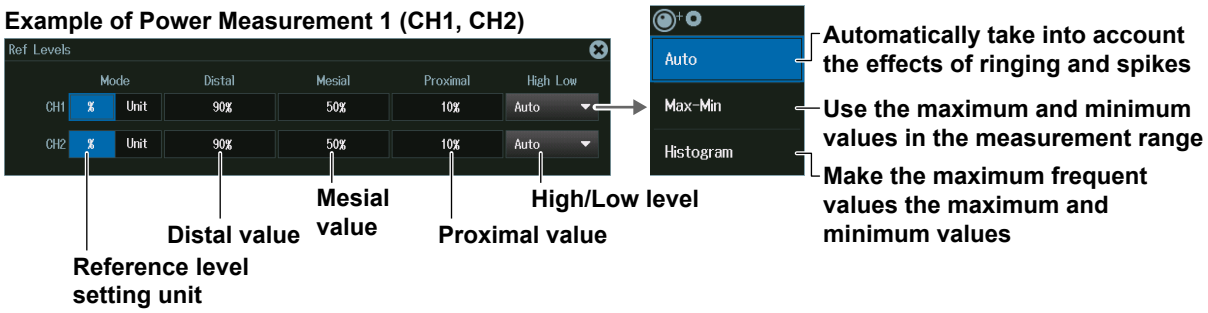
Press the **Item Setup** soft key to display the following menu.



Reference Level for Automated Measurement (Ref Levels)

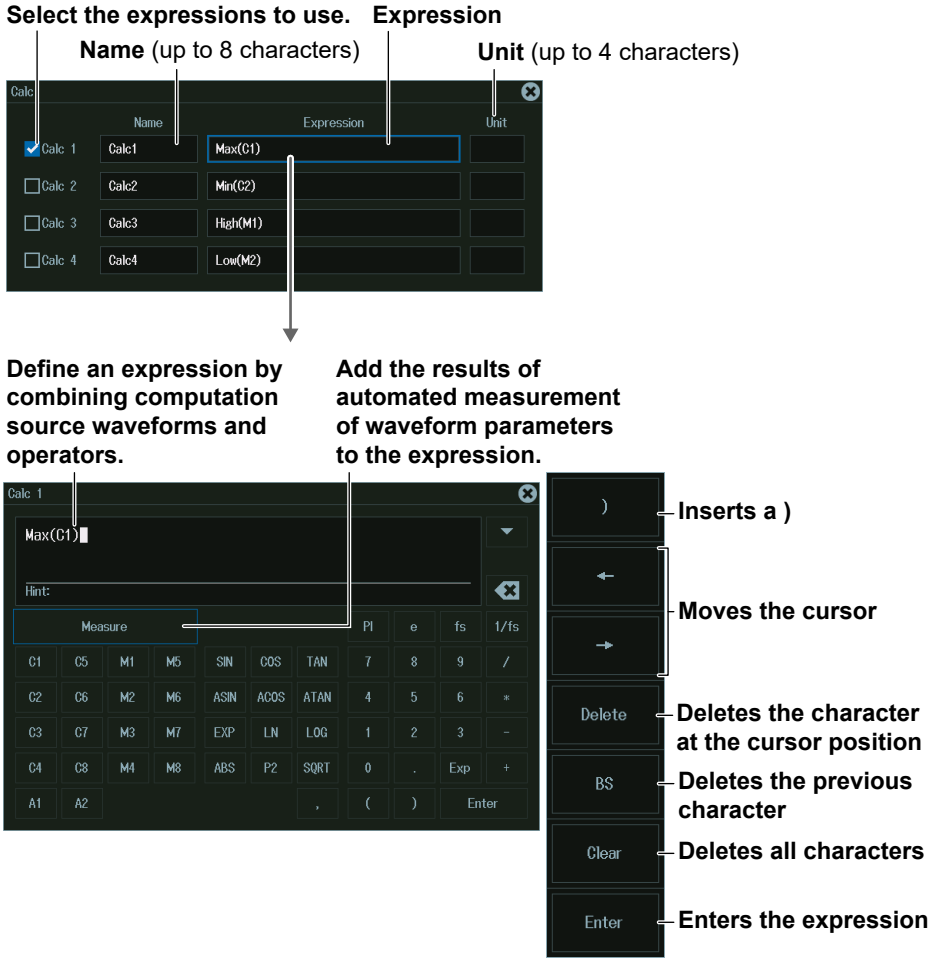
Press the **Ref Levels** soft key. Depending on the power measurement that is selected (Power Measurement1 to Power Measurement4), the following screen appears.

Example of Power Measurement 1 (CH1, CH2)



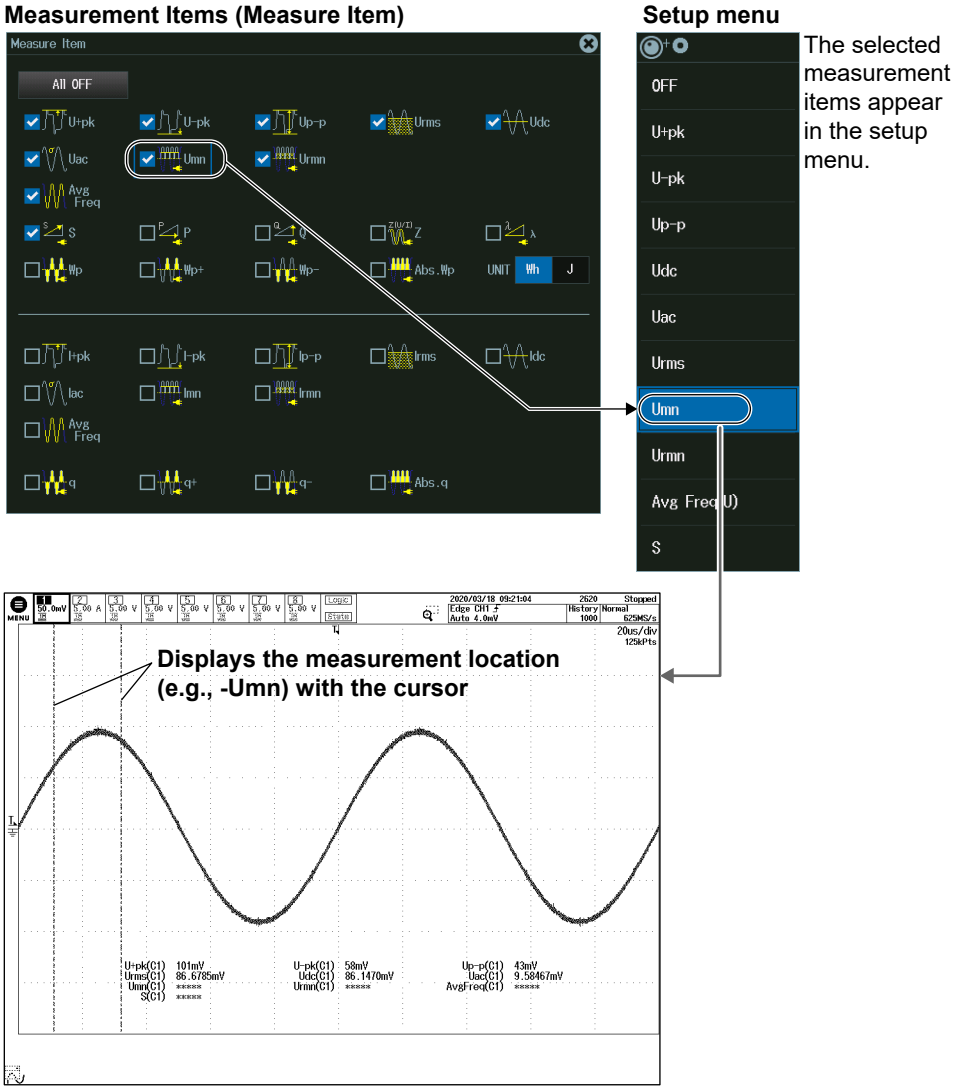
Calculations That Use Automated Measurement Values (Calc Setup)

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



Measurement Location Indicator (Indicator)

1. Press the **Indicator** soft key.
   A portion of the items selected in “Measurement Source Waveform and Measurement Items (Item Setup)” is listed in the setup menu.
2. Use the **jog shuttle** or the **SET** key to select the item whose measurement location you want to indicate.
3. Press **SET** to confirm your selection.
   The measurement location of the item you specify is indicated by a cursor.



Note

- If you turn the power measurement on, automated measurement of waveform parameters is enabled. The measured values from the measurement items set on the MEASURE menu and the power measurement items are displayed on the screen.
  A maximum of 30 measurement items can be displayed. If the measured power values are not displayed, reduce the number of MEASURE menu measurement items. ► section 9.1
- If you turn power measurement on, the cycle mode (Cycle Mode) on the MEASURE key menu’s Item Setup screen (page 9-2) is changed according to the power measurement cycle mode (Cycle Mode), and you will not be able to change it from the MEASURE key menu.
- If you change the statistical processing type (Statistics), the statistical processing type (Statistics) on the MEASURE key menu also changes in sync.

15.1 Displaying Waveform History Waveforms

This section explains the following settings for displaying history waveforms, which are waveforms that were previously saved to acquisition memory:

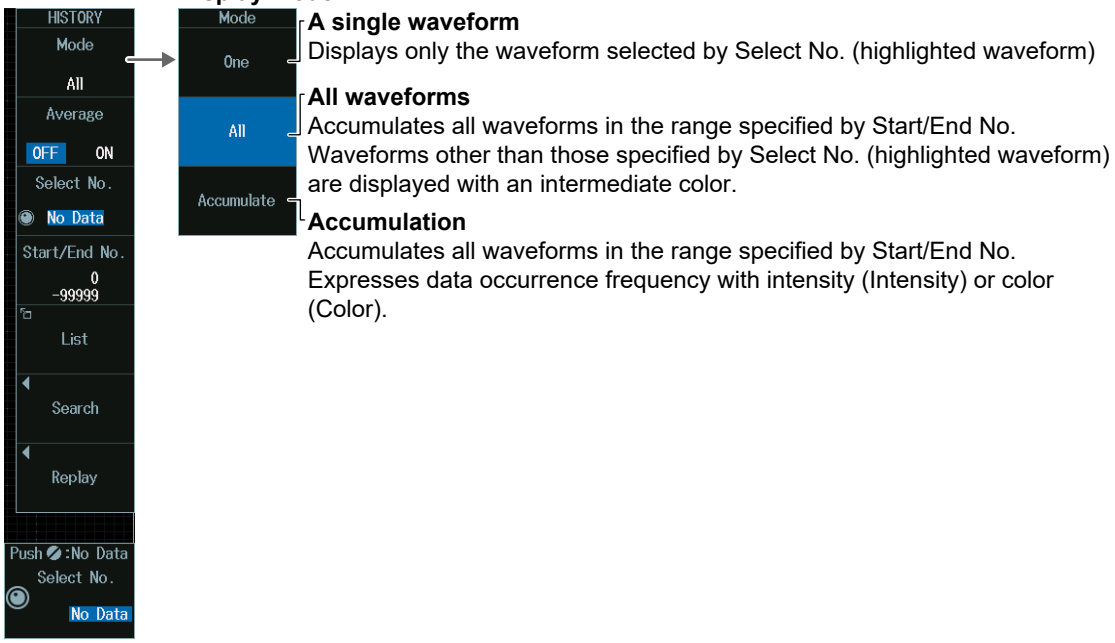
- Display mode
- Turning averaging on or off
- Highlighting of the selected record number
- Display range (start and end record numbers)
- Showing a list of timestamps
- Replay
- Gradation mode

► "Displaying and Searching History Waveforms" in the Features Guide

HISTORY Menu

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

You can also tap **MENU** (MENU) in the upper left of the screen and select the HISTORY menu from ACQ/DISP on the top menu that is displayed.



Display mode

A single waveform
Displays only the waveform selected by Select No. (highlighted waveform)

All waveforms
Accumulates all waveforms in the range specified by Start/End No.
Waveforms other than those specified by Select No. (highlighted waveform) are displayed with an intermediate color.

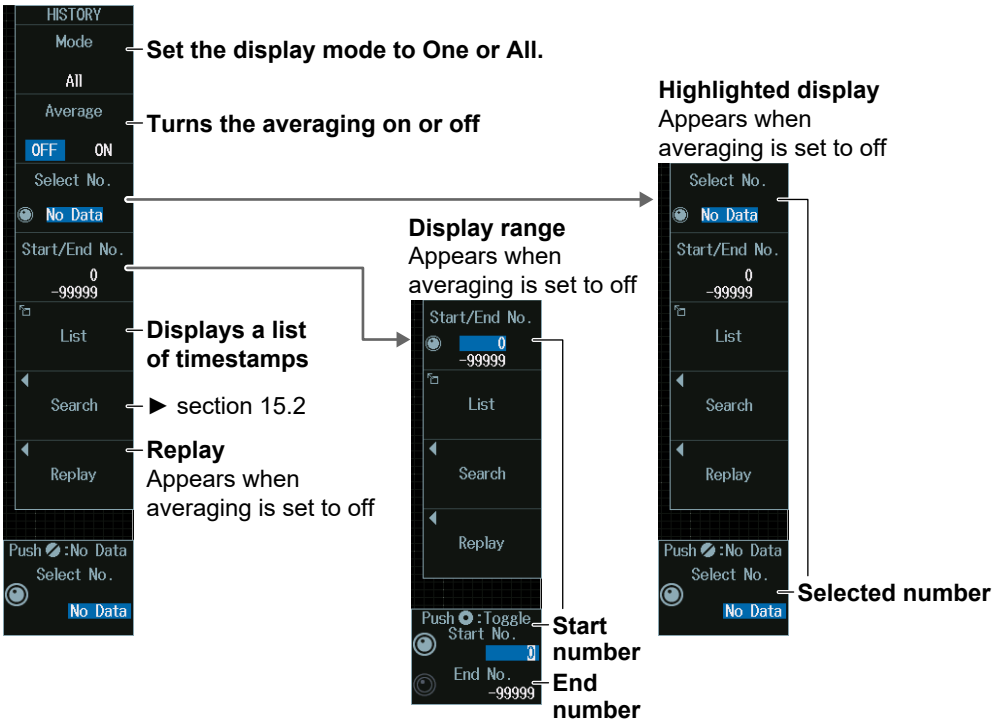
Accumulation
Accumulates all waveforms in the range specified by Start/End No.
Expresses data occurrence frequency with intensity (Intensity) or color (Color).

Note

- If you restart waveform acquisition by using the RUN/STOP key, all history waveforms that had been stored up to that point are cleared. However, if the trigger mode is set to Single (using the SINGLE key), the waveform that had been stored using the SINGLE key remains as a history waveform unless you change the waveform acquisition conditions.
- If you change the waveform acquisition conditions, all history waveforms that had been stored in the memory are cleared.
- If you change user-defined computation settings while using the history feature, recomputation is not performed on the history waveforms. To recompute, execute Math on History.

Single Waveform Mode (One), All Waveform Mode (All)

1. Press the **Mode** soft key.
2. Press the **One** or **All** soft key to display the following menu.



Highlighting (Select No.)

1. Press the **Select No.** soft key.
2. Turn the jog shuttle to set the record number (selection number) to highlight.
   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

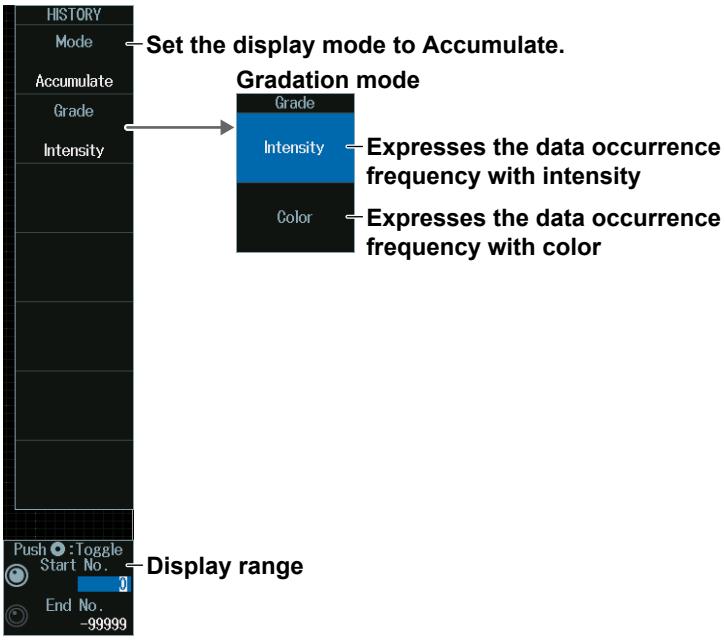
Display Range (Start/End No.)

1. Press the **Start/End No.** soft key.
2. Turn the jog shuttle to set the start or end number.
   - Press **SET** (upper right on the front panel) to switch between the display range start point (Start No.) and the display range end point (End No.).
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Accumulation Mode (Accumulate)

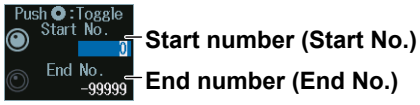
1. Press the **Mode** soft key.
2. Press the **Accumulate** soft key to display the following menu.



Display Range (Start/End No.)

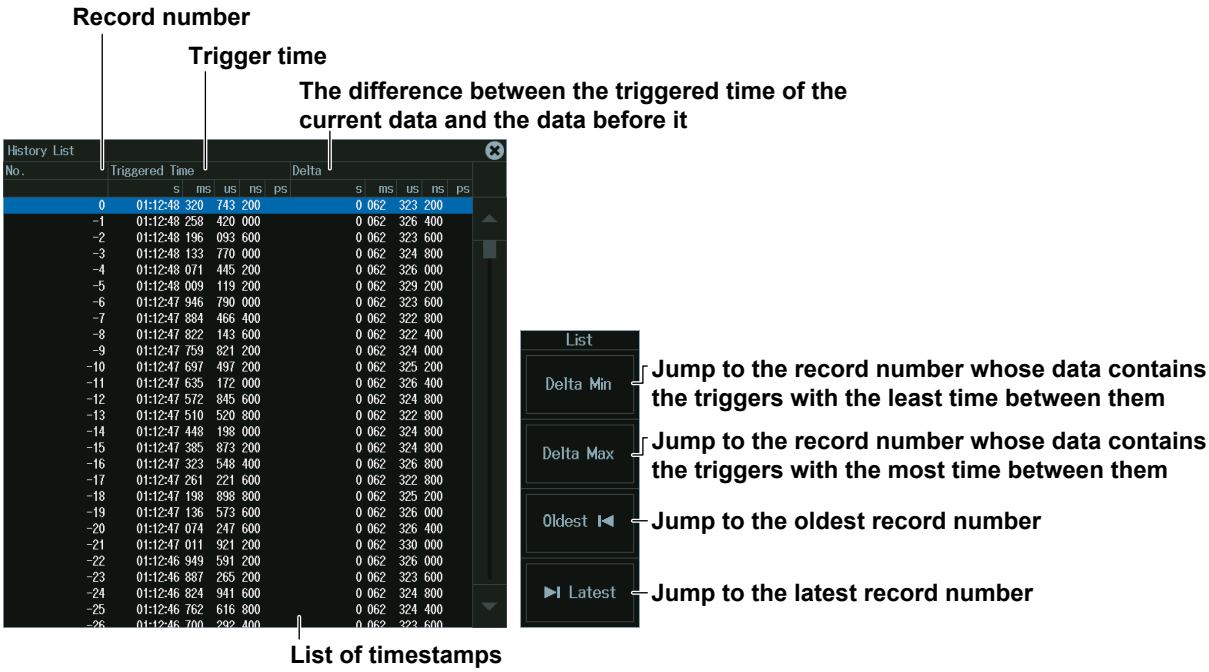
1. Press the **Start/End No.** soft key.
2. Turn the jog shuttle to set the start or end number.
   - Press **SET** (upper right on the front panel) to switch between the display range start point (Start No.) and the display range end point (End No.).
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu



List of Timestamps (List)

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



Note

Notes about Configuring the History Feature

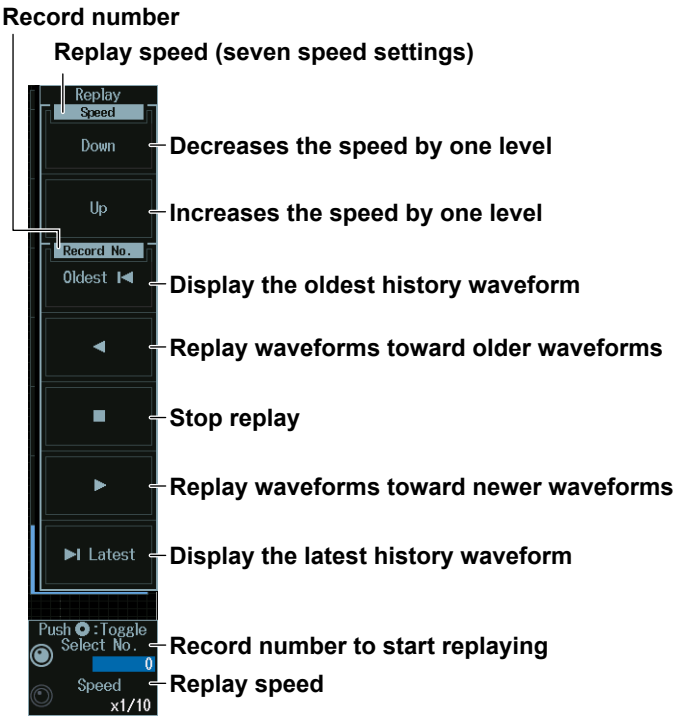
- When the acquisition mode is set to Average and the sampling mode is set to Repetitive, you cannot use the history feature.
- When the display is in roll-mode, you cannot use the history feature.
- If you stop waveform acquisition, the instrument only displays waveforms that have been acquired completely.

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 device, 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.



Note

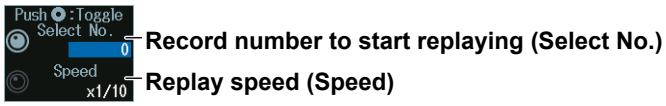
If you change the vertical scale, vertical position, time axis setting, trigger position, or other relevant settings and then display the preview, you cannot search for or replay history waveforms.

Record Number to Start Replaying (Select No./Speed), Replay Speed (Speed)

Turn the **jog shuttle** to set the record number to start replaying (Select No.) or the replay speed (Speed).

- Press **SET** (upper right on the front panel) to switch between the record number to start replaying (Select No.) and the replay speed (Speed).
- You can also tap the jog shuttle setting menu in the lower right of the screen and use the pop-up menu that appears on the screen.

