



DEBUGSCOPE

MIZOU PROJECT JAPAN with RORZE

DEBUGSCOPE Instruction Manual

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Introduction

Trademark

Microsoft, Windows is the registered brand or trademark of Microsoft Corporation located in the United States for the United States and other countries. Official name of Windows is Microsoft Windows Operating System.

Pentium, Core Duo, Core 2 Duo, Atom, Core i3, Core i5 and Core i7 are the registered brand of Intel Corporation and its subsidiaries for the United States and other countries.

Disclaimer

We would like you to understand in advance that we are not responsible for the damage which is caused by use or unusable this product or attached software to customers or the third party. We also have no legal responsibilities for the damaged which is caused by negligent use, use without paying attention to descriptions in caution or warning or act of providence. Even though we are informed such usage in advance, we are not responsible for the damage.

Screen of PC in this English manual is different from the actual one in some cases. We do not compensate the damage resulting from wrong descriptions in this manual.

Introduction

Warnings, Cautions, and Notes

In this manual, the warnings are classified according to severity of danger, as shown in the following table. Understand the meanings of the following warnings, and follow the instructions given in this manual.

| Symbols | Definition |
|--|--|
|  WARNING | Indicates potential danger. Used to indicate that neglecting the procedures or instructions may cause death or severe injury or damage to the product. |
|  CAUTION | Indicates potential danger. Used to indicate that neglecting the procedures or instructions may cause medium or slight injury or damage to the product. |
|  NOTE | Indicates some advice that helps you make better use of your DEBUGSCOPE. |

Introduction

Secure and pleasant use of product

Prior to using this product, for the purpose of correct and safe usage, please read and follow the rules described in the WARNING and CAUTION sections, in an avoidance of damages to human body and property losses.



WARNING

- **Always use a provided AC adapter (5V DC) to power up this product.**
Using other AC adapters may cause a fire or a damage.
- **Do not use this product in high humidity or in a dusty environment.**
If foreign materials, such as a piece of metal, water or dust are mixed in, it causes ignition or electric shock in some cases.
- **Do not handle this product with wet hands.**
This may cause an electric shock.
- **Do not use this product where there is flammable, combustible or explosive gas.**
This may cause a fire.
- **Do not disassemble, alter or repair this product.**
This may cause a fire, an electric shock, a damage and injuries.
- **This product shall not be used for measuring outlet directly, three-phase AC power source or other commercial power source.**
This may cause a fire, an electric shock and a damage of this product.
- **When abnormal odor, smoke, sound or heat is confirmed on this product, immediately stop using it and disconnect USB cable, AC adapter and Probe.**
Using this product without correcting the cause may cause a fire and an electric shock.
After confirming smoke has stopped, please contact us or our distributors for repair.
Do not try to repair the products under all conditions.
- **Do not exceed input allowable voltage.**
Input allowable voltage of this product is $\pm 10\text{V}$ and input impedance is $1\text{M}\Omega$.
If the voltage exceeds input allowable voltage, it may cause a fire, a damage of this product and a damage of the object to be measured.
- **Verify probe damping ratio whenever voltage is measured.**
When high voltage part is measured, please keep hands off to prevent from electric shock.
- **Always connect earth terminals between Probe and an object to be measured when measuring the object with the Probe.**
If an earth terminal of this product is connected to something other than an earth terminal of the object to be measured, there are possibilities of electrification, short circuit, damage of this product, damage of the object to be measured or damage of peripheral device.
Please pay attention to run of an earth terminal of the probe before use.

 **CAUTION**

- **Do not use this product for applications other than measurement.**
- **Measurement shall always be done only after setting a range, which enables a whole waveform to be observed.**

This product cannot measure precisely even though the voltage is within rating in some cases if waveform is flame out.
- **When this product is not used, all input media such as Probe shall be disconnected.**
- **Do not allow any contact between earth terminal of Probe and CAL terminal when the Probe is connected to this product.**

If this product is placed on unstable platform, it may fall and be broken.
- **Use this product only after a 30-minute warm-up of initial power-up.**

In order to measure precisely, this product should be used after 30 minutes warming up at least when the power is turned on.
- **Use this product in the environment with as little electrical noise as possible.**

Countermeasure for noise should be taken if this product is used where a lot of noise from peripheral device or electromagnetic ray is expected.
- **Use this product horizontally on a stable platform.**

If the products are placed on unstable platform, they may fall and be broken.
- **Use this product in a ventilated environment in order to prevent overheating.**
- **Use and store this product not under direct sunlight.**
- **If this product will not be used for a long time, the USB cable, the AC adapter and the probe should be disconnected.**
- **While still connected to a circuit of a measuring object, do not disconnect input media, such as Probe, from this product.**

There is a risk of damaging this product or electric shock.
- **For any enquiries of this product such as failure report and request for maintenance and calibration, contact a nearest distributor listed in the warranty certificate.**

We shall not be liable for any damages to human body (death or injury) if the damages were caused due to not following rules listed in the WARNING and CAUTION sections.

Introduction

Device and accessories

Please make sure that the following items are included.

- Main body / 1
- Guarantee form / 1
- USB cable (A-B) / 1
- AC adapter (DC +5V) / 1
- CD-ROM / 1
- CAL/Trigger cable / 1
- Carrying case / 1

CD-ROM Contents

- Attached software
DEBUGSCOPE software, Maintenance software, Data analysis software, Point detector
- Device driver
- Instruction manual

Specifications

Specifications of this product

| | |
|------------------------------------|--|
| Number of channel | 2 channels (for PC and for AC adapter insulation) |
| Setting of input | AC, DC |
| Input impedance | 1M Ω /30pF |
| Input allowable voltage | \pm 10V |
| Vertical axis range | 10mV/div to 2V/div (1-2-5 step) 10mV/div to 2V/div @ 1:1 (\times 1) probe 100mV/div to 20V/div @ 10:1 (\times 10) probe 1V/div to 200V/div @ 100:1 (\times 100) probe |
| DC accuracy | \pm (3% + 5mV) |
| Bandwidth | DC to 25MHz |
| Data resolution | 8 bits |
| Record length | Oscilloscope mode : 1024 points Pre-trigger mode : 512K points |
| Maximum sampling rate | Oscilloscope function : 100MS/s (operating 2 channels at a time) Data logger function : 100KS/s (operating 2 channels at a time) Pre-trigger function : 2MS/s (operating 2 channels at a time) |
| Time range | Oscilloscope mode (500ns/div, 1 μ s/div, 2.5 μ s/div, 5 μ s/div, 10 μ s/div, 25 μ s/div, 50 μ s/div, 100 μ s/div, 250 μ s/div, 500 μ s/div, 1ms/div, 2.5ms/div, 5ms/div, 10ms/div, 25ms/div, 50ms/div, 100ms/div, 250ms/div, 500ms/div, 1s/div, 2.5s/div, 5s/div, 10s/div) Data logger mode (10 μ s, 20 μ s, 50 μ s, 100 μ s, 200 μ s, 500 μ s, 1ms, 2ms, 5ms, 10ms, 20ms, 50ms, 100ms, 200ms, 500ms, 1s, 2s, 5s) Pre-trigger mode (25 μ s/div, 50 μ s/div, 100 μ s/div, 250 μ s/div, 500 μ s/div, 1ms/div, 2.5ms/div, 5ms/div, 10ms/div, 25ms/div, 50ms/div, 100ms/div, 250ms/div, 500ms/div, 1s/div, 2.5s/div, 5s/div, 10s/div) |
| Horizontal axis maximum resolution | 10ns |
| Range of horizontal axis | 10 div |

Introduction

| | |
|-------------------------------|---|
| Number of display point | 500 |
| Minimum unit to move position | 0.03125divs |
| Trigger type | Edge trigger |
| Trigger mode | Auto/Normal/Single |
| Range of trigger position | 8 div |
| Automatic measurement | Max. value, min. value, average value, RMS, peak to peak, peak frequency/level |
| Range of auto scale frequency | 10Hz to 15MHz (on condition that periodical waveform without noise only) |
| Cursor measurement | Time, difference in frequency, automatic measurement of voltage difference |
| Setting of probe ratio | 1:1, 10:1, 100:1 |
| Calculation of waveform | FFT (spectral display), IFFT, X-Y, spectrogram |
| Data recording time | Max. 24 hours or file size up to 2GB |
| Operation condition | +5°C to +35°C, 5% to +85% (non condensing) |
| Condition to store | -40°C to +70°C |
| Dimension (W x H x D) | 117.5mm x 36.9mm x131mm |
| Mass | 260g(typ) |
| Analog signal input | BNC x 2 |
| External terminal | [Front] FUNCTION terminal (EXT trigger/CAL) [Back] USB(B), FG terminal, External extended connector (modular jack) |
| Terminal for power | DC jack |

Introduction

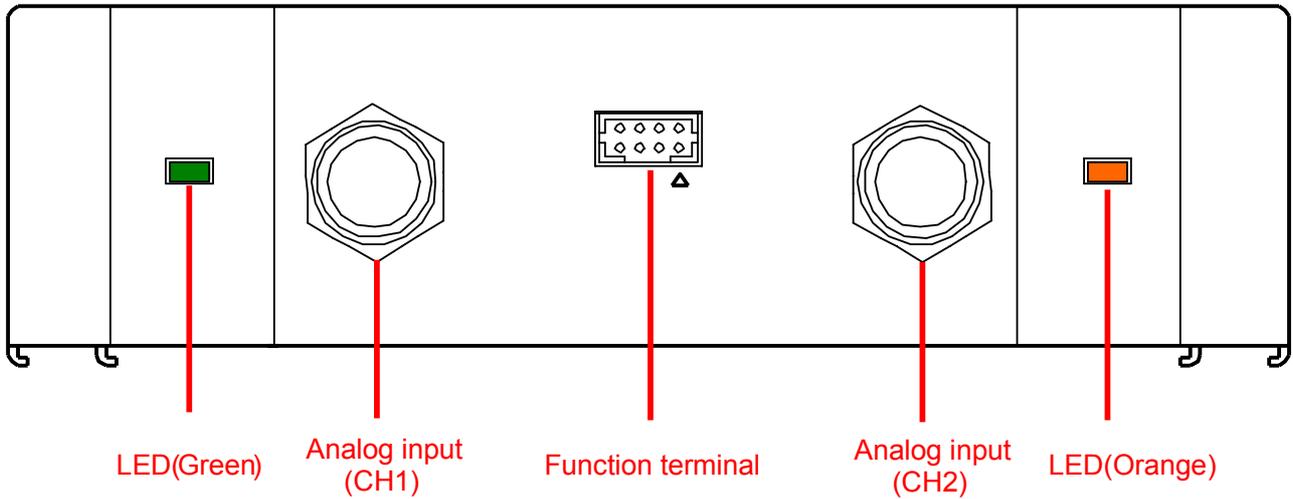
Hardware requirements

| | |
|-------------------|---|
| Computer | PC/AT compatible machine which has the CPU of Pentium III, 600MHz and above. It also should have USB1.1 (Full-Speed:12Mbps) or higher. |
| Memory | Windows 2000: 256MB Windows XP: 512MB Windows Vista: 1024MB Windows 7: 2048MB |
| Hard disk | Free area at 2.1GB or above |
| Hard disk | When data logger is executed, free area at 2.1GB or less is necessary. When data logger (repeat mode) is executed, free area at 16.1GB or more is necessary. |
| Disk device | CD-ROM drive |
| Display | Display adapter with 1024×768 pixels or above and color 24bits or above |
| Peripheral device | Mouse, keyboard |
| OS | Microsoft Windows 2000 SP4, XP(32bit), Vista(32bit), 7(32bit) |

Introduction

Part names

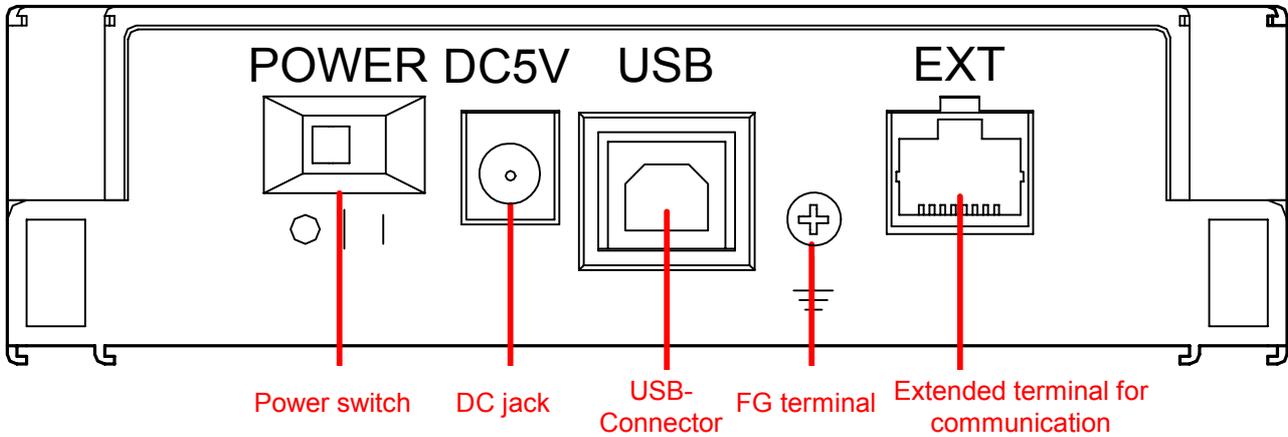
Front of DEBUGSCOPE



| Name | Description |
|--------------------|---|
| LED (Green) | Lights when the power of the main body is turned on. *Blinks 4 times and lights up immediately after the power is turned on. *Behavior is different when in a pre-trigger mode. |
| Analog input (CH1) | Input allowable voltage is $\pm 10V$. Can connect a probe or a BNC cable. |
| Function terminal | Connect the attached "CAL/trigger cable". |
| Analog input (CH2) | Input allowable voltage is $\pm 10V$. Can connect a probe or a BNC cable. |
| LED (Orange) | Blinks when the main body uses USB to communicate with a PC. |

Introduction

Back of DEBUGSCOPE



| Name | Description |
|--|---|
| Power switch (POWER) | Switch for power supply O : Power OFF I : Power ON |
| DC jack (DC5V) | Insert the provided AC adaptor in DC jack. There is a possibility of damage of this product when AC adaptor different from the provided one is used. Be sure to use accessories. |
| USB-Connector (USB) | Insert the provided USB cable in USB Connector. Insert USB Type-A plug in your PC and Type-B in DEBUGSCOPE. |
| FG terminal  | Terminal for earth Use M3 screw. |
| Extended terminal for communication (EXT) | Terminal for extension Connection shall not be made with a product which is not supported. This is not a LAN cable connection. Do not connect LAN cable to EXT jack or it may break or cause performance degradation. |

Introduction

Connection method

Connect the AC adapter, the probe and the USB cable.



Note for connection

- The attached AC adapter should be used. If not, it causes operation failure, heat and damage.

Introduction

Installation of software

- The attached software should be installed before DEBUGSCOPE is connected to PC. If the attached software is installed with connecting DEBUGSCOPE, there is a possibility of abnormal operation.
- Installation should be done after logging in as an administrator.
- Connect DEBUGSCOPE only with the PC which installed software.

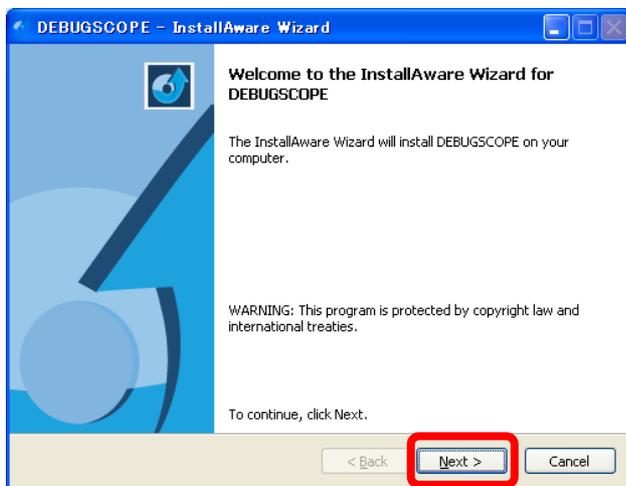
Installation of software

Insert an installation CD in CD-ROM drive. If CD is inserted, installation is started automatically. If it is not started automatically, open the CD-ROM and execute setup.exe file in CD-ROM to start installer.

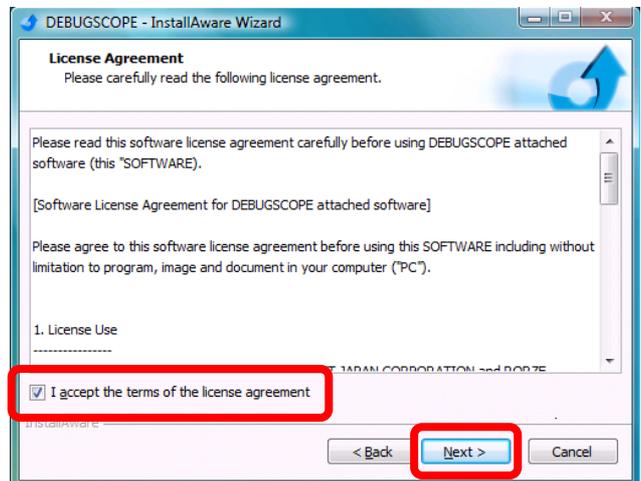
- Select the language for installer window and click "OK".



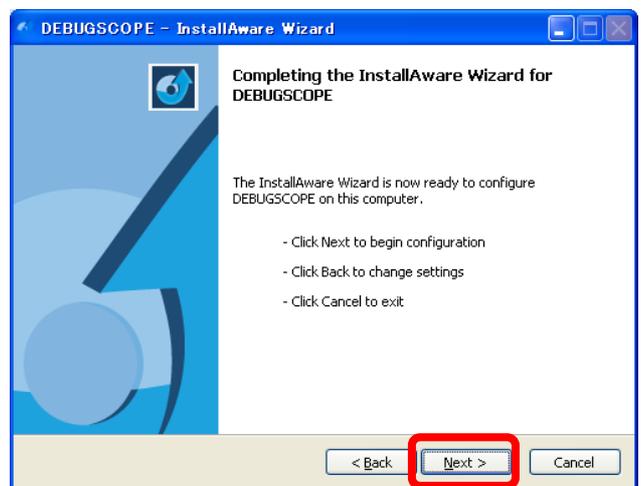
- Click "Next >" button.



- Tick the box located lower left of the license agreement and click "Next >".

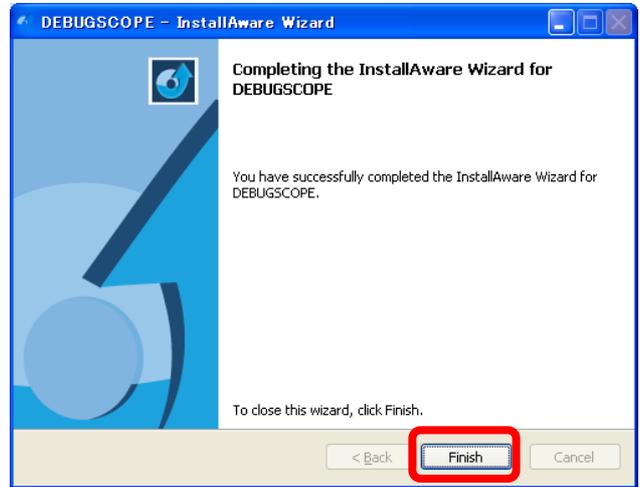
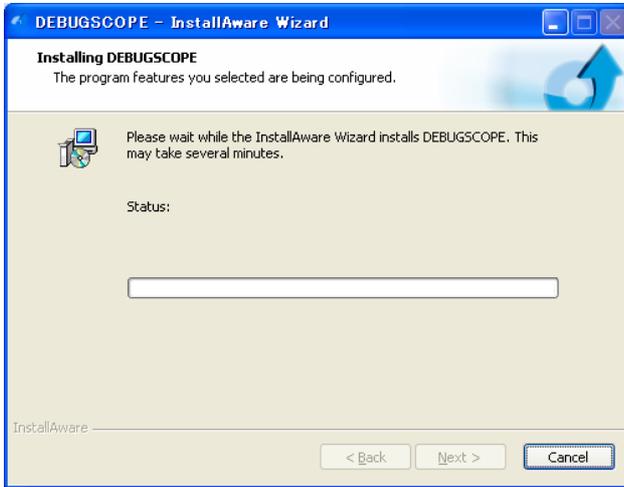


- After information of installation is confirmed, click "Next >".



Introduction

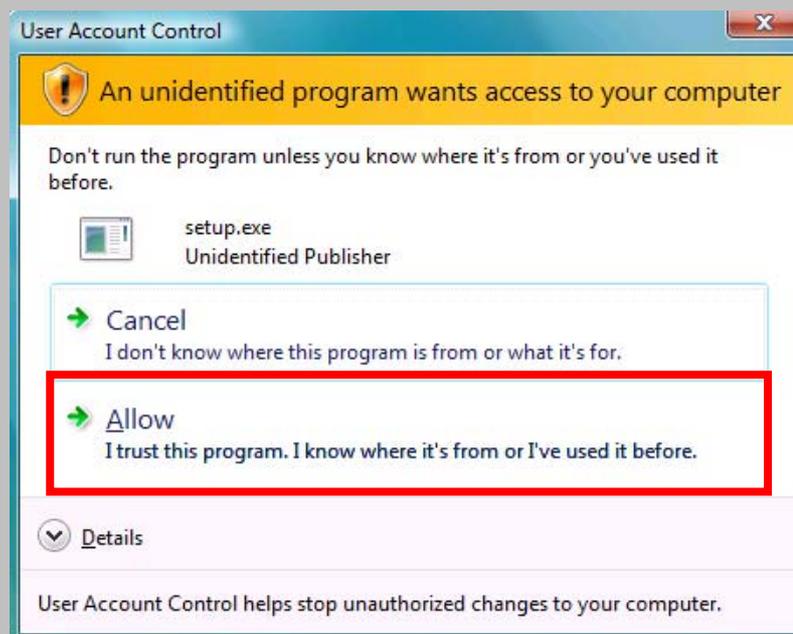
- The software is installed.
- After Installation is completed, the following message is shown. Click "Finish" button to close window.



About the influence of User Account Control (Windows Vista/7)

When you enable User Account Control (UAC) on Windows Vista/7, the following window is displayed after double-clicking setup.exe.

When the following screen is displayed, click "Allow" and continue installation.

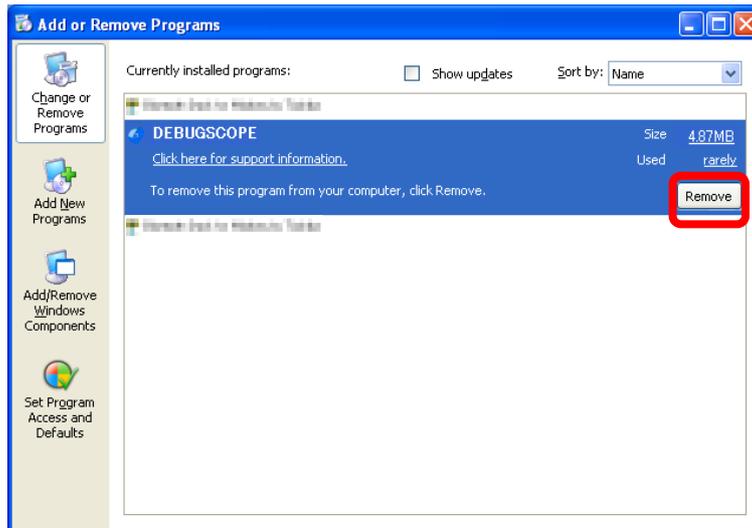


Introduction

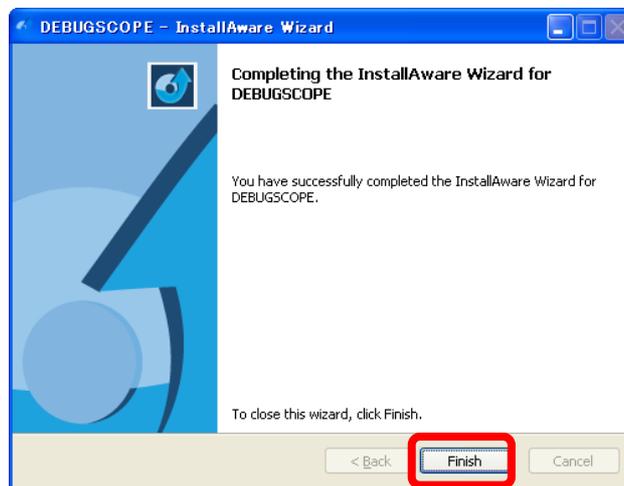
Uninstallation of software

Windows XP

Start "Add or Remove Application" or "Add or Remove Programs" in the control panel and select "Remove" button of DEBUGSCOPE.



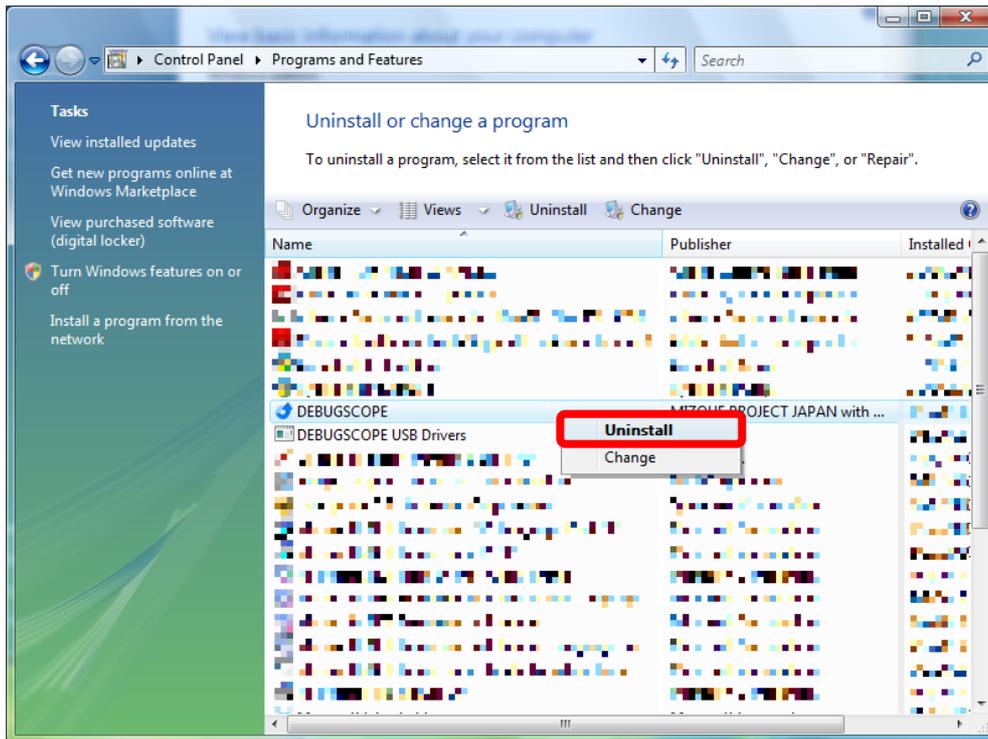
When the following window is shown, click "Finish" to complete uninstallation.