Jog shuttle setting menu



15.2 Searching History Waveforms

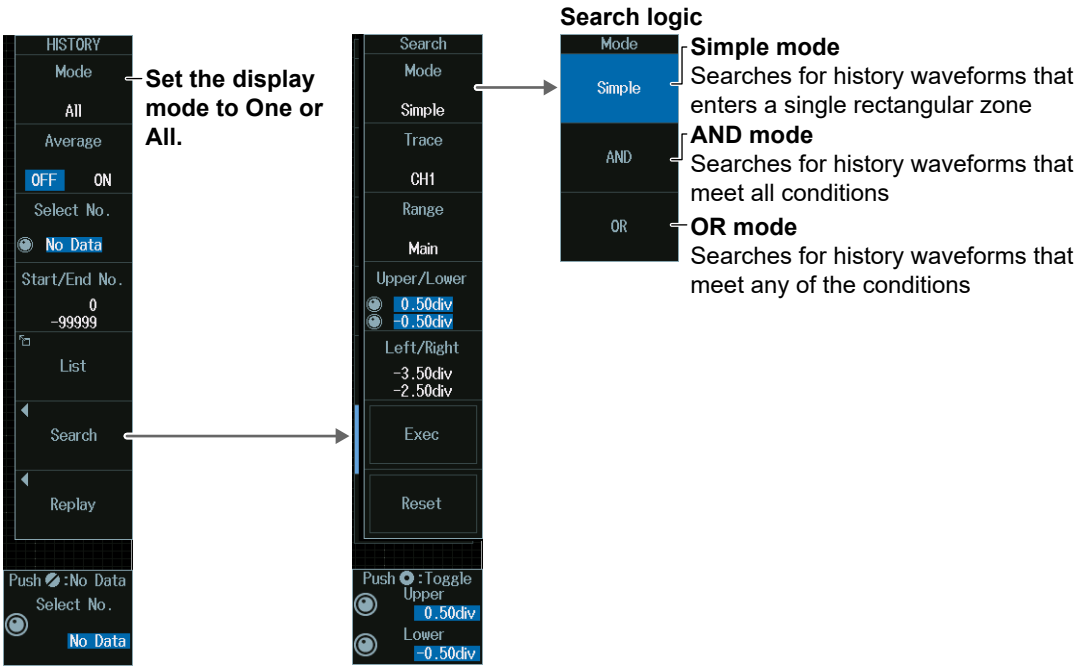
This section explains the following settings for searching history waveforms:

- Search condition
- Waveform to search
- Search source window
- Search range (rectangular zone)
- Search conditions (1 to 4)
  Search range mode
- Executing searches
- Finishing searches

► “Searching History Waveforms (Search)” in the Features Guide

HISTORY Menu

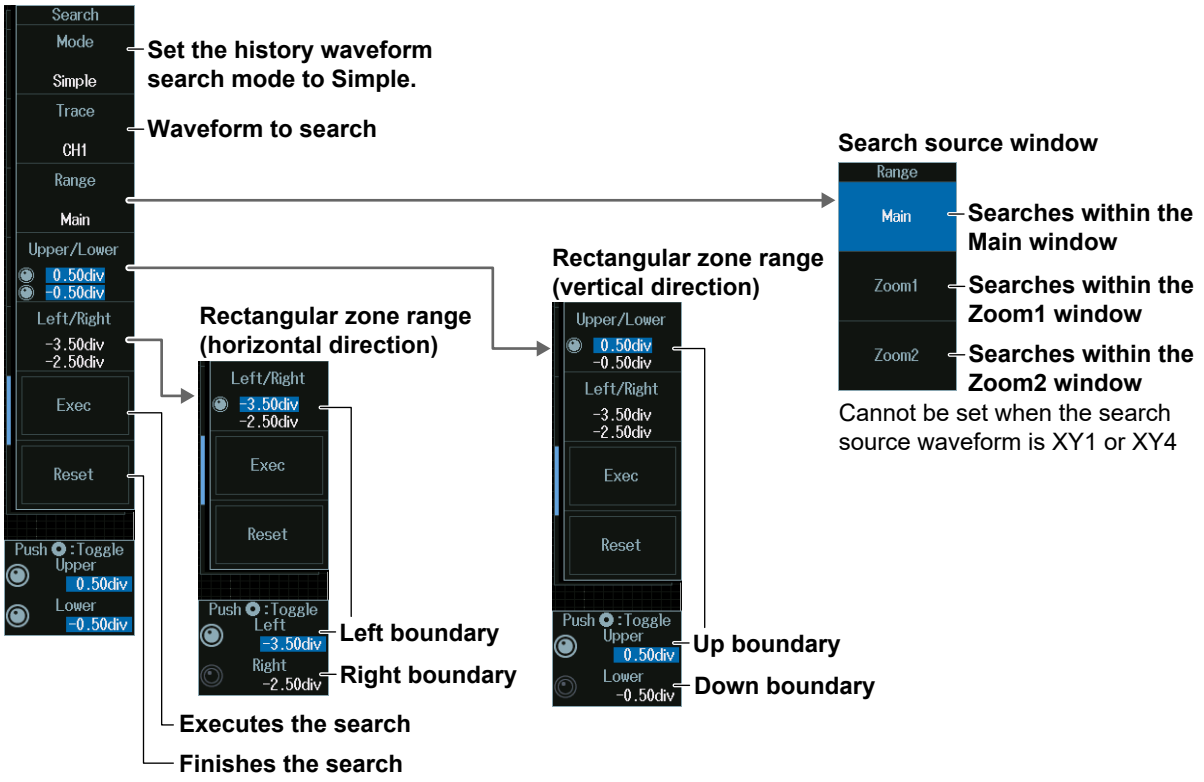
1. Press **HISTORY** to display the HISTORY menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the HISTORY menu from ACQ/DISP on the top menu that is displayed.
2. Press the **Mode** soft key and then the **One** or **All** soft key to display the following menu.



Search Logic (Mode)

In Simple Mode

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



Note

The available search source waveform settings vary depending on the model.

- The available settings on 8ch models are as follows:
  CH1 to CH8, Math1 to Math8, XY1 to XY4
- The available settings on 4ch models are as follows:
  CH1 to CH4, Math1 to Math4, XY1, XY2

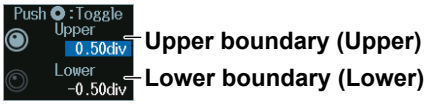
Rectangular Zone Range (Upper/Lower)

1. Press the **Upper/Lower** soft key.

2. Turn the **jog shuttle** to set the upper boundary (Upper) or lower boundary (Lower).

- Press **SET** (upper right on the front panel) to switch between upper and lower boundaries.
- You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu



Rectangular Zone Range (Left/Right)

1. Press the **Left/Right** soft key.
2. Turn the **jog shuttle** to set the left boundary (Left) or right boundary (Right).
   - Press **SET** (upper right on the front panel) to switch between left and right boundaries.
   - You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

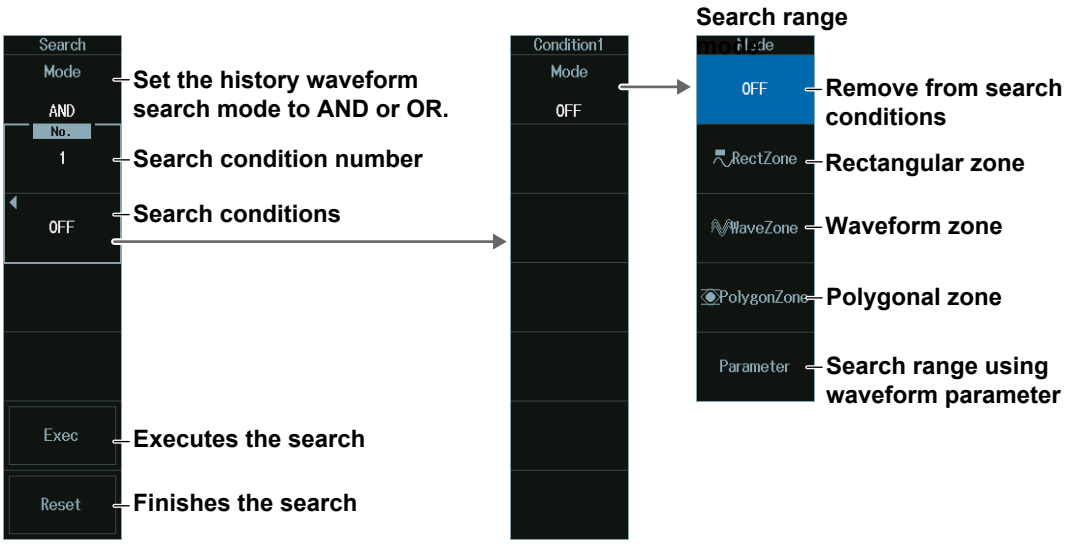
Jog shuttle setting menu

Left boundary (Left)

Right boundary (Right)

In AND or OR Mode

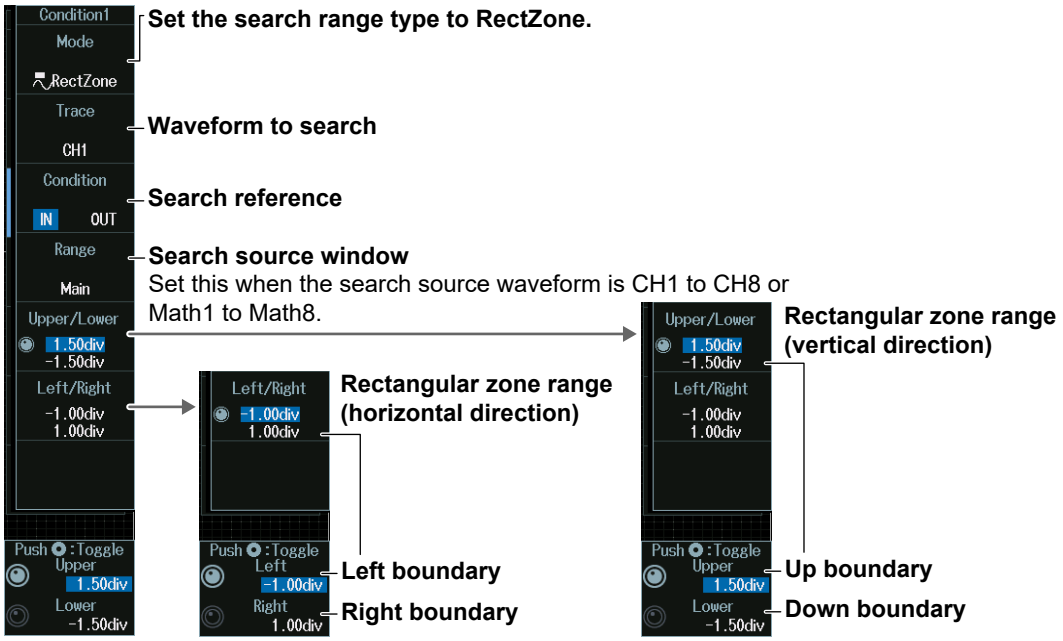
1. Press the **Mode** soft key, the AND soft key, and then the **OR** soft key to display the following menu.



Rectangular Zone (RectZone)

Set the search range (rectangular zone).

1. Press any of the search condition **1** to **8** (1 to 4 on 4ch models) soft keys and then the **Mode** soft key.
2. Press the **RectZone** soft key to display the following menu.



Note

The available source waveforms are as follows:

- No.1 to No.4
  CH1 to CH4, Math1 to Math4
- No.5 to 8 (8ch models only)
  CH5 to CH8, Math5 to Math8

Search source window

To make Zoom1 or Zoom2 a search source, turn on the Zoom1 or Zoom2 display from the ZOOM menu. For details, see section 10.1.

Rectangular Zone Range (Upper/Lower)

See the description of Rectangular Zone Range (Upper/Lower) of Simple mode.

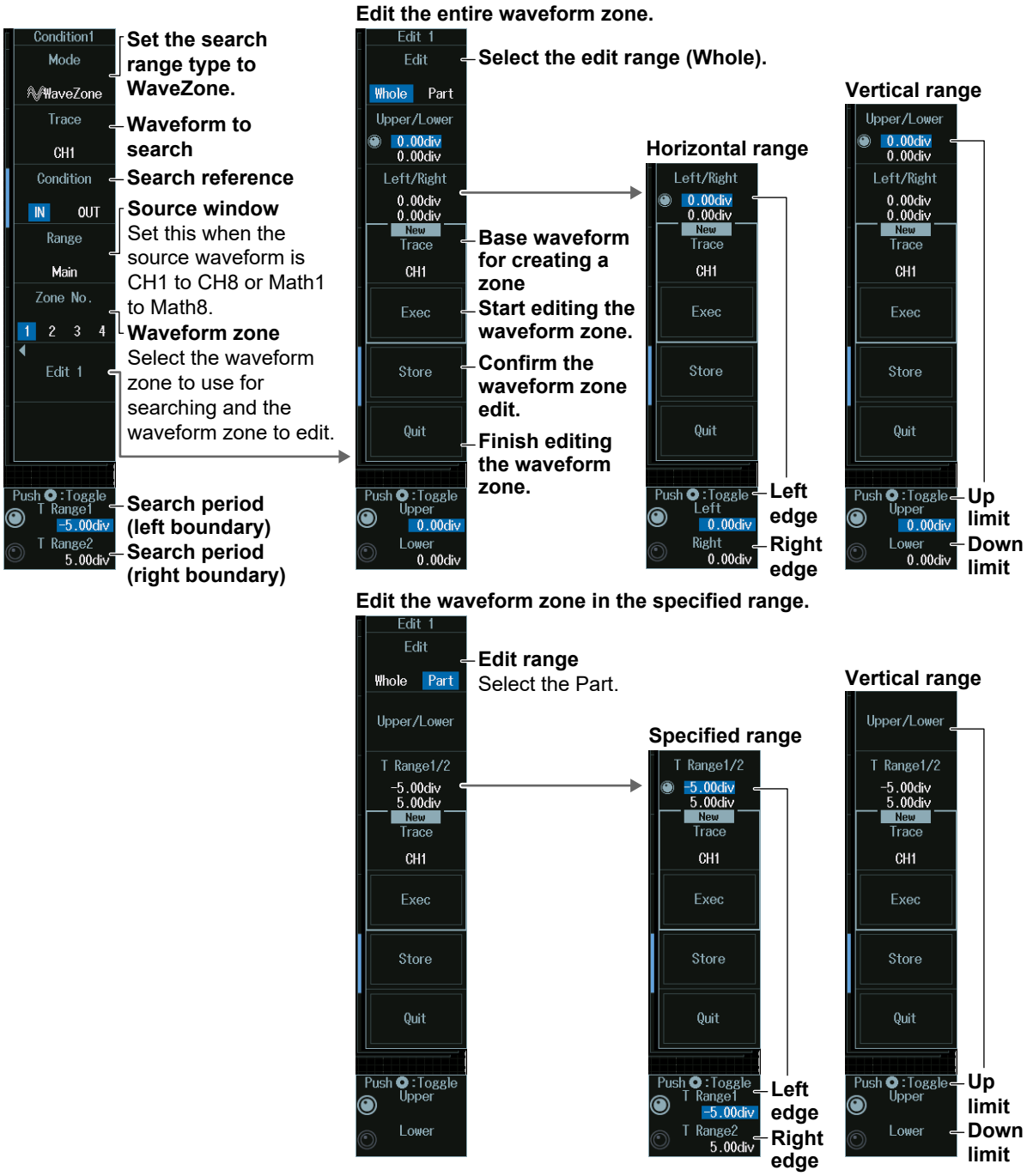
Rectangular Zone Range (Left/Right)

See the description of Rectangular Zone Range (Left/Right) of Simple mode.

Waveform Zone (WaveZone)

Set the search range (waveform zone).

1. Press any of the search condition **1** to **8** (1 to 4 on 4ch models) soft keys and then the **Mode** soft key.
2. Press the **WaveZone** soft key to display the following menu.



Note

The available source waveforms are as follows:

- No.1 to No.4
  CH1 to CH4, Math1 to Math4
- No.5 to 8 (8ch models only)
  CH5 to CH8, Math5 to Math8

Editing Waveform Zones (Edit 1 to Edit 8 (Edit1 to Edit4 on 4ch models))

1. Press the **Zone No** soft key, and select the number of the waveform zone that you want to edit.

   The appearance of the waveform zone edit soft keys (Edit 1 to Edit 8) changes depending on the selected waveform zone number.

2. Press one of the soft keys from **Edit 1** to **Edit 8** (Edit1 to Edit4 on 4ch models), whichever is shown on the menu. An edit menu for the waveform zone that you selected will be displayed.

- **Selecting the Base Waveform**

  To edit without changing the base waveform, proceed to step 5.

3. Press the **Trace (New)** soft key, and from the displayed menu, select the base waveform.

4. Press the **Exec (New)** soft key. A waveform zone is created from the base waveform.

- **Editing the Entire Waveform Zone**

5. Press the **Edit** soft key to select **Whole**.

6. Press the **Upper/Lower** soft key or the **Left/Right** soft key to select the zone boundaries to edit.

7. Turn the **jog shuttle** to edit the waveform zone.

   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

   Jog shuttle setting menu

   Left boundary

   Right boundary

   Press SET (upper right on the front panel) to switch between left and right boundaries.

- **Editing a Part of the Waveform Zone**

5. Press the **Edit** soft key to select **Part**.

6. Press the **T Range1/2** soft key.

7. Turn the **jog shuttle** to set the time scale range.

   You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

   Jog shuttle setting menu

   Left edge

   Right edge

   Press SET (upper right on the front panel) to switch between left and right edges.

8. Press the **Upper/Lower** soft key to select the upper and lower zone boundaries.

9. Turn the **jog shuttle** to edit the waveform zone.

   The procedure for using the jog shuttle setting menu is the same as that in step 7.

- **Confirming the Waveform Zone**

Press the **Store** soft key to confirm the waveform zone that you edited and store it in the internal memory.

- **Finishing Waveform Zone Editing**

Press the **Quit** soft key to confirm the waveform zone that you edited and store it in the internal memory.

The screen returns from the editing screen to the previous menu. 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 (Trace (New)) for creating a zone, the waveform zone that you edited up to that point will be lost.
- If you want to switch from the edit menu to a different menu, you need to finish editing first. Press the Quit soft key to finish editing.

Search Period (T Range)

Turn the **jog shuttle** to set the search period.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Search period (left boundary)

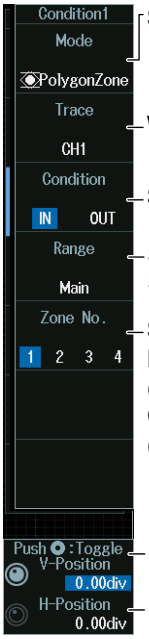
Search period (right boundary)

Press SET (upper right on the front panel) to switch between left and right search period boundaries.

Polygonal Zone (PolygonZone)

Set the search range (polygonal zone).

1. Press any of the search condition **1** to **8** (1 to 4 on 4ch models) soft keys and then the **Mode** soft key.
2. Press the **PolygonZone** soft key to display the following menu.



Set the search range type to PolygonZone.

Waveform to search

Search reference

Search source window
Set this when the search source waveform is CH1 to CH8 or Math1 to Math8.

Select the polygonal zone.
Load a polygonal shape in advance into the specified zone number (Zone No.1 to Zone No.8) using the file load feature (see section 17.7). Create polygonal shapes on your PC using the dedicated software (Mask Editor Software).

Moves the polygonal zone (vertical position)

Moves the polygonal zone (horizontal position)

* Load a polygonal zone in advance.

Note

The available source waveforms are as follows:

- No.1 to No.4
  CH1 to CH4, Math1 to Math4
- No.5 to 8 (8ch models only)
  CH5 to CH8, Math5 to Math8

Search source window

To make Zoom1 or Zoom2 a search source, turn on the Zoom1 or Zoom2 display from the ZOOM menu. For details, see section 10.1.

Moving the Polygonal Zone (V-Position, H-Position)

Turn the **jog shuttle** to move the polygonal zone.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Moves the polygonal zone (vertical position)

Moves the polygonal zone (horizontal position)

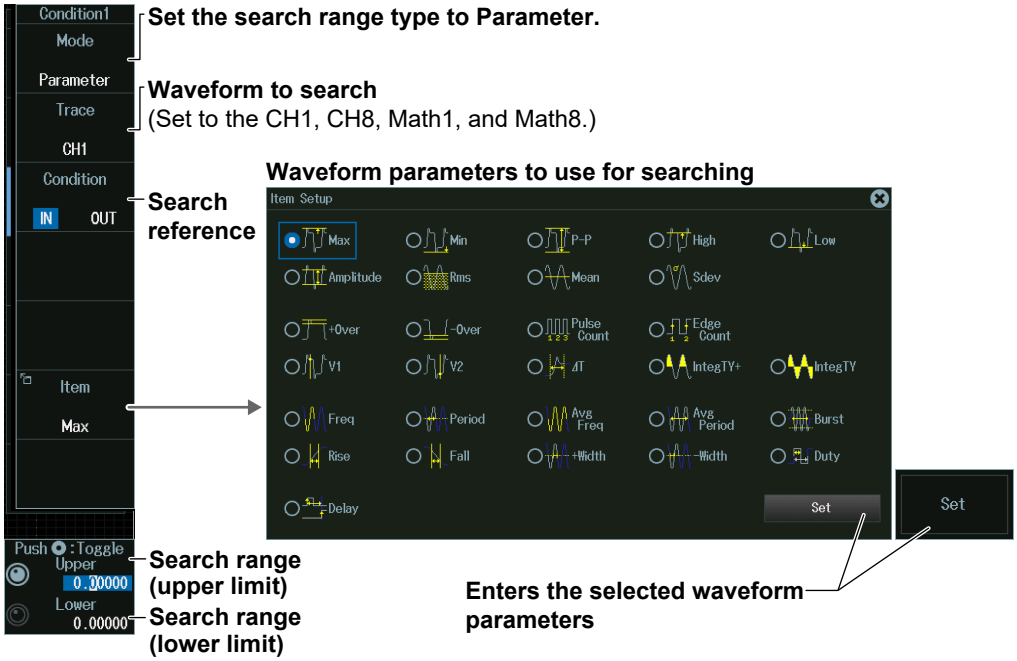
Press SET (upper right on the front panel) to switch between moving the polygonal zone horizontally or vertically.

Setting a Search Range Using Parameters (Parameter)

Set the search range (parameter).

1. Press any of the search condition **1** to **8** (1 to 4 on 4ch models) soft keys and then the **Mode** soft key.
2. Press the **Parameter** soft key to display the following menu.

When CH1 to CH8 or Math1 to Math8 Is the Search Source Waveform



Note

Waveform Parameters

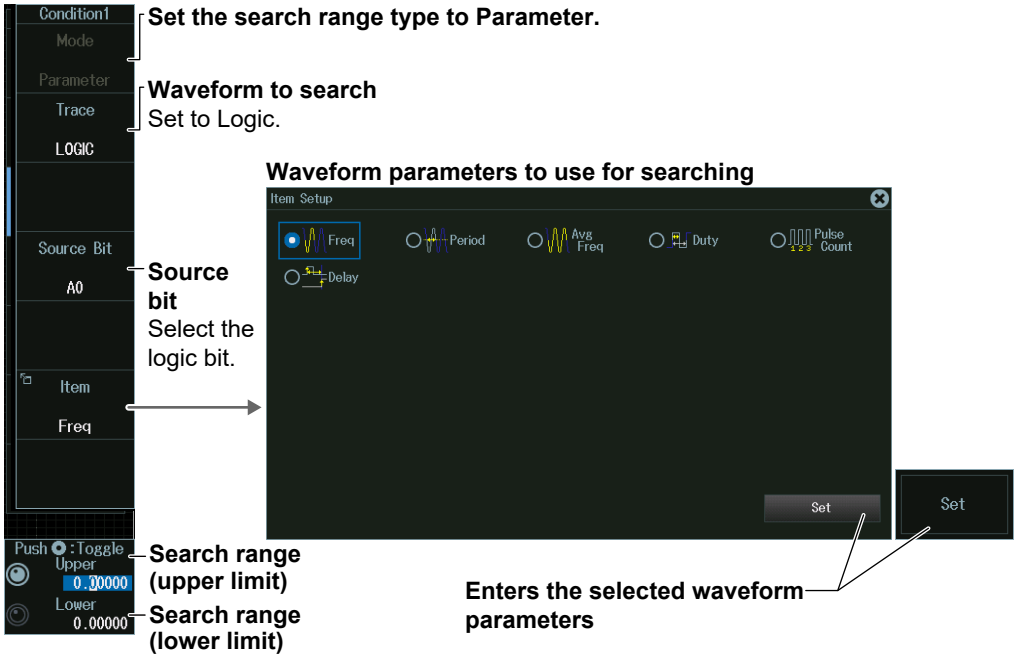
You can select the measurement items to use in searching from all of the items used for automated measurement of waveform parameters. For information on setting automated measurement of waveform parameters, see section 9.1.

Waveform to search

The available search source waveform settings vary depending on the model.

- The available settings on 8ch models are as follows:
  CH1 to CH8, Math1 to Math8, XY1 to XY4, Logic, FFT1 to FFT4
- The available settings on 4ch models are as follows:
  CH1 to CH4, Math1 to Math4, XY1, XY2, Logic, FFT1 to FFT2

When Logic Is the Search Source Waveform



Note

Waveform Parameters

You can select the measurement item to use in searching from the items used for time axis measurement of waveform parameters shown below.

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

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

Source bit

The following source bit display applies to models with the /L32 option.

C0 to C7 (LOGIC port C), D0 to D7 (LOGIC port D)

When XY1 to XY4 Is the Search Source Waveform

Set the search range type to Parameter.

Waveform to search
Set to a value from XY1 to XY4 (XY1 or XY2 on 4CH models).

Search reference

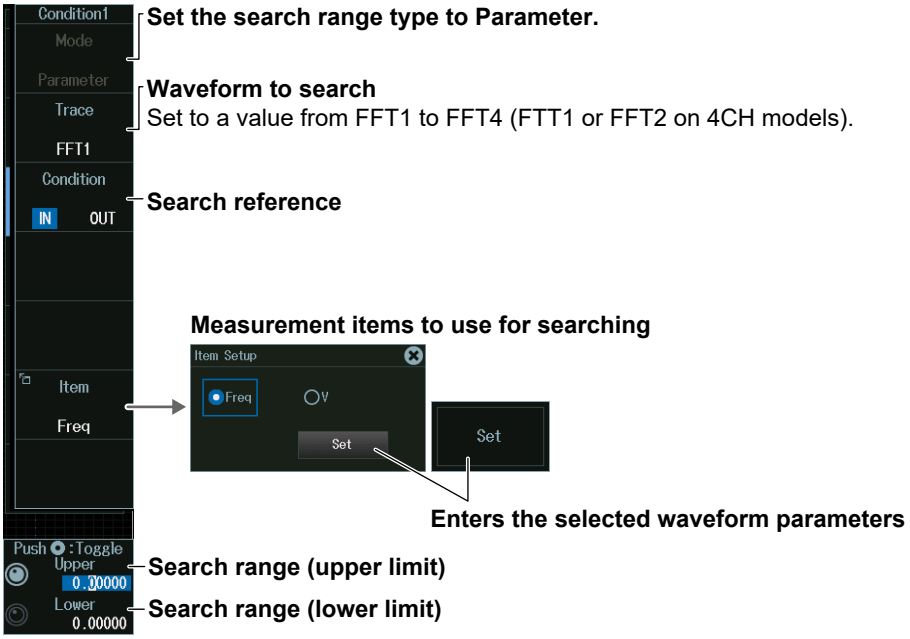
Search range (upper limit)

Search range (lower limit)

Note

The measurement item to use in searching is the waveform area of XY1 to XY4 (XY1 and XY2 on 4ch models). 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 DLM5058-01EN.

When FFT1 to FFT4 Is the Search Source Waveform



Set the search range type to Parameter.

Waveform to search
Set to a value from FFT1 to FFT4 (FTT1 or FFT2 on 4CH models).

Search reference

Measurement items to use for searching

Enters the selected waveform parameters

Search range (upper limit)

Search range (lower limit)

Note

- You can select the measurement item to use in searching from the peak cursor measurement items (Freq, V) for FFT. For details on peak cursor measurements, see section 7.2.
- The search source waveforms on 4ch models are FFT1 and FFT2.

Search Range (Upper/Lower)

Turn the **jog shuttle** to set the search range.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu

Search range (upper limit)

Search range (lower limit)

Press SET (upper right on the front panel) to switch between upper and lower search range limits.

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.

Printer Roll Paper

Use a YOKOGAWA roll paper. Do not use any other paper. When using the printer for the first time, use the roll paper supplied with the instrument. When you need extra roll paper, please contact your nearest YOKOGAWA dealer.

Part Number: B9988AE
Specification: Heat-sensitive paper, 10 m
Minimum Quantity: 10 rolls

Roll Paper Handling

The roll paper is made of heat-sensitive paper that changes color thermochemically. Please read the following information carefully.

Storage Precautions

The heat-sensitive paper starts changing color at about 70°C. The paper can be affected by heat, humidity, or chemicals, whether something has been recorded on it or not. As such, please follow the guidelines listed below.

- Store the paper in a cool, dry, and dark place.
- Use the paper as quickly as possible after you break its protective seal.
- If you attach a plastic film that contains plasticizing material such as vinyl chloride film or cellophane tape to the paper for a long time, the recorded sections will fade due to the effect of the plasticizing material. Use a holder made of polypropylene to store the roll paper.
- When starching the record paper, do not use starches containing organic solvents such as alcohol or ether. Doing so will change the paper's color.
- We recommend that you make copies of the recordings if you intend to store them for a long period of time. Because of the nature of heat-sensitive paper, the recorded sections may fade.

Handling Precautions

- Only use genuine YOKOGAWA 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 chemicals, oil, and the like, there is a chance that the paper will change color or that the recorded sections will disappear.

Loading the Roll Paper

CAUTION

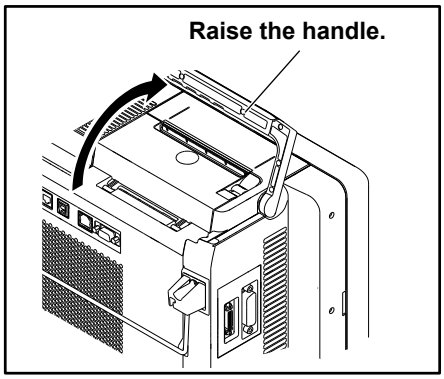
- Do not touch the print head. If you do, you may burn yourself.
- Do not touch the roll paper cutter section at the end of the printer cover. Doing so may cause injury.

French

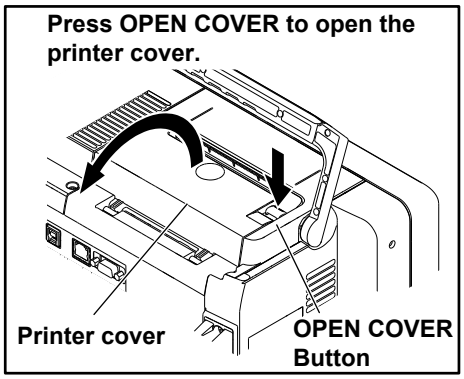
ATTENTION

- Ne pas toucher la tête d’impression. Vous pourriez vous brûler.
- Ne pas toucher la section du coupe-papier à l’extrémité du cache de l’imprimante. Vous pourriez vous blesser

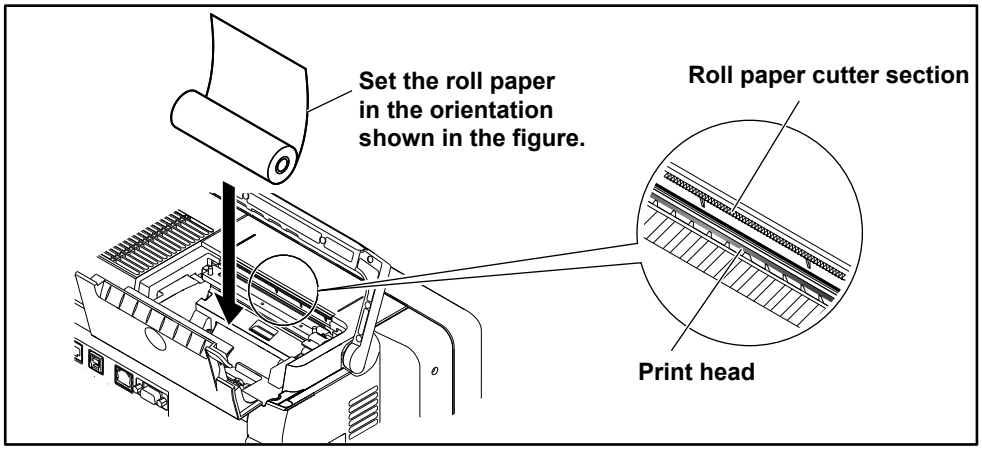
1.


Raise the handle.

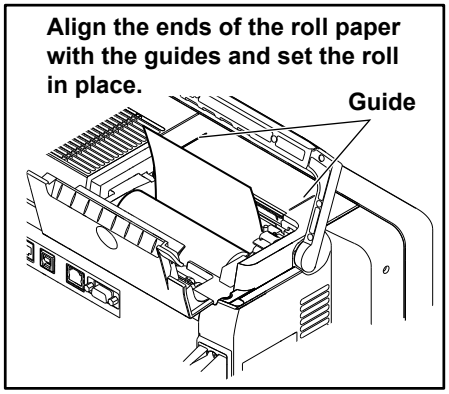
2.


Press OPEN COVER to open the printer cover.
Printer cover
OPEN COVER Button

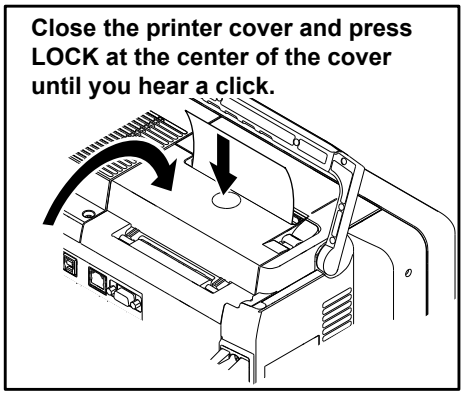
3.


Set the roll paper in the orientation shown in the figure.
Roll paper cutter section
Print head

4.


Align the ends of the roll paper with the guides and set the roll in place.
Guide

5.


Close the printer cover and press LOCK at the center of the cover until you hear a click.

16.2 Printing on the Built-in Printer (Option)

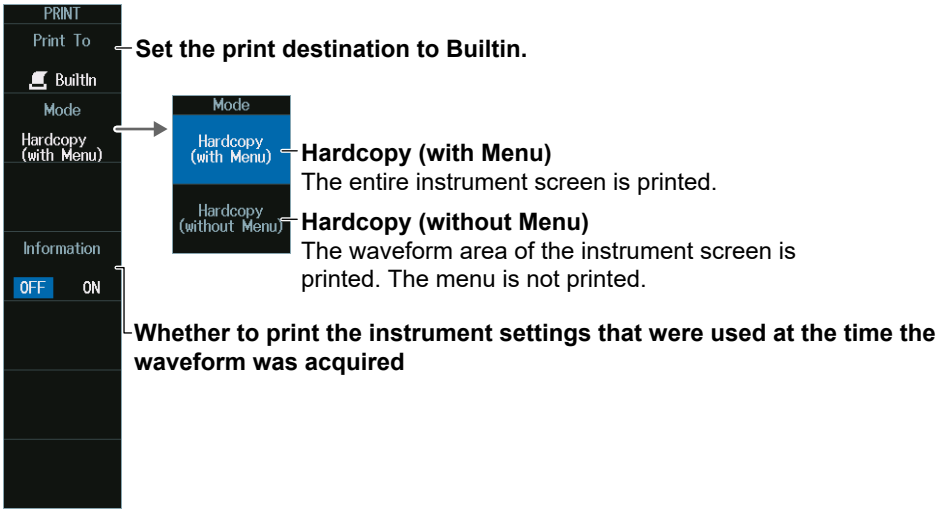
This section explains the following settings for printing on the built-in printer (option):

- Output destination
- Print mode
- Additional information

► “Printing on the Built-in Printer (BuiltIn) (Option)” in the Features Guide

PRINT BuiltIn Menu

1. Press **SHIFT+PRINT** (MENU) to display the PRINT menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the PRINT (PRINT MENU) menu from FILE/PRINT on the top menu that is displayed.
2. Press the **Print To** and then the **Builtin** soft key to display the following menu.



Printing

Press **PRINT**. The image is output to the built-in printer according to the settings.

16.3 Printing on a USB Printer

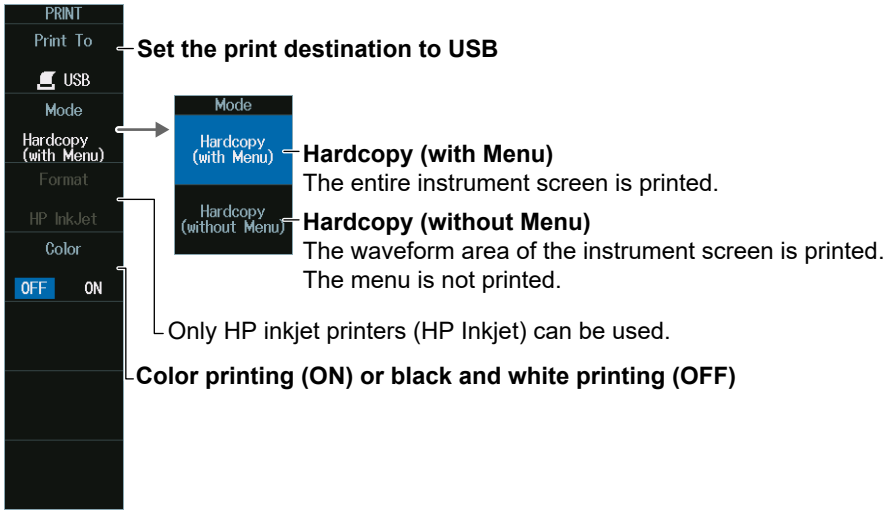
This section explains the following settings for printing on a USB printer:

- Output destination
- Print mode
- Printer type
- Color

► “Printing on a USB Printer (USB)” in the Features Guide

PRINT USB Menu

1. Press **SHIFT+PRINT** (MENU) to display the PRINT menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the PRINT (PRINT MENU) menu from FILE/PRINT on the top menu that is displayed.
2. Press the **Print To** and then the **USB** soft key to display the following menu.



Printing

Press **PRINT**. The image is output to the USB printer according to the settings.

Note

- Do not connect an incompatible USB printer.
- For USB printers that have been tested for compatibility, contact your nearest YOKOGAWA dealer.

16.4 Printing on a Network Printer

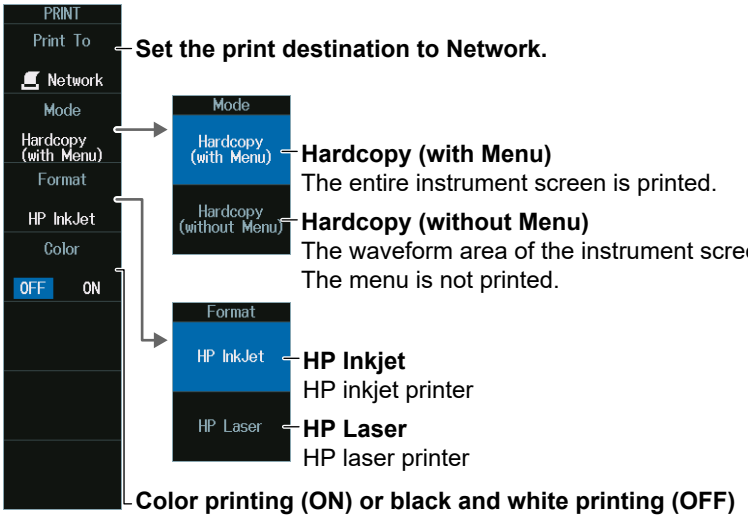
This section explains the following settings for printing on a network printer:

- Output destination
- Print mode
- Printer type
- Color

► “Printing on a Network Printer (Network)” in the Features Guide

PRINT Network Menu

1. Press **SHIFT+PRINT** (MENU) to display the PRINT menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the PRINT (PRINT MENU) menu from FILE/PRINT on the top menu that is displayed.
2. Press the **Print To** and then the **Network** soft key to display the following menu.



Printing

Press **PRINT**. The image is output to the network printer according to the settings.

Note

You must configure the network printer in advance by following the instructions in section 18.6.

16.5 Saving Screen Captures to Files

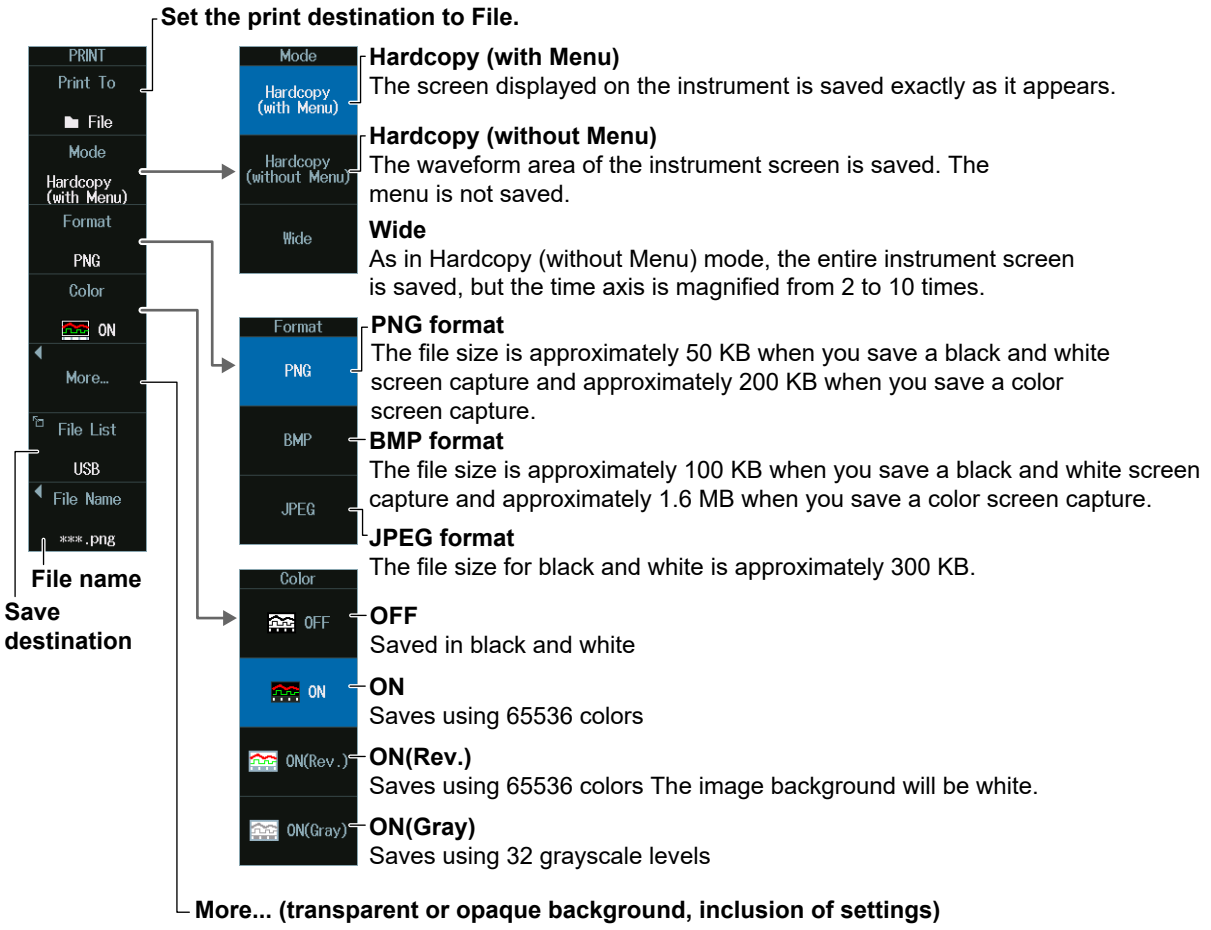
This section explains the following settings for saving screen captures to files:

- Output destination
- Save mode
- Data format
- Color data
- Background transparency (transparent or opaque)
- Including setting information
- Save destination
- File name

► "Saving Screen Captures to Files (File)" in the Features Guide

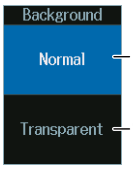
PRINT File Menu

1. Press **SHIFT+PRINT** (MENU) to display the PRINT menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the PRINT (PRINT MENU) menu from FILE/PRINT on the top menu that is displayed.
2. Press the **Print To** and then the **File** soft key to display the following menu.



Background Transparent or Opaque (Background)

1. Press the **More** soft key.
2. Press the **Background** soft key to display the following menu.

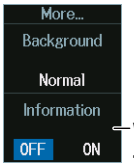


Normal
Saves data without changing the background (opaque)

Transparent
Saves data with a transparent background

Including Setting Information (Information)

1. Press the **More** soft key to display the following menu.
   When save mode is set to Hardcopy or Normal, channels, triggers, waveform acquisition, and other setting information can be included in waveform screen captures.

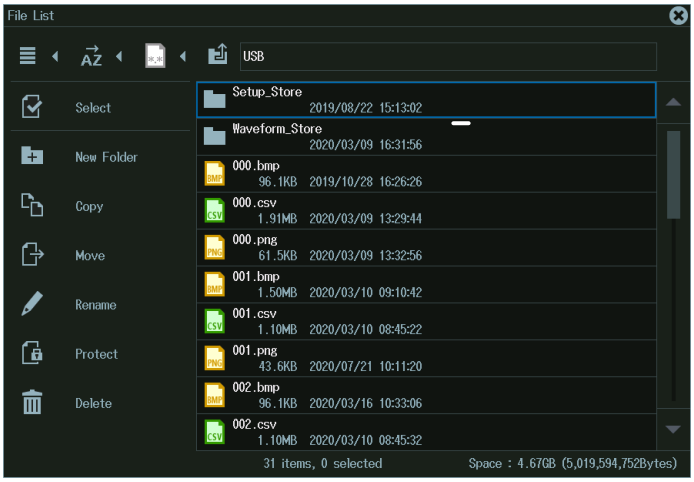


Whether to save the instrument settings that were used at the time the waveform was acquired

Save Destination (File List)

1. Press the **File List** soft key to display the following menu.

File List screen



Note

This is the same as the file feature. Set the drive and folder to save the file to. For details, see section 17.2.

File name (File Name)

1. Press the **File Name** soft key to display the following menu.

Auto naming
Sets file names automatically. You can select numbers or times.

File name
Enter the file name.
For details, see section 3.3 in IM DLM5058-03EN.

Note

This is the same as the file feature (except the comment 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.

Saving

Press **PRINT** to save the screen capture file to the specified folder.