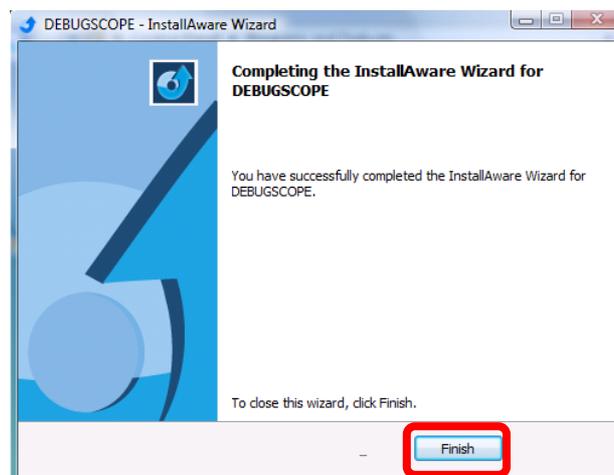
Introduction

Windows Vista

Open "Programs and Features" by clicking "Start" button, clicking "Control Panel", clicking "Programs", and then clicking "Programs and Features". Right-click "DEBUGSCOPE" to show the pop-up menu. Click "Uninstall" to start uninstallation.



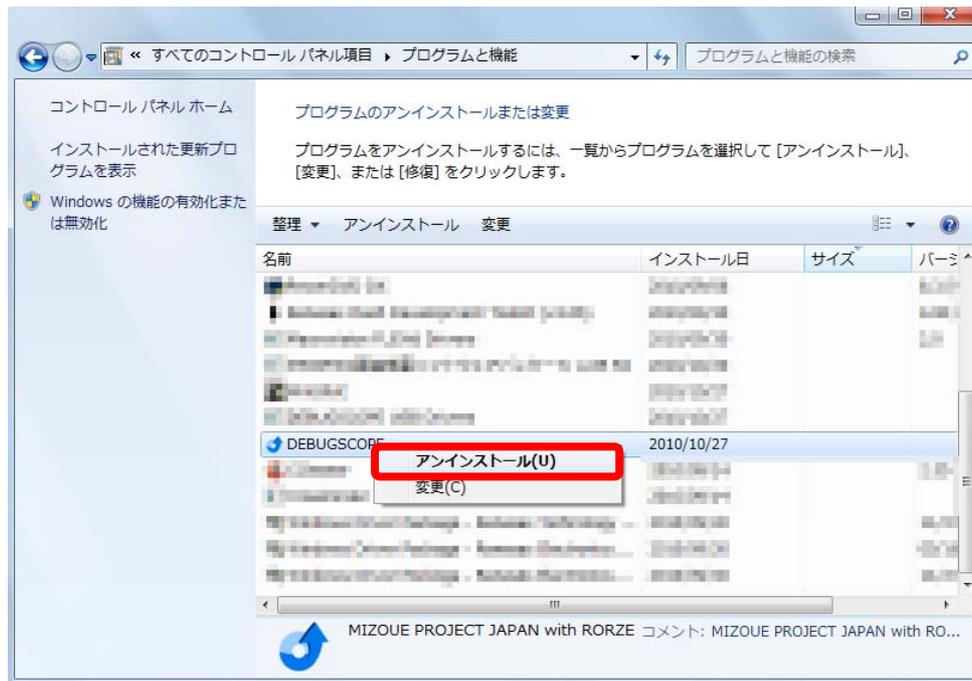
When the following window is shown, click "Finish" to complete uninstallation.



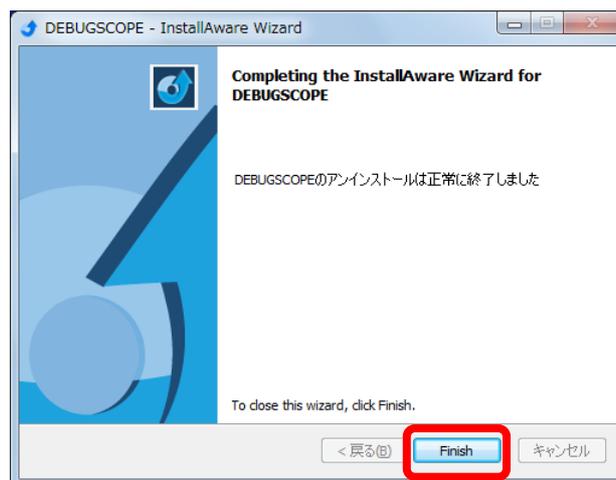
Introduction

Windows 7

Open "Programs and Features" by clicking "Start" button, clicking "Control Panel", clicking "Programs", and then clicking "Programs and Features". Right-click "DEBUGSCOPE" to show the pop-up menu. Click "Uninstall" to start uninstallation.



When the following window is shown, click "Finish" to complete uninstallation.



Introduction

Installation of DEBUGSCOPE driver

CAUTION

Before starting the software which is attached to DEBUGSCOPE, the driver should be installed. If the attached software is started without installing the driver for DEBUGSCOPE, error message is shown and the software is not started, or abnormally runs in some cases.

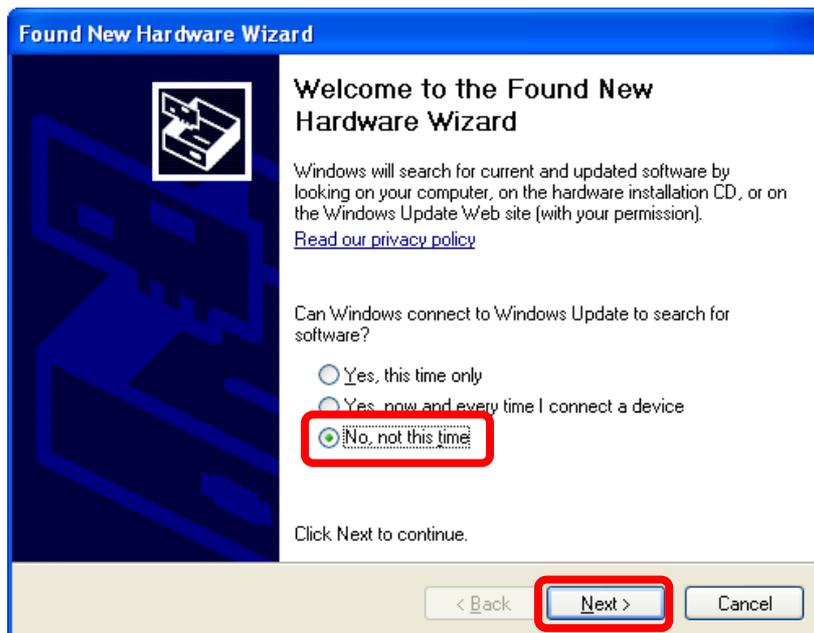
Windows XP

1. Connect DEBUGSCOPE and PC using a provided USB cable.
2. Insert a provided AC adapter into a DC jack located on backside of DEBUGSCOPE.
3. Power up DEBUGSCOPE by switching a POWER button, located on backside of DEBUGSCOPE, to ON.
4. PC recognizes the device automatically.



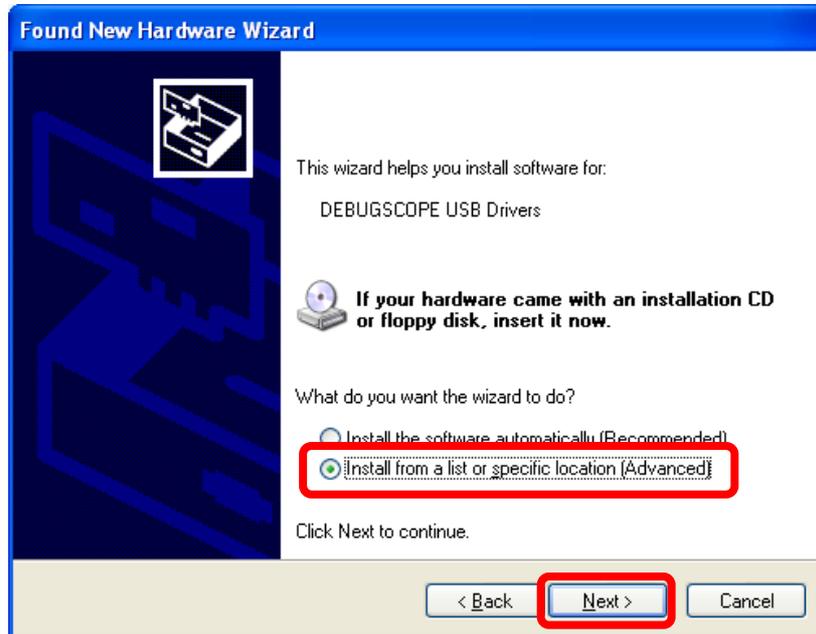
After it is recognized, install the driver in accordance with the following procedure.

5. When the following window is shown, tick "No, not this time", and click "Next >".

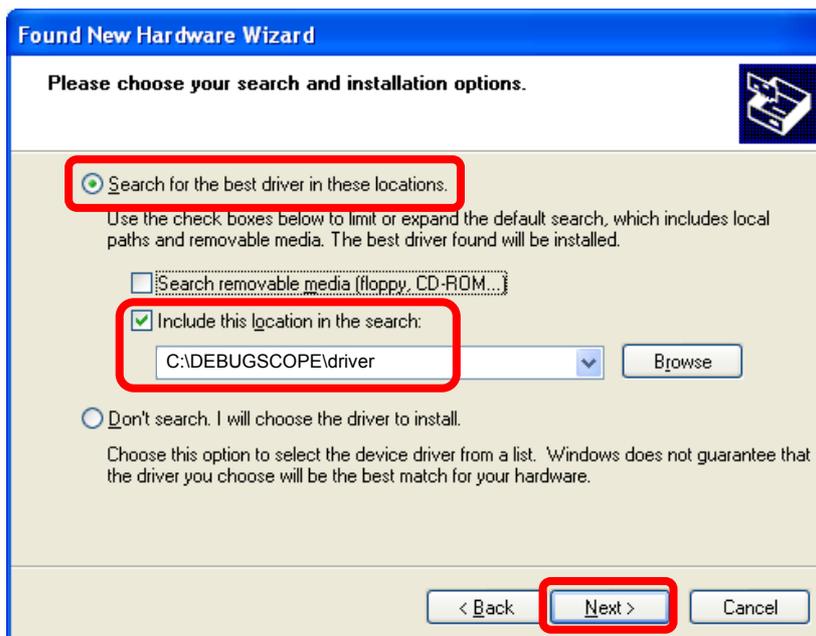


Introduction

6. When the following window is shown, tick "Install from a list or specific location (Advanced)".
Click "Next >".



7. When the following window is shown, tick "Search for the best driver in these locations".
Tick "Include this location in the search".
Click "Browse" button, and select the folder where the driver is installed. (In normal, "C:\DEBUGSCOPE\driver")
Click "Next >".



Introduction

8. When the following window is shown, click "Continue Anyway".



9. When the following window is shown, click "Finish".

Installation of USB driver is completed.

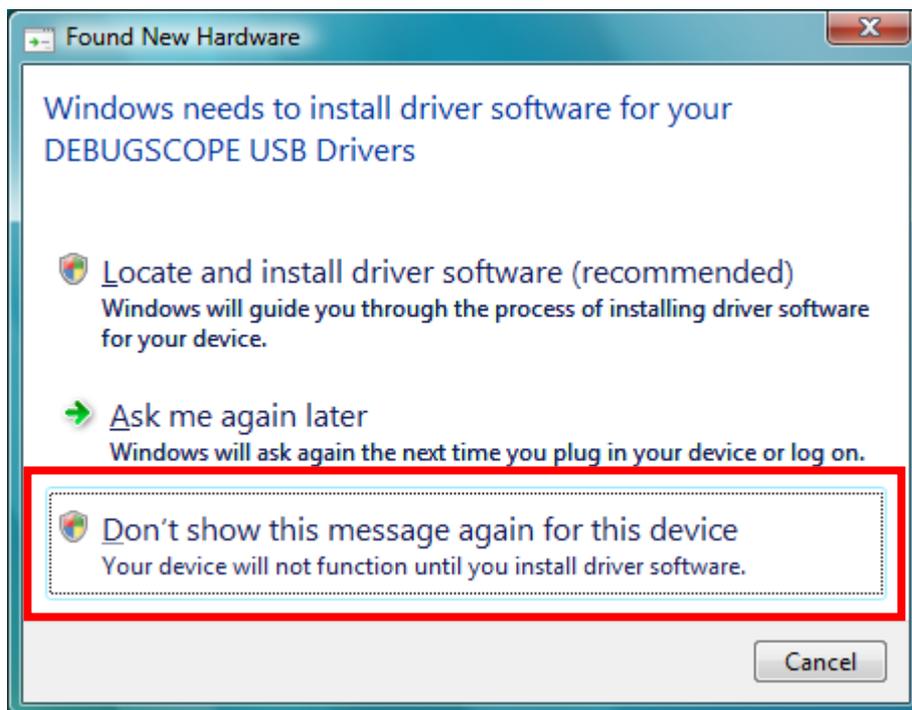


Follow the same procedure whenever PC needs to recognize a new device such as connecting to a different USB port.

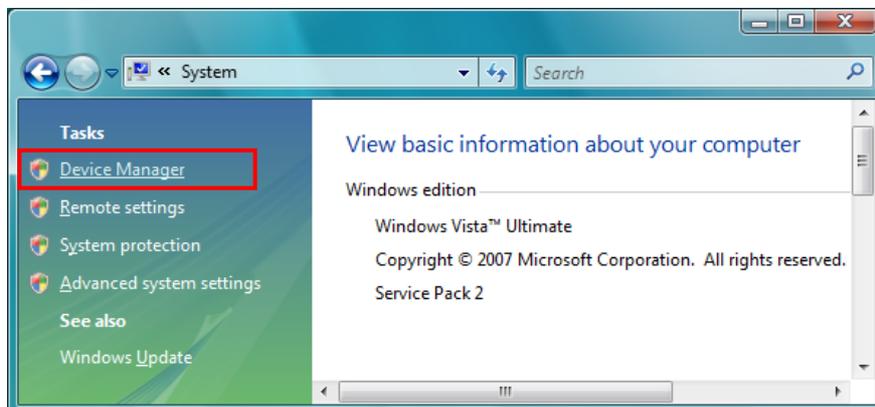
Introduction

Windows Vista

1. Connect DEBUGSCOPE and PC using a provided USB cable.
2. Insert a provided AC adapter into a DC jack located on backside of DEBUGSCOPE.
3. Power up DEBUGSCOPE by switching a POWER button, located on backside of DEBUGSCOPE, to ON.
4. PC recognizes the device automatically. In the following window, click "Don't show this message again for this device".

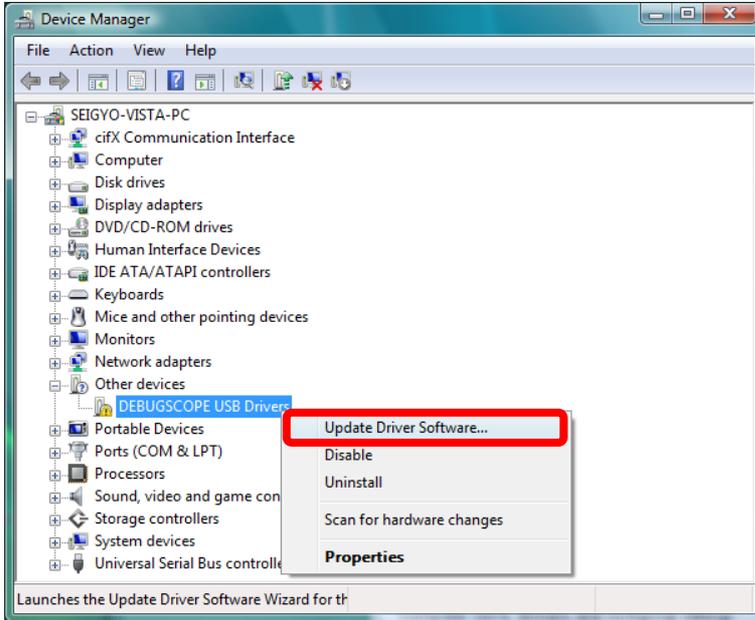


5. Open "Device Manager" by clicking "Start" button, clicking "Control Panel" and then clicking "Device Manager". When the User Account Control window is shown after clicking, click "Continue".

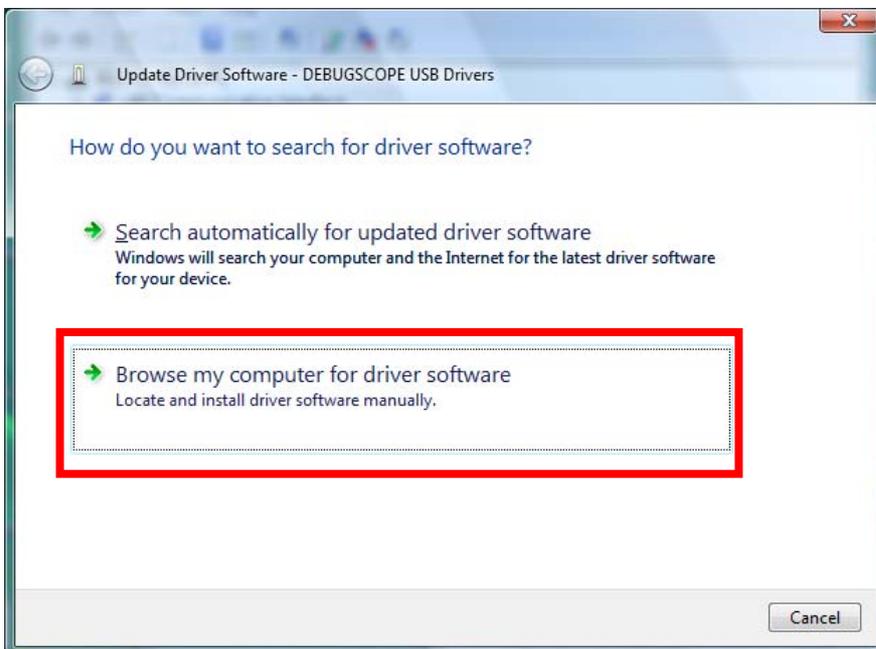


Introduction

6. "DEBUGSCOPE USB Drivers" is displayed in "Other devices" on the Device Manager window. After right-clicking on the "DEBUGSCOPE USB Drivers", click "Update Driver Software..."

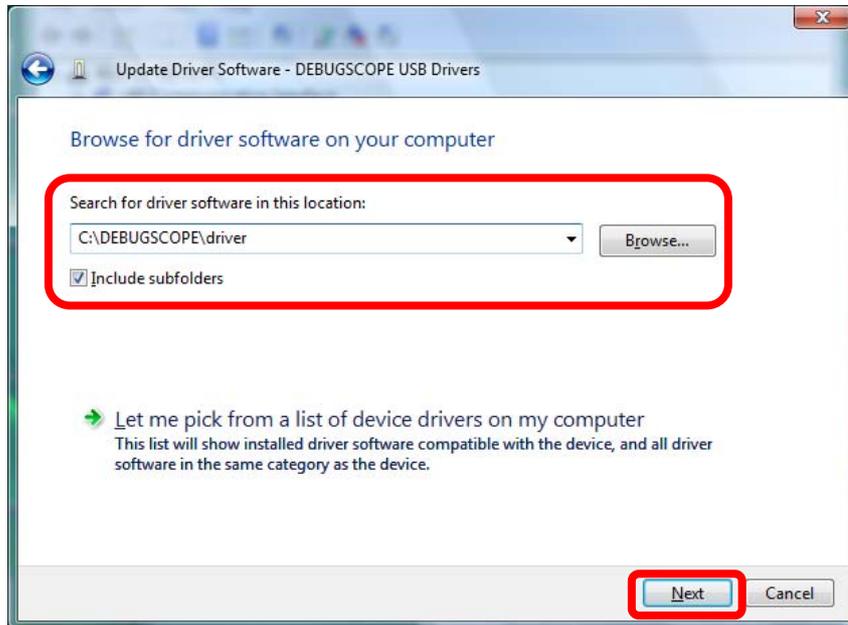


7. Click "Browse my computer for driver software".

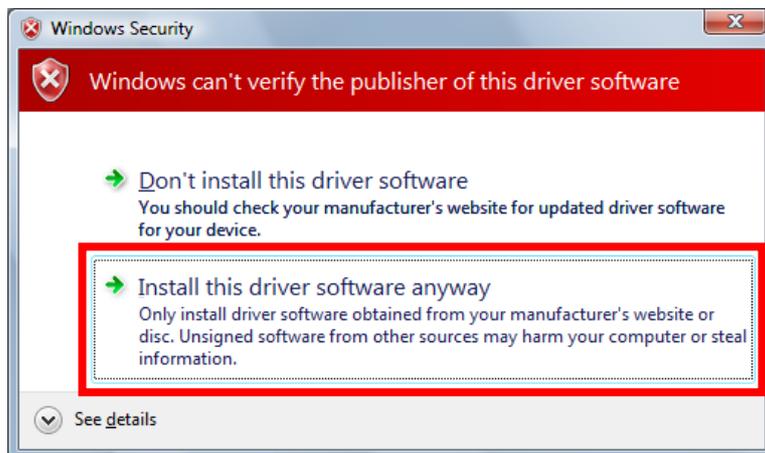


Introduction

8. Select the installation path (C:\DEBUGSCOPE\driver) of the driver file and click "Next".

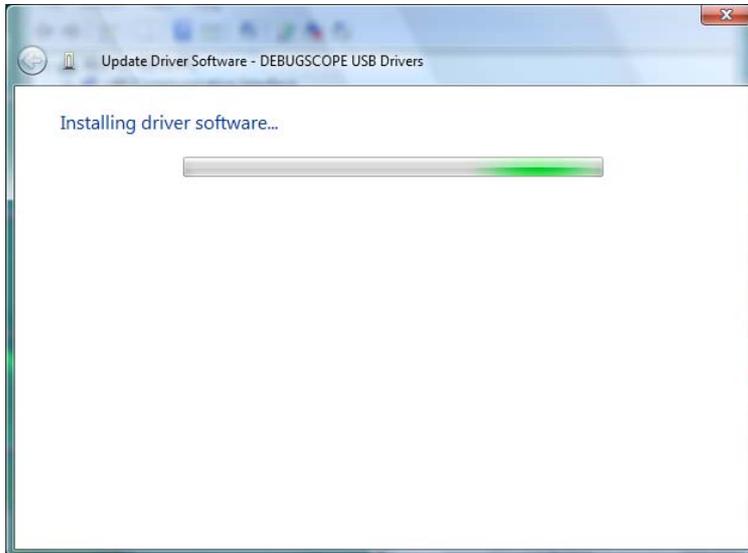


9. Click "Install this driver software anyway".

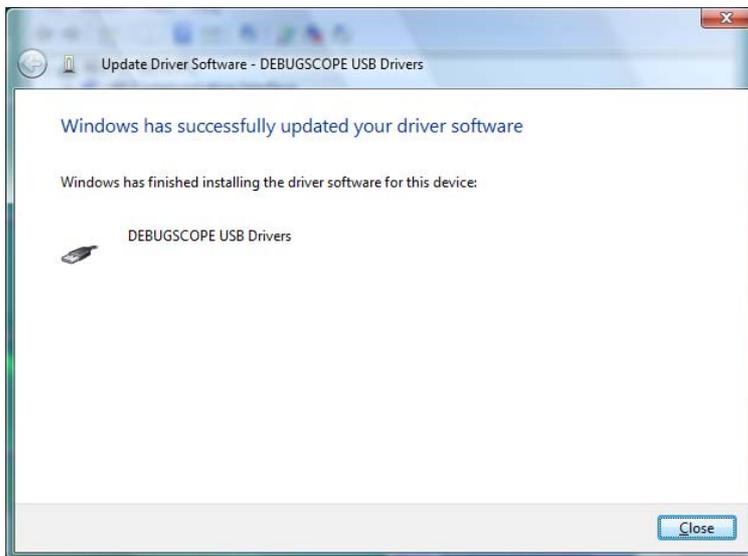


Introduction

10. The following window is displayed during installation.



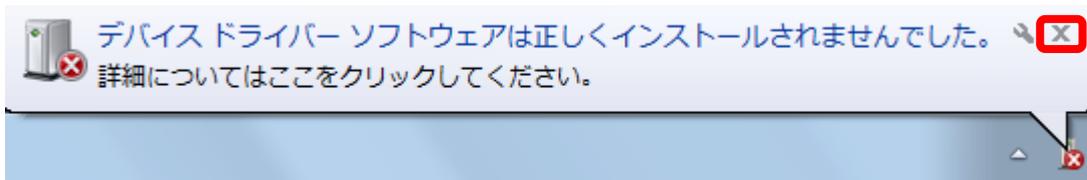
11. When the installation is completed, the following window is displayed.



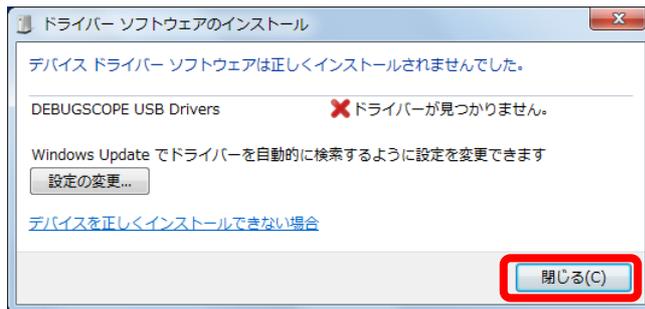
Introduction

Windows 7

1. Connect DEBUGSCOPE and PC using a provided USB cable.
2. Insert a provided AC adapter into a DC jack located on backside of DEBUGSCOPE.
3. Power up DEBUGSCOPE by switching a POWER button, located on backside of DEBUGSCOPE, to ON.
4. The balloon tip "Device driver software was not installed correctly" is displayed.
to Click "x" button on the right of the balloon tip.



Moreover, although the following window may be displayed, click "Close" as it is.



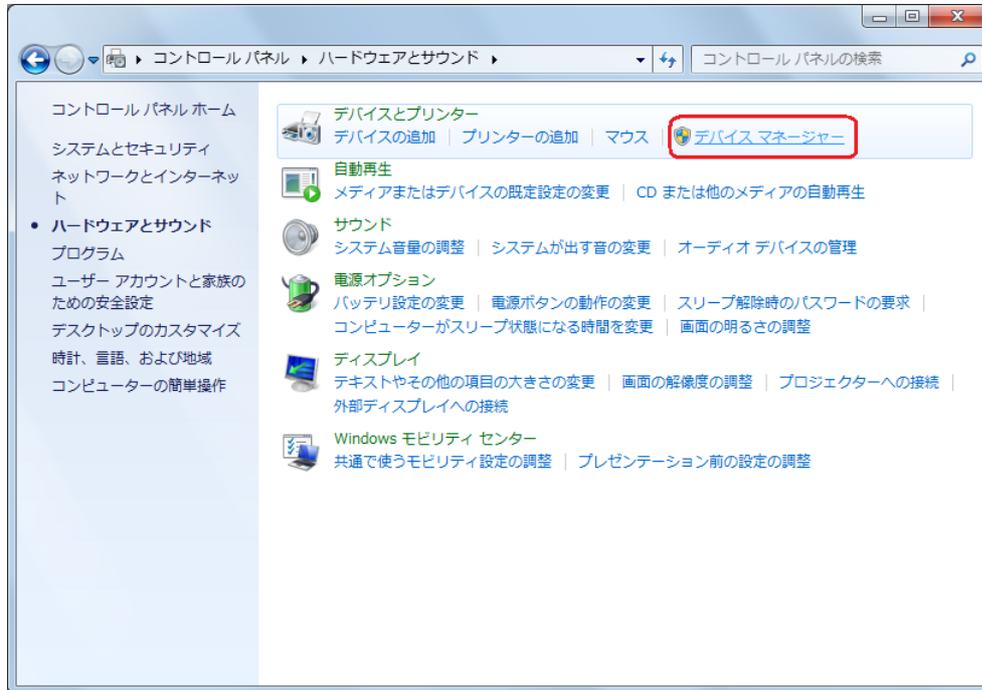
5. Click [Hardware and sound] in the control panel.