16.6 Printing and Saving Screen Capture Data to Multiple Output Destinations at the Same Time

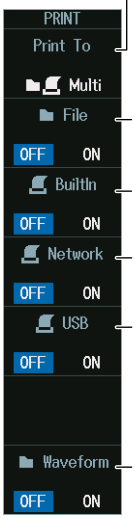
This section explains the following settings for printing and saving screen capture data and waveform data to multiple output destinations at the same time:

- Output destination
- Saving screen captures to files
- Printing screen captures on the built-in printer (option)
- Printing screen captures on the USB printer
- Printing screen captures on the network printer
- Saving Waveform Data

► **"Printing and Saving Screen Captures to Multiple Destinations (Multi)" in the Features Guide**

PRINT Multi Menu

1. Press **SHIFT+PRINT** (MENU) to display the PRINT menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the PRINT (PRINT MENU) menu from FILE/PRINT on the top menu that is displayed.
2. Press the **Print To** and then the **Multi** soft key to display the following menu.



Set the output destination to Multi.
The instrument 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 16.5

Printing screen captures on the built-in printer (option)
► section 16.2

Printing screen captures on the network printer
► section 16.4

Printing screen captures on the USB printer
► section 16.3

Saving waveform data
► section 17.2

Note

You cannot execute action-on-trigger or GO/NO-GO determination if Print To is set to Multi when Print is set to ON on the ACTION menu.
► sections 2.27 to 2.28

Printing and Saving

Press **PRINT**. The screen capture or waveform data is output to the specified output destinations.

17.1 Connecting USB Storage Devices to the USB Ports

CAUTION

Do not remove the USB storage device or turn off the power when the media (internal storage or USB storage device) access icon is blinking in the center of the screen or when the USB storage device access indicator is blinking. Doing so may damage the storage device or corrupt its data.

Access Icon

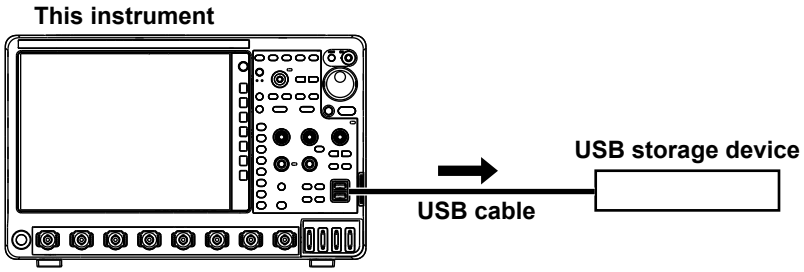
French

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

You can connect/disconnect a USB cable at any time regardless of whether the instrument is on or off (hot-plugging is supported). Connect the type A connector of the USB cable to the instrument, and connect the other connector to the USB storage device. If you connect a USB storage device when the power switch is on, the device becomes available for use after the instrument identifies it.



Note

- Only connect a compatible USB keyboard, mouse, printer, or storage device to the USB port for peripherals.
- Do not connect and disconnect multiple USB devices repetitively. Provide at least a 10-second interval between removal and connection.
- Do not connect or remove USB cables from the time when the instrument is turned on until key operation becomes available (approximately 20 to 30 seconds).
- You can use USB storage devices that are compatible with USB Mass Storage Class version 1.1.
- The supported formats of USB storage are exFAT, FAT32, and FAT16.
- The instrument can handle up to two storage devices. If the connected medium is partitioned, the instrument treats each partition as a separate storage device. As such, the instrument can handle up to two partitions.

Confirming What Connected USB Storage Device Can Be Used

1. Press **FILE**, and then press the **Utility** soft key to display the file list.
   For details on the file list, see section 17.8.
2. Select (display one level up), and then press **SET**.
   - The next higher level is displayed. Repeat this step until the file list displays the media.
   - For more information on file operations, see section 17.8.

17.2 Saving Waveform Data

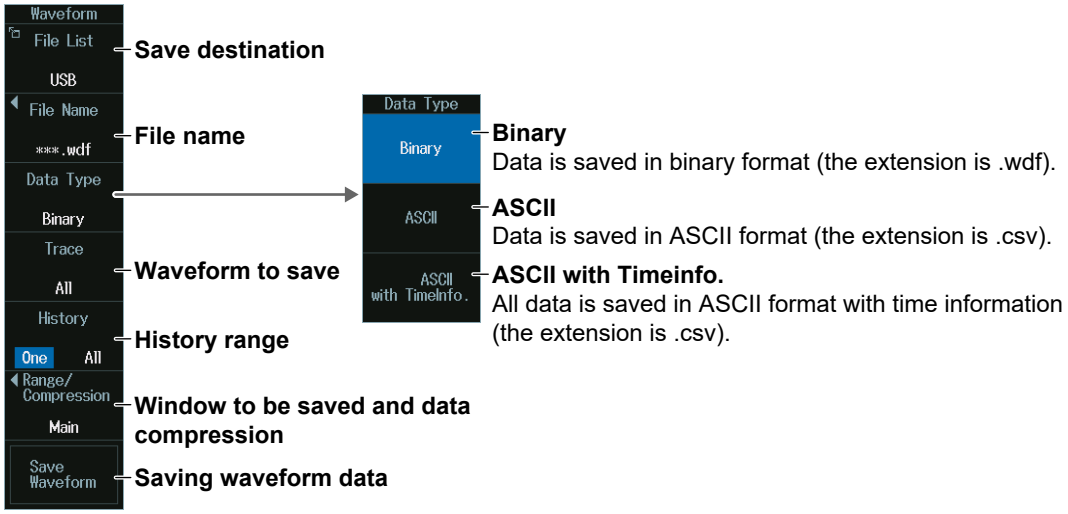
This section explains the following settings for saving waveform data):

- 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

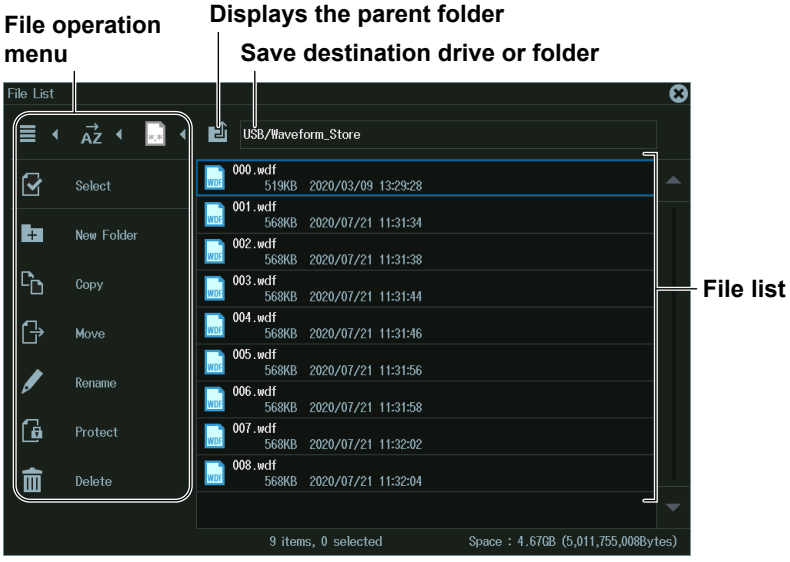
File Waveform (Save) Menu

1. Press **FILE** to display the FILE menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the FILE menu from FILE/PRINT on the top menu that is displayed.
2. Press the **Waveform (Save)** soft key to display the following menu.



Save Destination (File List)

Press the **File List** soft key to display the following screen.

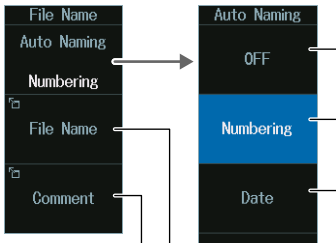


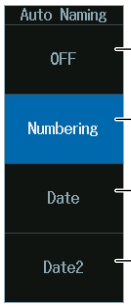
Note

- For more information on file operations, see section 17.8.
- The available settings for saving waveforms vary depending on the model.
  - The available settings on 8ch models are as follows:
    All, CH1 to CH8, Math1 to Math8, Logic
  - The available settings on 4ch models are as follows:
    All, CH1 to CH4, Math1 to Math4, Logic

File name (File Name)

Press the **File Name** soft key to display the following menu.



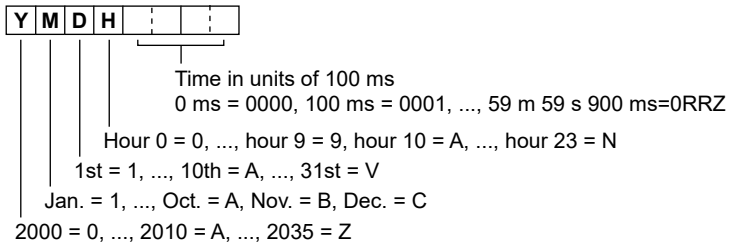


Auto naming

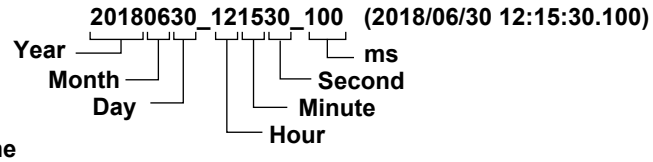
OFF
The auto naming feature is disabled. The name that you specify using the File Name setting is used. If a file with the same name exists in the save destination folder, an overwrite confirmation dialog box is displayed.

Numbering
The instrument automatically adds a three-digit number from 000 to 999 after the common name specified using the File Name setting and saves files.

Date
As shown in the following figure, the instrument uses an 8-character file name that is produced based on the date and time using base-36 numbers (0 to 9 and A to Z). The file name specified using the File Name setting is not used.



Date2
The file name is the date and time (down to ms) when the file is saved. The file name specified using the File Name setting is not used.



File name
You can set the common file name that is used when the auto naming feature is turned off or when the auto naming feature is set to Numbering.

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.

History Range (History)

Press the **History** soft key to select **One** or **All**.

History Range

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.[1]

All: All history waveforms within the range bounded by Start No. and End No. on the HISTORY menu will be saved.[1]

1 The waveform that you specify with Select No. is not necessarily highlighted.

The history range is fixed to One or All depending on the history waveform display mode (see section 15.1) and the type of data to be saved (Data Type) on the HISTORY menu.

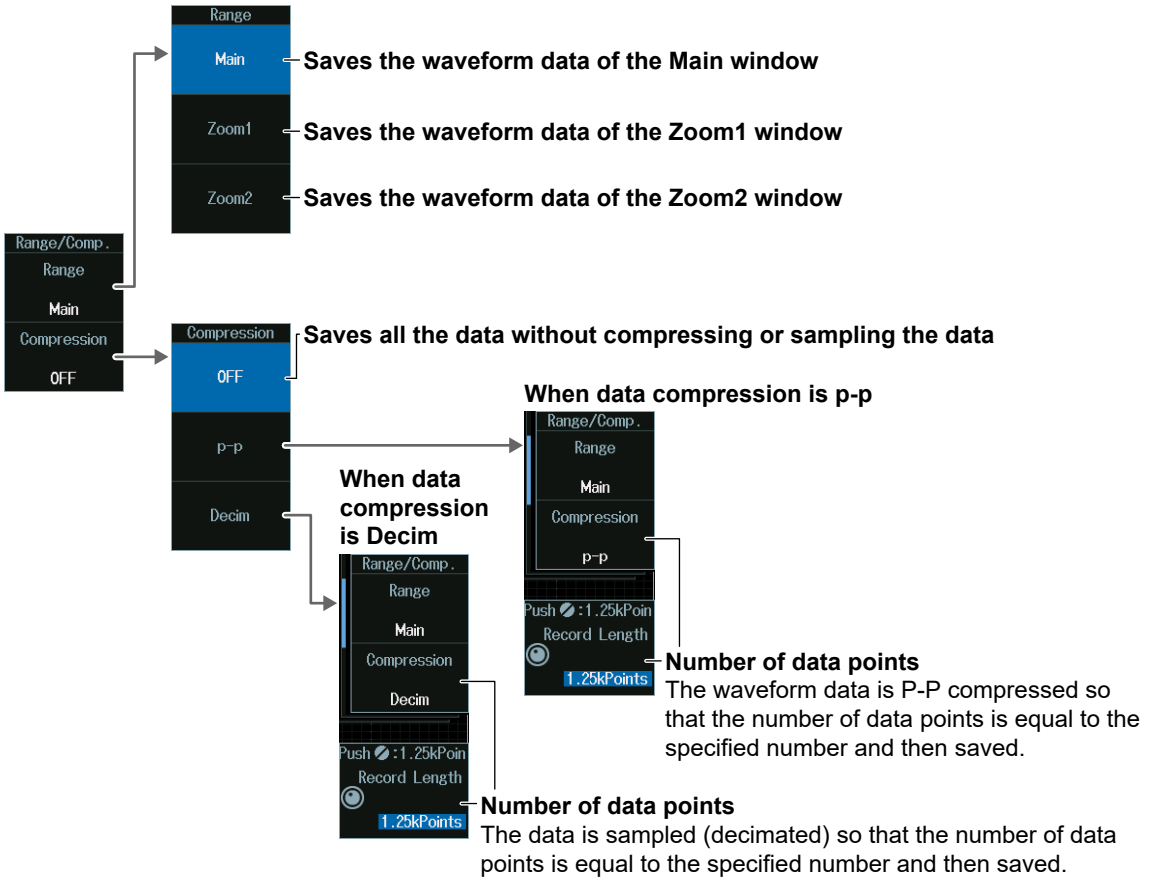
Display Mode (Mode) on the HISTORY Menu		One	All	Accumulate
Type of data to be saved (Data Type)	Binary	One or All selectable	One or All selectable	Fixed to All
	ASCII	Fixed to One	Fixed to One	Fixed to One
	ASCII with TimeInfo.	Fixed to One	Fixed to One	Fixed to One

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.

Window to Be Saved and Data Compression (Range/Compression)

Press the **Range/Compression** soft key to display the following menu.



Saving Waveform Data in ASCII Format

If the window to be saved is set to Main, you can save the waveform data by compressing or sampling it. If you want to save waveform data whose record length exceeds is 1.25 Mpoints to a file in ASCII format, the data must be compressed. If the window to be saved is set to Zoom1 or Zoom2, data compression is not possible. Therefore, waveform data whose number of data points on the window to be saved exceeds1.25 Mpoints cannot be saved to a file in ASCII format.

Whether Data Compression and Waveform Loading Are Possible

Waveform data saved in binary format can be loaded into the instrument, but the possible load destinations vary depending on the data compression setting.
Waveform data saved in ASCII or ASCII with TimeInfo. format cannot be loaded into the instrument regardless of the data compression setting.

Waveform Load Destination		Loading into Channels (Load to Channels)	Loading into Reference Waveforms (Ref1 to Ref8)
Data compression (Compression)	OFF	Allowed	Allowed
	P-P	Not allowed	Allowed
	Decim	Not allowed	Allowed

Note

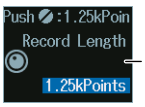
- For details on loading waveform data, see section 17.5.
- The available load destination settings vary depending on the model.
  The available settings on 8ch models are as follows:
  Ref1 to Ref8
  The available settings on 4ch models are as follows:
  Ref1 to Ref4

Number of Data Points (Record Length)

Turn the **jog shuttle** to set the number of actions.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu



Number of data points

17.3 Saving Setup Data

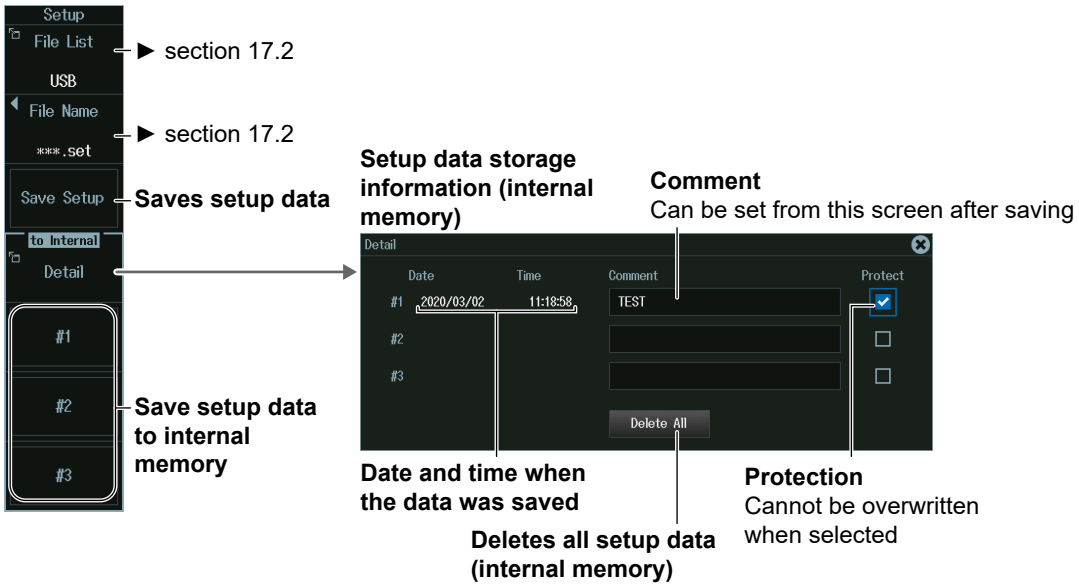
This section explains the following settings for saving setup data:
You can save setup data to a file or to three different internal memory locations.

- Save destination
- File name
- Detailed internal memory settings
- Saving setup data

► “Saving Setup Data (Setup)” in Features Guide

File Setup (Save) Menu

1. Press **FILE** to display the FILE menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the FILE menu from FILE/PRINT on the top menu that is displayed.
2. Press the **Setup (Save)** soft key to display the following menu.



Saving Setup Data (Save Setup)

Press the Save Setup soft key to save the setup data with the specified file name at the selected save destination.

Saving Setup Data to Internal Memory (#1 to #3 (to Internal Memory))

Press a soft key from **#1** to **#3** to save the setup data at the selected internal memory number (.set extension).

Note

“Flash_Mem,” which is a save destination for Save Setup, is a memory area inside the instrument, but is different from the save destination of “to Internal #1 to #3.” The save destinations of “to Internal” are fixed to three locations. You cannot specify their file names. If you want to save more than three sets of setup data or if you want to assign file names to each file, save the setup data to “Flash_Mem,” which is a save destination for Save Setup.

17.4 Saving Other Types of Data

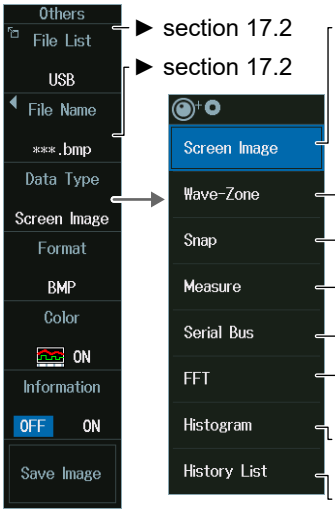
This section explains the following settings for saving screen captures, waveform zone data, snapshot waveform data, automated measurement values of waveform parameters, serial bus analysis results, FFT results, histogram data, and the list of timestamps:

- Save destination
- File name
- Saved data
- Data format
- Color data
- Waveform zone number
- Serial bus
- FFT
- Histogram
- Saved data

► "Saving Other Types of Data (Others)" in Features Guide

File Others (Save) Menu

1. Press **FILE** to display the FILE menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the FILE menu from FILE/PRINT on the top menu that is displayed.
2. Press the **Others (Save)** soft key to display the following menu.



► section 17.2

► section 17.2

Screen Image:[1] Saves the displayed screen image in PNG, BMP, or JPEG format.

Wave-Zone: Saves the waveform zone to a file with a .zwf extension.

Snap: Saves the waveform data captured in a snapshot to a file with a .snp extension.

Measure: Saves the results of the specified item of automatic waveform parameter measurement to a file in CSV format.

Serial Bus: Saves the results of the serial bus analysis specified by Serial Bus 1 to Serial Bus 4 to a file in CSV format.

FFT:[2] Saves the computed results specified by FFT1 to FFT4 (FFT1, FFT2 on 4ch models) to a file in CSV format. Up to 1.25 Mpoints of data can be saved.

Histogram: Saves the waveform or waveform parameter histogram specified by Histogram1 or Histogram2 to a file in CSV format.

History List: Saves the list of timestamps to a file in CSV format.

1 Screen Image

- You can select whether to include setting information such as channels, triggers, and waveform acquisition, in waveform screen captures. For details on screen captures that include setting information, see section 16.5.
- Screen captures that can be saved on the FILE menu are those that correspond to Hardcopy (without Menu) save mode on the SHIFT+PRINT menu.

2 FFT Group

- 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.

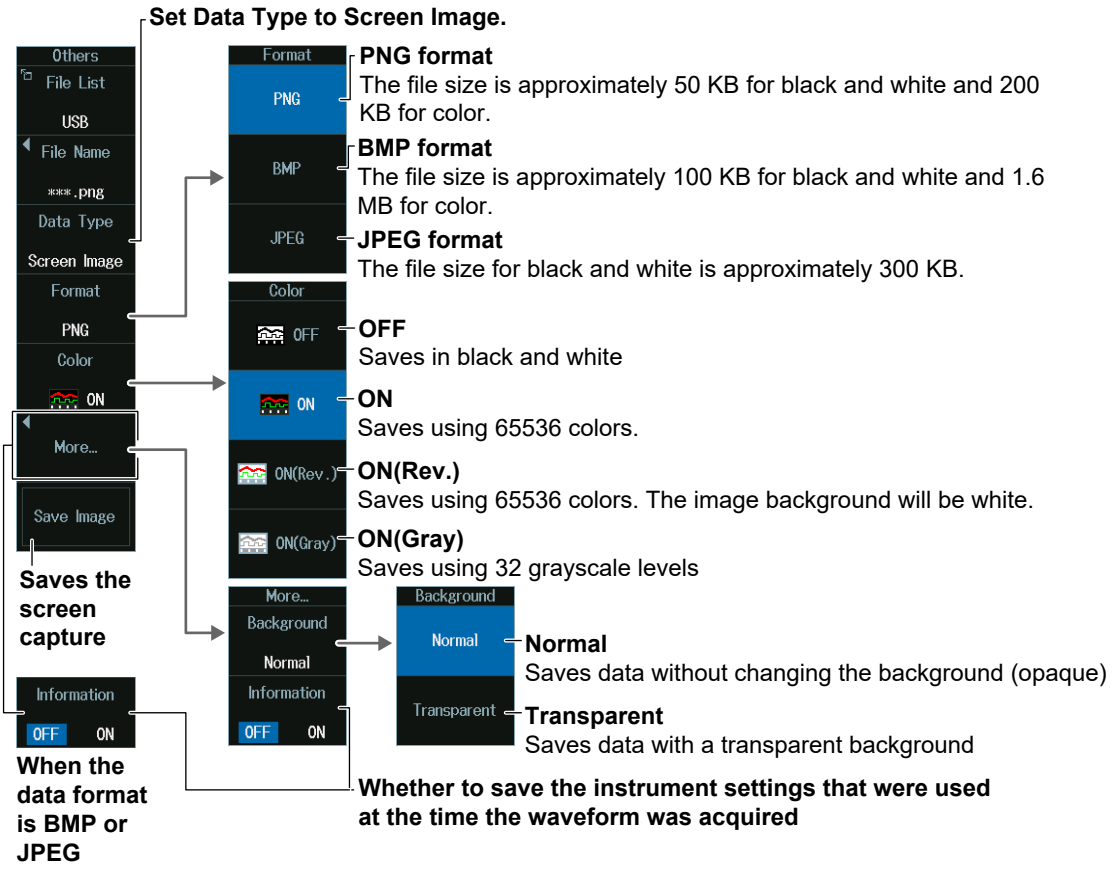
Note

The serial bus analysis results are saved according to the history range (History) of section 17.2.

Data Type to Save (Data Type)

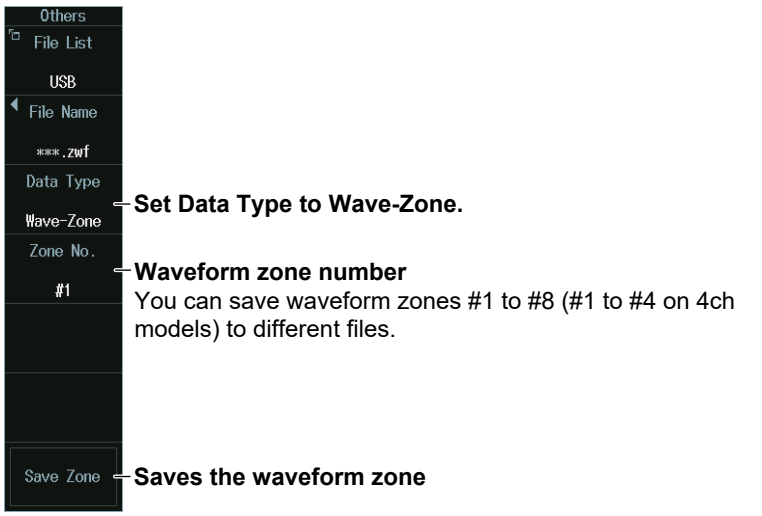
Screen Captures (Screen Image)

1. Press the **Data Type** soft key.
2. Press the **Screen Image** soft key to display the following menu.



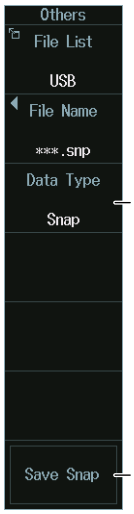
Waveform Zone (Wave Zone)

1. Press the **Data Type** soft key.
2. Press the **Wave-Zone** soft key to display the following menu.



Snapshot Waveforms (Snap)

1. Press the **Data Type** soft key.
2. Press the **Snap** soft key to display the following menu.



Set Data Type to Snap

Saves a snapshot waveform

Automated Measurement Values of Waveform Parameters (Measure)

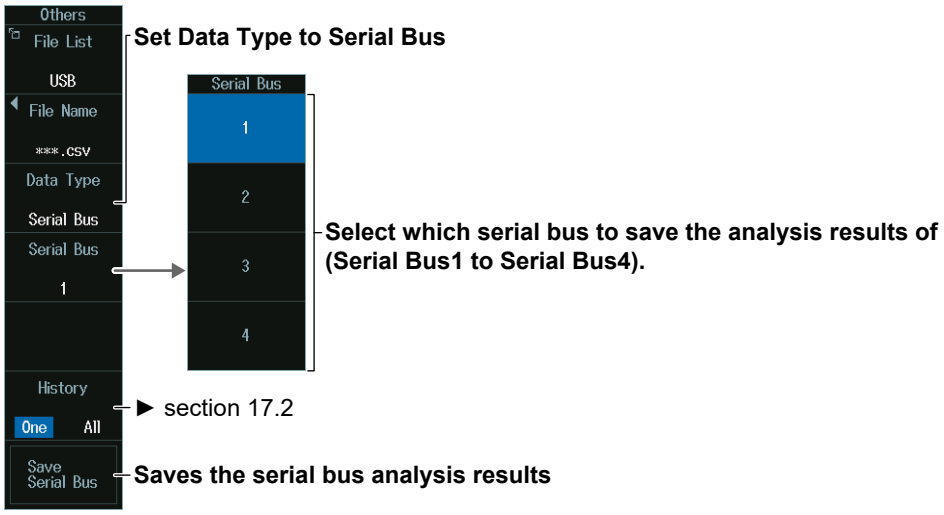
1. Press the **Data Type** soft key.
2. Press the **Measure** soft key to display the following menu.

Set Data Type to Measure

Saves the automated measurement values of waveform parameters

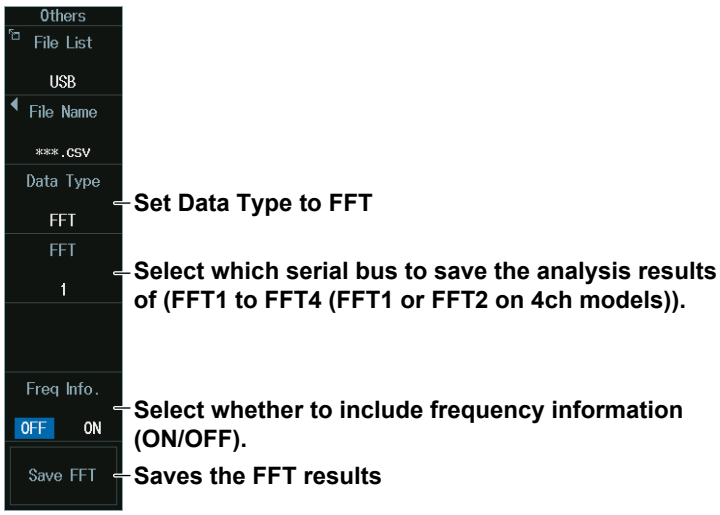
Serial Bus Analysis Results (Serial Bus)

1. Press the **Data Type** soft key.
2. Press the **Serial Bus** soft key to display the following menu.



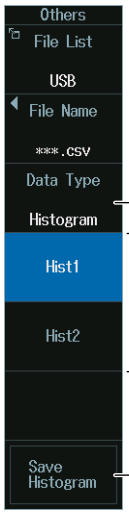
FFT Computation Results (FFT)

1. Press the **Data Type** soft key.
2. Press the **FFT** soft key to display the following menu.



Histogram (Histogram)

1. Press the **Data Type** soft key.
2. Press the **Histogram** soft key to display the following menu.



Set Data Type to Histogram.

Selects which histogram, Histogram1 or Histogram2, to save the history display of.

Saves the histogram display

List of Timestamps (History List)

1. Press the **Data Type** soft key.
2. Press the **History List** soft key to display the following menu.

Set Data Type to History List

Saves the list of timestamps

17.5 Loading Waveform Data

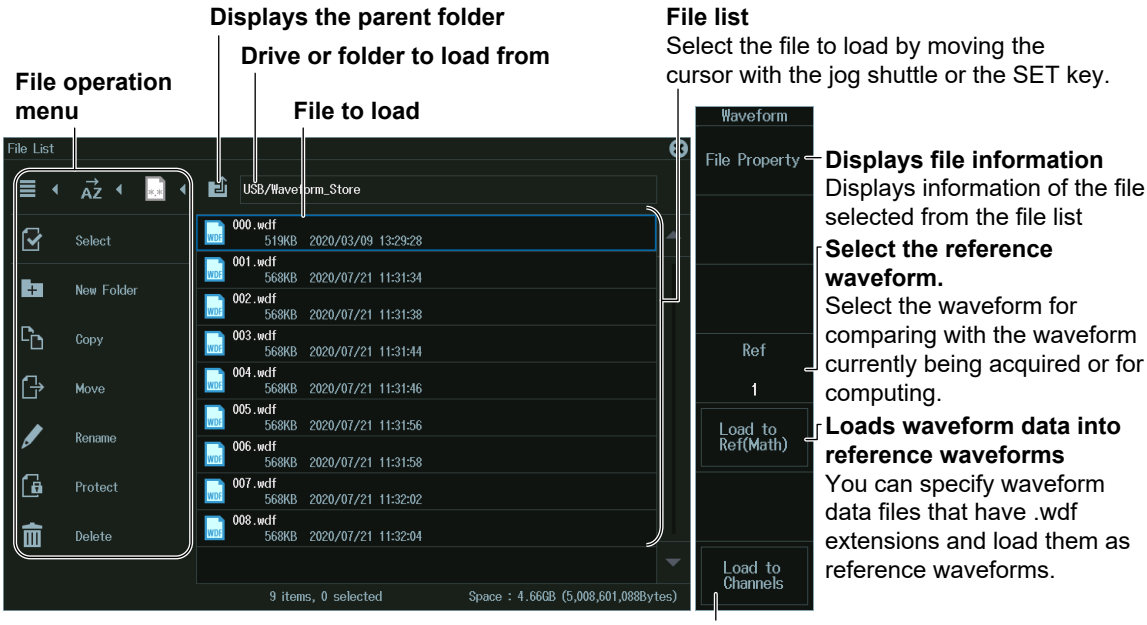
This section explains the following settings for loading waveform data):

- Displaying file information
- Loading waveform data into reference waveforms
- Loading waveform data into channels

► "Loading Waveform Data (Waveform)" in Features Guide

File Waveform (Load) Menu

1. Press **FILE** to display the FILE menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the FILE menu from FILE/PRINT on the top menu that is displayed.
2. Press the **Waveform (Load)** soft key to display the following menu.



Note

- For instructions on how to use the file list, see section 17.8.
- 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

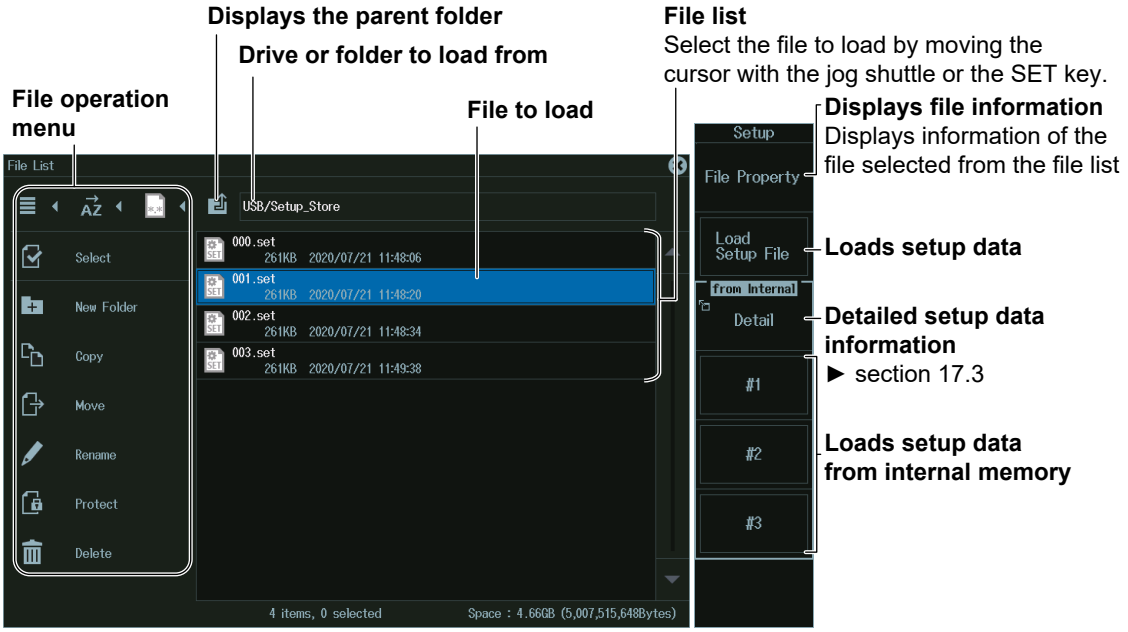
This section explains the following settings for loading setup data:
There are two methods you can use to load setup data. One method is to load setup data that has been saved to a file. The other method is to load setup data that is saved in the internal memory.

- Displaying file information
- Internal memory details
- Loading setup data

► "Loading Setup Data (Setup)" in the Features Guide

File Setup (Load) Menu

1. Press **FILE** to display the FILE menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the FILE menu from FILE/PRINT on the top menu that is displayed.
2. Press the **Setup (Load)** soft key to display the following menu.



Note

For instructions on how to use the file list, see section 17.8.

17.7 Loading Other Types of Data

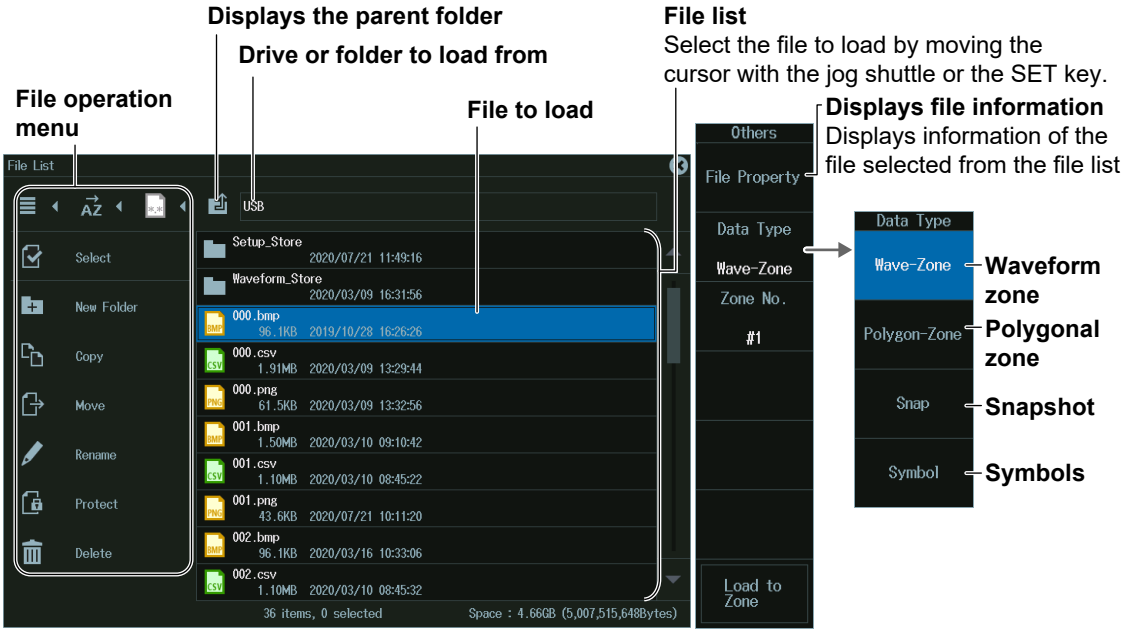
This section explains the following settings for loading waveform zones, polygonal zones, snapshot waveforms, or serial bus waveform symbol data:

- Displaying file information
- Data to load
- Loading data

► “Loading Other Types of Data (Others)” in Features Guide

File Others (Load) Menu

1. Press **FILE** to display the FILE menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the FILE menu from FILE/PRINT on the top menu that is displayed.
2. Press the **Others (Load)** soft key to display the following menu.



Note

For instructions on how to use the file list, see section 17.8.

Data to Load (Data Type)

Waveform Zone (Wave Zone)	Load waveform zone files that have .zwf extensions that you created on the instrument into internal memory areas Zone1 to Zone8 (Zone1 to Zone4 on 4ch models).
Polygonal Zone (Polygon-Zone)	Load polygonal zone files that have .msk extensions that you created with the Mask Editor software into internal memory areas Zone1 to Zone8 (Zone1 to Zone4 on 4ch models).
Snapshot (Snap)	Load snapshot waveform files that have .snp extensions that you have saved.
Symbol (Symbol)	Load physical value/symbol definition files that have .sbl extensions that you have edited using the Symbol Editor tool.

Data to Load (Data Type)

Waveform Zone (Wave Zone)

1. Press the **Data Type** soft key.
2. Press the **Wave-Zone** soft key to display the following menu.

Set Data Type to Wave-Zone.

Select the waveform zone from the internal memory (#1 to #8).

Loads a waveform zone

Polygonal Zone (Polygon-Zone)

1. Press the **Data Type** soft key.
2. Press the **Polygon-Zone**Zone soft key to display the following menu.

Set Data Type to Polygon-Zone.

Select the polygonal zone from the internal memory (#1 to #8).

Loads a polygonal zone

Snapshot Waveforms (Snap)

1. Press the **Data Type** soft key.
2. Press the **Snap** soft key to display the following menu.

Set Data Type to Snap

Loads snapshot waveforms

Serial Bus Waveform Symbols (Symbol)

1. Press the **Data Type** soft key.
2. Press the **Symbol** soft key to display the following menu.

Set Data Type to Symbol.

Loads serial bus waveform symbol data (.sbl)

Note

Symbols (.sbl)

Character string bit pattern based on definitions in a CANdb file.
This is a file (.sbl) created by converting the data in a CANdb file (.dbc) using Symbol Editor.

Symbol Editor

This is a free software that you can download from the YOKOGAWA website (http://www.yokogawa.com/jp-ymi/).

CANdb File (.dbc)

A definition database file created using the CANdb or CANdb++ software produced by Vector Informatik.

17.8 Performing File Operations

This section explains the following settings for performing various file operations from the file list or the file UTILITY menu:

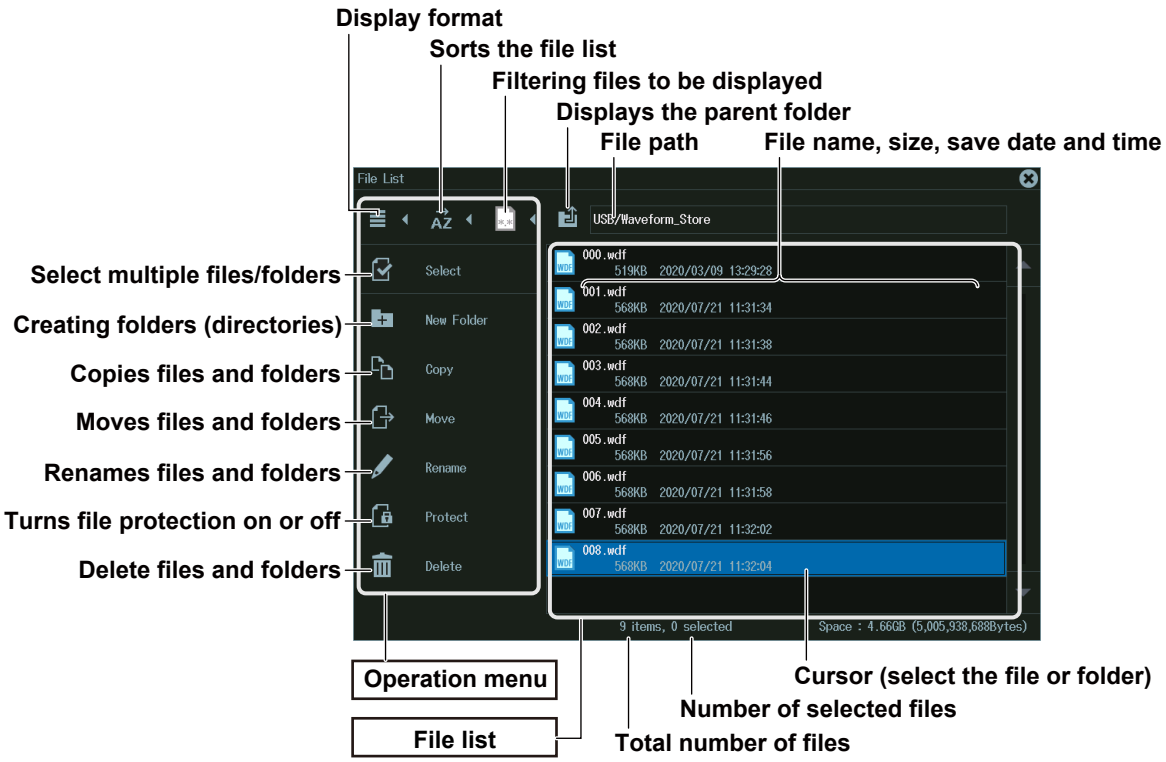
File list
- Display format
- Sorting the file list
- Filtering files to be displayed

- Displaying the parent folder
- Selecting multiple files and folders (All Set, All Reset, and Set/Reset)
- Creating folders (directories)
- Coping files and folders
- Moving files and folders
- Renaming files and folders
- Turning file protection on or off
- Deleting files and folders

FILE UTILITY menu
- Displaying file information
- Turning file protection on or off
- Selecting multiple files and folders (All Set, All Reset, and Set/Reset)

► “File Operations (Utility)” in Features Guide

File List (File List)



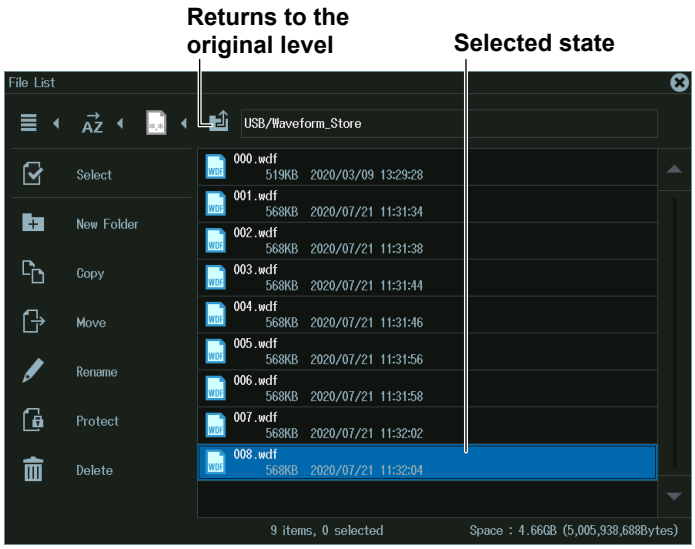
Switching Between the Operation Menu and the File List

- Tilt **SET** (●) to the left to move the cursor to the operation menu. Tilt it to the right to move the cursor to the file list.
- • To move the cursor between ☰, AZ,* and ,* tilt the **SET** key to the left or right.
  The icon varies depending on the selected menu item.
- To move the cursor to (display the parent folder), move the cursor to the top of the file list, then tilt **SET** up.

Selecting the Item to Operate (File List)

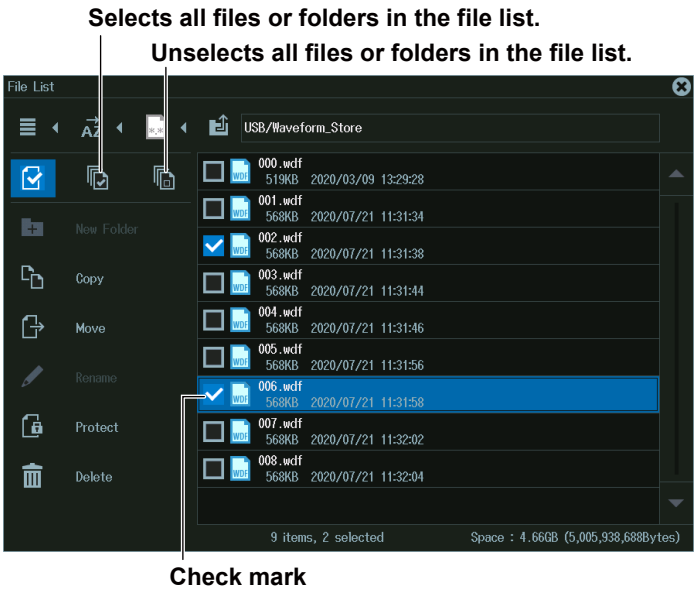
When Operating a File or Folder

1. Turn the **jog shuttle** or tilt the **SET** (●) key up and down to move the cursor to the file or folder you want to select.
   A blue frame appears around the selected file or folder.
2. To display inside of a folder, move the cursor to the folder, and press **SET** (●).
   To return to the original folder, move the cursor to (display the parent folder) and press SET.