Introduction

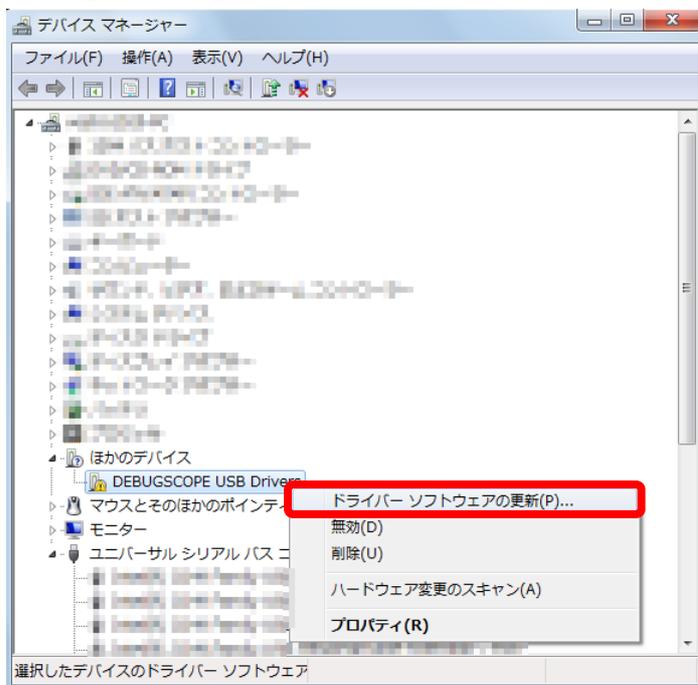
6. Click [Device manager].

When the User Account Control window is shown after clicking, click "Continue".



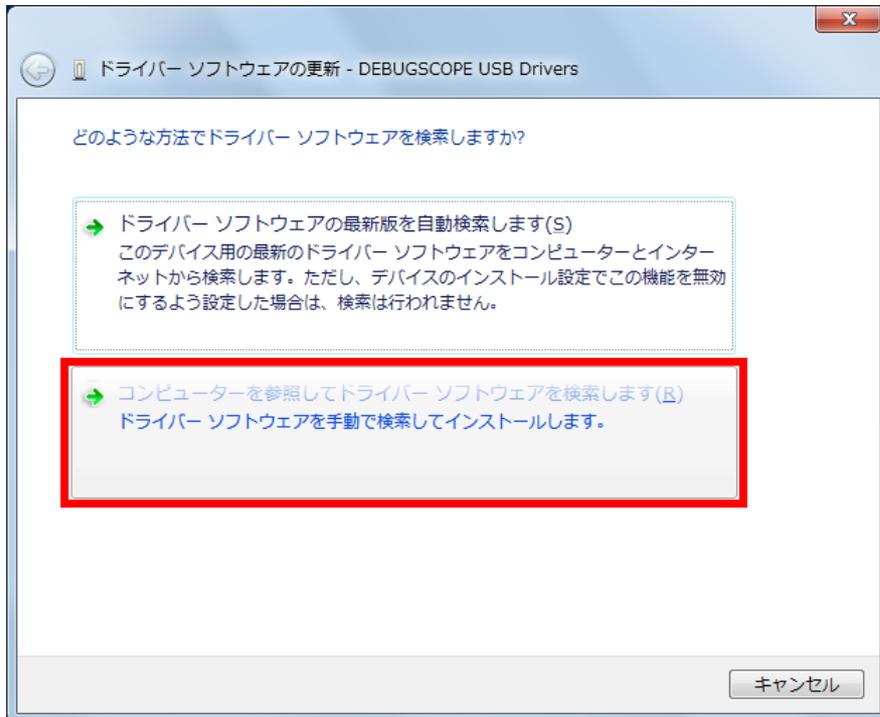
7. "DEBUGSCOPE USB Drivers" is displayed in "Other devices" on the Device Manager window.

After right-clicking on the "DEBUGSCOPE USB Drivers", click "Update Driver Software...".

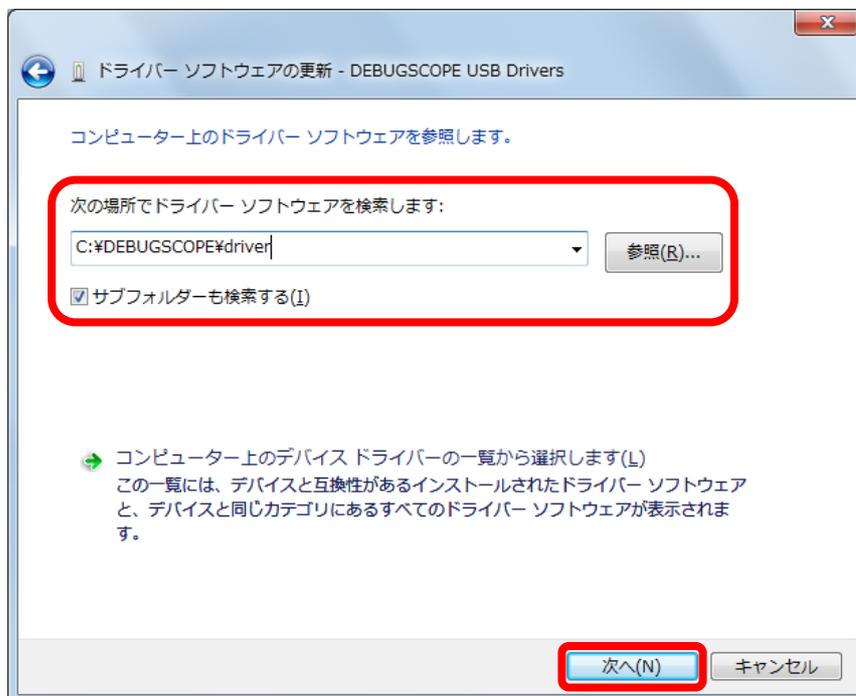


Introduction

8. Click "Browse my computer for driver software".

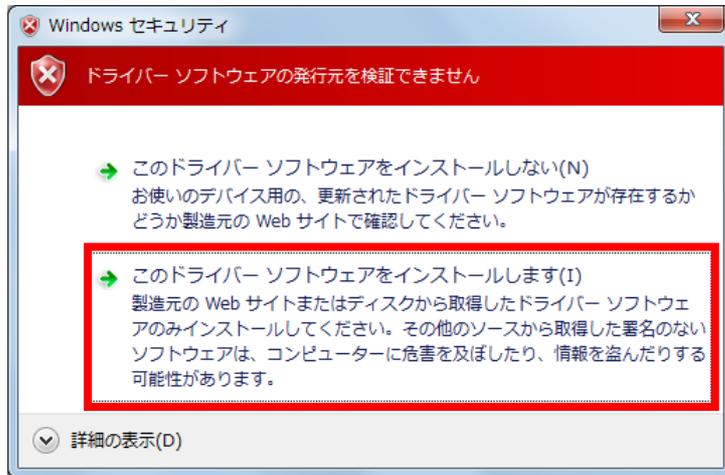


9. Select the installation path (C:\DEBUGSCOPE\driver) of the driver file and click "Next".

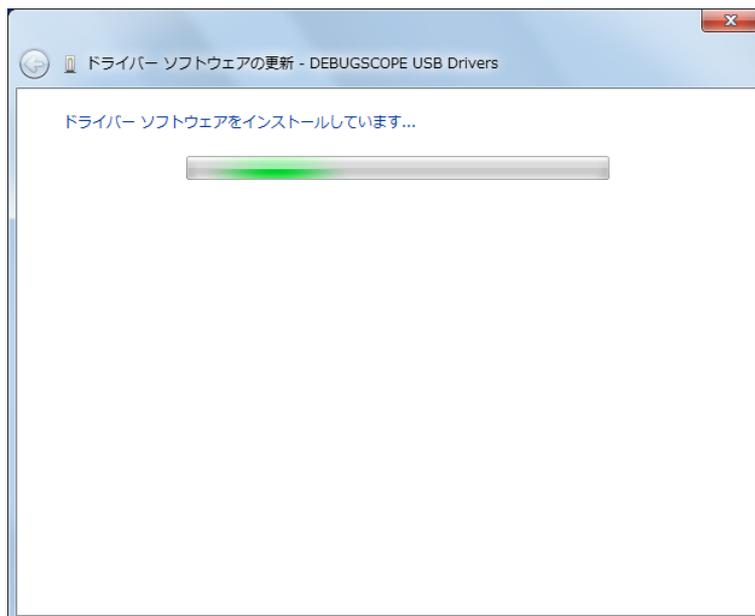


Introduction

10. Click "Install this driver software anyway".

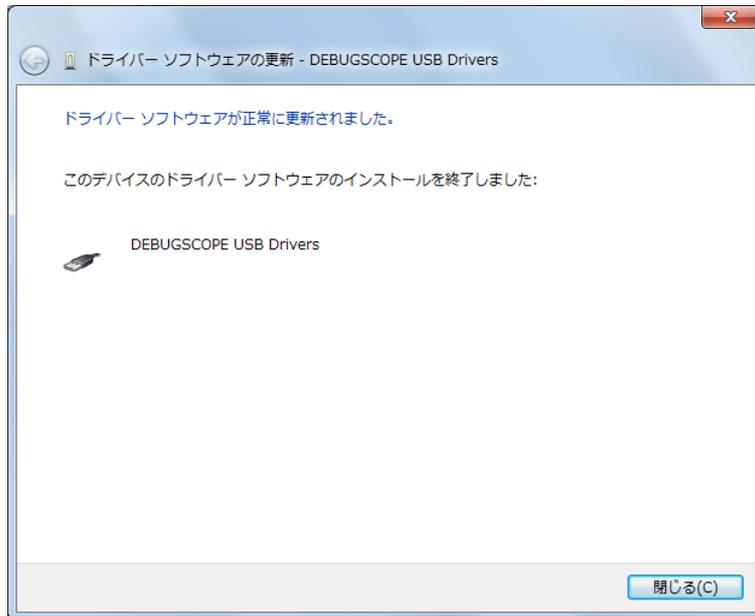


11. The following window is displayed during installation.



Introduction

12. When the installation is completed, the following window is displayed.



Introduction

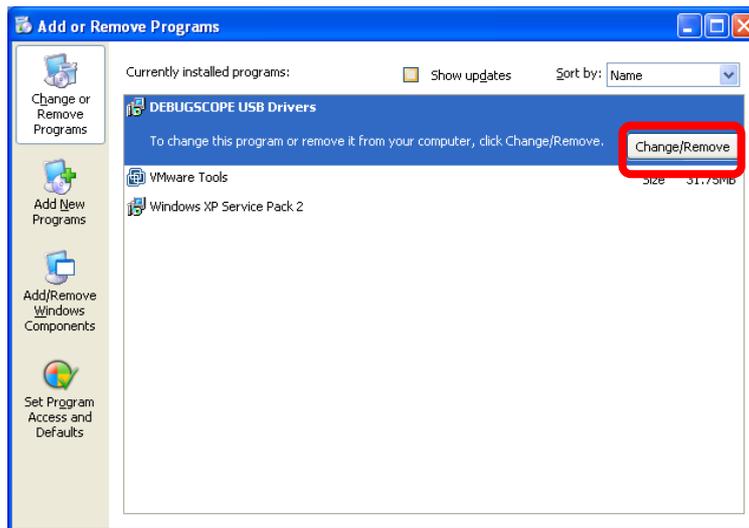
Uninstallation of DEBUGSCOPE driver

Uninstall the USB driver in accordance with the following procedure.

Windows XP

1. Start "Add or Remove Applications" or "Add or Remove Programs" in the control panel and select "DEBUGSCOPE USB Drivers".

Click "Change/Remove".



2. Window of FTDI uninstaller version 2.1 is shown. Click "Continue".



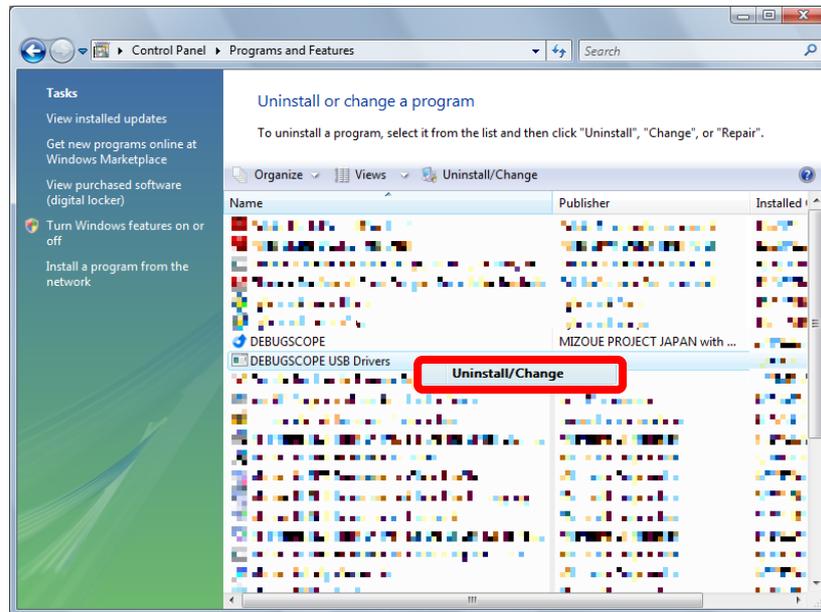
3. Uninstallation is started. When Uninstallation is completed, "Finish" button becomes effective. Click "Finish". Uninstallation of USB driver is completed.



Introduction

Windows Vista

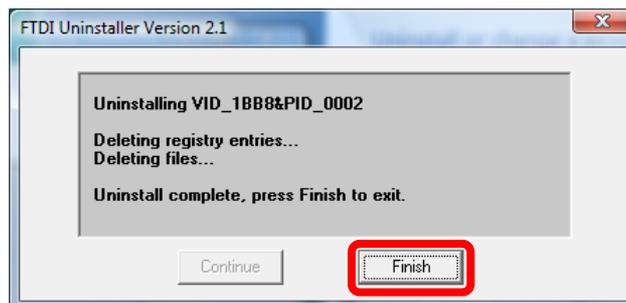
1. Open "Programs and Features" by clicking "Start" button, clicking "Control Panel", clicking "Programs", and then clicking "Programs and Features". Right-click "DEBUGSCOPE USB Drivers" to show the pop-up menu. Click "Uninstall/Change" to start uninstallation.



2. Window of FTDI uninstaller version 2.1 is shown. Click "Continue".

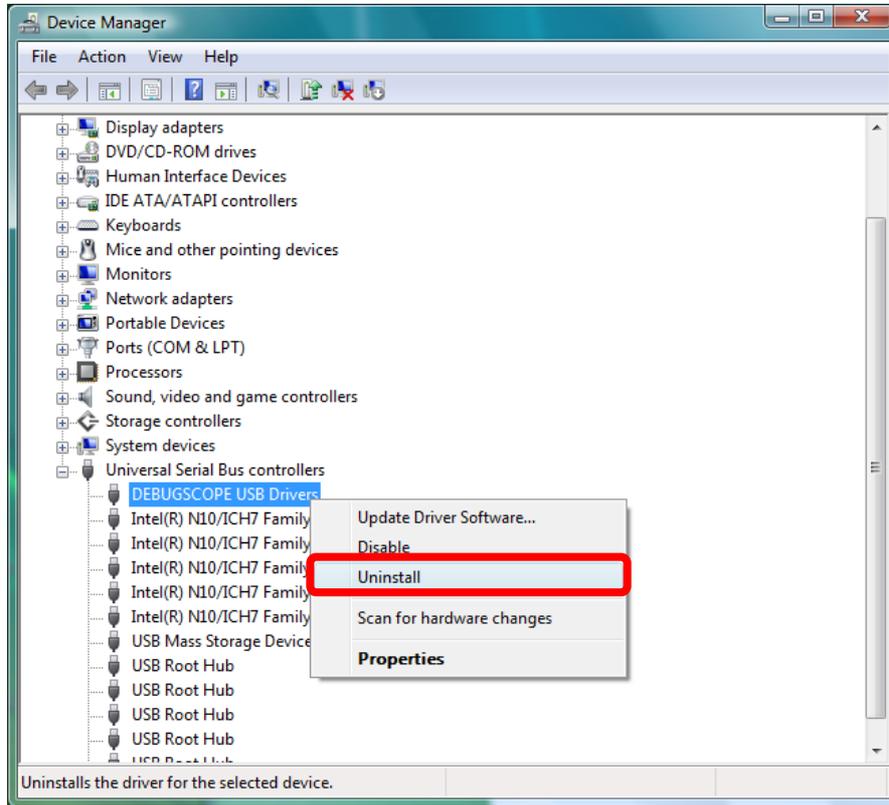


3. Uninstallation is started. When uninstallation is completed, "Finish" button becomes effective. Click "Finish". Uninstallation of USB driver is completed.



Introduction

- Open the Device Manager window in the same procedure as the time of installation.
 "DEBUGSCOPE USB Drivers" is displayed in "Universal Serial Bus controllers" on the Device Manager window. After right-clicking on the "DEBUGSCOPE USB Drivers", click "Uninstall".



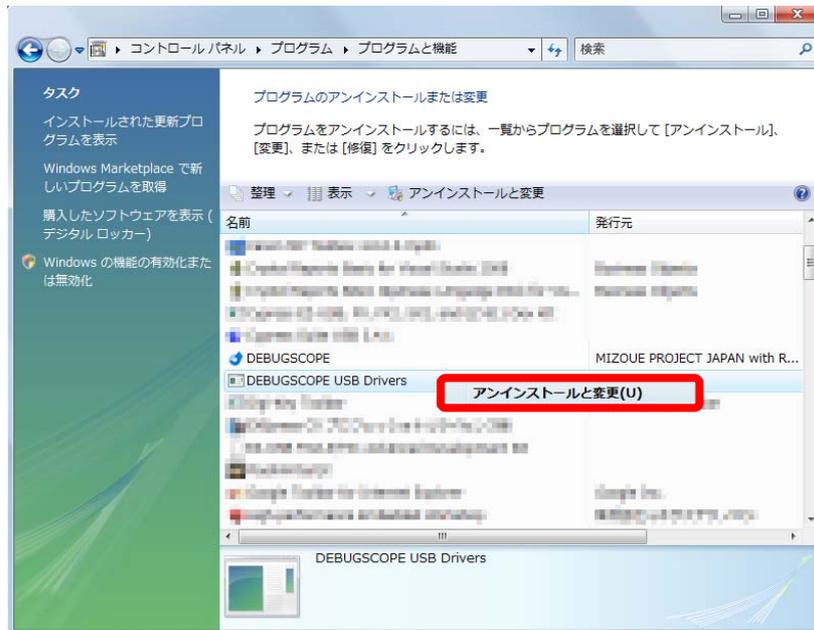
- Tick "Delete the driver software for this device" checkbox and click "OK".



Introduction

Windows 7

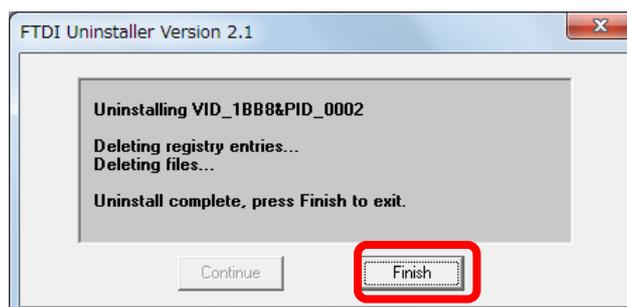
1. Open "Programs and Features" by clicking "Start" button, clicking "Control Panel", clicking "Programs", and then clicking "Programs and Features". Right-click "DEBUGSCOPE USB Drivers" to show the pop-up menu. Click "Uninstall/Change" to start uninstallation..



2. Window of FTDI uninstaller version 2.1 is shown. Click "Continue".

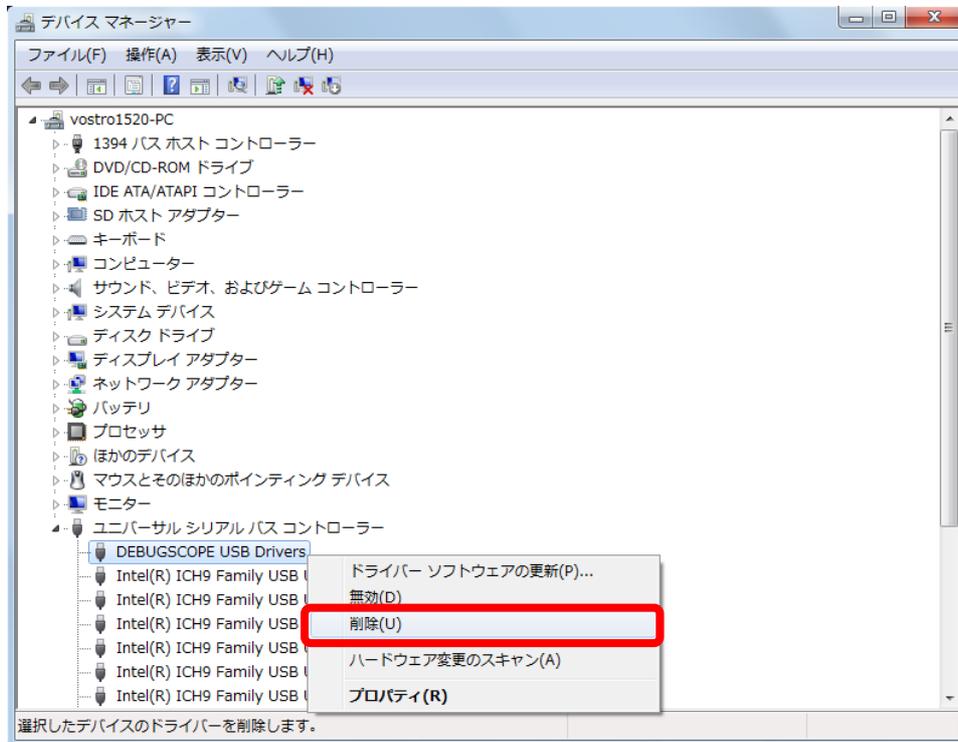


3. Uninstallation is started. When uninstallation is completed, "Finish" button becomes effective. Click "Finish". Uninstallation of USB driver is completed.



Introduction

4. Open the Device Manager window in the same procedure as the time of installation.
"DEBUGSCOPE USB Drivers" is displayed in "Universal Serial Bus controllers" on the Device Manager window. After right-clicking on the "DEBUGSCOPE USB Drivers", click "Uninstall".



5. Tick "Delete the driver software for this device" checkbox and click "OK".



Basic operation

Basic operation

Start DEBUGSCOPE

Method to start

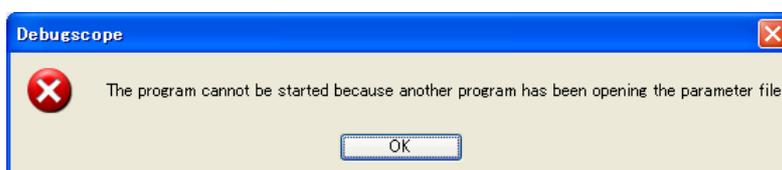
- 1 Connect the main body to PC by the attached USB cable. Insert the attached AC adapter to DC jack which is located on the backside of the main body and turn on the power.
- 2 Start the software by clicking shortcut icon  on the desktop or "Start" -> "All programs" -> "DEBUGSCOPE" -> "DEBUGSCOPE".
 - * If it is firstly started, "Select setup language" window is shown. Select the language from the list box and click "SELECT".
 - * Language can be set again by window of the software.



- If the software is started with wrong connection, the following error is shown. Check the connection of the AC adapter and USB, and start the software again.



- Parameter file (PRM.mpj) which is generated in the same folder as the program execution file should not be opened or edited by the editor software. If the parameter file is being opened by the other software and the software is started, the following error window is shown. Close the parameter file and reboot the software.



Basic operation

Termination of DEBUGSCOPE

Method to terminate

There are two methods described below to terminate the software.

(1) Select "Mode" -> "Exit"

(2) Click  which is located upper right on the main window.

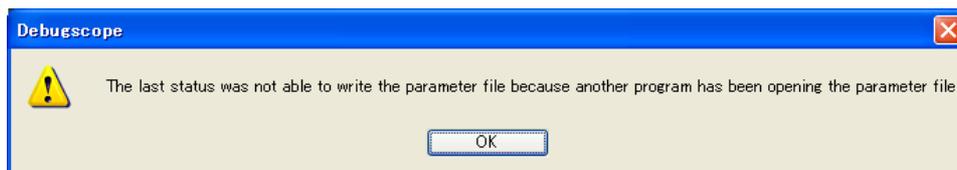
*** The power for the main body should be turned off after the software is terminated.**

- If the power for the main body was turned off with running the software, the following window is shown.



- If the parameter file (PRM.mpj) is being opened by other software and termination is executed, the following window for warning is shown.

If the software is rebooted, the latest parameter is not set and the parameter which is used last time is set.



Parameter of the software

- If the software is started, parameters, such as sampling, trigger and voltage range which were set last time is reflected.
- If the USB cable is removed or the power for the main body is turned off when the software is running, parameter information which was used last time is not reflected in case that the software is rebooted.

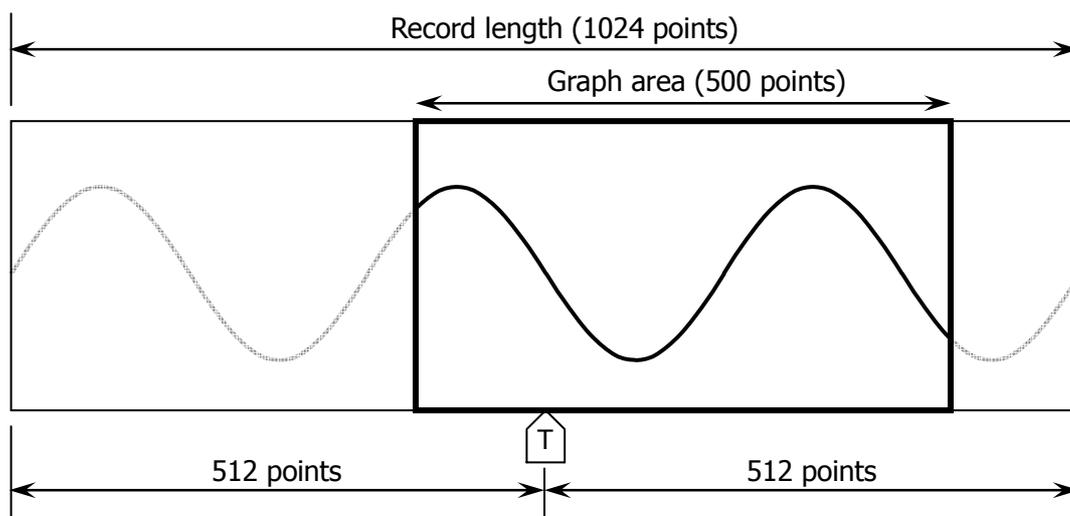
Oscilloscope function

Oscilloscope function

Oscilloscope function is a function to observe the analog signal in real time input from the BNC connector located in the front of the main body. There are various functions, such as voltage range setting, time range setting, trigger setting, and auto scale.

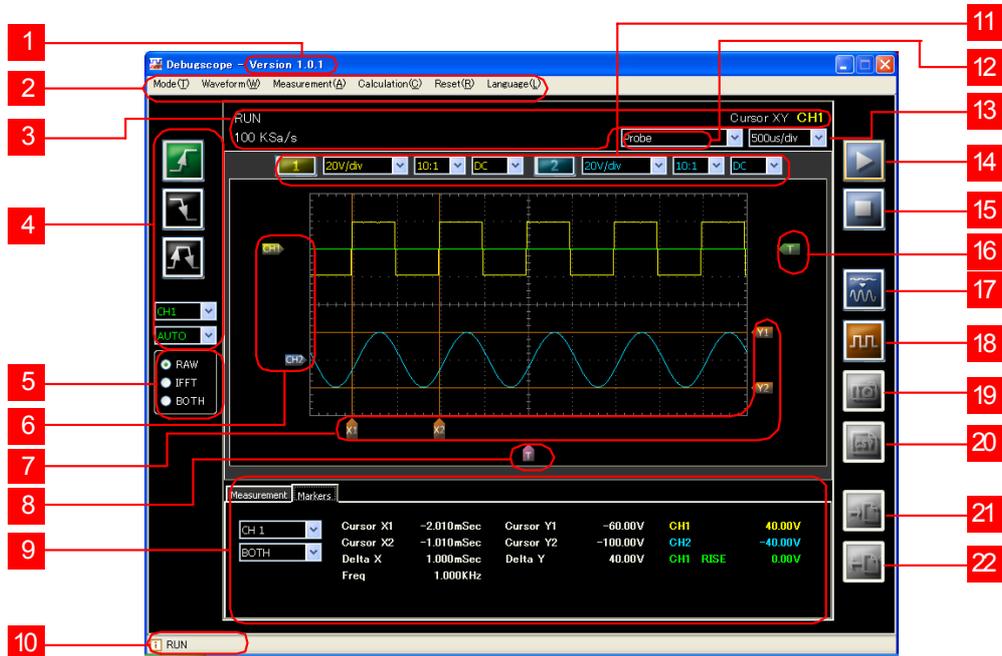
- Sampling frequency setting
- Voltage position setting
- Voltage range setting
- Auto scale
- Snapshot of a screen
- Trigger mode setting (AUTO, NORMAL, SINGLE)
- Trigger channel setting (CH1, CH2, EXT)

In oscilloscope mode, the data of 512 points before and after the trigger position is captured, and 500 points of them are displayed on the screen.



Oscilloscope function

Description of oscilloscope mode screen



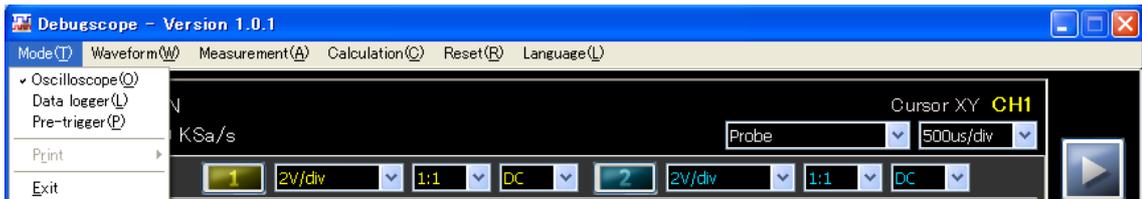
- | | | |
|--|---|--|
| <p>1 • Version Show this software version</p> <p>2 • Menu Switch modes and make setting</p> <p>3 • Status display Measurement status, sampling frequency, marker channel and so on are shown.</p> <p>4 • Trigger setting Trigger channel, trigger mode and trigger edge are set.</p> <p>5 • Setting of waveform to show Select measured waveform and IFFT waveform to show</p> <p>6 • Voltage position Set the voltage position</p> <p>7 • Cursor Show voltage and time cursor</p> <p>8 • Trigger position Set the trigger point</p> | <p>9 • Control tab Switch each tab</p> <p>10 • Hint Show explanations for buttons and text boxes</p> <p>11 • Setting of voltage range Set display channel, voltage range, probe ratio and input coupling</p> <p>12 • Setting of input kind Set the input kinds (probe, accelerometer, microphone) attached to the main body.</p> <p>13 • Setting of time range Set time range</p> <p>14 • "RUN" button Start measurement</p> <p>15 • "STOP" button Stop measurement</p> <p>16 • Trigger level Set trigger level</p> | <p>17 • "AUTO SCALE" button Set voltage range and time range Automatically</p> <p>18 • "CAL" button Output CAL signal</p> <p>19 • "SNAPSHOT" button Save displayed screen in JPG file</p> <p>20 • "CSV" button Output data of displayed waveform in CSV file</p> <p>21 • "EXPORT" button Output setting file</p> <p>22 • "IMPORT" button Read setting file</p> |
|--|---|--|

Oscilloscope function

Measurement of signal

Description

- 1 After the software is started, click "Mode" -> "Oscilloscope" in menu.



If the waveform is not shown, the following items should be confirmed.

- Turn trigger mode to "AUTO" -> Refer to "Setting of trigger" in P52
 - Set time range to "500ns/div" -> Refer to "Setting of time range" in P44
- 2 Set the probe ratio to "10:1" and voltage range to "20V/div". -> Refer to "Setting of voltage range and others" in P40
 - 3 Set the switch for probe damping ratio to 10:1(×10) and connect the probe to the signal source.
 - 4 Adjust the waveform so that it can be seen easily. -> Refer to "Setting of voltage range and others" in P40 and "Setting of time range" in P44
 - 5 Set the trigger mode to "AUTO" and adjust the trigger level with checking the waveform. -> Refer to "Setting of trigger" in P52



Confirm the following items before connecting to the signal source

- It is recommended to use the optional probe.
- Input the signal after checking that the signal source voltage is within the following ranges not to exceed input allowable voltage ($\pm 10V$) of this product.

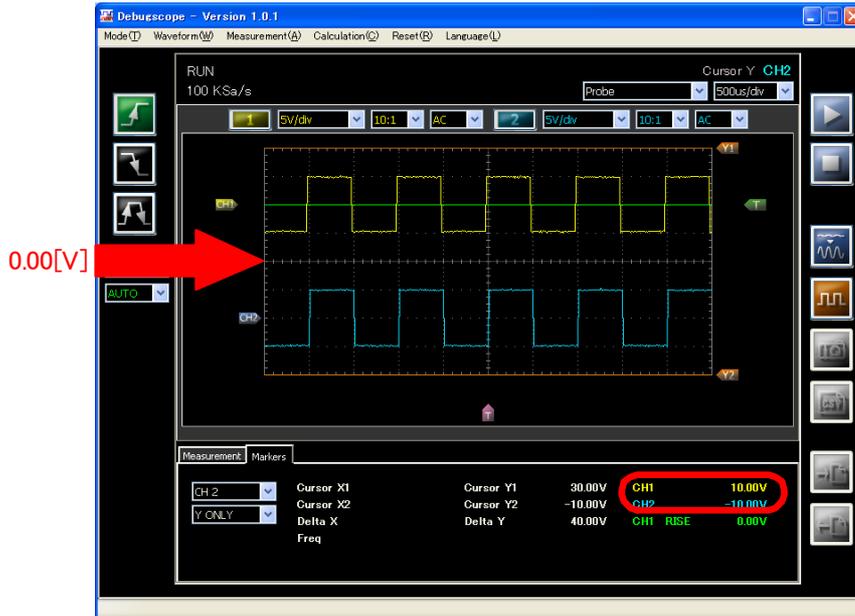
| Probe damping ratio | Signal source voltage |
|---------------------|-----------------------|
| ×1 (1:1) | $\pm 10V$ |
| ×10 (10:1) | $\pm 100V$ |
| ×100 (100:1) | $\pm 1000V$ |

Oscilloscope function

Setting of voltage position

Description

CH1, CH2 are moved up and down to change the voltage position.
 Value of the voltage position is shown in red circle in the below figure.
 0.00[V] position of the voltage position is the center of graph area.



If the voltage position in channel which sets trigger is moved, trigger level  is also moved in accordance with that.

* In case that trigger type is "EXT", trigger level does not move. -> Refer to "Setting of EXT trigger" in P55

* In case of auto scale, the voltage position and trigger level move automatically. -> Refer to "Execution of auto scale" in P45



Move of voltage position

- In single trigger mode, voltage position cannot be moved.

Oscilloscope function

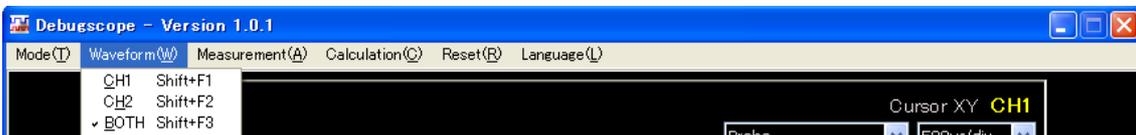
Setting of voltage range and others

Setting of waveform display, voltage range, probe ratio and input coupling is made by buttons and list box in the following figure.



Setting of waveform display

Click a button  or  in the main screen which shows waveform to turn on or off of waveform display. Waveform display can be switched to on or off by "Waveform" in menu or the shortcut key.



- CH1 and CH2 cannot be set to nondisplay at the same time.
If CH1 is set to nondisplay, waveform of CH2 is shown in spite of display or nondisplay of CH2. The same is applied to the setting of CH2 to nondisplay.

| Setting | Display of button | Display of waveform |
|---|--|--|
| - Menu – "Waveform" -> "CH1" - "Shift" + "F1" |   | CH1 is displayed. CH2 is not displayed. |
| - Menu – "Waveform" -> "CH2" - "Shift" + "F2" |   | CH1 is not displayed. CH2 is displayed. |
| - Menu – "Waveform" -> "BOTH" - "Shift" + "F3" |   | Both CH1 and CH2 are displayed. |



Display of waveform

- If the trigger is set to the channel which makes waveform not displayed, waveform is displayed by switching the trigger to the other channel automatically.
- Setting of waveform display is not available until waveform is displayed by the trigger after RUN button is pressed with the trigger type "Single".
- If one channel is displayed, trigger channel, marker, automatic calculation, FFT, spectrogram and CSV are only displayed in the channel which is displayed.

Oscilloscope function

Setting of voltage range and probe ratio

Voltage range and probe ratio can be selected from the following table. Set probe ratio in accordance with the damping ratio setting of the probe to be used.

| Probe ratio | Voltage range |
|-------------|--|
| 1:1 | 10mV/div,20mV/div,50mV/div,100mV/div, 200mV/div,500mV/div,1V/div,2V/div |
| 10:1 | 100mV/div,200mV/div,500mV/div,1V/div, 2V/div,5V/div,10V/div,20V/div |
| 100:1 | 1V/div,2V/div,5V/div,10V/div, 20V/div,50V/div,100V/div,200V/div |

Setting of input coupling

Input coupling can be selected from AC or DC types.

| Input coupling | |
|----------------|-------------|
| AC | AC coupling |
| DC | DC coupling |



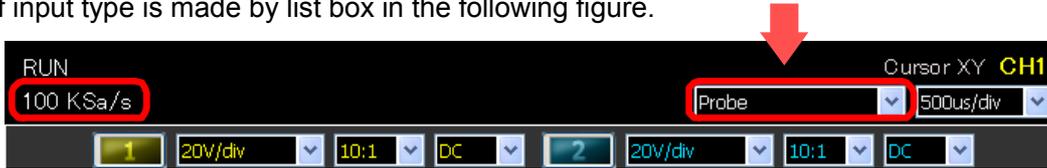
Setting of voltage range, probe ratio, and input coupling

- The voltage range, the probe ratio, and the input coupling can be independently set respectively by channel 1 and channel 2.

Oscilloscope function

Setting of input type

Setting of input type is made by list box in the following figure.



Setting of input type

The input type and each feature are as below.

| Type | Unit | Probe ratio | Valid CH | Remarks |
|-------------------|------|----------------------------------|----------|---------------------------------------|
| Probe | [V] | 1:1 / 10:1 / 100:1 Selectable | CH1,2 | |
| Accelerometer 4G | [G] | 1:1 Fixed | CH1,2 | Be sure to use the designated option. |
| Accelerometer 12G | [G] | 1:1 Fixed | CH1,2 | Be sure to use the designated option. |
| Microphone Lo | [V] | 1:1 Fixed | CH1 Only | Be sure to use the designated option. |
| Microphone Hi | [V] | 1:1 Fixed | CH1 Only | Be sure to use the designated option. |

When an accelerometer is selected, the following displays change from voltage value to acceleration value.

| | |
|-----------------------------|--|
| Acceleration range | |
| Automatic measurement value | |
| Marker measurement value | |

Oscilloscope function

Acceleration range

The acceleration range varies depending on the sensors (2G, 4G, 8G, 12G type) to attach.

| Accelerometer | Acceleration range |
|---------------|--|
| 2G type | 10mG/div, 20mG/div, 50mG/div, 100mG/div, 200mG/div, 500mG/div, 1G/div, 2G/div |
| 4G type | 20mG/div, 40mG/div, 100mG/div, 200mG/div, 400mG/div, 1G/div, 2G/div, 4G/div |
| 8G type | 40mG/div, 80mG/div, 200mG/div, 400mG/div, 800mG/div, 2G/div, 4G/div, 8G/div |
| 12G type | 74.07mG/div, 148.2mG/div, 370.4mG/div, 740.7mG/div, 1.481G/div, 3.704G/div, 7.407G/div, 14.81G/div |



About accelerometer and microphone

- A designated optional set is necessary to measure using an accelerometer or a microphone in this device. Please contact sales companies about optional goods.
(Refer to the attached Option Instruction Manual.)
- When you use an optional set, select the input type described in the Option Instruction Manual.

Oscilloscope function

Setting of time range

Operation procedure

Time range is changed by the list box in the following figure.



Time range can be selected from the following table. Sampling is changed in accordance with time range.

| Time range | Sampling | Time range | Sampling | Time range | Sampling |
|------------|----------|------------|----------|------------|----------|
| 500ns/div | 100MSa/s | 250us/div | 200KSa/s | 100ms/div | 500Sa/s |
| 1us/div | 50MSa/s | 500us/div | 100KSa/s | 250ms/div | 200Sa/s |
| 2.5us/div | 20MSa/s | 1ms/div | 50KSa/s | 500ms/div | 100Sa/s |
| 5us/div | 10MSa/s | 2.5ms/div | 20KSa/s | 1s/div | 50Sa/s |
| 10us/div | 5MSa/s | 5ms/div | 10KSa/s | 2.5s/div | 20Sa/s |
| 25us/div | 2MSa/s | 10ms/div | 5KSa/s | 5s/div | 10Sa/s |
| 50us/div | 1MSa/s | 25ms/div | 2KSa/s | 10s/div | 5Sa/s |
| 100us/div | 500KSa/s | 50ms/div | 1KSa/s | | |



Display of time range

- If 250ms/div to 10s/div is set and type of the trigger is AUTO, type of display is scroll display. At this time, the trigger position  moves to the leftmost automatically. (To display the latest waveform)
- In case of scroll display, setting of trigger level, trigger edge and trigger channel are invalid. Although the trigger position  is once automatically moved to the leftmost, the position can be changed manually after that.

Oscilloscope function

Execution of auto scale

Operation procedure

- 1 Input signal. -> Refer to "Measurement of signal" in P34
- 2 Click "Auto scale" button .
Status turns to "AUTO SCALE".
- 3 After auto scale is completed, the voltage position of CH1 is displayed in upper half of the graph area and that of CH2 is displayed lower half of the graph area. (However, it depends on offset voltage of input signal.)
Status turns to "RUN".
Type of the trigger turns to "AUTO".
When CH1 is displayed, trigger channel is "CH1" and trigger edge is "RISE".
When CH1 is not displayed, trigger channel is "CH2" and the same trigger edge which was set last time is used.
* When auto scale is executed, there is sound from the main body in some cases, but it is not malfunction.

**In case that auto scale is not available**

- If there are much noise or signal level is low, auto scale does not work properly in some cases. Execute auto scale again after wiring and connection are checked.
- Scaling is done in auto scale based on signal waveform of CH1
In case that auto scale is executed by one channel, connection should be made to CH1.
- When status is "STOP", "AUTO SCALE" button is invalid and auto scale is not available.

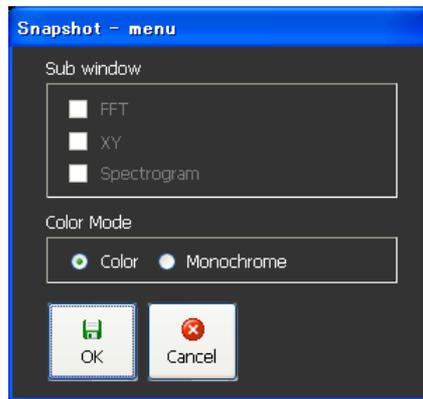
Oscilloscope function

Snapshot of screen

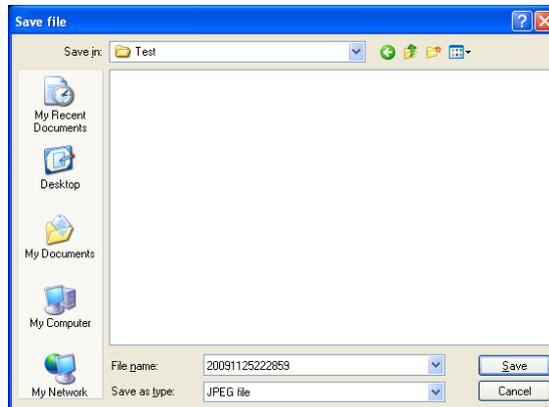
Save the main screen and the sub screen in image file (JPEG format).

Operation procedure

- 1 Click "STOP"  in the main screen and click "SNAPSHOT" button .
- 2 Select a sub-window image and color mode to be saved. If "Monochrome" is ticked, the image is saved in monochrome.



- 3 Name the image in the dialogue box which is shown after "OK" is clicked.



- 3 When snapshot is completed, the following message is shown. Click "OK" to complete. Only the main screen is saved by the above setting.



Oscilloscope function

Operation procedure (continued)

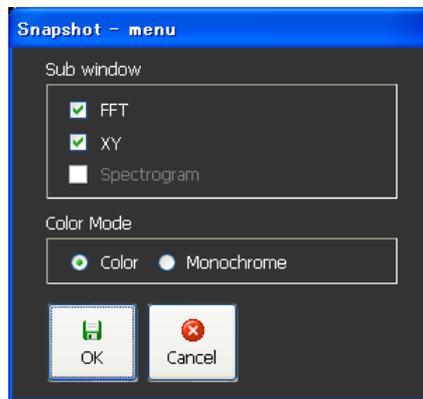
In case that the sub-window of "FFT", "XY" or "Spectrogram" is displayed, selection can be made by the screen of "Snapshot – menu".

If the above image is displayed, the applicable box is ticked automatically.

If there is the image which is not saved, untick that image.

* "FFT" and "Spectrogram" cannot be displayed at the same time, accordingly, they cannot be saved at the same time by snapshot.

The following is "Snapshot – menu" screen when "FFT" and "XY" are displayed.



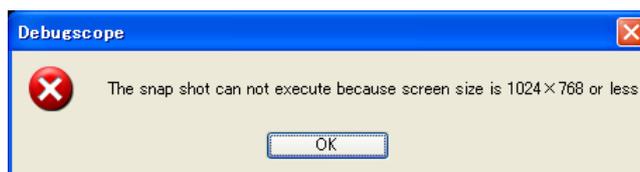
Name of image file

- Name of Image file of FFT, XY and spectrogram is automatically fixed. If the file of the main screen is named "TEST.jpg", the following names are used.

| Screen | File name |
|--------------------|--------------|
| Main screen | TEST.jpg |
| FFT screen | fft_TEST.jpg |
| XY screen | xy_TEST.jpg |
| Spectrogram screen | s_TEST.jpg |

If the following error message is shown, snapshot is not available.

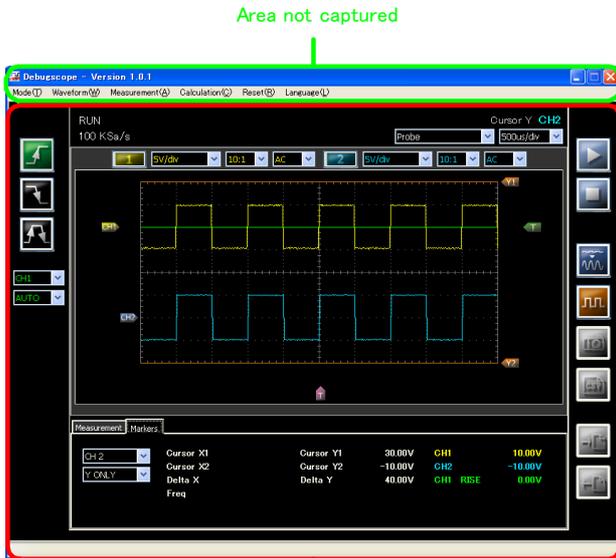
Set the resolution of PC to be used to 1024 x 768 or above.



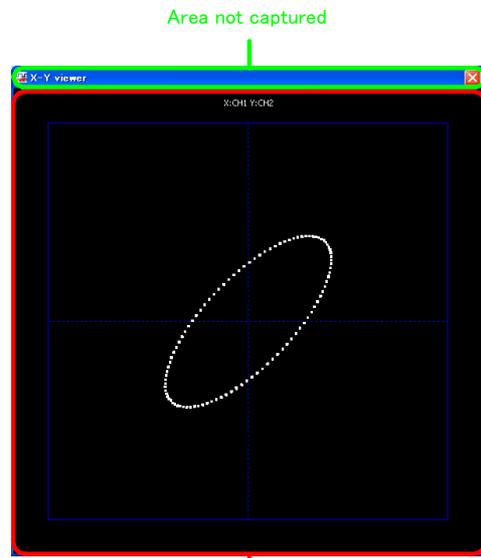
Oscilloscope function

Capture range

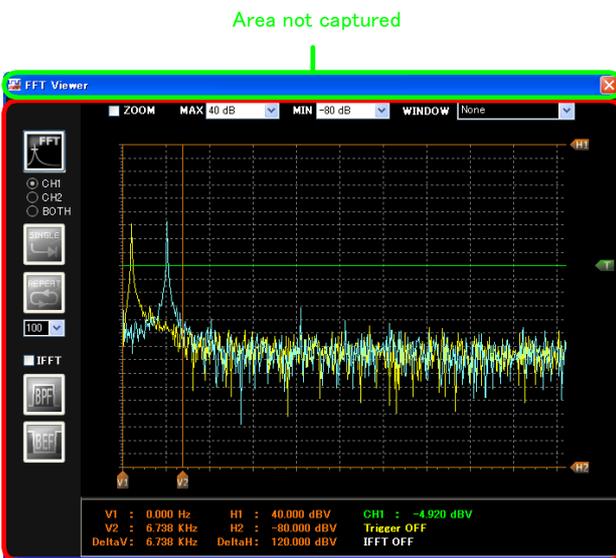
As shown in the following figure, only the range enclosed with the red frame is captured. In each screen, "Title bar" and "Menu" (green frame) are not captured.



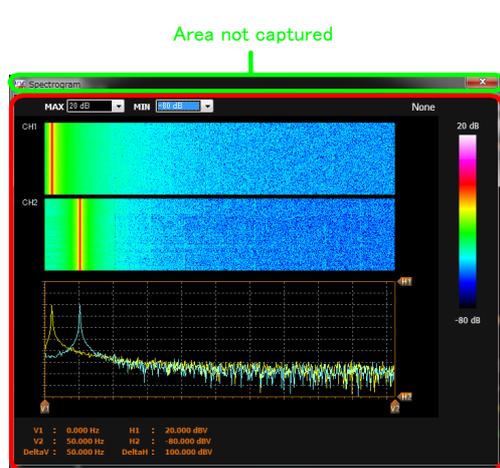
Main screen



X-Y screen



FFT screen



Spectrogram screen

Oscilloscope function

Use of cursor

Measure voltage and frequency by the cursor.

Operation procedure in oscilloscope mode

- 1 Switch the tab in the main screen to "Markers".
- 2 Select a channel to be measured and select the type of display of the cursor.
If "INVISIBLE" is selected for the type of display, channel cannot be switched.



- 3 Measurement is done by moving the horizontal cursor Y1 and Y2 , and the vertical cursor X1 and X2 .

Operation procedure during FFT display and spectrogram display

- 1 Display "FFT" or "spectrogram".
-> Refer to "Use of FFT" in P91
-> Refer to "Use of spectrogram display" in P109



- 2 Measurement is done by moving the horizontal cursor H1 and H2 , and the vertical cursor V1 and V2 .

Oscilloscope function

Initialization of setting

Initialize the setting of the voltage position and so on.

Resetting of the voltage position

Click "Reset" -> "Offset" -> "CH1" in menu and the voltage position of CH1 backs to the center.
Click "Reset" -> "Offset" -> "CH2" to initialize the voltage position of CH2.



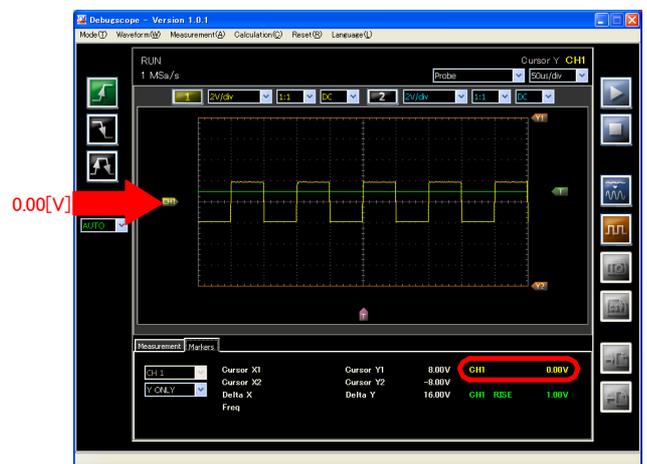
| Setting | Waveform display |
|---|--|
| - "Reset" -> "Offset" -> "CH1" in menu - "Shift" + "Ctrl" + "F1" | The voltage position of CH1 turns to 0.00V |
| - "Reset" -> "Offset" -> "CH2" in menu - "Shift" + "Ctrl" + "F2" | The voltage position of CH2 turns to 0.00V |

The left figure below shows that the voltage position of CH1 is "4.00V".

Click "Reset" -> "Offset" -> "CH1" in menu and the voltage position of CH1 is "0.00V" as shown in the right figure below.