When Operating Multiple Files and Folders (Select)

1. Display the content of a drive or folder that contains multiple files or folders that you want to select.
2. Select **Select** (☑) on the operation menu and press **SET**. to display the following screen.
   The cursor moves to the file list.



3. Move the cursor to a file or folder that you want to select on the file list.
4. Press **SET** (●).
   - A check mark is displayed next to the selected file or folder.
   - Press **SET** again to remove the check mark.
5. Repeat steps 3 and 4 to select all the files and folders you want.
   - To select all or unselect all, move the cursor to the operation menu, select Select All (⧉) or Unselect All (⧉), and then press **SET**.
   - To close the multiple selection screen, move the cursor to the operation menu, select Select (☑) and press **SET**. Multiple selection will be canceled.

Selecting the Operation Content (Operation Menu)

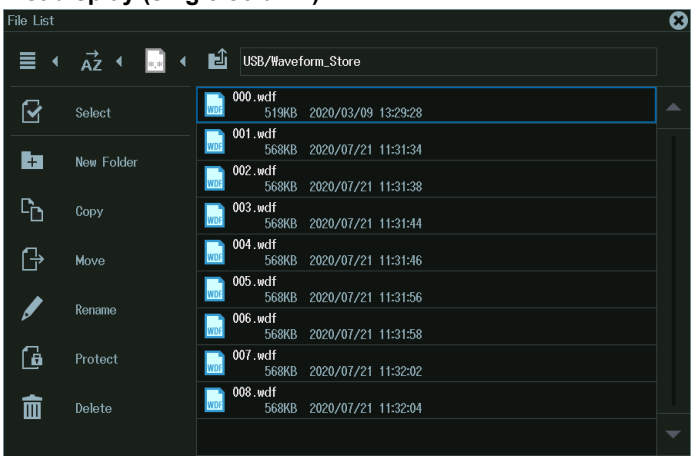
1. Turn the **jog shuttle** or move the **SET** (●) key up and down to move the cursor to the menu item you want to use.
2. Press **SET** (●).
   - The screen for the selected item appears.
   - To return to the previous screen, press **ESC**.

Display Format (☰)

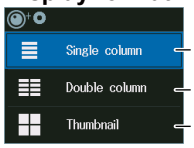
Select the icon (☰) from the operation menu, and press **SET**. The following screen appears.

The icon will change according to the currently selected display format.

List display (single column)



Display format

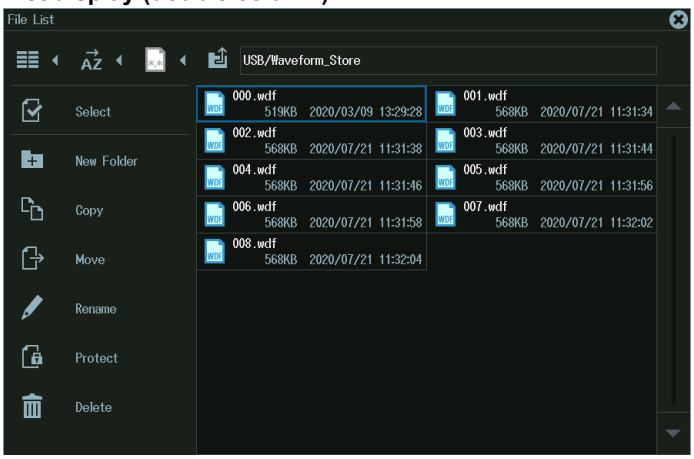


List display (single column)

List display (double column)

Thumbnail display

List display (double column)

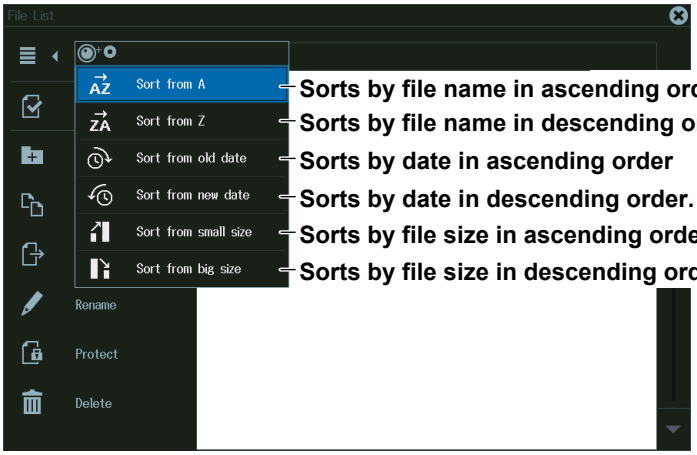


Thumbnail display

Sorting the File List (AZ)

Select the icon (AZ) from the operation menu, and press **SET**. The following screen appears.

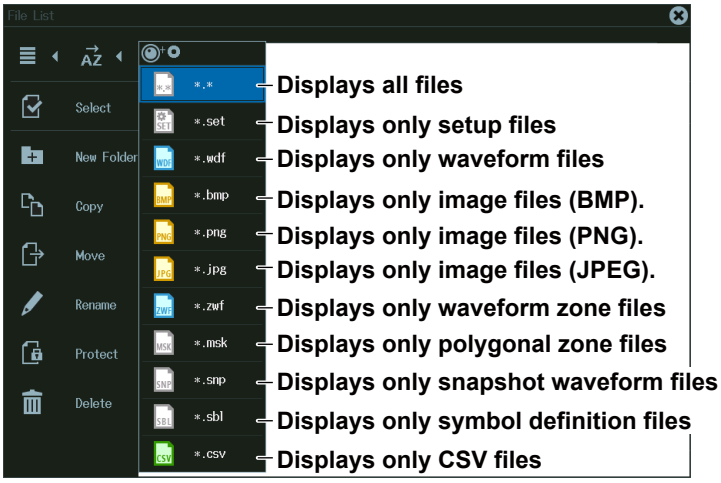
The icon will change according to the currently sort order.



Filtering the Files to Display (*.*)

Select the icon (*.*) from the operation menu, and press **SET**. The following screen appears.

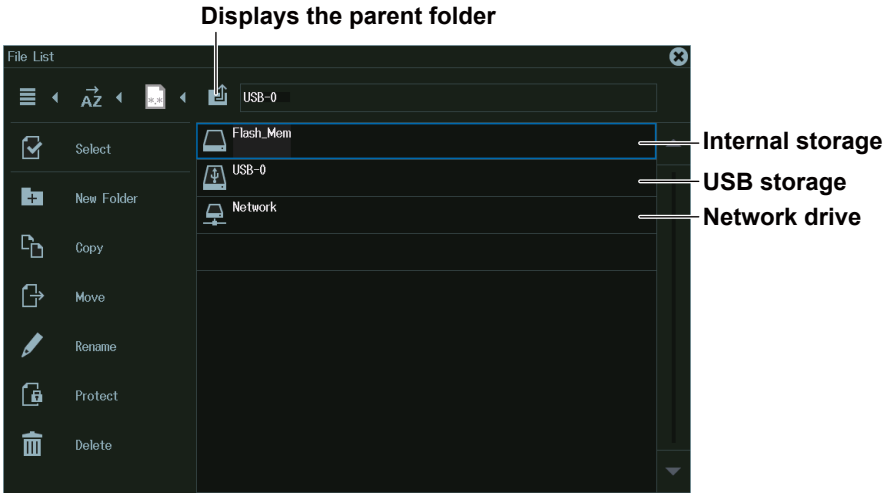
The icon varies depending on the selected file type.



Displaying the Parent Folder ( )

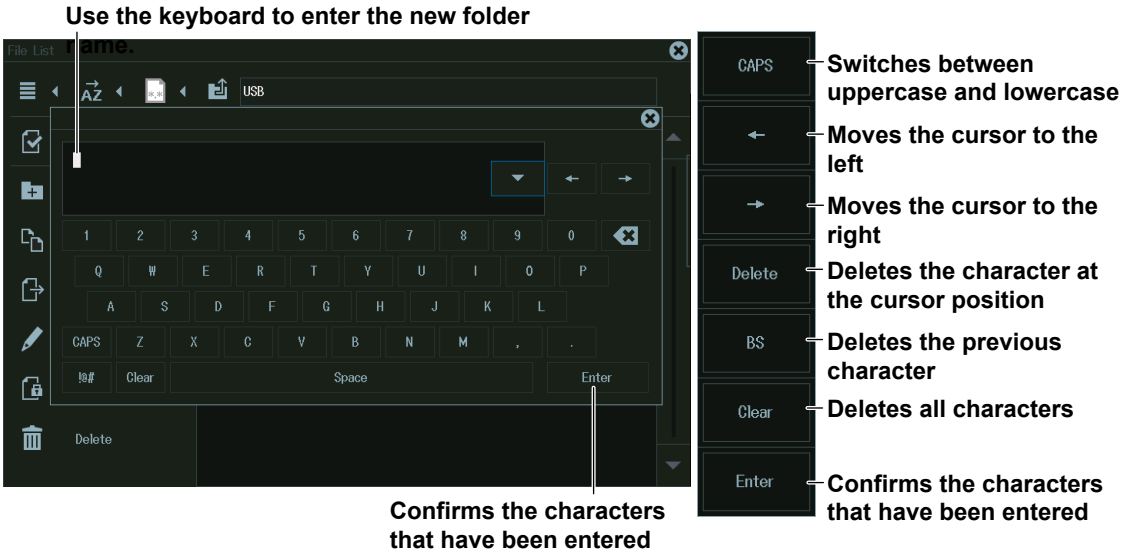
Select the icon ( ) from the operation menu, and press **SET**. The parent folder is shown in the file list.

When the top folder is displayed, you can change the storage device.



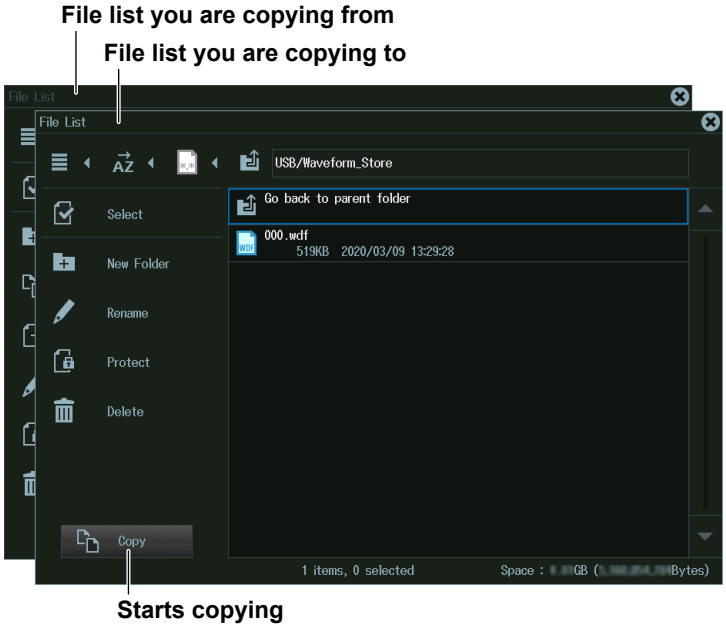
Making Folders (Directories) (New folder)

1. Create a folder and display the content of the drive or folder in the file list.
2. Select **New Folder** from the operation menu, and press **SET**. The following screen appears.



Copying Files and Folders (Copy)

1. Select the files and folders in the file list that you want to copy.
2. Select **Copy** from the operation menu, and press **SET**. The following screen appears.



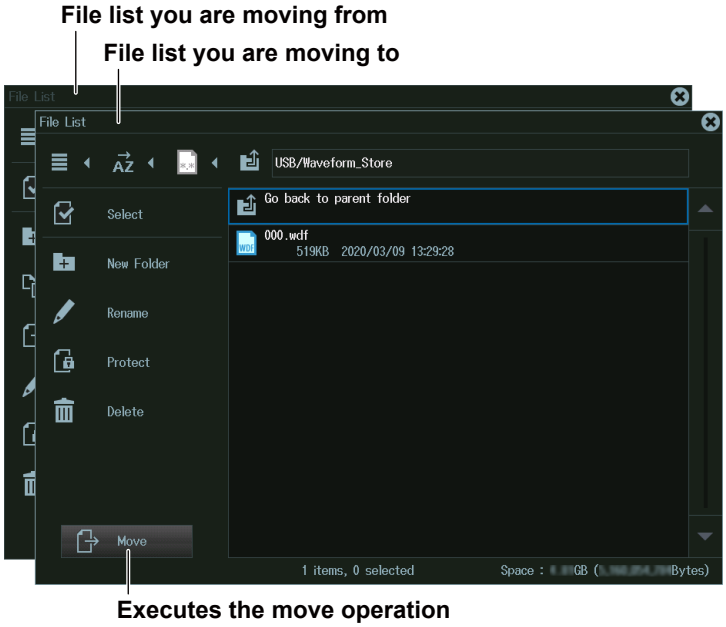
3. Select the drive or folder in the file list that you want to copy to.
4. Tilt **SET** to the left and move to the copy destination operation menu.
5. Select **Copy**, and press **SET**. The files and folders are copied to the destination.

Note

- By selecting multiple files, you can copy them all at the same time. For instructions on how to select multiple files, see page 17-19.
- You can perform file operations on the file list that you are copying to as well.

Moving Files and Folders (Move)

1. Select the files and folders in the file list that you want to move.
2. Select **Move** from the operation menu, and press **SET**. The following screen appears.



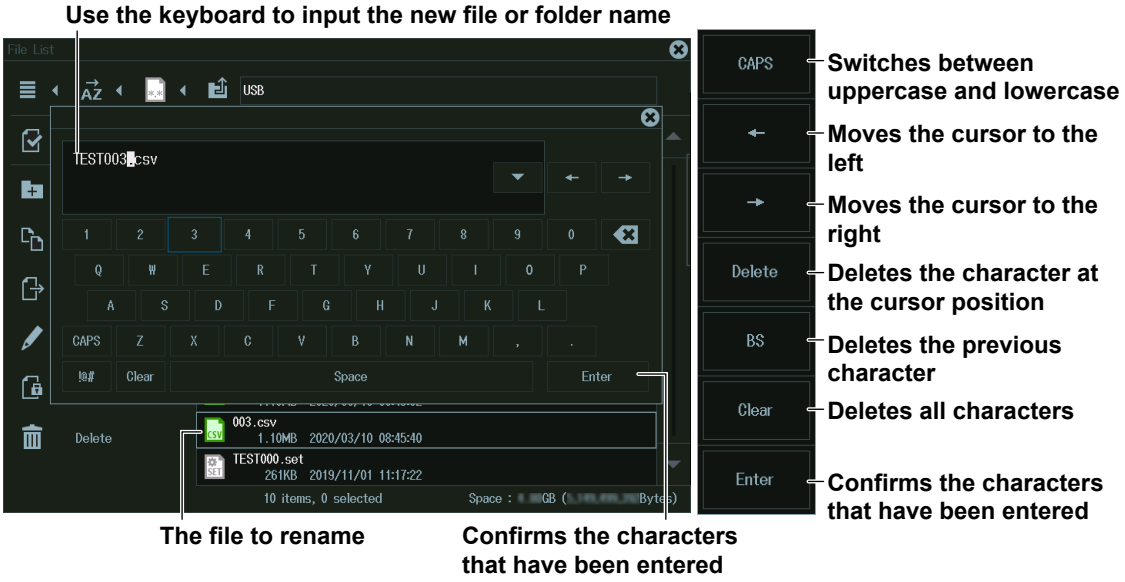
3. Select the drive or folder in the file list that you want to move to.
4. Tilt **SET** to the left and move to the move destination operation menu.
5. Select **Move**, and press **SET**. The files or folders are moved to the destination.

Note

- By selecting multiple files, you can move them all at the same time. For instructions on how to select multiple files, see page 17-19.
- You can perform file operations on the file list that you are moving files to as well.

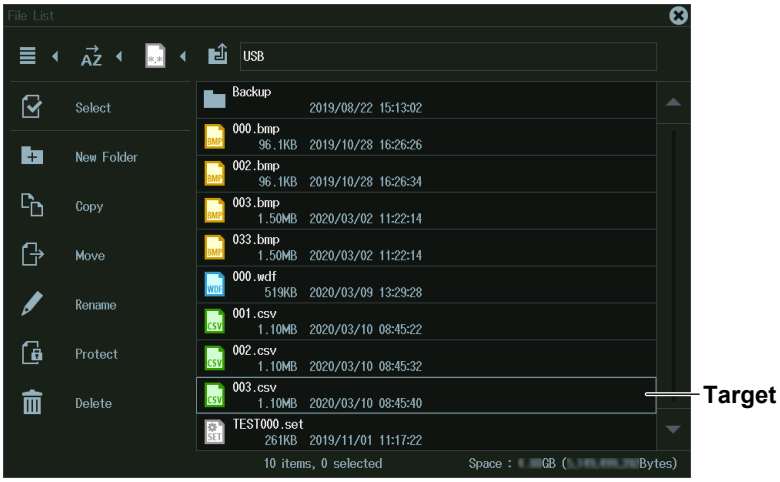
Renaming Files and Folders (Rename)

1. Select the file or folder that you want to rename from the file list.
2. Select **Rename** from the operation menu, and press **SET**. The following screen appears.



Deleting Files and Folders (Delete)

1. Select the file or folder that you want to delete from the file list.
2. Select **Delete** from the operation menu, and press **SET**. The selected file is deleted.

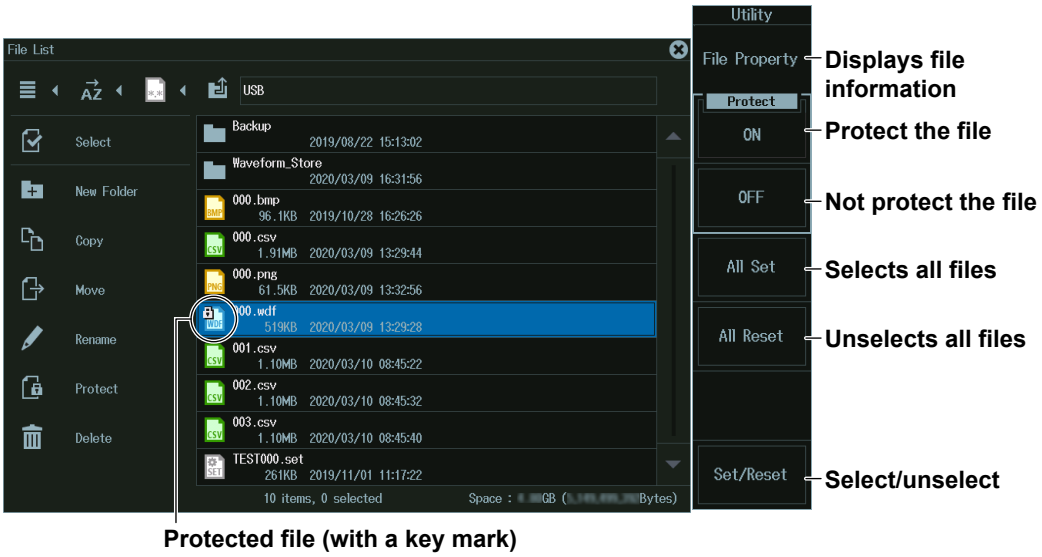


Note

By selecting multiple files, you can delete them all at the same time. For instructions on how to select multiple files, see page 17-19.

File Utility Menu

1. Press **FILE** to display the FILE menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the FILE menu from FILE/PRINT on the top menu that is displayed.
2. Press the **Utility** soft key to display the following screen.



Turning File Protection On or Off (Protect ON/OFF)

1. Select the file you want to protect.
2. Press the **ON (Protect)** soft key. A key mark is displayed on the selected file icon.
   You can also tap Protect on the operation menu to do the same.
   Pressing the **OFF (Protect)** soft key clears the key mark displayed on the selected file icon.

File Protection (Protect)

File Protection (Protect)	Description
ON	The selected file is protected. The file can be read from but cannot be written to. Nor can the file be deleted.
OFF	The selected files not protected. The file can be read from, written to, and deleted.

Selecting and Unselecting (Set/Reset)

1. Move the cursor to the file you want to access.
2. Press the **Set/Reset** soft key. Each time you press the soft key, the file toggles between selected and unselected.

18.1 Connecting the Instrument to a Network

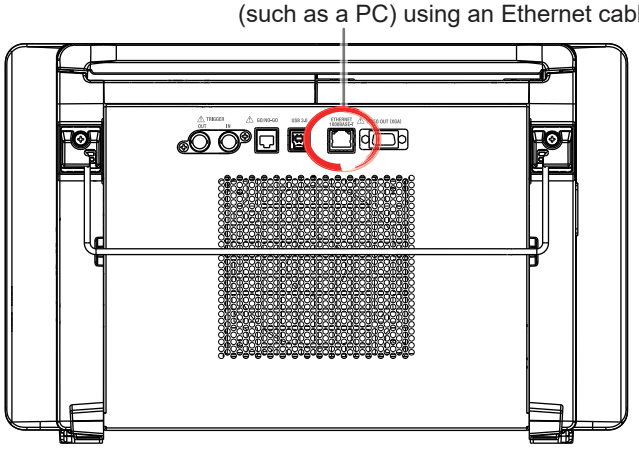
This section explains how to connect the instrument to a network.

Ethernet Interface Specifications

There is a 1000BASE-T port located on the rear panel of the instrument.

Item	Specifications
Ports	1
Electrical and mechanical specifications	IEEE802.3 compliant
Transmission system	Ethernet(1000BASE-T/100BASE-TX/10BASE-T)
Communication protocol	TCP/IP
Supported services	Server: FTP, VXI-11, Socket Client: FTP (Net Drive), SMTP (Mail), SNTP, LPR (Net Print), DHCP, and DNS
Connector type	RJ-45 connector

Ethernet port
This port is for connecting the instrument to a controller (such as a PC) using an Ethernet cable.