Before offset reset



After offset reset

Oscilloscope function

Resetting of setting

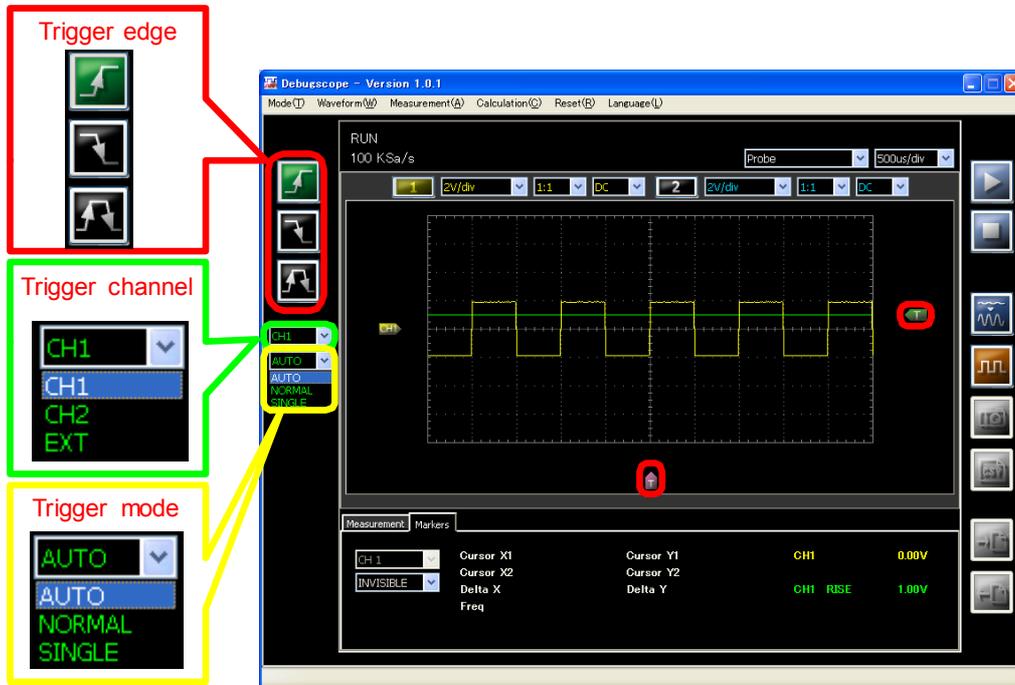
Items in the following table are initialized if "Reset" -> "Initialization" in menu is clicked.

| Name | Status | 名称 | 状態 |
|--|-------------------------|-----------------------------|---------------------------------|
| Status | RUN | FFT viewer screen | Non-display |
| Waveform display | BOTH | FFT trigger | OFF |
| Time range | 500ns/div | FFT trigger channel | CH1 |
| Voltage range | 2V/div | FFT trigger position | Top of graph area |
| Probe ratio | 1:1 | Generation number for FFT | 10 |
| Input coupling | DC | IFFT calculation processing | OFF |
| Trigger edge | RISE | Waveform at FFT filter | Measured waveform (RAW) display |
| Trigger channel | CH1 | FFT filter type | BPF (Band-pass filter) |
| Trigger type | AUTO | FFT viewer cursor | Both ends of graph area |
| Voltage position | 0.00V | FFT window function | None |
| Cursor | Both ends of graph area | FFT viewer range | -80 dBV to 40 dBV |
| Trigger level  | 0.00V | FFT viewer zoom | OFF |
| Trigger position  | Center of graph area | Spectrogram screen | Non-display |
| CAL | OFF | Spectrogram cursor | Both ends of graph area |
| Marker display | Non-display | X-Y viewer screen | Non-display |
| Marker channel | CH1 | | |
| Automatic calculation | Non-display | | |
| Input type selection | Probe | | |

Oscilloscope function

Setting of trigger

CH1 and CH2 are internal triggers which perform sampling based on the point where trigger level is reached. Trigger can be set in edge of "RISE", "FALL" and "BOTH" of CH1, CH2 or EXT.



Trigger edge

Setting can be made by buttons in the following figure.

| Button | Trigger edge |
|--------|--------------|
| | RISE |
| | FALL |
| | BOTH |

Trigger channel

Setting can be made by the list box in the green frame in the following figure. There are three types; "CH1", "CH2" and "EXT".

*** Setting is not available for a channel which is set to invisible in the setting of waveform display.**

Trigger mode

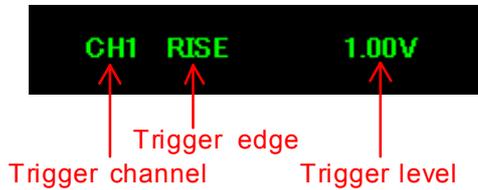
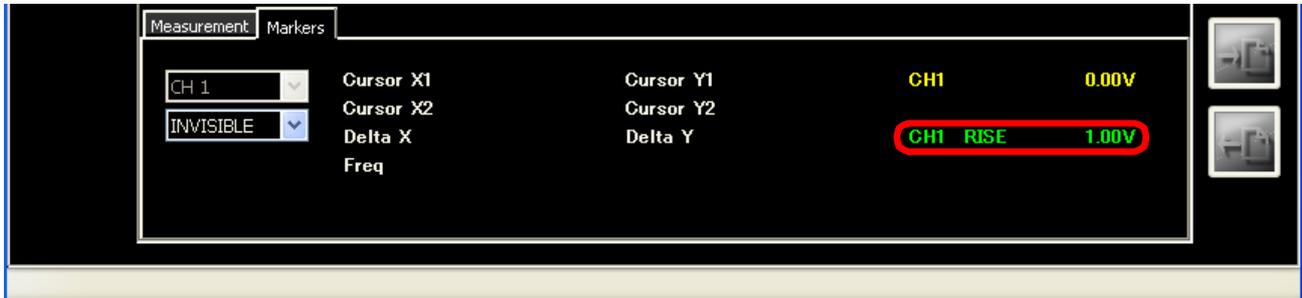
Setting can be made by the list box in the yellow frame in the following figure. There are three types; "AUTO", "NORMAL" and "SINGLE".

Oscilloscope function

Trigger level

Move the trigger level  up and down and fix it.

The value of trigger level is displayed at the position (red frame) shown in the figure below in "Marker" tab.

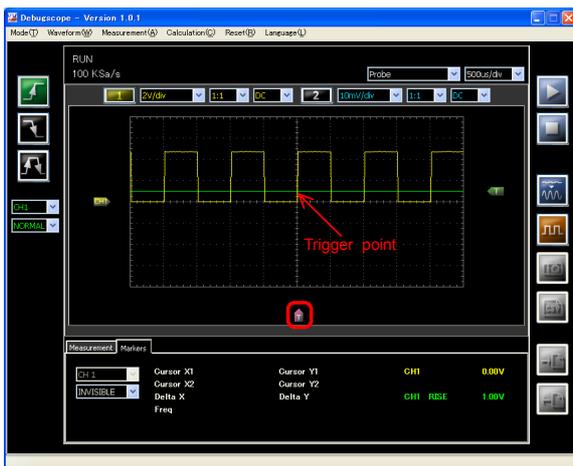


Trigger position

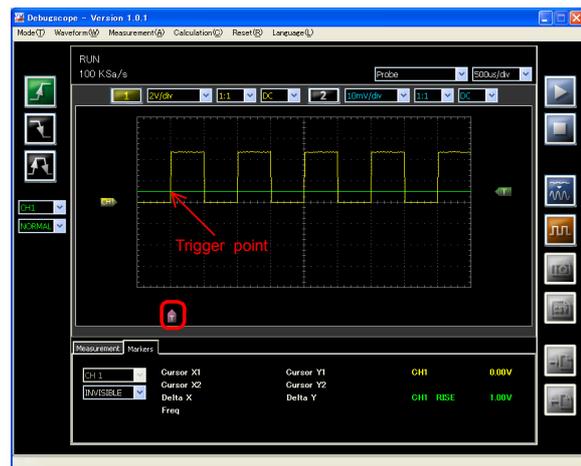
Move the trigger position  right and left and fix it.

Movement of the trigger position moves a trigger point.

The following figure is a waveform when the trigger position is moved from the center to the left.



The trigger position is a center



The trigger position is moved to the left

Oscilloscope function

Operation procedure

- 1 Set the trigger.
 - Trigger edge RISE in edge
 - Trigger channel CH1
 - Trigger mode NORMAL
 - Trigger level 1.00V
 - Trigger position Center

- 2 Input signal which exceeds trigger level (1.00V).
 The following is a sample of inputting square wave with 0-5V.



Oscilloscope function

Setting of EXT trigger

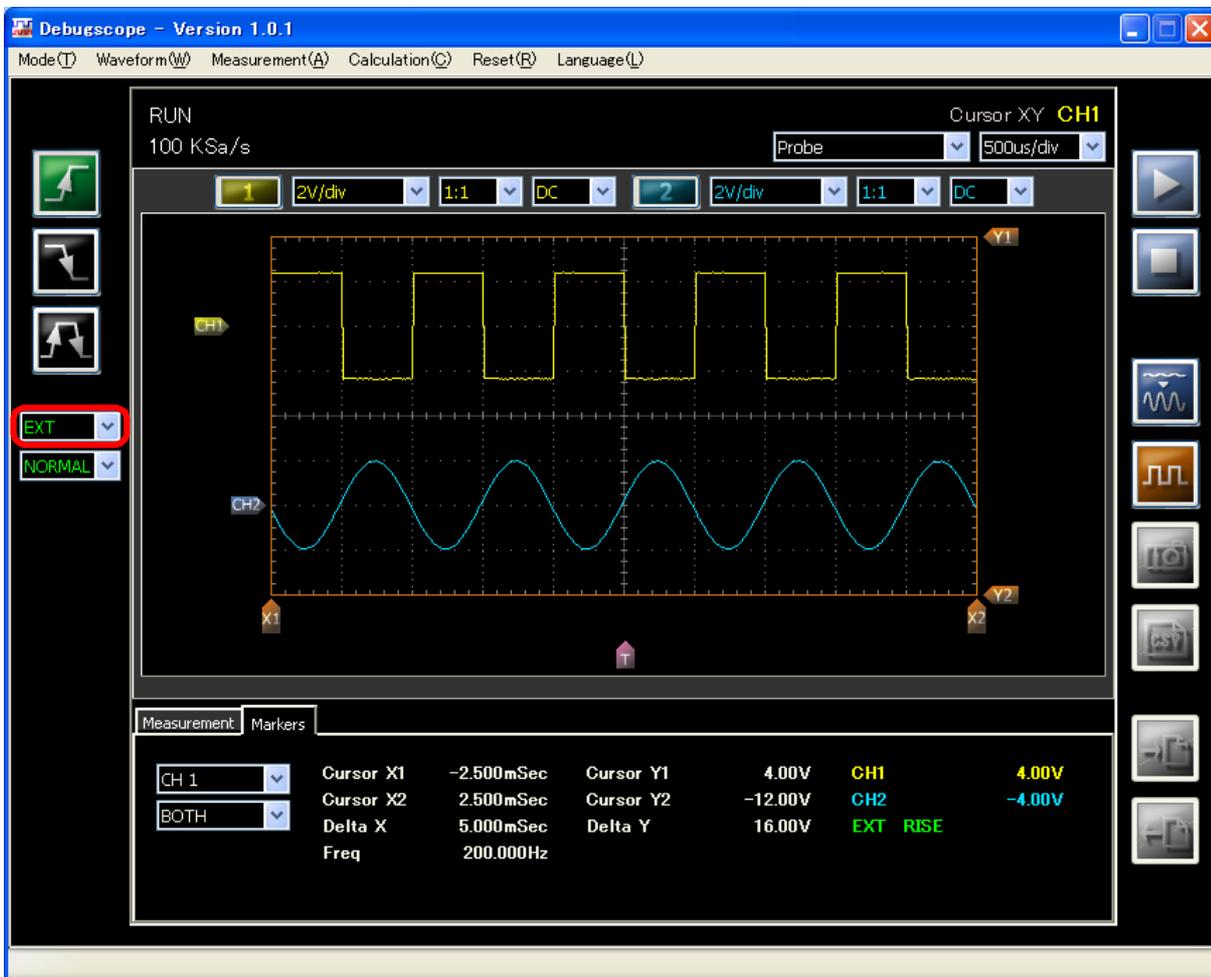
Connect the attached "CAL/trigger cable" to the "FUNCTION" connector which is located in the front face of the main body and input external trigger signal.

Trigger is made in accordance with the point when pulse signal is input from outside.

Operation procedure

- 1 Set the trigger.
 - Trigger edge RISE in edge
 - Trigger channel EXT
 - Trigger mode NORMAL

* EXT trigger does not have trigger level.



Oscilloscope function

- Connect the attached "CAL/trigger cable" to the "FUNCTION" terminal which is located in the front face of the main body.



The following table shows the pin assignment of "CAL/trigger cable".

| Pin number of connector | Color of IC clip | Signal name |
|-------------------------|------------------|-------------|
| 5 | Black | GND |
| 6 | Yellow | EXT |

Open or short circuit IC-clip of black (GND) and yellow (EXT) to input EXT trigger. The following table shows operation and trigger edge.

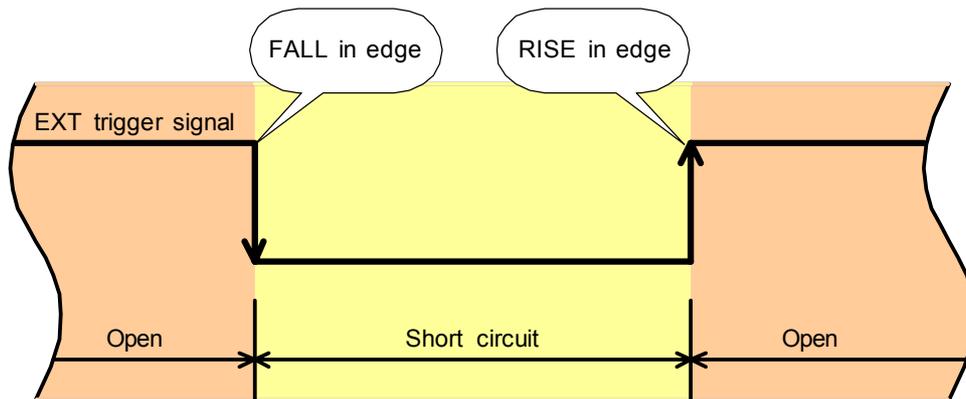
| Operation | Trigger edge |
|---|--------------|
| Open after short circuit | RISE |
| Short circuit | FALL |
| Open or short circuit after short circuit | BOTH |

Oscilloscope function

* EXT trigger signal is shown below.

EXT trigger signal turns to "HIGH" during open and turns to "LOW" during short circuit.

When the EXT trigger input is short-circuited, it makes edge in FALL. After that, if it is opened, it makes edge in RISE.



Detection of EXT trigger

- It takes 4ms to 5ms to detect the trigger because input part of EXT trigger has the chattering prevention circuit. During this time, fix trigger level to short circuit or open.
- Detection is made per sampling time. Therefore, pulse signal which is longer than sampling time should be input. The pulse signal that corresponds to 1div or more for time range is recommended.

(Ex.) When time range is 50ms/div (1kSa/s) : Pulse signal that the interval between pulses is more than 50ms

Data logging function

Data logging function

Data logging function allows to save data into the hard disk, therefore, long time and large volume of data can be saved. In addition to setting of logging time, setting of conditions to start logging/stop logging by each trigger factor is available. And timing of start logging/stop logging can be used with keeping opening/closing contact point or alarm signal in synchronization.

- Maximum sampling frequency :100KS/s(10 μ sec)
- Maximum size of data to be recorded : Data size which is equal to 24-hour measurement or 2GB size of file
- Trigger type of CH1, CH2 and EXT can be selected like the function of oscilloscope.

* Acquired data can be reproduced by the data analysis software. **(Refer to the attached Data analysis software Manual)**

This product may work slowly or miss measurement data depending on the condition of OS and PC because data collection and control are done by PC.

Especially, logging process should be done under the condition that other software and resident software are terminated as much as possible. The followings are recommended software and service to be stopped and recommended property to be set.

[In case that antivirus software is installed]

Set constantly-monitored function (auto protect) to off.

[In case that automatic data backup software is installed]

Stop this software before starting data logging function or set automatic data backup to "Not use".

Software which constantly accesses the hard disk of PC, such as defragmentation should not be used during logging process.

Data logging function

Explanation of data logger mode screen

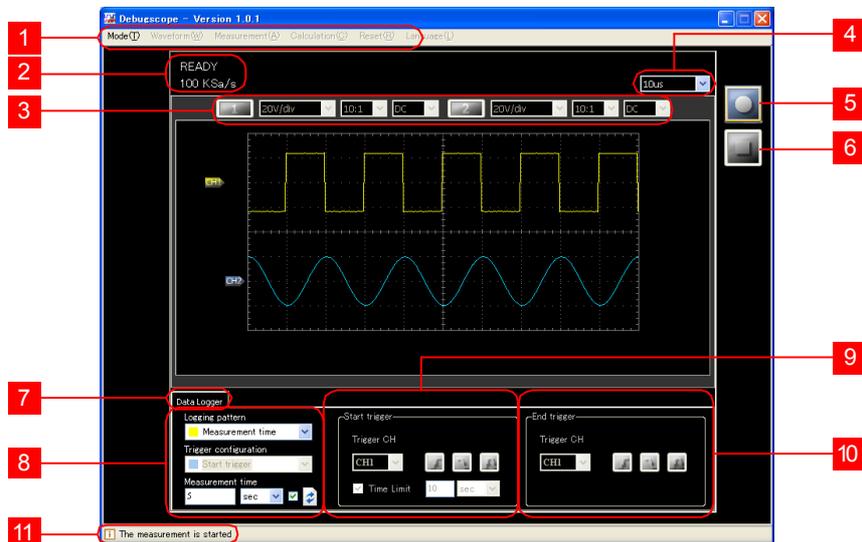
Operation procedure

1 Set voltage range and time range in oscilloscope mode. **-> Refer to "Measurement of signal" in P38.**

* Setting of display channel, voltage range, probe ratio and coupling cannot be changed by data logger mode. Setting should be done by oscilloscope.

2 Click "Mode" -> "Data logger" in menu.

* "Waveform", "Measurement", "Calculation", "Reset" and "Language" in menu are invalid.



- | | |
|---|---|
| <p>1 ● Menu Switch modes and make setting</p> <p>2 ● Status display Display sampling frequency and status of measurement</p> <p>3 ● Display of voltage range Display voltage range, input coupling and probe ratio</p> <p>4 ● "Monitoring start"/"Monitoring stop" Start monitoring/Stop monitoring</p> <p>5 ● REC Start logging</p> <p>6 ● STOP Stop logging</p> | <p>7 ● Data logger tab Display each setting information</p> <p>8 ● Data logger menu Set logging pattern, trigger, measurement time and repeat</p> <p>9 ● Setting of trigger to start measurement Set the trigger to start measurement</p> <p>10 ● Setting of trigger to stop measurement Set the trigger to stop measurement</p> <p>11 ● Hint Show explanations for buttons and maximum measurement time</p> |
|---|---|

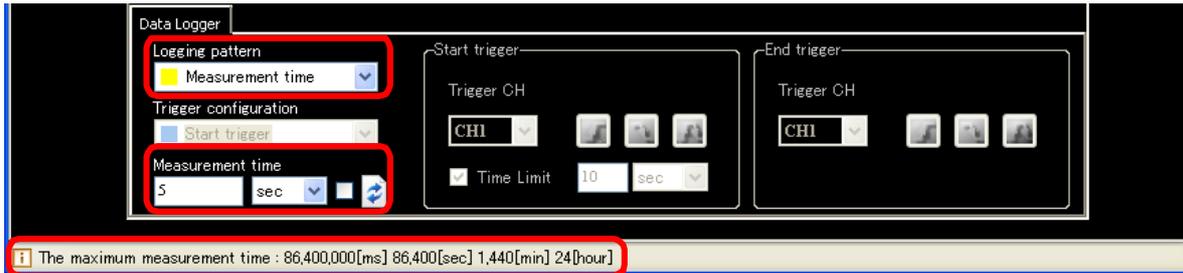
Data logging function

Logging by manual start

1 Set "Logging pattern" to "Measurement time" and "Measurement time" to time to measure in "Data Logger" tab.

The following figure shows the setting below.

- Logging pattern Measurement time
- Measurement time 5 sec
- Repeat measurement None



As for measurement time, enter the number into the text box on the left and fix the unit by the list box on the right.

[ms], [sec], [min] and [hour] are available as unit.

The maximum measurement time is shown in the hint which is in the bottom of the screen when the mouse pointer is positioned over the text box.

Set measurement time within the maximum measurement time.

Do not tick the check box on the right of "Measurement time" setting.

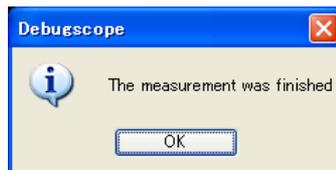
*** Only number can be input as measurement time. Decimal point and characters are not available. Integer should be entered.**

2 Select a destination to save the file by clicking "REC" button  in the main screen.

Status display changes from "READY" to "REC" and recording is started.

3 In case of aborting logging process, click "STOP" button . Status display changes from "REC" to "READY". Data which is before stop of logging is saved into the data file.

4 When time which was designated as measurement time has passed, measurement is stopped and the following screen is shown. Click "OK" and status returns to "READY".



* If  button is clicked during data logging, the above screen is shown, logging process stops, and the software is terminated. At this time, measurement data during completion of logging process is saved into the file. The saved file can be read by the data analysis software.

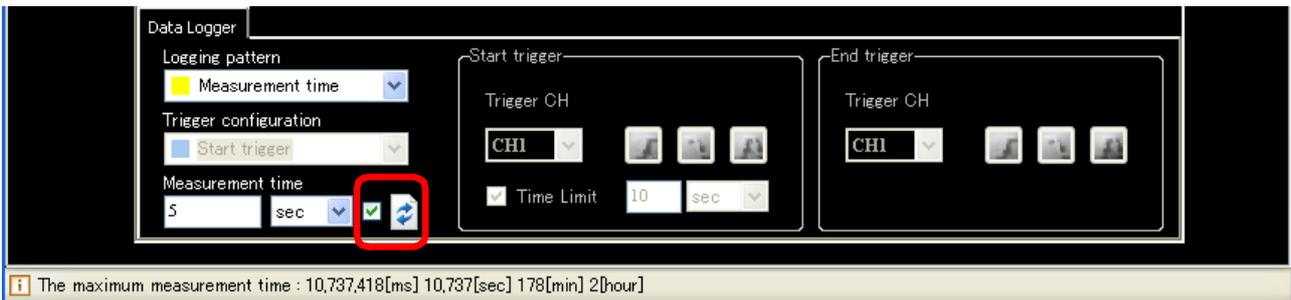
Data logging function

Logging by manual start (repeat measurement)

1 Validity/invalidity of the data logging functional repeat mode is controlled by the checkbox on the right of the measurement time unit. The repeat mode of "Measurement time" pattern can be measured only when the measurement time is 5 seconds or more.

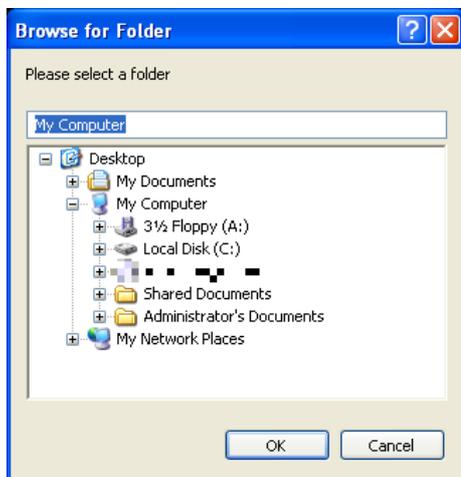
The following figure shows the setting below.

- Logging pattern Measurement time
- Measurement time 5 sec
- Repeat measurement Valid



- Tick the check box on the right of "Measurement time" setting.

2 Select a destination to save the file by clicking "REC" button  in the main screen.



The status display changes from "READY" to "REC" after clicking [OK] button, and the record is started.

3 In case of aborting logging process, click "STOP" button . Status display changes from "REC" to "READY". Data which is before stop of logging is saved into the data file.

4 When time which was designated as measurement time has passed, the logging data will be saved automatically and the next logging process will start. The number of save generations is eight and when making the ninth file, the first file is overwritten.

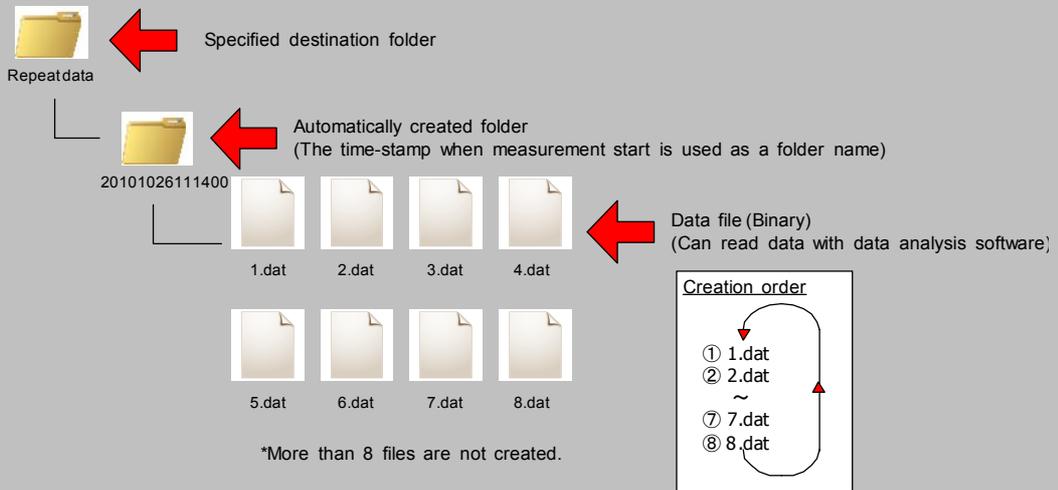
Data logging function

 **Destination to save data file at repeat measurement**

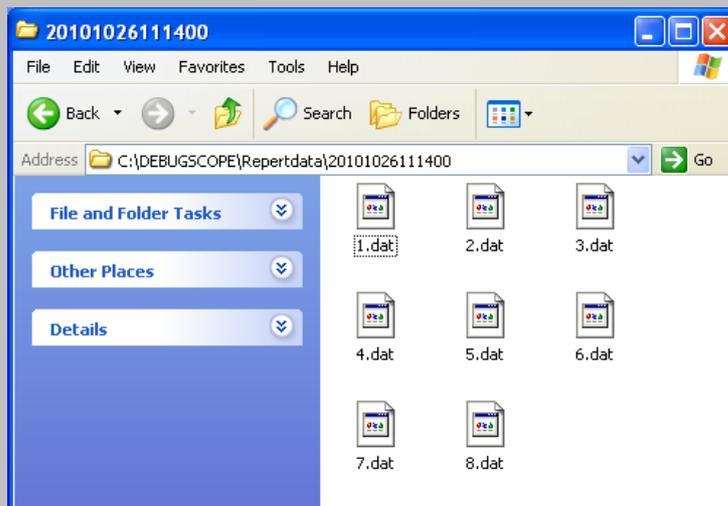
Select the folder to save and click the "OK" button before repeat measurement. The data file is generated automatically as follows.

e.g.) Example of specifying folder "C:\DEBUGSCOPE\Repeat data"

In case the date and time when the measurement was started is "October 26th 2010, 11:14:00".



The data file is saved as follows.



Data logging function

Logging with start trigger

Operation procedure

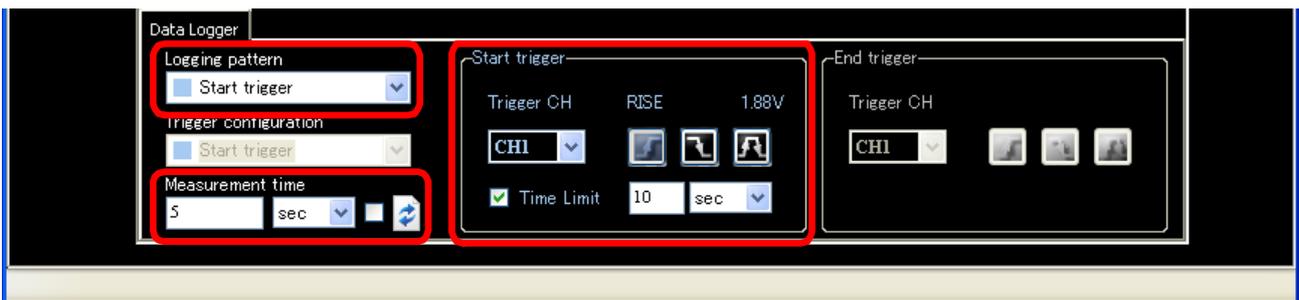
- 1 Set voltage range and time range to be measured in oscilloscope mode. **-> Refer to "Measurement of signal" in P38**
- 2 Click "Mode" -> "Data logger" in menu.
- 3 Set items in "Data logger" tab to the followings.
 - Logging pattern Start trigger
 - Measurement time 5 sec
 - Repeat measurement None

Start trigger

 - Trigger CH CH1
 - Trigger edge RISE
 - Trigger level 1.88V
 - Time limit 10 sec

* If the logging pattern is switched to "Start trigger", the various settings of the trigger channel, the trigger edge, and the time limit of "Start trigger" is available.

* Move start trigger for measurement  and fix trigger level.

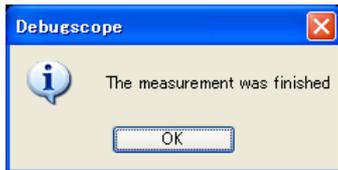


- 4 Select a destination to save the file by clicking "REC" button  in the main screen.
 Status display changes from "READY" to "WAITING" and the trigger is waited.
 * In case that the trigger does not work even though time limit has come (in this case, time limit is 10 sec.), status changes to "TIMEOVER" and recording of data is terminated.
- 5 If the trigger works, status display changes to "REC", and "START" (time when measurement is started) and "END" (time when measurement is ended) are shown.

Data logging function

6 In case of aborting logging process, click "STOP" button . Status display changes from "REC" to "READY". Data which is before stop of logging is saved into the data file.

7 When time which was designated as measurement time has passed, measurement is stopped and the following screen is shown. Click "OK" and status returns to "READY".



Time limit

- Tick "Time Limit" and time limit becomes valid.
- The maximum time limit is 24 hours.
- In case that there is no start trigger within time limit after REC is clicked, status display turns to "TIMEOVER" and recording of data is terminated.

Data logging function

Logging with start trigger (repeat measurement)

Operation procedure

1 Set voltage range and time range to be measured in oscilloscope mode. **-> Refer to "Measurement of signal" in P38**

2 Click "Mode" -> "Data logger" in menu.

3 Set items in "Data logger" tab to the followings.

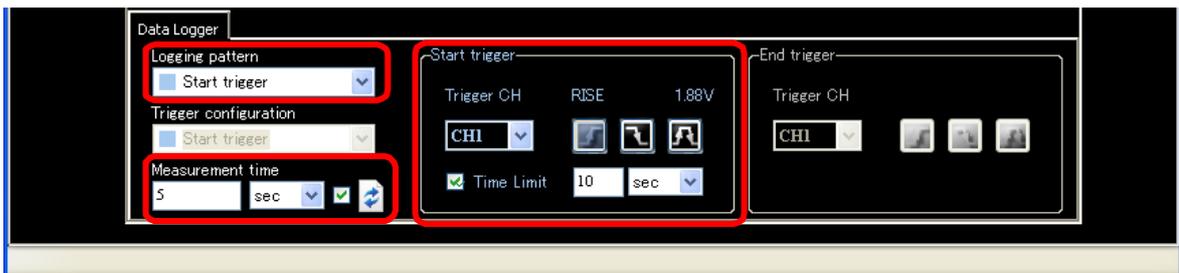
- Logging pattern Start trigger
- Measurement time 5 sec
- Repeat measurement Valid

Start trigger

- Trigger CH CH1
- Trigger edge RISE
- Trigger level 1.88V
- Time limit 10 sec

* If the logging pattern is switched to "Start trigger", the various settings of the trigger channel, the trigger edge, and the time limit of "Start trigger" is available.

* Move start trigger for measurement  and fix trigger level.



4 Select a destination to save the file by clicking "REC" button  in the main screen.

Status display changes from "READY" to "WAITING" and the trigger is waited.

* In case that the trigger does not work even though time limit has come (in this case, time limit is 10 sec.), status changes to "TIMEOVER" and recording of data is terminated.

5 If the trigger works, status display changes to "REC", and "START" (time when measurement is started) and "END" (time when measurement is ended) are shown.

Data logging function

- 6 In case of aborting logging process, click "STOP" button  . Status display changes from "REC" to "READY". Data which is before stop of logging is saved into the data file.
- 7 When time which was designated as measurement time has passed, the logging data will be saved automatically and the next logging process will start. The number of save generations is eight and when making the ninth file, the first file is overwritten.
-> Refer to "Logging by manual start (repeat measurement)" in P61

Data logging function

Logging with end trigger

Operation procedure

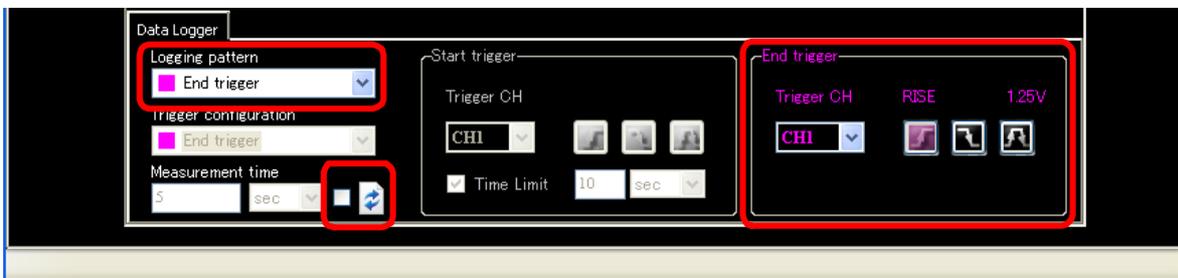
- 1 Set voltage range and time range to be measured in oscilloscope mode. **-> Refer to "Measurement of signal" in P38**
- 2 Click "Mode" -> "Data logger" in menu.
- 3 Set items in "Data logger" tab to the followings.
 - Logging pattern End trigger
 - Repeat measurement None

* If the logging pattern is switched to "End trigger", the various settings of the trigger channel and the trigger edge of "End trigger" is available.

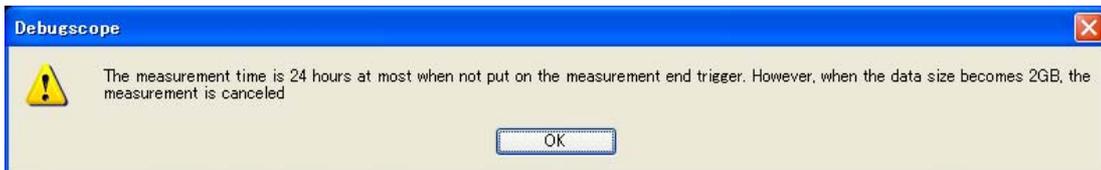
End trigger

 - Trigger CH CH1
 - Trigger edge RISE
 - Trigger level 1.25V

* Move end trigger for measurement  and fix trigger level.



- 4 Click "REC" button  in the main screen and the following is shown.
Click "OK" to select a destination to save the file.



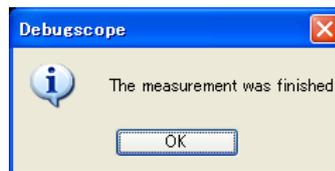
- 5 Status display changes to "REC", and "START" (time when measurement is started) and "END" (time when measurement is ended) are shown.
* "END" (time when measurement is ended) is shown 24 hours after "START" (time when measurement is started.)

Data logging function

If the data size exceeds 2GB or stop trigger works, measurement is ended earlier than time displayed in "END" in some cases.

6 In case of aborting logging process, click "STOP" button . Status display changes from "REC" to "READY". Data which is before stop of logging is saved into the data file.

7 When the trigger works, logging process is terminated and the following screen is shown. Click "OK" and status returns to "READY".



Record of data when "end trigger" is set

- In case that end trigger does not work until the condition mentioned below, record of data is automatically stopped.

Logging process stops when;

- Measurement time exceeds 24 hours.
- Data size reaches 2GB

Data logging function

Logging with end trigger (repeat measurement)

Operation procedure

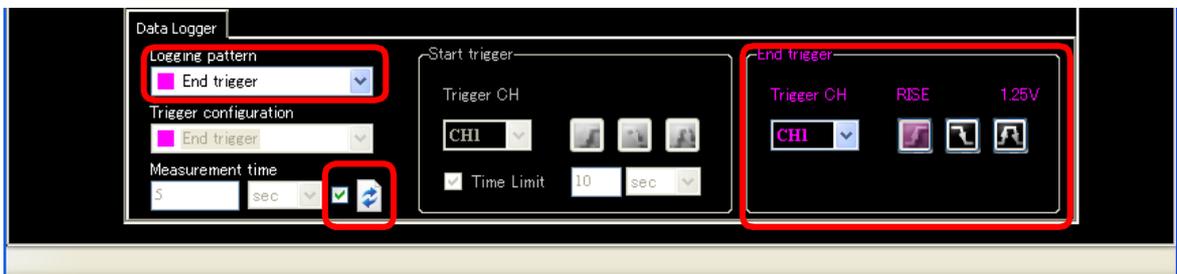
- 1 Set voltage range and time range to be measured in oscilloscope mode. **-> Refer to "Measurement of signal" in P38**
- 2 Click "Mode" -> "Data logger" in menu.
- 3 Set items in "Data logger" tab to the followings.
 - Logging pattern End trigger
 - Repeat measurement Valid

End trigger

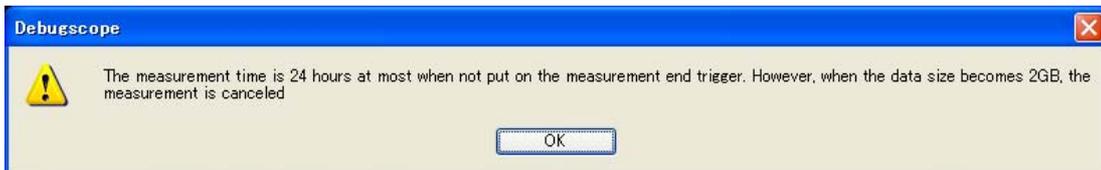
 - Trigger CH CH1
 - Trigger edge RISE
 - Trigger level 1.25V

* If the logging pattern is switched to "End trigger", the various settings of the trigger channel and the trigger edge of "End trigger" is available.

* Move end trigger for measurement  and fix trigger level.



- 4 Click "REC" button  in the main screen and the following is shown.
Click "OK" to select a destination to save the file.



- 5 Status display changes to "REC", and "START" (time when measurement is started) and "END" (time when measurement is ended) are shown.
* "END" (time when measurement is ended) is shown 24 hours after "START" (time when measurement is started.)

Data logging function

If the data size exceeds 2GB or stop trigger works, measurement is ended earlier than time displayed in "END" in some cases.

6

In case of aborting logging process, click "STOP" button . Status display changes from "REC" to "READY". Data which is before stop of logging is saved into the data file.

7

When the trigger works, the logging data will be saved automatically and the next logging process will start. The number of save generations is eight, and when making the ninth file, the first file is overwritten.

-> Refer to "Logging by manual start (repeat measurement)" in P61

Data logging function

Logging with start and end trigger

Operation procedure

1 Set voltage range and time range to be measured in oscilloscope mode. **-> Refer to "Measurement of signal" in P38**

2 Click "Mode" -> "Data logger" in menu.

3 Set items in "Data logger" tab to the followings.

- Logging pattern Start & end trigger
- Repeat measurement None

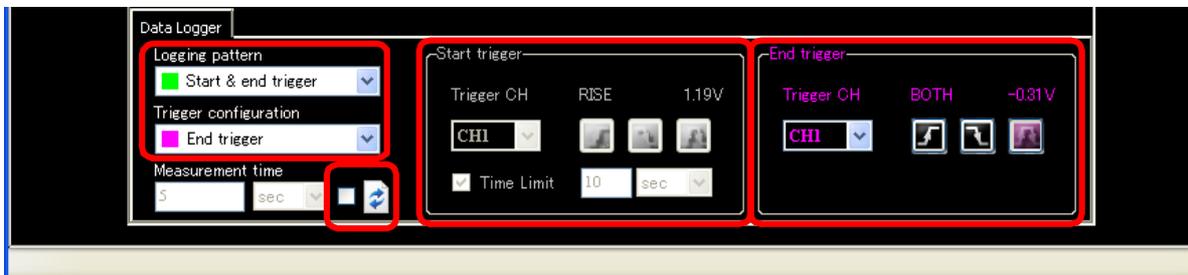
Set "Start trigger" and "End trigger" by "Trigger configuration".

Start trigger

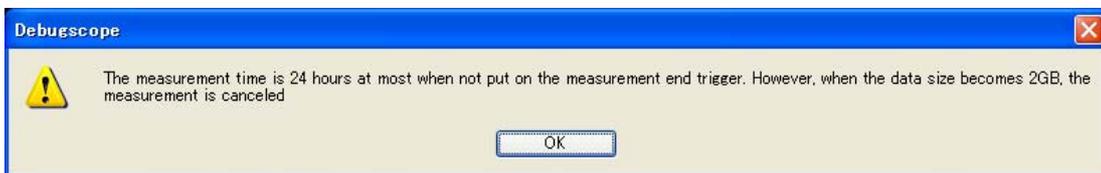
- Trigger CH CH1
- Trigger edge RISE
- Trigger level 1.19V
- Time limit 10 sec

End trigger

- Trigger CH CH2
- Trigger edge BOTH
- Trigger level -0.31V



4 Click "REC" button  in the main screen and the following is shown.



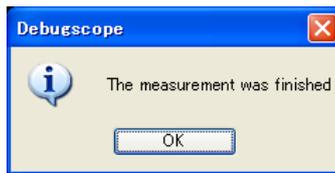
Click "OK" to select a destination to save the file.

Status display changes from "READY" to "WAITING" and the trigger is waited.

5 If start trigger works, status display changes to "REC" and logging process starts. In case that the trigger does not work even though time limit (in this case, time limit is 10 sec.) has come, status changes to "TIMEOVER" and logging process stops.

Data logging function

- 6 In case of aborting logging process, click "STOP" button . Status display changes from "REC" to "READY". Data which is before stop of logging is saved into the data file.
- 7 If end trigger works, logging process stops and the following screen is shown. Click "OK" and status returns to "READY".



Record of data when "Start & end trigger" is set

- In case that start trigger does not work within time limit, logging process does not start.
- In case that end trigger does not work, logging process stops when measurement time exceeds 24 hours or data size reaches 2GB.

Data logging function

Logging with start and end trigger (repeat measurement)

Operation procedure

1 Set voltage range and time range to be measured in oscilloscope mode. **-> Refer to "Measurement of signal" in P38**

2 Click "Mode" -> "Data logger" in menu.

3 Set items in "Data logger" tab to the followings.

- Logging pattern Start & end trigger
- Repeat measurement Valid

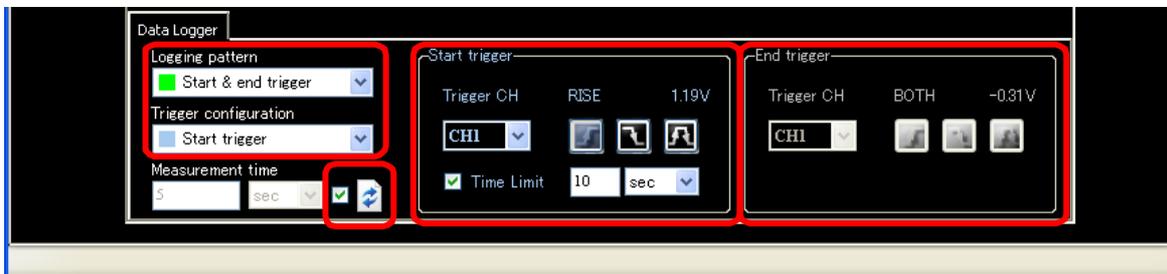
Set "Start trigger" and "End trigger" by "Trigger configuration".

Start trigger

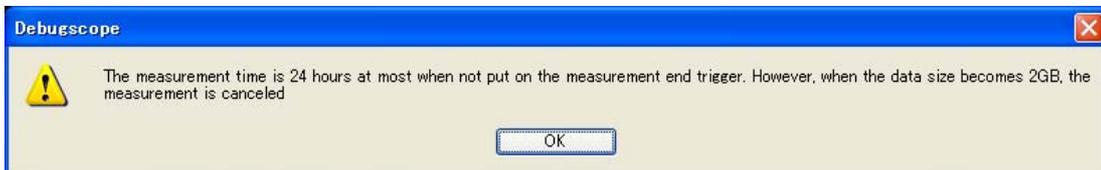
- Trigger CH CH1
- Trigger edge RISE
- Trigger level 1.19V
- Time limit 10 sec

End trigger

- Trigger CH CH2
- Trigger edge BOTH
- Trigger level -0.31V



4 Click "REC" button  in the main screen and the following is shown.



Click "OK" to select a destination to save the file.

Status display changes from "READY" to "WAITING" and the trigger is waited.

5 If start trigger works, status display changes to "REC" and logging process starts. In case that the trigger does not work even though time limit (in this case, time limit is 10 sec.) has come, status changes to "TIMEOVER" and logging process stops.

Data logging function

6

In case of aborting logging process, click "STOP" button . Status display changes from "REC" to "READY". Data which is before stop of logging is saved into the data file.

7

When the trigger works, the logging data will be saved automatically and the next logging process will start. The number of save generations is eight, and when making the ninth file, the first file is overwritten.

-> Refer to "Logging by manual start (repeat measurement)" in P61

Data logging function

Configurable sampling time, sampling frequency and maximum measurement time by each unit are shown as follows.

| Sampling time | Sampling frequency | Maximum measurement time | | | |
|---------------|--------------------|--------------------------|--------|-------|--------|
| | | [ms] | [sec] | [min] | [hour] |
| 10us | 100KSa/s | 10,737,418 | 10,737 | 178 | 2 |
| 20us | 50KSa/s | 21,474,836 | 21,474 | 357 | 5 |
| 50us | 20KSa/s | 53,687,091 | 53,687 | 894 | 14 |
| 100us | 10KSa/s | 86,400,000 | 86,400 | 1,440 | 24 |
| 200us | 5KSa/s | 86,400,000 | 86,400 | 1,440 | 24 |
| 500us | 2KSa/s | 86,400,000 | 86,400 | 1,440 | 24 |
| 1ms | 1KSa/s | 86,400,000 | 86,400 | 1,440 | 24 |
| 2ms | 500Sa/s | 86,400,000 | 86,400 | 1,440 | 24 |
| 5ms | 200Sa/s | 86,400,000 | 86,400 | 1,440 | 24 |
| 10ms | 100Sa/s | 86,400,000 | 86,400 | 1,440 | 24 |
| 20ms | 50Sa/s | 86,400,000 | 86,400 | 1,440 | 24 |
| 50ms | 20Sa/s | 86,400,000 | 86,400 | 1,440 | 24 |
| 100ms | 10Sa/s | 86,400,000 | 86,400 | 1,440 | 24 |
| 200ms | 5Sa/s | 86,400,000 | 86,400 | 1,440 | 24 |
| 500ms | 2Sa/s | 86,400,000 | 86,400 | 1,440 | 24 |
| 1s | 1Sa/s | 86,400,000 | 86,400 | 1,440 | 24 |
| 2s | 0.5Sa/s | 86,400,000 | 86,400 | 1,440 | 24 |
| 5s | 0.2Sa/s | 86,400,000 | 86,400 | 1,440 | 24 |



Setting of sampling time

- When mode is switched from oscilloscope mode to data logger mode with setting sampling frequency above 100KSa/S in oscilloscope mode, sampling frequency is automatically set to 100KSa/s (10μsec).
- In case that the free space of destination drive is less than 100MB, measurement cannot be done.

Data logging function

Status display and its status are shown below.

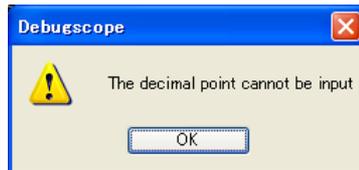
| Status display | Status |
|----------------|---|
| READY | Before starting data logging |
| REC | In process of data logging |
| WAITING.. | It is status of waiting start trigger after "REC" button  is clicked when the setting of "Logging pattern" is "Start trigger" or "Start & end trigger". |
| TIME OVER | <p>When followings are occurred, this status is shown.</p> <ol style="list-style-type: none"> 1. Start trigger does not work within time limit when the setting of "Logging pattern" is "Start trigger" and time limit is valid. (it is ticked) 2. Start trigger does not work within time limit when the setting of "Logging pattern" is "Start & end trigger" and time limit is valid (it is ticked). 3. Data is not collected completely. <ul style="list-style-type: none"> * If data is not collected completely, the saved data file cannot be read by the data analysis software. |
| COLLAPSE | <p>This status is shown where there is something wrong with the main body.</p> <p>When this status is shown, terminate the software and turn off the power for the main body. Check the setting condition and contact distributors.</p> <p>* If this status is shown, the saved data file cannot be read by the data analysis software.</p> |

Data logging function

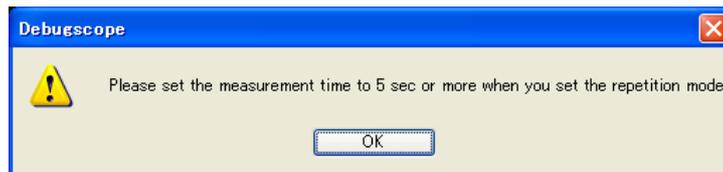
Alarm, error (Data logger function)

When the following alarm is shown, check the setting.

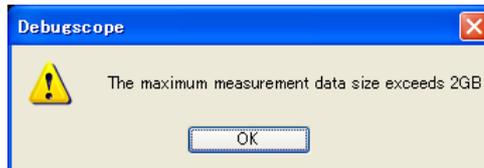
- If decimal point is input into text box of measurement time or time limit, the following alarm is shown.
Integer should be input into text box.



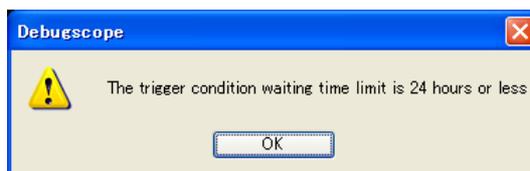
- If "Logging pattern" is "Measurement time", "Repeat measurement" is valid, and "Measurement time" is set to less than 5[sec], the following alarm is shown.
The measurement time should be set to 5[sec] or more.



- When the measurement time exceeds the maximum measurement time, the following alarm is shown. Confirm the settings of the measurement time and the sampling time.

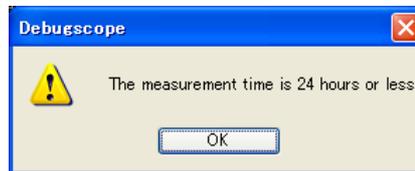


- If "Logging pattern" is "Start trigger" or "Start & end trigger", time limit is valid (time limit is ticked) and more than 24[hour] is set, the following alarm is shown.
Time limit should be set to 24[hour] or less.



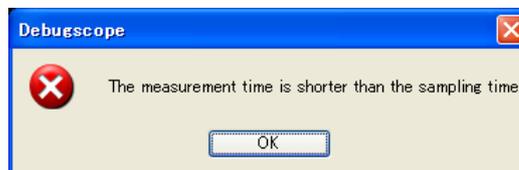
Data logging function

- If "Logging pattern" is "Measurement time" or "Start trigger", 50[us] or slower sampling time is set and "Measurement time" is set to more than 24[hour], the following alarm is shown.
The measurement time should be set to 24[hour] or less.



When the following error is shown, check setting and free space of destination.

- If measurement time is shorter than sampling time, the following error is shown.
Set longer measurement time than sampling time.



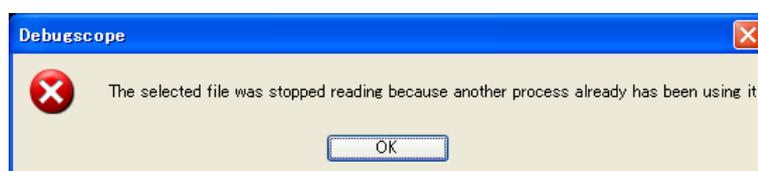
- If free space of destination drive is less than 100MB, the following error is shown.
Increase free space to more than 100MB or save the data into another drive.



- Size of data file by data logging is larger than free space of destination drive, the following error is shown. Save the data into another drive.



- If the same file name as the name of data file which is being opened or edited by the data analysis software is designated, the following error is shown. Designate the different file name.



Data logging function

- If the power for the main body is shut down or the USB cable is disconnected during data logging, the following error is shown. Reboot the software and the main body. In this case, data file is generated but it cannot be read by the data analysis software.



- * When an error, such as shutdown of the power supply of PC, other than the above happens, the extension is not attached to the data file. Delete the file.

Pre-trigger function

Pre-trigger is function to measure data before and after trigger signal.

Pre-trigger can do logging faster than "Data logging function" -> Refer to "Data logging function" in P58 because data is saved into the built-in memory of the main body.

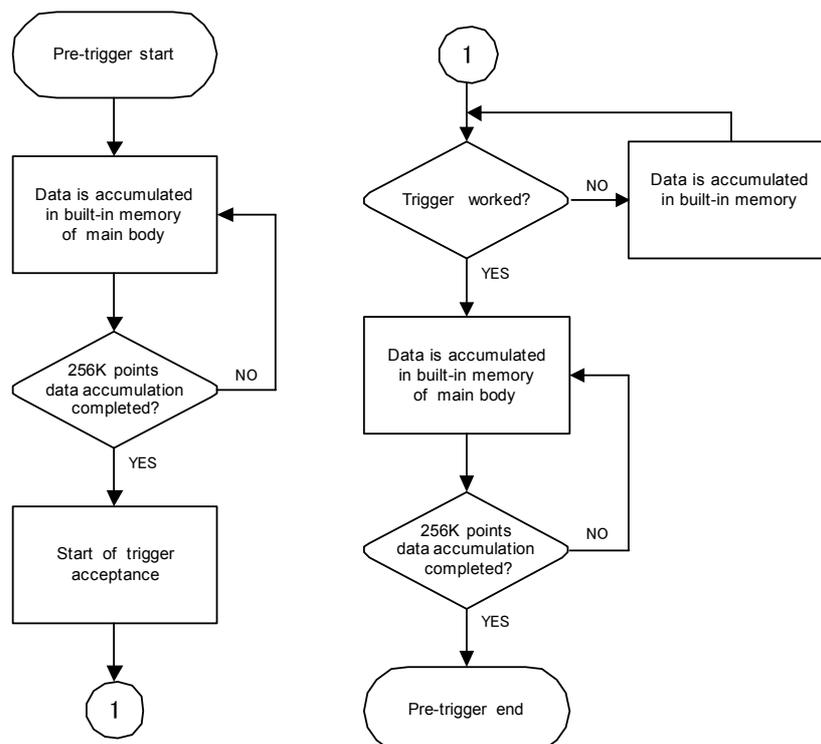
- Maximum sampling frequency : 2MS/s(500nsec)
- Maximum record length : 512K points per channel
 * 1K point = 1024 points In fact, 524,288-point data can be recorded.
- Trigger type for CH1, CH2 and EXT can be selected like oscilloscope.