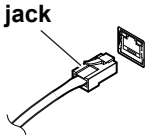
Items Required to Connect the Instrument to a Network

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

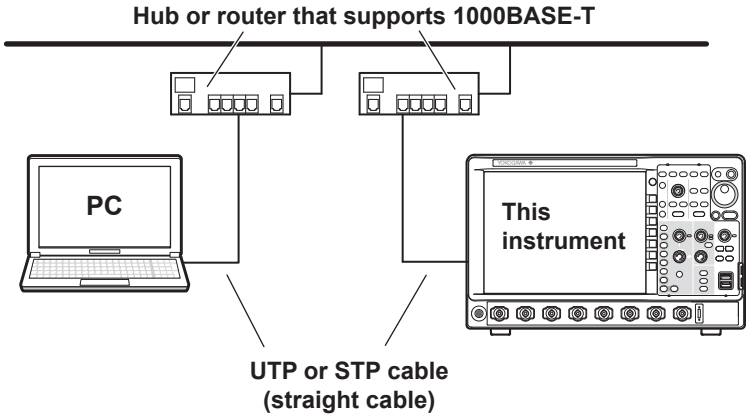
RJ-45 modular jack



Connection Procedure

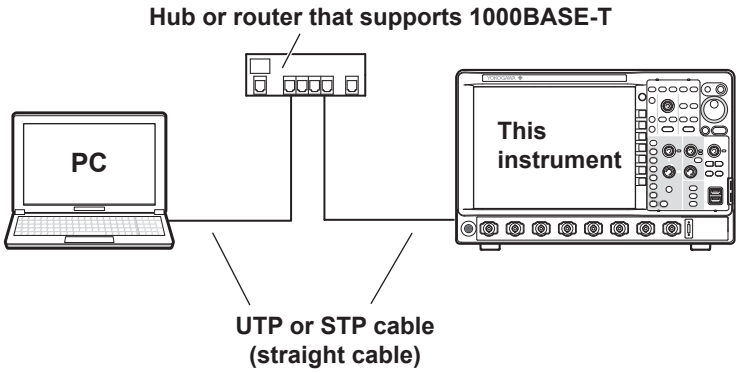
To Connect to a PC over a Network

1. Turn off the instrument.
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 instrument.



To Connect to a PC through a Hub or Router

1. Turn off the instrument 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 instrument.



Note

- Use a hub or router that conforms to the transfer speed of your network.
- When you connect a PC to the instrument 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 instrument to a PC directly. Direct communication without a hub or router is not guaranteed to work.

18.2 Configuring TCP/IP Settings

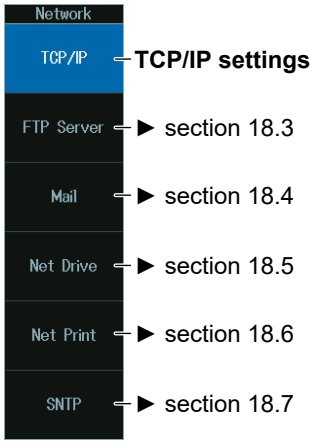
This section explains the following TCP/IP settings for connecting to a network:

- 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

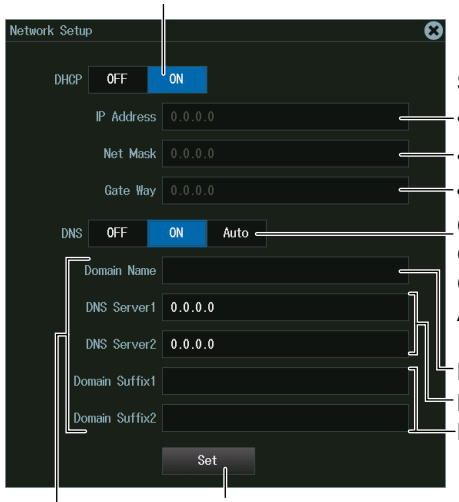
1. Press **UTILITY** to display the UTILITY menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the UTILITY menu from UTILITY on the top menu.
2. Press the **Network** soft key to display the following menu.



TCP/IP settings
► section 18.3
► section 18.4
► section 18.5
► section 18.6
► section 18.7

TCP/IP(TCP/IP)

Press the **TCP/IP** soft key to display the following screen.



Turns DHCP on or off

Set these when DHCP is disabled.
• IP address
• Subnet mask
• Default gateway

Configure the DNS settings.
OFF: DNS is disabled.
ON: DNS is enabled. The server addresses set manually.
Auto: DNS is enabled. The server address is set automatically.

Appears when DHCP is set to off

Domain name
IP address of DNS (primary, secondary)
Domain suffixes (primary and secondary)

Applies the settings

These are displayed when DNS is set to ON or Auto.

18.3 Accessing the Instrument from a PC (FTP Server)

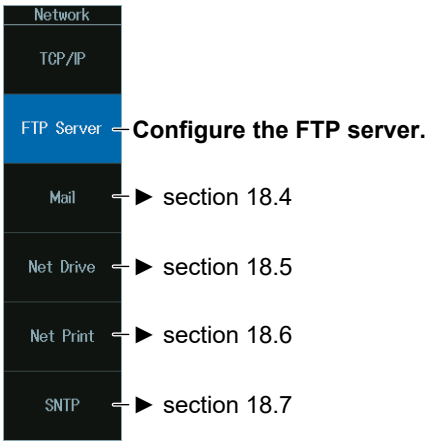
This section explains the following settings for accessing the instrument from a PC on a network:

- User name
- Password
- Timeout
- Starting an FTP client

► “FTP Server (FTP Server)” in Features Guide

UTILITY Network Menu

1. Press **UTILITY** to display the UTILITY menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the UTILITY menu from UTILITY on the top menu.
2. Press the **Network** soft key to display the following menu.



Configure the FTP server.

► section 18.4

► section 18.5

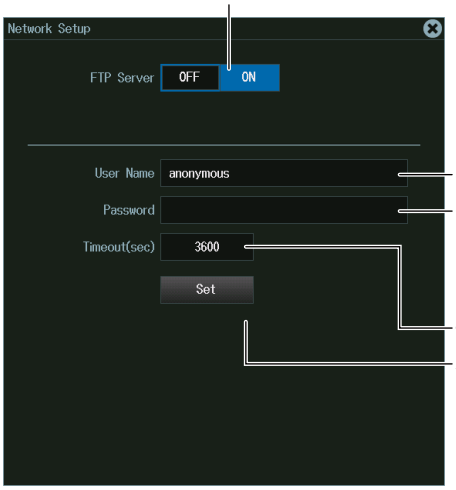
► section 18.6

► section 18.7

FTP Server (FTP Server)

Press the **FTP Server** soft key to display the following screen.

Turns FTP server on or off



Settings for accessing the instrument from a PC

- **User name** (up to 30 characters)
- **Password** (up to 15 characters)
  You do not need to set the password when the user name is set to “anonymous.”
  You can connect to the instrument without entering a password.
- **Timeout**

Applies the settings

How to Access from a PC

Start an FTP client on a PC. Enter the user name and password that you set on the instrument’s network setup screen, which is shown above, and connect to the instrument.

18.4 Configuring Mail Transmission (SMTP Client)

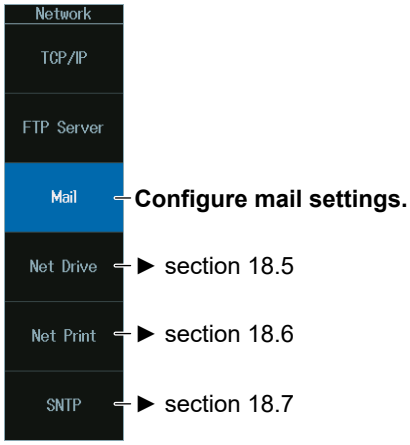
This section explains the following settings for transmitting mail to a specified mail address on a network:

- Mail server
- Mail address
- Comments
- Attaching image files
- Timeout
- User authentication
- Sending a test mail

► "Mail (Mail)" in Features Guide

UTILITY Network Menu

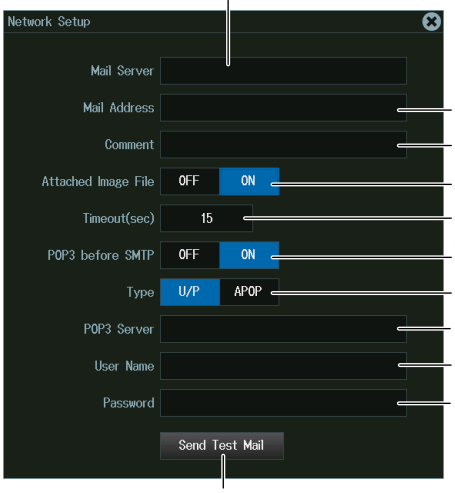
1. Press **UTILITY** to display the UTILITY menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the UTILITY menu from UTILITY on the top menu.
2. Press the **Network** soft key to display the following menu.



Configure mail settings.
► section 18.5
► section 18.6
► section 18.7

Mail (Mail)

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



Mail server
(IP address, or when DNS is enabled, the host name and domain name)
Mail address
Comment
Attaches image files
Timeout
Turns user authentication on or off
Encryption type (when user authentication is enabled)
Name of POP3 server
User name (up to 30 characters)
Password (up to 30 characters)
Sends a test mail

18.5 Connecting to a Network Drive (FTP Client)

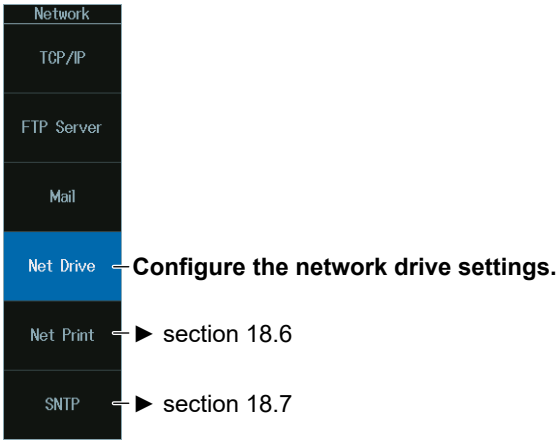
This section explains the following settings for accessing a network drive through an Ethernet connection to load or save various instrument's data:

- FTP server (file server)
- User name
- Password
- Turning FTP passive mode on or off
- Timeout
- Connecting to and disconnecting from network drives

► "Network Drive (Net Drive)" in the Features Guide

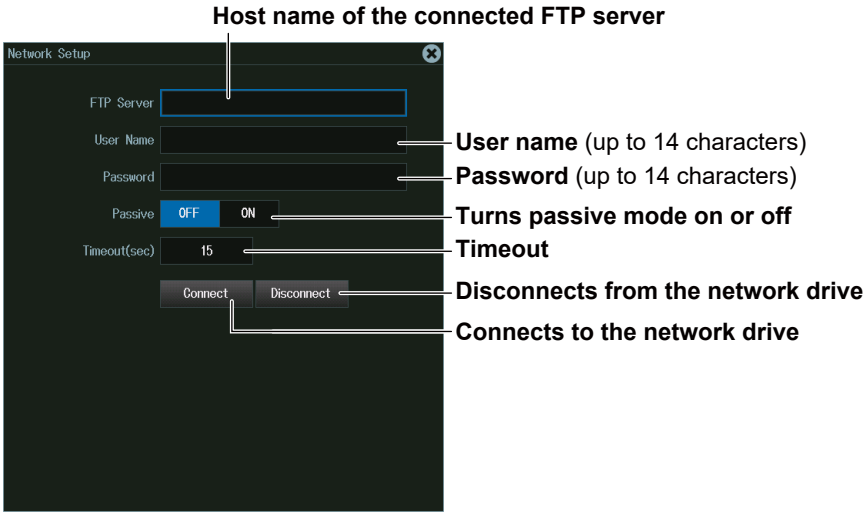
UTILITY Network Menu

1. Press **UTILITY** to display the UTILITY menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the UTILITY menu from UTILITY on the top menu.
2. Press the **Network** soft key to display the following menu.



Configuring Network Drive (Net Drive) Settings and Connecting to It

Press the **Net Drive** soft key to display the following screen.



18.6 Configuring a Network Printer

This section explains the following settings for printing screen images to a network printer:

- LPR server
- LPR name
- Timeout

► "Network Printer (Net Print)" in the Features Guide

UTILITY Network Menu

1. Press **UTILITY** to display the UTILITY menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the UTILITY menu from UTILITY on the top menu.
2. Press the **Network** soft key to display the following menu.

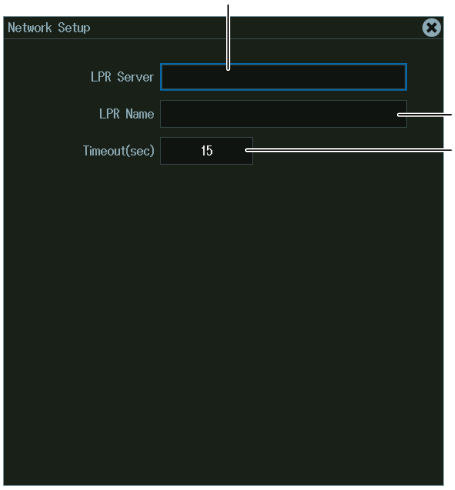
Configure network printer settings.

► section 18.7

Network Printer (Net Print)

Press the **Net Print** soft key to display the following screen.

LPR server
(IP address, or when DNS is enabled, the host name and domain name)



LPR name (name of shared printer)

Timeout

18.7 Using SNTP to Set the Date and Time

This section explains how to use SNTP to set the Instrument's date and time.

- SNTP server
- Timeout
- Executing time adjustment
- Automatic adjustment

► "SNTP (SNTP)" in the Features Guide

UTILITY Network Menu

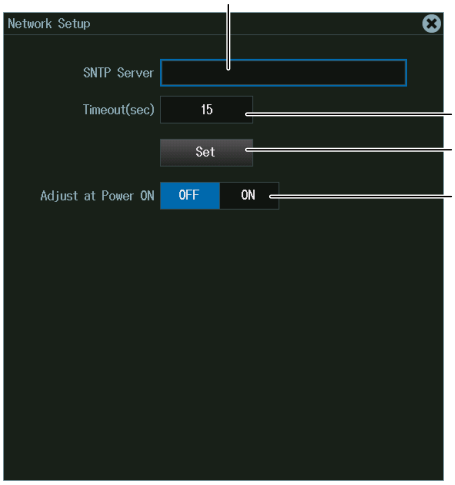
1. Press **UTILITY** to display the UTILITY menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the UTILITY menu from UTILITY on the top menu.
2. Press the **Network** soft key to display the following menu.

Configure the SNTP settings.

SNTP(SNTP)

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

SNTP server
(IP address, or when DNS is enabled, the host name and domain name)



Timeout

Executes clock adjustment

Automatic adjustment

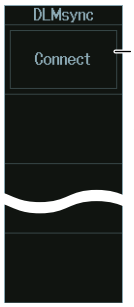
19.1 Starting and Stopping Synchronous Operation (DLMsync)

This section explains the settings for connecting this instrument to another DLM5034, DLM5038, DLM5054, or DLM5058.

► “Synchronous Operation (DLMsync)” in the Features Guide

UTILITY DLMsync Menu

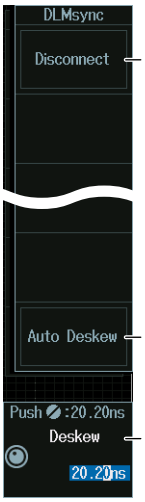
1. Press **UTILITY** to display the UTILITY menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the UTILITY menu from UTILITY on the top menu.
2. Press the **DLMsync** soft key to display the following menu.



Starts synchronous operation
This instrument becomes the main unit and connects to the sub unit.
When a connection is established, the soft key menu changes to Disconnect.

Ending Synchronous Operation

Press the **Disconnect** soft key.



Ends synchronous operation
Disconnects from the sub unit.

► section 19.2

► section 19.2

Note

- During synchronous operation, a main unit or sub unit icon is displayed at the top of the screen.
- “Trigger: Controlled by Main Unit” is displayed at the top of the sub unit screen during synchronous operation.

19.2 Correcting the Sampling Skew between Units

This section explains the settings for correcting the sampling timing error (skew) between the main unit and sub unit.

UTILITY DLMsync Menu

1. Press **UTILITY** to display the UTILITY menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the UTILITY menu from UTILITY on the top menu.
2. Press the **DLMsync** and then the **Connect** soft key to display the following menu.

Executes auto deskewing
Auto deskewing is performed according to the connected signal source.

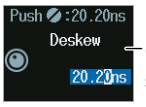
Correcting the sampling skew between units

Correcting the Sampling Skew between Units (Deskew)

Turn the jog shuttle to set the correction value for the sampling timing between units.

You can also tap the jog shuttle setting menu in the lower right of the screen and use the numeric keypad that appears on the screen.

Jog shuttle setting menu



Correcting the sampling skew between units

Note

To execute on auto deskew, you need to apply a same signal to CH1 of the main unit and CH1 of the sub unit through probes with the same specifications.
For details, see chapter 22, “Synchronous Operation,” in the Features Guide, IM DLM5058-01EN.

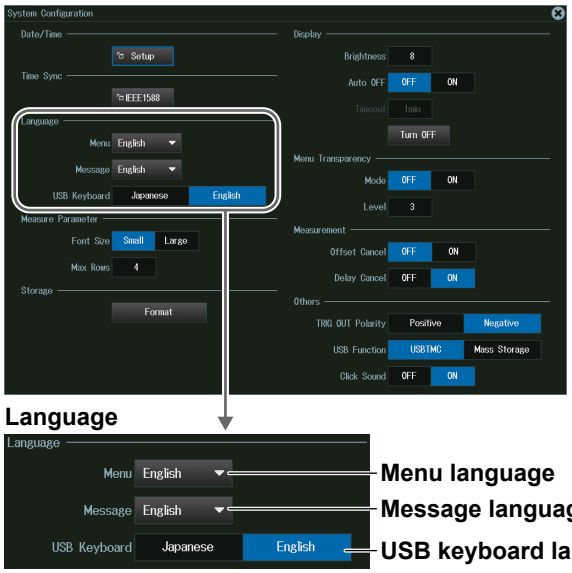
20.1 Changing the Menu, Message, and USB Keyboard Languages

This section explains the settings that you can use to change the instrument's menu, message, and USB keyboard languages.

► "Language (Language)" in Features Guide

UTILITY System Configuration Menu

1. Press **UTILITY**to display the UTILITY menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the UTILITY menu from UTILITY on the top menu.
2. Press the **System Configuration** soft key to display the following menu.



Language

Menu language

Message language

USB keyboard language

Note

Even if you set the menu or message language to a language other than English, some terms will be displayed in English.

USB Keyboard (USB Keyboard)

You can use the following keyboards that conform to USB Human Interface Devices (HID) Class Ver. 1.1.

English:	104-key keyboards
Japanese:	109-key keyboards

Note

For details on how the keys of this instrument are mapped to the keys on a USB keyboard, see appendix 2 in the *Getting Started Guide* (IM DLM5058-03EN).

20.2 Setting the Click Sound, Measured Value Font Size, and Number of Rows for Displaying Measurement Values

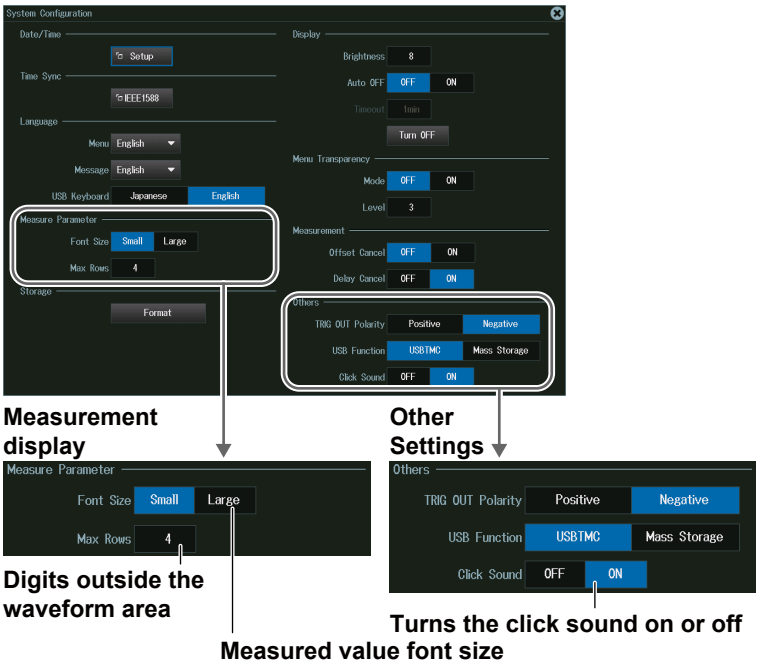
This section explains the following settings:

- Click sound on/off
- Measured value font size
- Number of rows for displaying measured values

► “Measurement Display (Measure Parameter)”
“Turning On or Off the Click Sound (Click Sound)”
in the Features Guide

UTILITY System Configuration Menu

1. Press **UTILITY**to display the UTILITY menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the UTILITY menu from UTILITY on the top menu.
2. Press the **System Configuration** soft key to display the following menu.



20.3 Viewing Setup Information (Overview)

This section explains how to view the current setup information.

► “Overview (Overview)” in the Features Guide

UTILITY Overview Menu

1. Press **UTILITY**to display the UTILITY menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the UTILITY menu from UTILITY on the top menu.
2. Press the **Overview** soft key to display the following menu.

Displays system overview
Displays mainly model and suffix code information

Displays setup information 1
Displays mainly the vertical and horizontal scale settings

Displays setup information 2
Displays mainly the trigger settings

Adds options
►IM 709821-01EN DLM5000 Additional Option License User’s Manual

Adding Options

A portion of the functions provided as options (with the instrument’s model name) can be installed by purchasing additional licenses after the purchase of the instrument. For more details, contact your nearest YOKOGAWA dealer.

20.4 Using the DLM5000 as a USB Storage Device

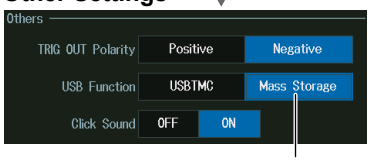
This section explains the setting that enables you to use the instrument as a USB storage device through a USB connection made between the USB port on the instrument's rear panel and a PC.

► "USB Communication (USB Function)" in the Features Guide

UTILITY System Configuration Menu

1. Press **UTILITY**to display the UTILITY menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the UTILITY menu from UTILITY on the top menu.
2. Press the **System Configuration** soft key to display the following menu.

Other Settings



Set USB Function to Mass Storage

Note

- From a PC, you can access the instrument's internal storage as a storage device. You cannot access the instrument's network drives or the storage device connected to the instrument's USB ports.
- Mass Storage functions as a read-only storage device.
- When you perform file operations in the internal storage from this instrument, the content of the internal storage of the instrument displayed on the PC is updated. During updating, the display on the PC may momentarily disappear.
- The USB communication function (USB Function) can also be set in Remote Control from the UTILITY menu. The setting values are linked with the settings on the System Configuration menu. For the operating procedure, see section 1.4 in IM DLM5058-17EN.

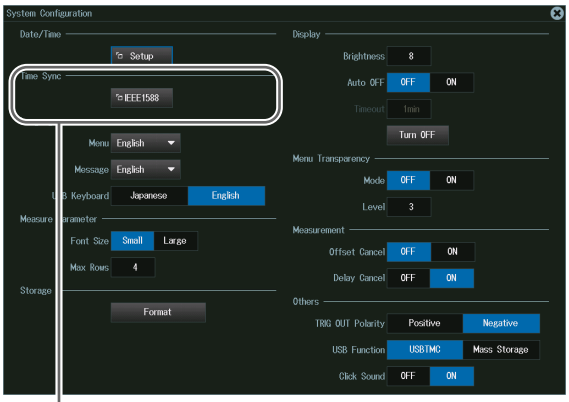
20.5 Synchronizing the Clock Using IEEE 1588

This section explains the settings used when running the instrument as a IEEE1588 slave device and synchronizing the clock and sampling clock by receiving Precision Time Protocol (PTP) packets from a master device.