After measurement is started, the main body and PC can be separated. After data is saved into the built-in memory, connect USB to PC, and the recorded data in the memory can be written out to file.

* Saved data can be replayed by the data analysis software (refer to the attached Data analysis software Manual).

Pre-trigger operates in the following order. (Refer to the figure below)

- After pre-trigger starts, 256K points data are accumulated.
- The trigger is not accepted until the data of 256K points are accumulated.
- If 256K points are accumulated, the trigger acceptance starts.
- While waiting for trigger, data is accumulated in order.
- When the trigger works, 256K points data are accumulated and pre-trigger ends.
- Data which consists of 256K points before and after the position in which the trigger worked is saved in built-in memory of main body. Data before it is deleted.



Pre-trigger function

Explanation of pre-trigger screen

1 Set voltage range, time range and trigger level to be measured by oscilloscope mode.

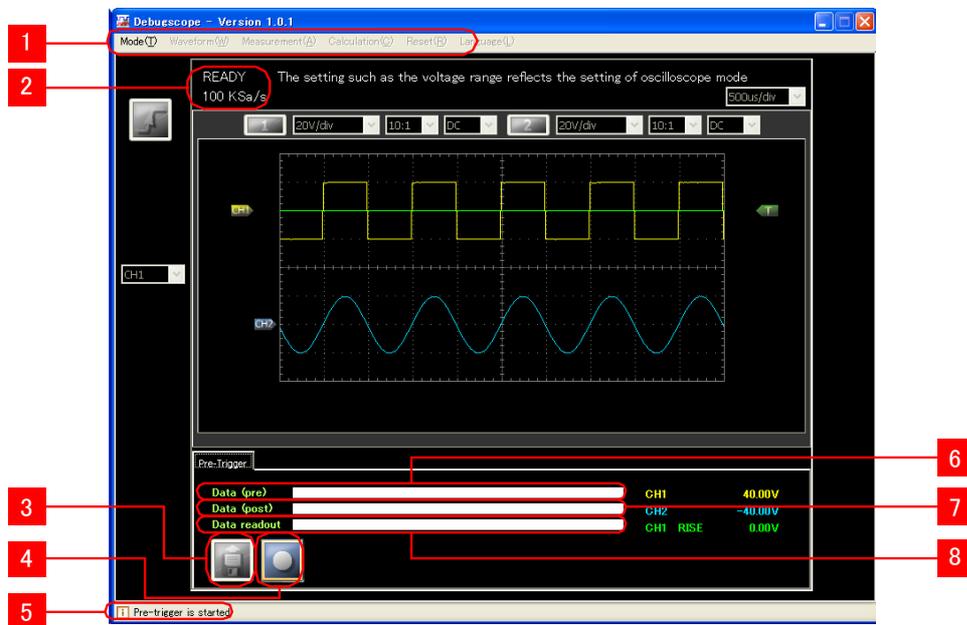
-> Refer to "Measurement of signal" in P38

- Trigger level :0.00V
- Trigger CH :CH1
- Trigger edge :RISE
- Time range :500us/div

* Range and trigger cannot be changed in pre-trigger mode.

Setting of range and trigger should be made by oscilloscope mode.

2 Click "Mode" -> "Pre-trigger" in Menu



- | | |
|--|---|
| <p>1 • Menu Switch modes and termination of the software</p> <p>2 • Status display Display sampling frequency and status of measurement</p> <p>3 • Reading of data Read data which is gathered in the memory of the main body and save it into the file</p> <p>4 • "Monitoring start"/"Monitoring stop" Start monitoring/Stop monitoring</p> | <p>5 • Hint Explain buttons</p> <p>6 • Progress bar of trigger acceptance Show progress until trigger waiting status</p> <p>7 • Progress bar of data Show progress from inputting the trigger to saving data</p> <p>8 • Progress bar of reading data Show progress of reading of data</p> |
|--|---|

Pre-trigger function

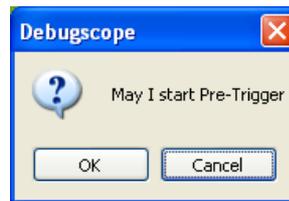
Setting of pre-trigger

Setting of pre-trigger

1

Click "Monitoring start" button .

When the following is shown, click "OK".

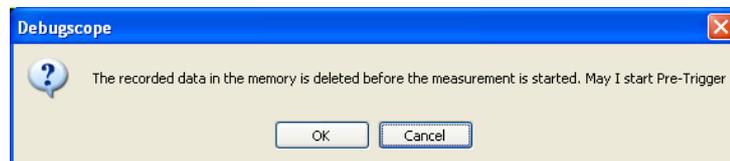


* If there is data which was monitored last time (when  is valid), the following is shown.

Click "OK" and data which was monitored last time is deleted, and monitoring is started.

(If "OK" is once clicked, data which was monitored last time cannot be read.)

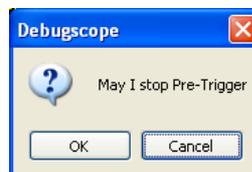
If "Cancel" is clicked, monitoring is not started.



In case of aborting measurement, click .

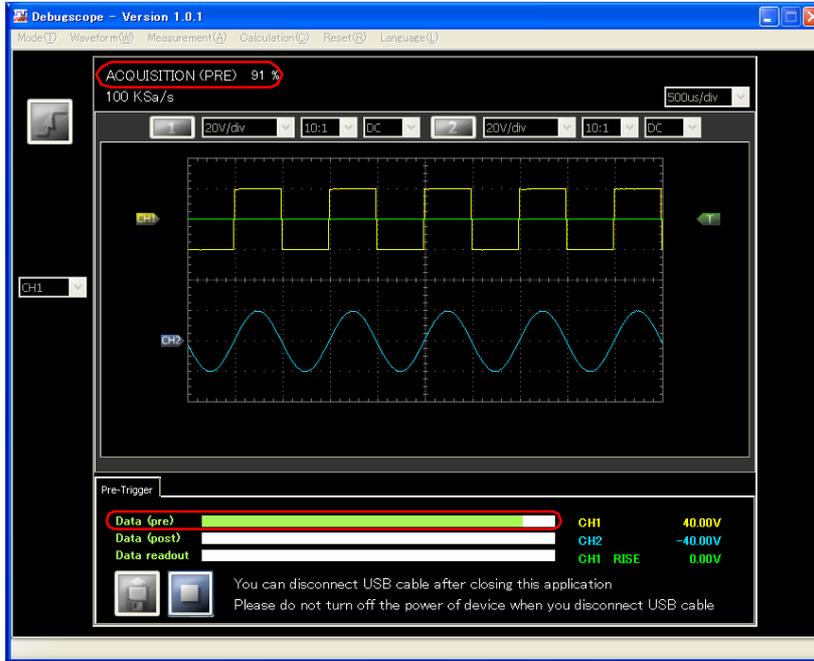
The following message is shown and when click "OK", monitoring is stopped.

If "Cancel" is clicked, monitoring is continued.

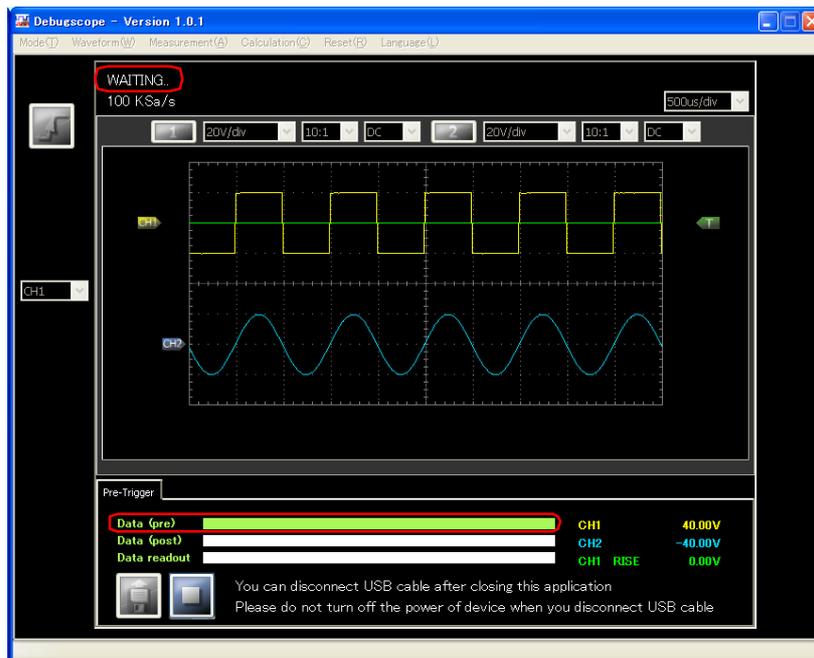


Pre-trigger function

- During pre-trigger, communication between the main body and PC can be disconnected.
 -> Refer to "Disconnect communication with PC" in P86
- Status display changes from "READY" to "AQUISITION(PRE)".
- The trigger is not accepted until percentage next to status becomes 100%.

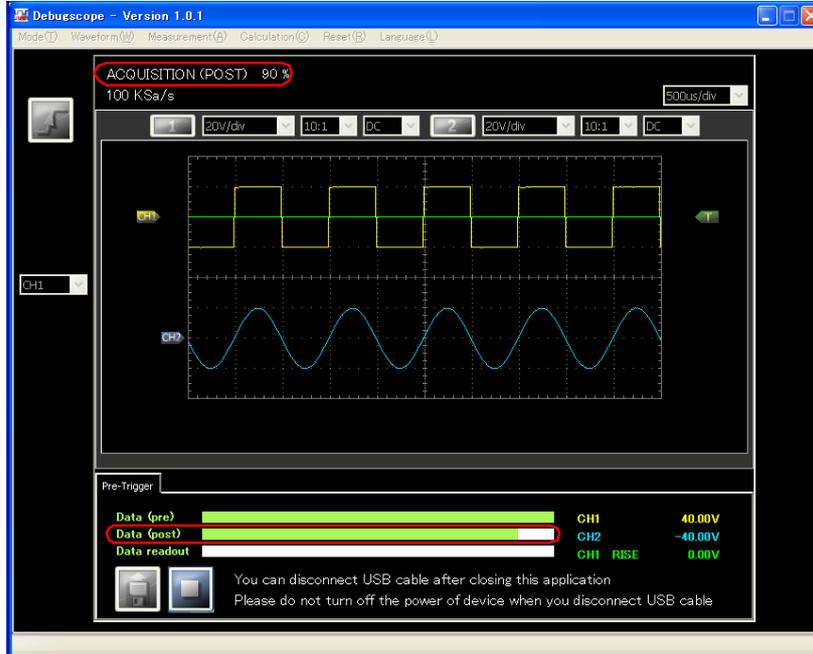


- When percentage becomes 100% (maximum of progress bar of Data(pre) in "Pre-trigger" tab), status display changes to "WAITING.." and turns to status of waiting the trigger.

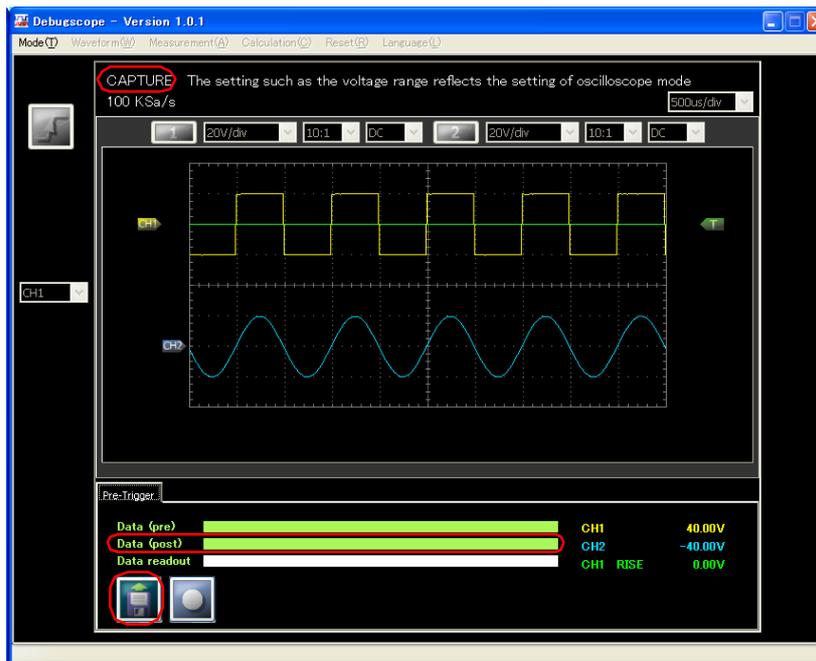


Pre-trigger function

- When the trigger works, status display changes from "WAITING.." to "AQUISITION (POST)". Data is gathered until percentage next to status becomes 100%.



- When percentage becomes 100% (maximum of progress bar of Data (post) in "Pre-trigger" tab), status display changes to "CAPTURE" and "Reading of data" button  is valid.



Pre-trigger function

Indicator LED when pre-trigger operates

Green LED usually lights when the power of the main body is turned on. However, during pre-trigger mode, operation is varied in accordance with status described in following table.

| Status of green LED | Status display | Description |
|------------------------|------------------|--|
| Blinking at high speed | AQUISITION(PRE) | From monitoring start to waiting trigger |
| Blinking at low speed | WAITING.. | From waiting trigger to inputting trigger |
| Blinking two times | AQUISITION(POST) | From inputting trigger to gathering data |
| Lighting | CAPTURE | Completion of gathering data Data can be read |

Time to become "Waiting trigger"

The trigger cannot be accepted between "Monitoring start" to "Waiting trigger" (Status display is AQUISITION(PRE)).

Time to become "Waiting trigger" (Status display is "WAITING..") is varied in accordance with time range (sampling frequency). The following table shows time from "Monitoring start" to "Waiting trigger".

| Sampling frequency | Time range | Time to "Waiting trigger" | Time from inputting trigger to gathering data |
|--------------------|------------|---------------------------|---|
| 2MSa/s | 25us/div | 0.128sec | 0.128sec |
| 1MSa/s | 50us/div | 0.256sec | 0.256sec |
| 500KSa/s | 100us/div | 0.512sec | 0.512sec |
| 200KSa/s | 250us/div | 1.28sec | 1.28sec |
| 100KSa/s | 500us/div | 2.56sec | 2.56sec |
| 50KSa/s | 1ms/div | 5.12sec | 5.12sec |
| 20KSa/s | 2.5ms/div | 12.8sec | 12.8sec |
| 10KSa/s | 5ms/div | 25.6sec | 25.6sec |
| 5KSa/s | 10ms/div | 51.2sec | 51.2sec |
| 2KSa/s | 25ms/div | 128sec | 128sec |
| 1KSa/s | 50ms/div | 256sec | 256sec |
| 500Sa/s | 100ms/div | 512sec | 512sec |
| 200Sa/s | 250ms/div | 1280sec | 1280sec |
| 100Sa/s | 500ms/div | 2560sec | 2560sec |
| 50Sa/s | 1s/div | 5120sec | 5120sec |
| 20Sa/s | 2.5s/div | 12800sec | 12800sec |
| 10Sa/s | 5s/div | 25600sec | 25600sec |
| 5Sa/s | 10s/div | 51200sec | 51200sec |

In the sampling frequency below 50KSa/s (time range : 1ms/div), the use of data logger mode is practicable.

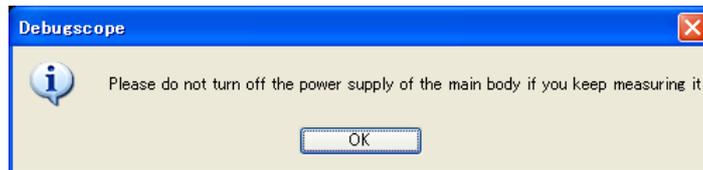
Pre-trigger function

Disconnect communication with PC

After "Monitoring start" button is clicked, the main body can be disconnected from PC. Even though after USB is disconnected, the status of "Waiting trigger" are kept, and data is recorded in the built-in memory when the trigger works.

Method to disconnect communication between the main body and PC

- 1 After click "Monitoring start" button , click  in upper right of the software..
The following message is shown.
Click "OK" and terminate the software.



- 2 Remove the USB cable.

Note

- If the power of the main body is turned off, "Pre-trigger setting" such as voltage range and trigger level, and data which was recorded in the built-in memory are lost.
- There is a possibility to causes false operation or breaking data by impact or noise. Therefore, the USB cable should be removed carefully.
- Once the above mentioned situation occurred, pre-trigger functions cannot work until setting is made by the software again.

Pre-trigger function

Reading of data from built-in memory

After data is acquired, data can be read from the built-in memory in the main body.

Method to read data

1 If the main body is disconnected from PC in accordance with **"Disconnect communication with PC"** in **P86**, connect the main body to PC by USB.

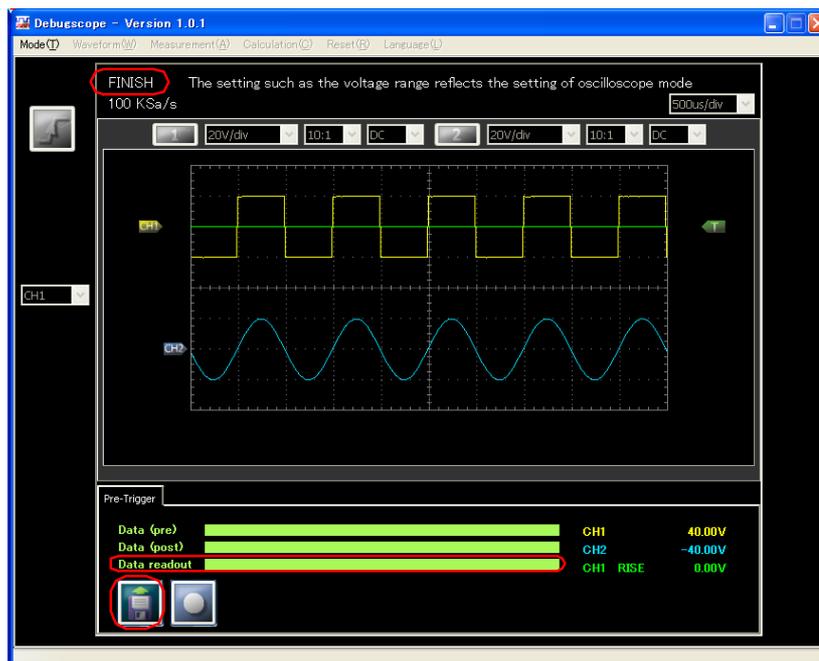
Check the status of LED light and status display of the software, and make sure that the main body is in "Completion of data recording" status.

- LED in main body: LED (green) is lit.
- Status display : "CAPTURE" is shown.



2 Click "Reading of data" button , and select a destination and file name. Data is transferred from the main body to PC.

When saving file is completed (maximum of progress bar of Data (readout) in "Pre-trigger" tab), status display turns to "FINISH" and data transfer is completed.



Pre-trigger function



Note

- During data transfer, USB cable should not be taken out or put in, and the power of the main body should not be turned off.
- Use the hard disk of the PC which is being used as a destination where data is saved. Data may not be saved properly if external record medium is used to save data.



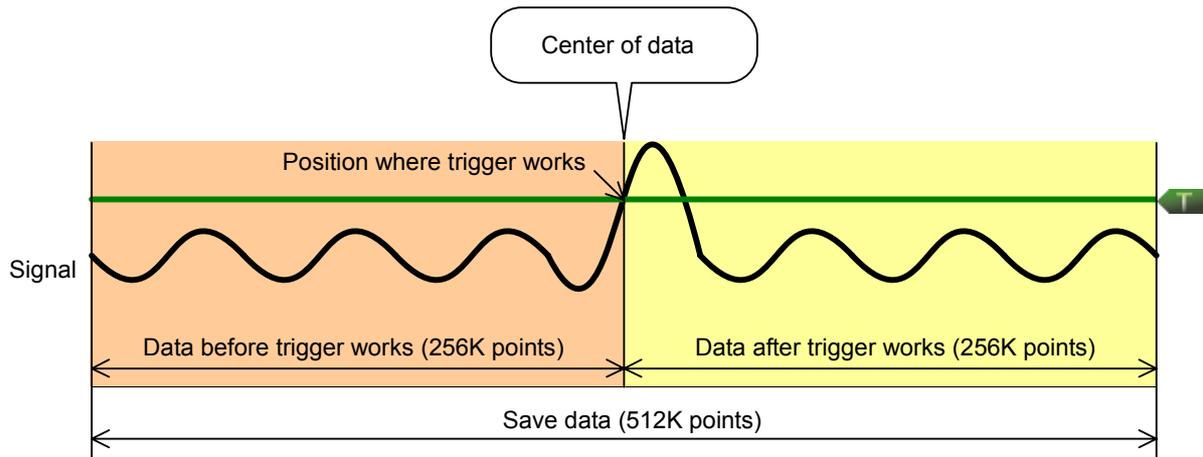
Data in memory

- Data cannot be read if monitoring is stopped in the middle of process or the power of the main body is turned off.
- In case that data is overwritten, data which was previously recorded cannot be read.

Pre-trigger function

Pre-trigger data

Pre-trigger data is 512K points data which consists of 256K points before and after the position in which the trigger worked.

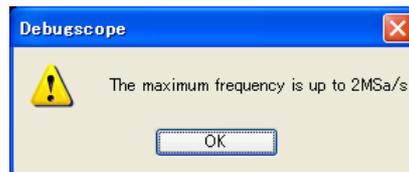


Pre-trigger function

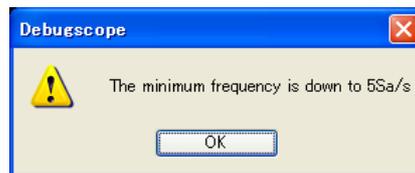
Alarm, error (Pre-trigger function)

When the following alarms are shown, check setting.

- If mode is changed to pre-trigger mode with setting to sampling frequency over 2MSa/s in oscilloscope mode, the following alarm is shown and sampling frequency is automatically set to 2MSa/s. Maximum sampling frequency in pre-trigger function is 2MSa/s. Sampling frequency over 2MSa/s cannot be set.

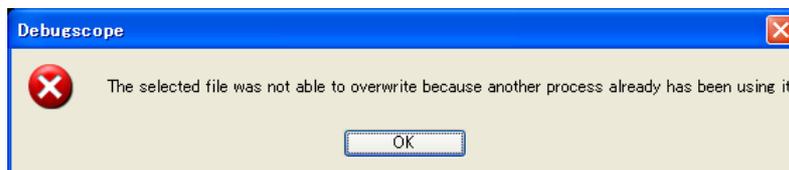


- If mode is changed to pre-trigger mode with setting to sampling frequency less than 5MSa/s in data logger mode, the following alarm is shown and sampling frequency is automatically set to 5Sa/s. Minimum sampling frequency in pre-trigger function is 5Sa/s. Sampling frequency below 5Sa/s cannot be set.



Please note that in case that the following error is shown, data file is not generated.

- When a file which has been opened by the data analysis software or the editor software, etc. is trying to be overwritten, the following error is shown. File name should be changed.



- If the USB cable is taken out when pre-trigger data is being read or the power of the main body is turned off, the following error is shown. If this error is shown, data file is not generated. Click  and reboot.



Calculation function

Calculation function

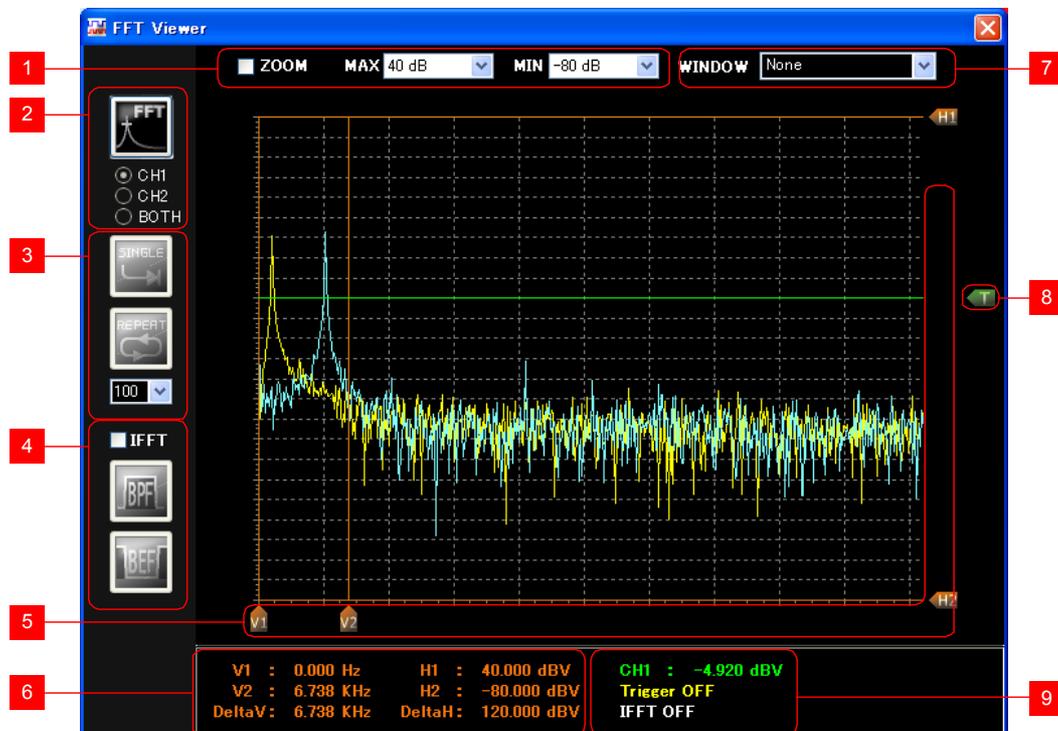
Use of FFT

Measured waveform is calculated by FFT, and shown in spectral display.

- Number of display data :512 points (FFT calculation is performed using 1024 points and the results shows spectrum up to Nyquist frequency)
- Window function : None • Hanning • Hamming • Blackman • Blackman-Harris • flat-top

Operation procedure

Click "Calculation" -> "FFT" in menu. Or hold "Shift" and press "F9" in the main screen and FFT is shown.



- | | |
|--|--|
| <p>1 • Zoom control and Vertical range Set the zoom and the maximum and the minimum value of spectrum axis.</p> <p>2 • "FFT trigger" button Set FFT trigger channel and ON/OFF.</p> <p>3 • FFT trigger type Set single/repeat mode and the number of repeats.</p> <p>4 • IFFT and FFT filter Set ON/OFF of IFFT and the FFT filter.</p> <p>5 • Cursor Measurement is done with using this cursor.</p> | <p>6 • Cursor display Frequency and the value of spectrum are shown.</p> <p>7 • Window function Set window function.</p> <p>8 • FFT trigger position Set FFT trigger position.</p> <p>9 • Setting display Show FFT trigger position, ON/OFF of FFT trigger and ON/OFF of IFFT.</p> |
|--|--|

Calculation function

Setting of window function

FFT window function is switched by "WINDOW" list box in FFT display.

Type of window function :None•Hanning•Hamming•Blackman•Blackman-Harris•flat-top

Zooming graph / Release of zoom

The graph is zoomed by dragging the mouse in the direction of lower right within the graph area after ticking "zoom" checkbox. Zoom is released by unticking "zoom" checkbox or dragging the mouse in the direction of lower left within the graph area.



The maximum and the minimum value of the spectrum axis cannot be changed while zooming.