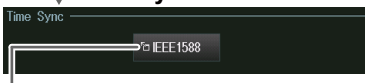
► "IEEE 1588 Clock Synchronization Feature (IEEE 1588)" in the Features Guide

UTILITY System Configuration Menu

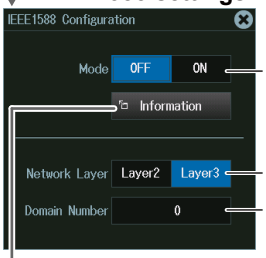
1. Press **UTILITY**to display the UTILITY menu.
   You can also tap **MENU** (MENU) in the upper left of the screen and select the UTILITY menu from UTILITY on the top menu.
2. Press the **System Configuration** soft key to display the following menu.



Time synchronization



IEEE 1588 settings

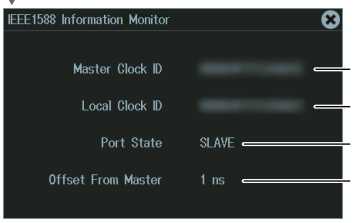


Select whether to synchronize the clock.

Network layer

Domain number

IEEE 1588 information monitor



Master clock ID (64-bit identifier)

Local clock ID (64-bit identifier)

Port status

Offset from master

Note

When time synchronization is enabled, start measuring after is displayed at the top of the screen. is displayed when the sampling clock stabilizes.

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User's Manual

DLM5034, DLM5038, DLM5054, DLM5058 Mixed Signal Oscilloscope

Notice of Alterations

This document describes changes to the following manuals. Please review them before using the manuals.

- Features Guide (IM DLM5058-01EN)*
- User's Manual (IM DLM5058-02EN)*
- Communication Interface User's Manual (IM DLM5058-17EN)*

* Included in the accompanying CD.

This manual is compatible with firmware version 2.80 and later.

Features Guide (IM DLM5058-01EN)

■ Page 5-7

Change the underlined sections.

Points to Consider When Setting the Action Setting to Save Waveform

……

- If you set sequential numbering as the automatic naming method (using the FILE menu), as the number of saved files increases, the amount of time required to save a file will also increase. Also, the maximum number of files that can be saved using sequential numbering is 5000. To save more than 5000 files, set the automatic naming function so that files are named by date. However, if the save location is a USB storage device formatted to FAT16 or FAT32, the maximum number of files that can be saved when Numbering [serial number] is selected is 1000.

……

- Up to 12500 files and folders can be displayed in the file list. If there are more than a total of 12500 files and folders in a given folder, the file list for that folder will display only 12500 files and folders. There is no way to set which files and folders are displayed.

■ Page 12-2

Change the underlined sections.

……

- If the power measurement mode of the power supply analysis feature (/G03 option) is turned on, you will not be able to set the following measurement items.
  Max, Min, P-P, Rms, Mean, Sdev(AC RMS), Avg Freq

Voltage Measurement Items

……

Sdev(AC RMS)*: Standard deviation [V] $((\Sigma Xn^2 - (\Sigma Xn)^2/N)/N)^{1/2}$

……

■ Page 12-5

Change the underlined sections.

Cycle Mode (Cycle Mode)

……

In cycle mode, the following items can be measured.

……

Sdev(AC RMS)*: Standard deviation [V] $((\Sigma Xn^2 - (\Sigma Xn)^2/N)/N)^{1/2}$

……

Measurement Location Indicator (Indicator)

Indicates the measured location of a specified item using cursors. The measurement locations of the following items can be indicated.

Max, Min, P-P, High, Low, Amplitude, Rms, Mean, Sdev(AC RMS), ……

■ Page 17-14

Change the underlined sections.

……

- For input channels that are assigned to power measurement and whose mode is set to ON, the following waveform parameters cannot be set: Max, Min, P-P, Rms, Mean, Sdev(AC RMS), Avg Freq. This is because these parameters overlap with those of the power measurement parameters, and the power measurement parameters are used in their place. ▶ See here.

……

■ Page 17-16

Change the underlined sections.

……

- For input channels that are assigned to power measurement and whose mode is set to ON, the following waveform parameters cannot be set: Max, Min, P-P, Rms, Mean, Sdev(AC RMS), Avg Freq. This is because these parameters overlap with those of the power measurement parameters, and the power measurement parameters are used in their place.
  If you select any of the power measurement item U+pk, U−pk, Up-p, Urms, Udc, Uac, Avg Freq, I+pk, I−pk, Ip-p, Irms, Idc, Iac, and Avg Freq check boxes, the corresponding input channel waveform parameter Max, Min, P-P, Rms, Mean, Sdev(AC RMS), or Avg Freq check boxes will be selected.

■ Page 19-3

Add the following explanation after “Color (Color).”

Waveform Gradation (Waveform Gradation)

Select this option when the color setting is ON.

- ON: The gradation of the waveform is the same as that of the waveform displayed on the screen.
- OFF: The printing color of the waveform is monochrome.

■ Page 19-4

Add the following explanation after “Color (Color).”

Waveform Gradation (Waveform Gradation)

Select this option when the color setting is ON.

- ON: The gradation of the waveform is the same as that of the waveform displayed on the screen.
- OFF: The printing color of the waveform is monochrome.

■ Page 19-6

Add the following explanation after “Including Setting Information (Information).”

Waveform Gradation (Waveform Gradation)

Select this option when the color data setting is ON (Rev.).

- ON: The gradation of the waveform is the same as that of the waveform displayed on the screen.
- OFF: The printing color of the waveform is monochrome.

■ Page 20-2

Add the underlined sections.

Auto Naming (Auto Naming)

……

- Numbering
  The instrument automatically adds a three-digit number from 000 to 999 or a four-digit number from 1000 to 4999 after the common name specified using the File Name setting and saves the file.

Add the following explanation after the above sentence.

If the file save location is the internal storage,* a net drive, or a USB storage device formatted to exFAT, a three-digit number from 000 to 999 or a four-digit number from 1000 to 4999 is added. If the save location is a USB storage device formatted to FAT16 or FAT32, a three-digit number from 000 to 999 is added.
If there are already numbered files in the save location, the instrument searches for the file with the highest file name number and numbers the file with that number plus one.

Example
If files test000.wdf, test001.wdf, and test071.wdf are present, test072.wdf is created.
If files test000.wdf and test4001.wdf are present, test4002.wdf is created.

However, if the file name number is four digits from 0000 to 0999, it is ignored.

Example
If files test000.wdf, test0001.wdf, and test0071.wdf are present, test001.wdf is created.

* If the factory firmware version is earlier than 2.00 on a standard model (without the /C8 option), it is applied after formatting by pressing the Utility key > System Configuration soft key > Format soft key.

■ Page 20-4

Change the underlined sections.

……

- Up to 12500 files and folders can be displayed in the file list. If there are more than a total of 12500 files and folders in a given folder, the file list for that folder will display only 12500 files and folders. There is no way to set which files and folders are displayed.

……

■ Page 20-6

Add the following explanation after “Including Setting Information (Information).”

Waveform Gradation (Waveform Gradation)

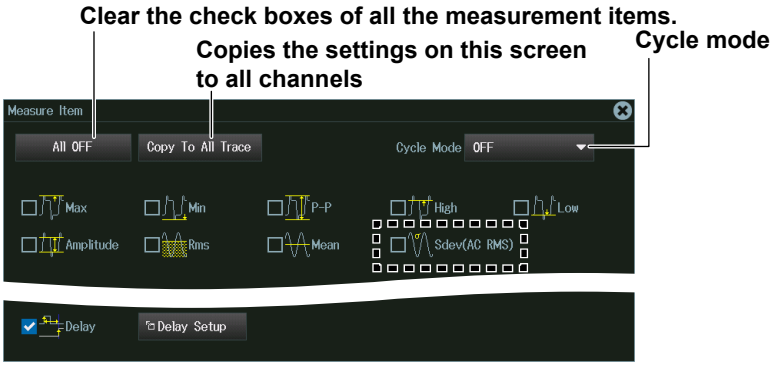
Select this option when the color data setting is ON (Rev.).

- ON: The gradation of the waveform is the same as that of the waveform displayed on the screen.
- OFF: The printing color of the waveform is monochrome.

User’s Manual (IM DLM5058-02EN)

■ Page 9-2

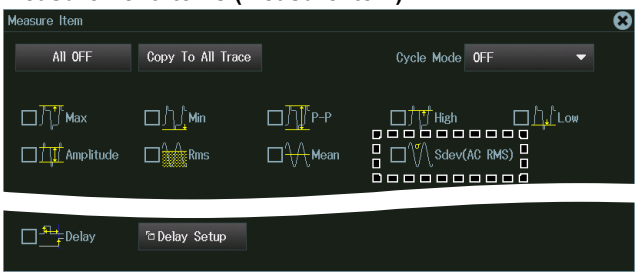
Please change the information as shown in the area enclosed by the broken line.



■ Page 9-4

Please change the information as shown in the area enclosed by the broken line.

Measurement Items (Measure Item)



Change the underlined sections.

Note

The measurement locations of the following items can be indicated.

Max, Min, P-P, High, Low, Amplitude, Rms, Mean, Sdev(AC RMS), ……

■ Page 14-17 ANALYSIS Power Measurement Menu

Change the underlined sections.

Note

……

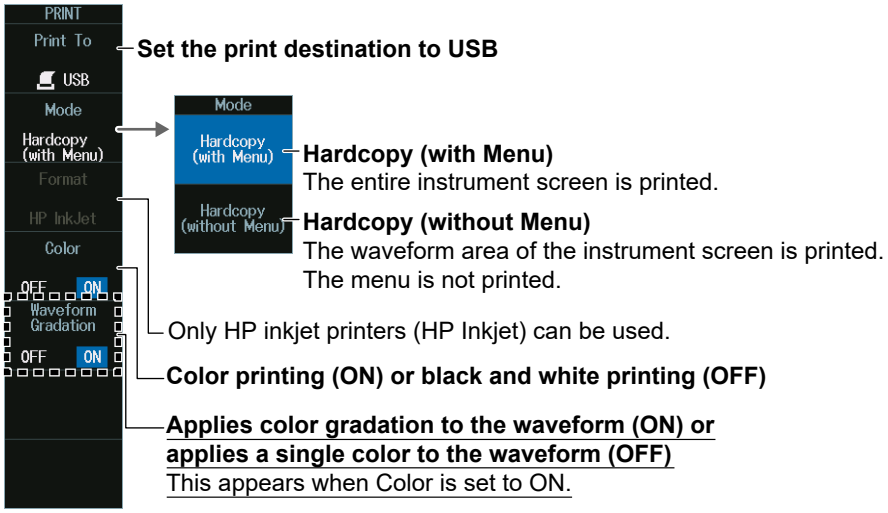
- For input channels that are assigned to power measurement and whose mode is set to ON, the following standard waveform parameters cannot be set. Because the measurement items of power measurement are the same as the following standard waveform parameters, the power measurement values are used in place of waveform parameters.

  Max, Min, P-P, Rms, Mean, Sdev(AC RMS), Avg Freq

……

■ Page 16-5 PRINT USB Menu

Add the description in the area enclosed by the broken line and the underlined text section.



Set the print destination to USB

Hardcopy (with Menu)
The entire instrument screen is printed.

Hardcopy (without Menu)
The waveform area of the instrument screen is printed.
The menu is not printed.

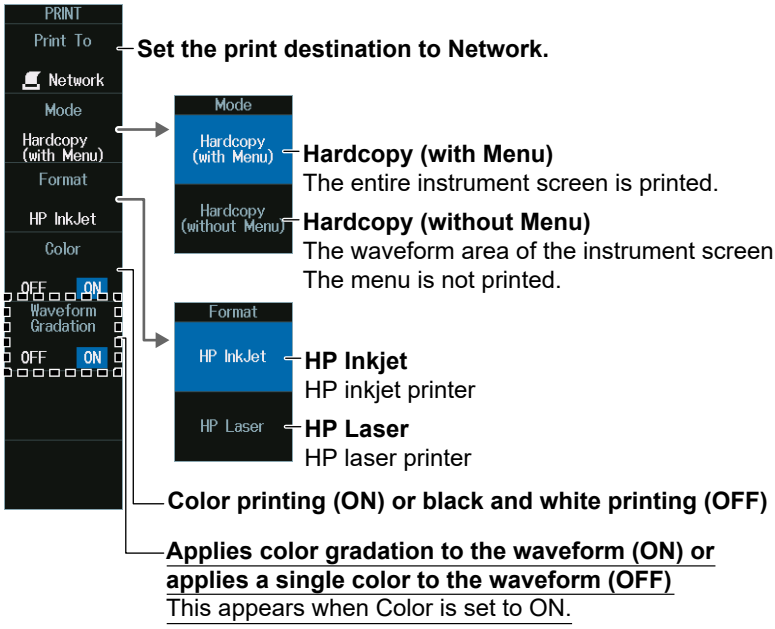
Only HP inkjet printers (HP Inkjet) can be used.

Color printing (ON) or black and white printing (OFF)

Applies color gradation to the waveform (ON) or applies a single color to the waveform (OFF)
This appears when Color is set to ON.

■ Page 16-6 PRINT Network Menu

Add the description in the area enclosed by the broken line and the underlined text section.



Set the print destination to Network.

Hardcopy (with Menu)
The entire instrument screen is printed.

Hardcopy (without Menu)
The waveform area of the instrument screen is printed.
The menu is not printed.

HP Inkjet
HP inkjet printer

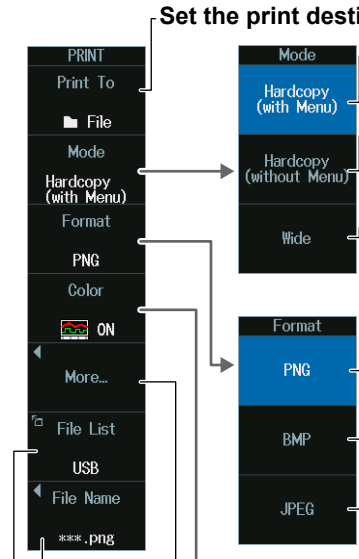
HP Laser
HP laser printer

Color printing (ON) or black and white printing (OFF)

Applies color gradation to the waveform (ON) or applies a single color to the waveform (OFF)
This appears when Color is set to ON.

■ Page 16-7 PRINT File Menu

Add the underlined sections.



Set the print destination to File.

Hardcopy (with Menu)
The screen displayed on the instrument is saved exactly as it appears.

Hardcopy (without Menu)
The waveform area of the instrument screen is saved.
The menu is not saved.

Wide
As in Hardcopy (without Menu) mode, the entire instrument screen is saved, but the time axis is magnified from 2 to 10 times.

PNG format
The file size is approximately 50 KB when you save a black and white screen capture and approximately 200 KB when you save a color screen capture.

BMP format
The file size is approximately 100 KB when you save a black and white screen capture and approximately 1.6 MB when you save a color screen capture.

JPEG format
The file size for black and white is approximately 300 KB.

File name

Save destination

OFF
Saved in black and white

ON
Saves using 65536 colors

ON(Rev.)
Saves using 65536 colors The image background will be white.

ON(Gray)
Saves using 32 grayscale levels

More... (transparent or opaque background, inclusion of settings, waveform gradation)

■ Page 16-8 PRINT File Menu

Add the following explanation after “Including Setting Information (Information).”

Waveform Gradation (Waveform Gradation)

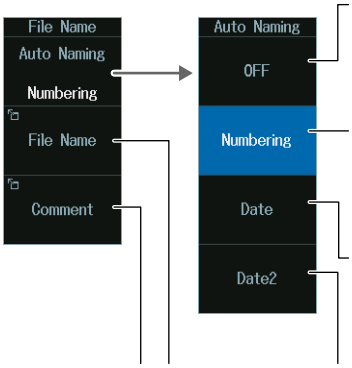
1. Press the **More** soft key to display the following menu.
Gradation can be applied to the waveform color when Color is set to ON (Rev.).

Applies color gradation to the waveform (ON) or applies a single color to the waveform (OFF)

■ Page 17-4 File name (File Name)

Add the underlined sections.

Auto naming



OFF
The auto naming feature is disabled. 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.

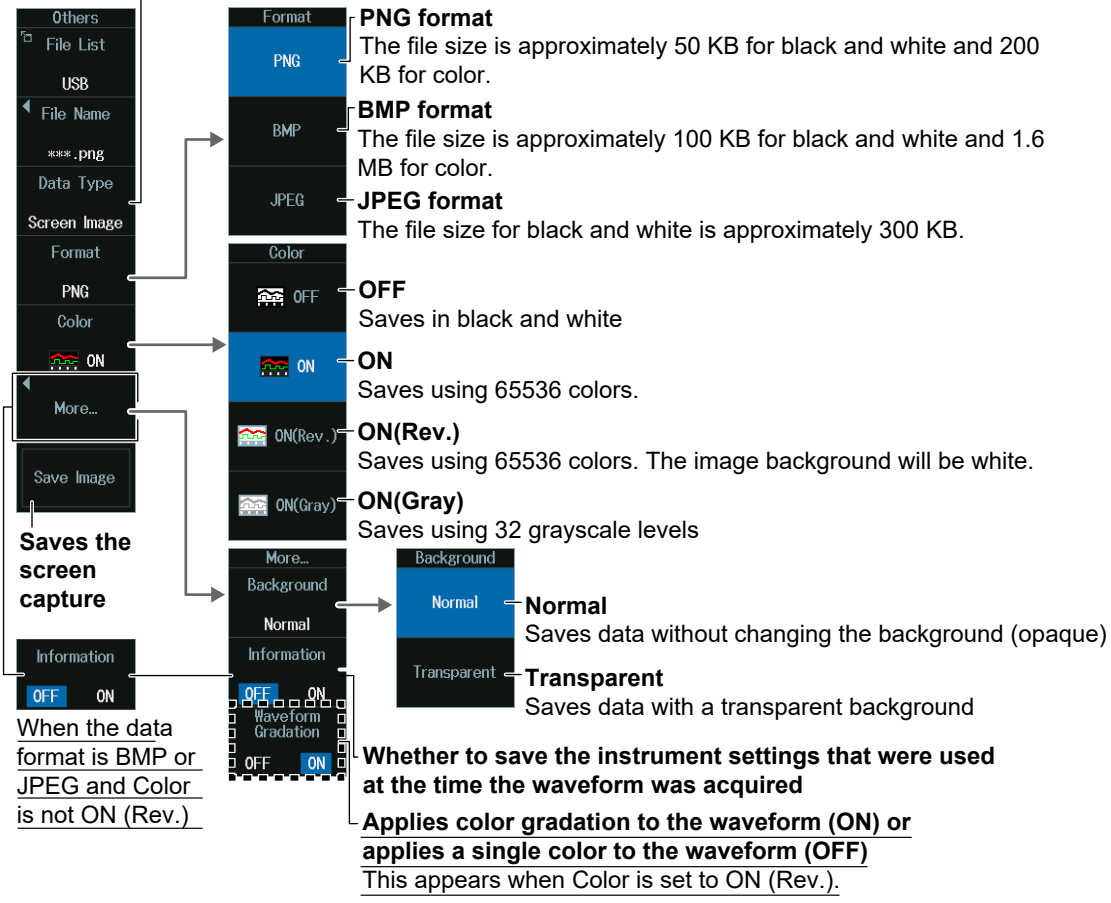
Numbering
The instrument automatically adds a three-digit number from 000 to 999 or a four-digit number from 1000 to 4999 after the common name specified using the File Name setting and saves the file.

Date
As shown in the following figure, the instrument uses an 8-character file name that is produced based on the date and time using base-36 numbers (0 to 9 and A to Z). The file name specified using the File Name setting is not used.

■ Page 17-9 Screen Captures (Screen Image)

Add the description in the area enclosed by the broken line and the underlined text section.

Set Data Type to Screen Image.



Saves the screen capture

When the data format is BMP or JPEG and Color is not ON (Rev.)

PNG format
The file size is approximately 50 KB for black and white and 200 KB for color.

BMP format
The file size is approximately 100 KB for black and white and 1.6 MB for color.

JPEG format
The file size for black and white is approximately 300 KB.

OFF
Saves in black and white

ON
Saves using 65536 colors.

ON(Rev.)
Saves using 65536 colors. The image background will be white.

ON(Gray)
Saves using 32 grayscale levels

Normal
Saves data without changing the background (opaque)

Transparent
Saves data with a transparent background

Whether to save the instrument settings that were used at the time the waveform was acquired

Applies color gradation to the waveform (ON) or applies a single color to the waveform (OFF)
This appears when Color is set to ON (Rev.).

Communication Interface User's Manual (IM DLM5058-17EN)

■ Page 5-128

Add the following commands after `:IMAGe:TONE`.

`:IMAGe:WGRadation`

Function Sets or queries whether or not gradation is applied to the waveform portion of the screen image to be output.

Syntax
```
:IMAGe:WGRadation {<boolean>}
:IMAGe:WGRadation?
```

Example
```
:IMAGE:WGRADATION ON
:IMAGE:WGRADATION?
-> :IMAGE:WGRADATION 1
```

Description This command is valid only when `:IMAGe:TONE REVerse` is selected.

■ Page 5-256

Add the following commands after `:SYSTem:OCANCel (Offset Cancel)`.

`:SYSTem:POWeroff:EXECute`

Function Turns the instrument off. This command also sets how the instrument is to behave when the main power switch turned on the next time.

Syntax
```
:SYSTem:POWeroff:EXECute [<NRf>
[,<Boolean>]]
```
<NRf> = 1 to 60

Example
```
:SYSTEM:POWEROFF:EXECUTE
```

Description
- For <NRf>, set the time in seconds before the instrument is turned off. If <NRf> is omitted, the power is turned off after 5 seconds. Here, turning off the power means turning off the power switch on the front panel.
  Turning off the instrument while it is communicating with the controller may cause a communication error on the controller. To prevent communication errors, the following procedure is recommended.
  1. Enter the time required to close controller communication and send this command.
  2. Close communication between the controller and this instrument within the entered time period.
- For <Boolean>, set how the instrument is to behave when the main power switch turned on the next time. When <Boolean> is ON, the instrument will turn on when you turn off the power switch and then turn it back on. When <Boolean> is OFF, the instrument will remain off even when you turn off the power switch and then turn it back on. If <Boolean> is omitted, the behavior is the same as if it were set to OFF.

■ Page 5-332

Add the following commands after `:TRIGger:DELay:TIME`.

`:TRIGger:DETect?`

Function Queries whether a trigger has occurred.

Syntax
```
:TRIGger:DETect? [{<NRf>}]
```
<NRf> = 0 to 360000 (timeout value, in units of 10 ms)

Example
```
:TRIGGER:DETECT? 0
-> :TRIGGER:DETECT 1
```

Description
- The instrument returns 1 when it is triggered, 0 when it is not. If the instrument was triggered before sending this command, it returns 1.
- If a timeout period is set, the instrument returns 1 when it is triggered. If the instrument is not triggered within the timeout period, it returns 0. If the timeout period is set to 0, the instrument returns 1 if it is triggered when the command is sent or 0 otherwise.
- The timeout period can be omitted. If omitted, the behavior is the same as when <NRf>=0.
- When the following operation is performed, the instrument resets to the state where no trigger is detected (the state where the instrument returns 0 when this command is sent).
  - When this command is sent
  - When waveform acquisition starts
  - When the waveform acquisition conditions are changed while waveform acquisition is in progress