Maximum/Minimum value of spectrum axis

The table below shows the maximum/minimum value of a spectrum axis.

| Input type | Probe | Accelerometer/Microphone |
|---------------|----------------------------------|--------------------------------|
| Step | 10dB | 10dB |
| Maximum range | -20dB to 40dB (Default 40dB) | 100dB to 160dB (Default 160dB) |
| Minimum range | -120 dB to -60dB (Default -80dB) | 0 dB to 60dB (Default 40dB) |

Calculation function

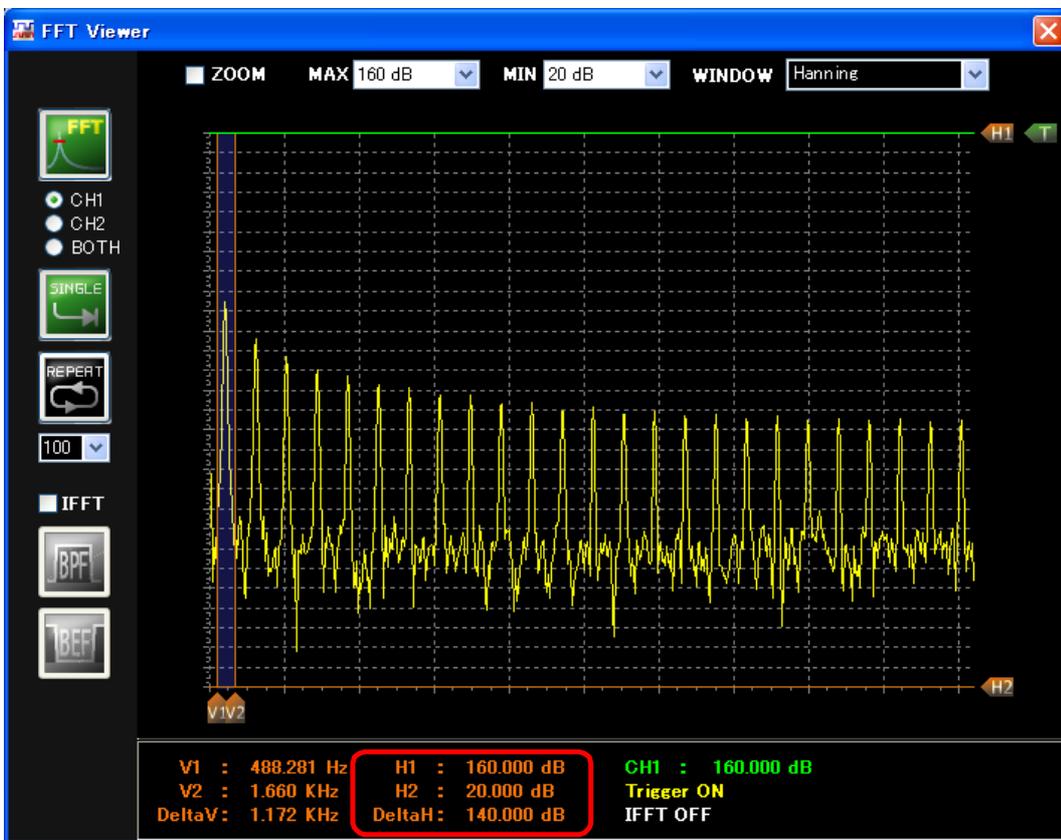
Measurement by cursor

Frequency and spectrum value are measured by cursor. -> Refer to "Use of cursor" in P49

The table below shows the display units on the spectrum value (decibel).

| | | |
|---------------|-------|--------------------------|
| Input type | Probe | Accelerometer/Microphone |
| Display units | dBV | dB |

The figure below shows the FFT viewer screen when using the microphone input.



Calculation function



Automatic measurement when FFT is displayed

- When FFT is displayed, "FPEAK" (peak frequency) and "FFTMAX" (peak level) of automatic measurement function are shown.

| Measurement | | Markers | | | | | |
|-------------|--------|---------|----------|------|--------|--------|----------|
| MAX | 2.19V | FPEAK | 976.56Hz | MAX | 2.00V | FPEAK | 976.56Hz |
| MIN | -2.13V | FFTMAX | 14.343dB | MIN | -2.00V | FFTMAX | 13.682dB |
| P-P | 4.31V | | | P-P | 4.00V | | |
| RMS | 2.12V | | | RMS | 1.97V | | |
| MEAN | 0.00V | | | MEAN | 0.00V | | |
| AVG | 0.02V | | | AVG | 0.07V | | |



CSV file output when FFT is displayed

- If CSV file is output when FFT is displayed, frequency (FREQ[KHz]) and spectrum level (decibel value) are output.

Calculation function

Use of IFFT (inverse FFT)

IFFT (inverse transform of FFT) can be calculated if tick the "IFFT" checkbox in FFT display. FFT filter function in which cutoff frequency can be set by cursor operation is available. FFT viewer screen and the main screen are used when FFT filter function is used.

Usage example of Band-Pass Filter (BPF)

The following is an example of extracting basic frequency (1KHz) from square wave with 1KHz.

- 1 Measure square wave with 1KHz.



- 2 Click "Calculation" -> "FFT" in menu to show FFT.
- 3 Tick "IFFT" checkbox and click "BPF" button .
 - Window function is automatically set to "Hamming".

Calculation function

4

Sandwich a part of spectrum in square wave by vertical cursors V1 and V2 as shown below.

- Cursor V1 :488.281Hz
- Cursor V2 :1.660KHz



5

Extract the frequency range which is sandwiched by cursor V1 and V2 to perform inverse transform of FFT.

The result of inverse transform is shown in the main screen.

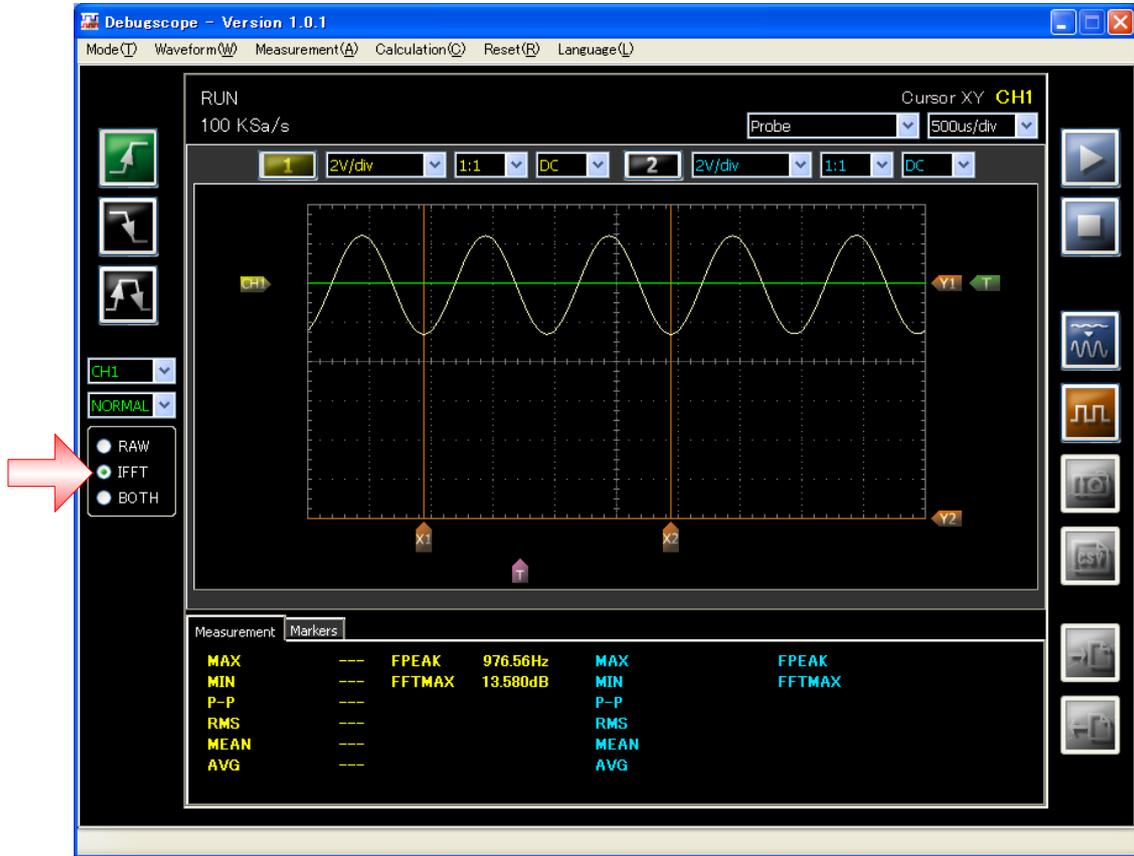
Radio button  in the following page can set to display waveform in the main screen.

Setting and displayed waveform are shown in the following table.

| Setting | Displayed waveform |
|---------|--|
| RAW | Only measured waveform is shown. |
| IFFT | Only waveform which was performed IFFT is shown. |
| BOTH | Both measured waveform and waveform of IFFT are shown. |

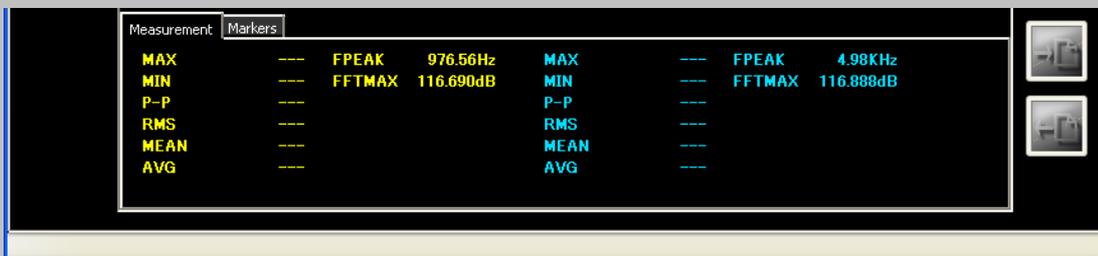
Calculation function

The figure below shows the waveform after inverse transform of FFT.



Automatic measurement when FFT filter is used

When IFFT or BOTH is selected by Waveform selection, the measurements other than the frequency are not performed.

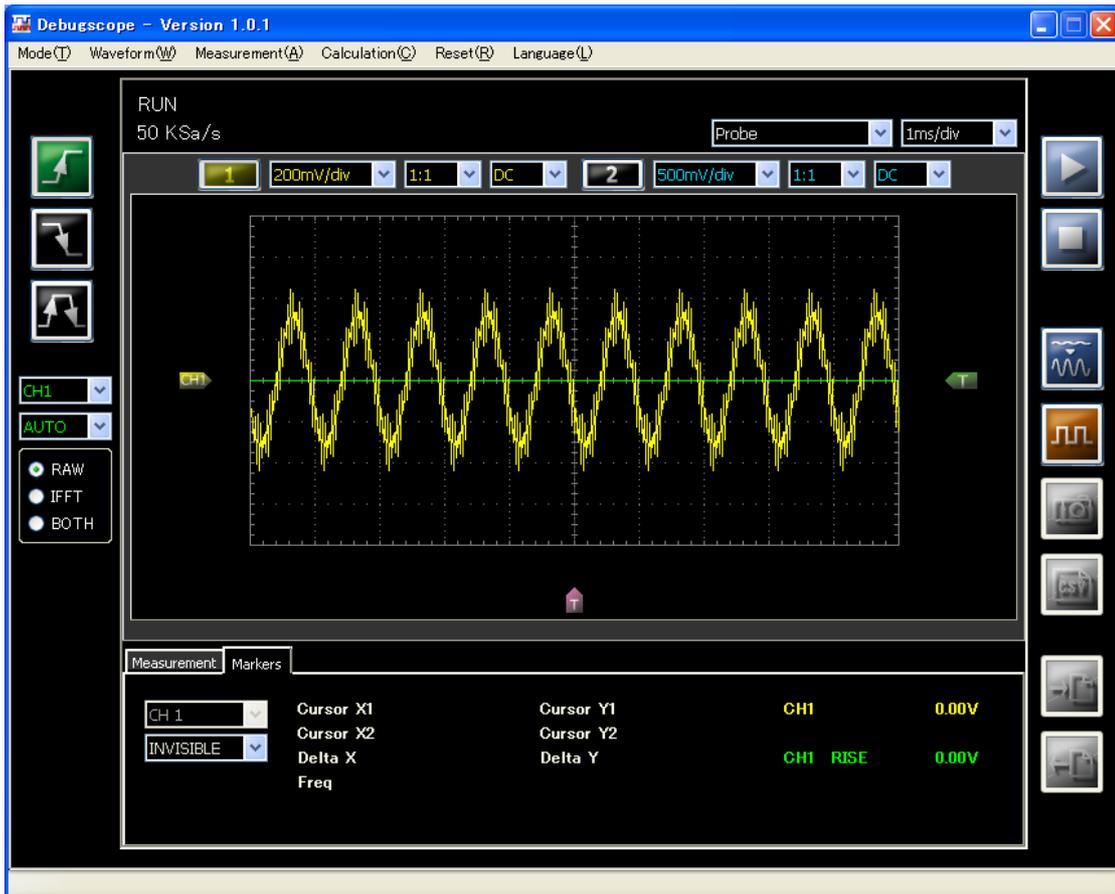


Calculation function

Usage example of Band Eliminate Filter (BEF)

The following is an example of removing the noise signal from the sine wave of 1KHz which the 22kHz noise signal superimposed.

1 The figure below shows the measured waveform.



2 Click "Calculation" -> "FFT" in menu to show FFT.

3 Tick "IFFT" checkbox and click "BEF" button .

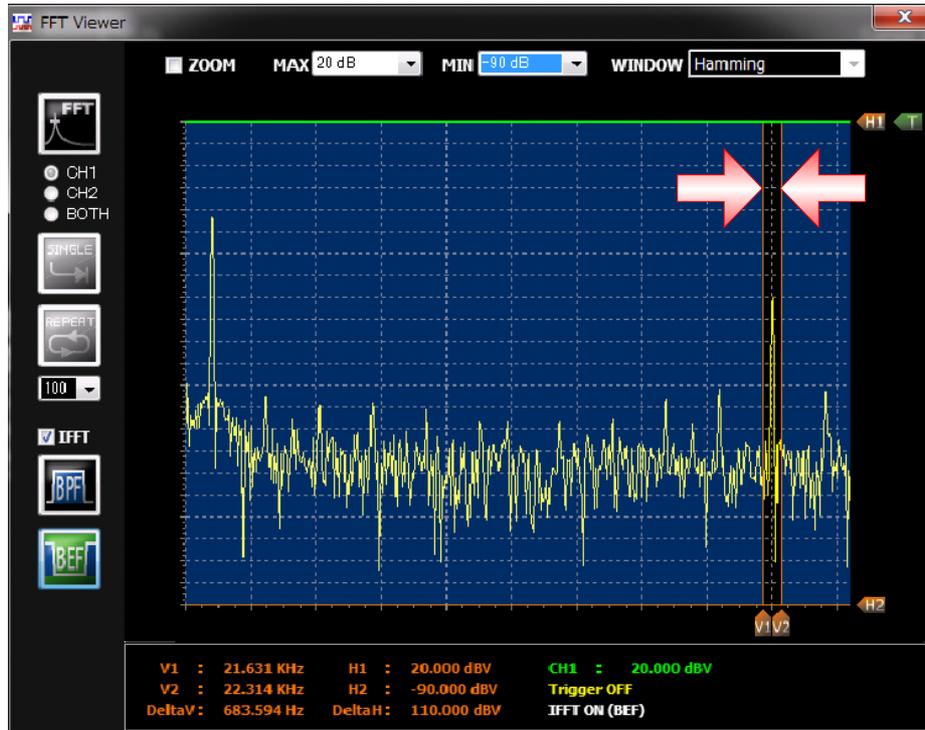
* Window function is automatically set to "Hamming".

Calculation function

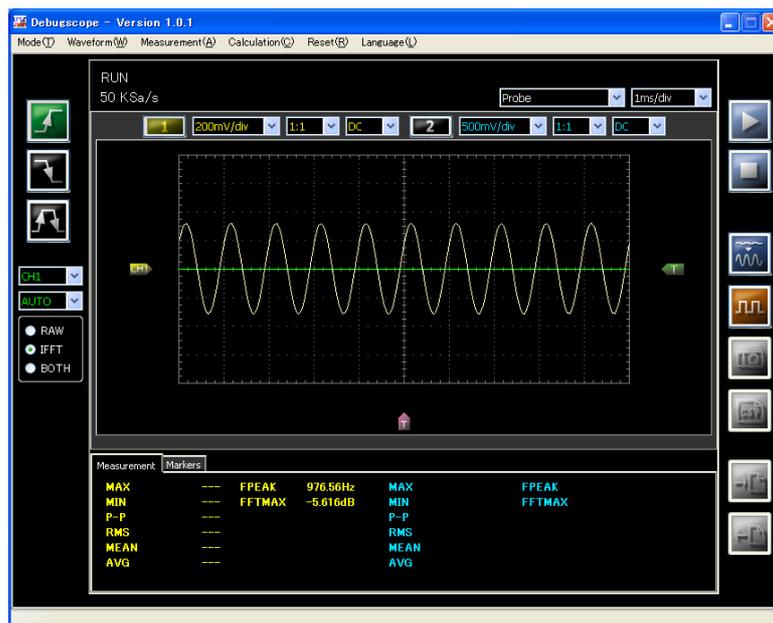
4

Sandwich a part of spectrum in square wave by vertical cursors V1 and V2 as shown below.

- Cursor V1 :21.631KHz
- Cursor V2 :22.314KHz



The figure below shows the waveform after inverse transform of FFT.



Calculation function

Use of FFT trigger (Single mode)

FFT trigger monitors the spectrum level within the frequency range to be designated.
 If FFT trigger is used, the trigger can be worked for signal waveform which has specific frequency.

Use of FFT trigger (single mode)

The following is an example to monitor approximately 1.2KHz spectrum and when setting level is exceeded, get the trigger to work.

- 1 A normal signal waveform is measured by CH1. (peak frequency about 400Hz)



- 2 Click "Calculation" -> "FFT" in menu to show FFT viewer.

Calculation function

3

Set the area where trigger monitoring is performed.

Sandwich frequency range which is monitored by vertical cursors V1 and V2 as shown below.

Set trigger cursor to any value.

Vertical cursor

- Cursor V1 :1.094KHz
- Cursor V2 :1.299KHz

Trigger cursor

- Trigger level :-25.000dBV



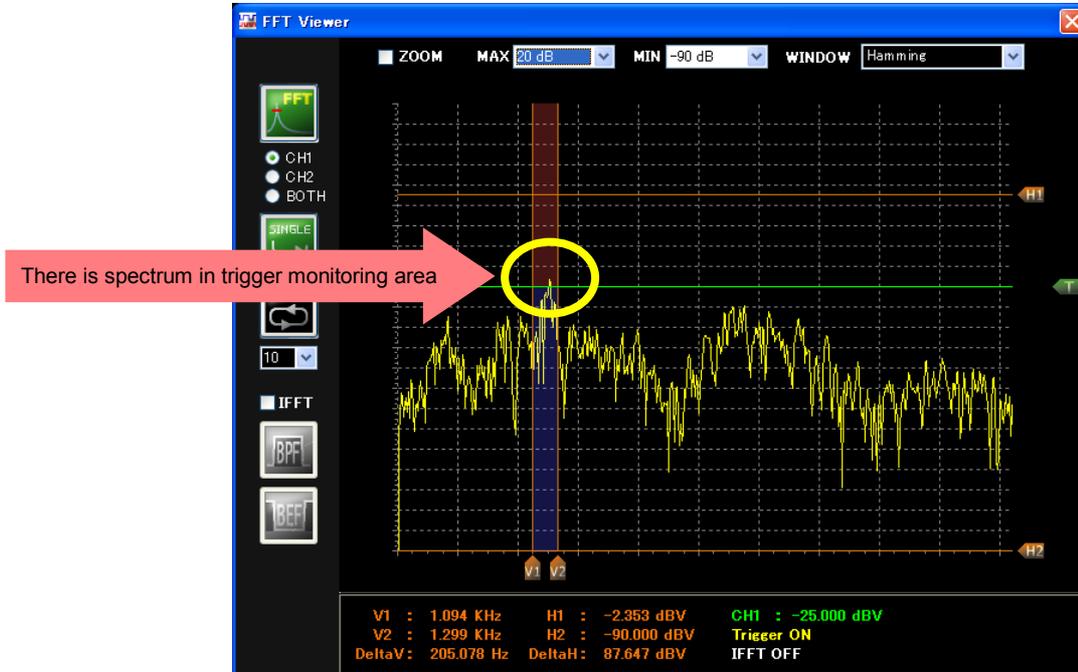
4

Click FFT trigger button , tick "CH1" radio button, and then click single mode button . When "Trigger ON" is displayed, trigger monitoring starts.

Spectrum shown in the above figure is not in the red region, therefore, the trigger does not work at this point.

Calculation function

- When spectrum is detected in trigger monitoring area, status turns to "CAPTURE" and waveform stops.



The following shows the waveform when FFT trigger worked.



Calculation function

Use of FFT trigger (Repeat mode)

FFT trigger monitors the spectrum level within the frequency range to be designated.

If FFT trigger is used, the trigger can be worked for signal waveform which has specific frequency.

When the FFT trigger repeat mode is set, the measured data (waveform data of a time domain and a frequency domain) is saved in CSV format whenever it exceeds the FFT trigger level setting.

Use of FFT trigger (repeat mode)

The following is an example to monitor approximately 1.2KHz spectrum and when setting level is exceeded, get the trigger to work.

- 1 A normal signal waveform is measured by CH1. (peak frequency about 400Hz)



- 2 Click "Calculation" -> "FFT" in menu to show FFT viewer.

Calculation function

3

Set the area where trigger monitoring is performed.

Sandwich frequency range which is monitored by vertical cursors V1 and V2 as shown below.

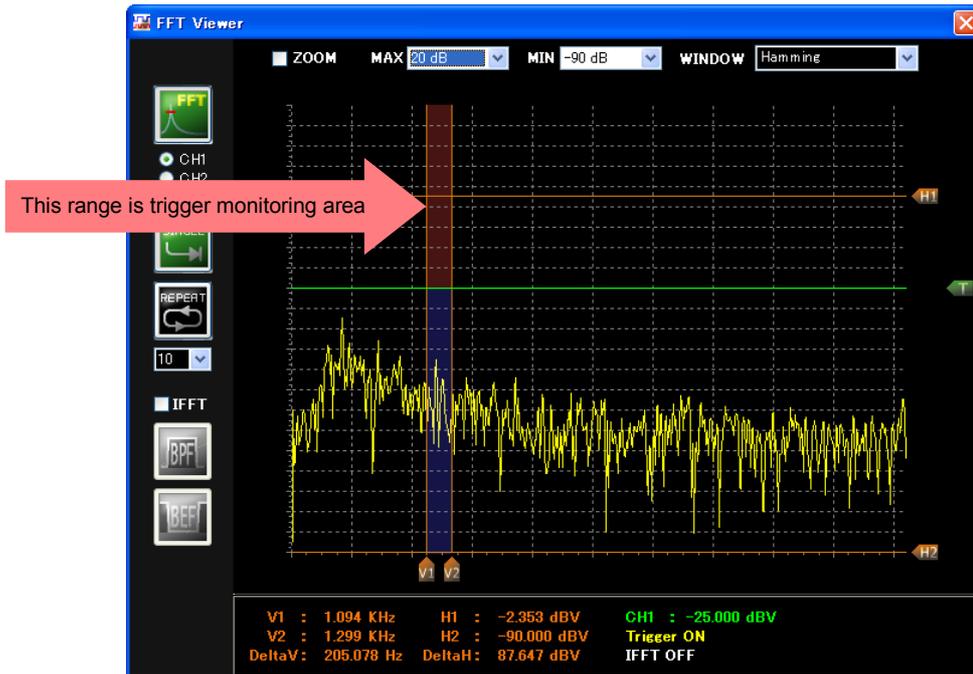
Set trigger cursor to any value.

Vertical cursor

- Cursor V1 :1.094KHz
- Cursor V2 :1.299KHz

Trigger cursor

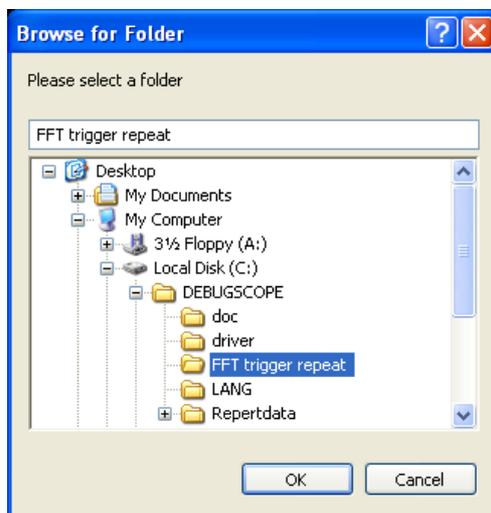
- Trigger level :-25.000dBV



4

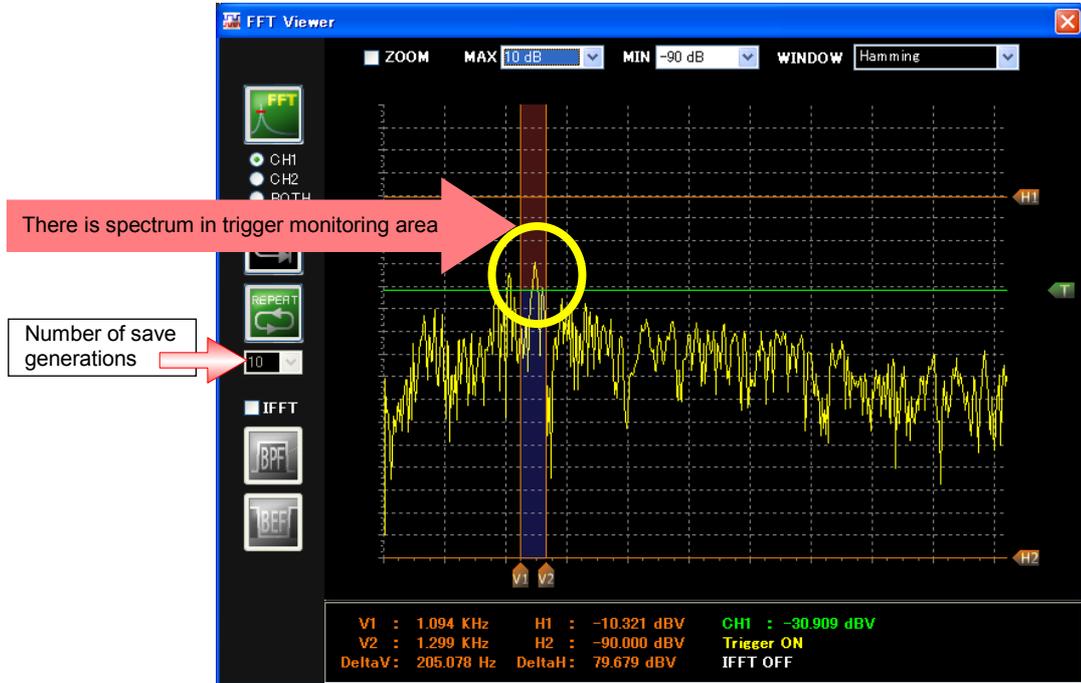
Click FFT trigger button . Tick "CH1" radio button and then click repeat mode button  to show the folder specification screen.

Specify a destination folder and click [OK] button. Then, trigger monitoring starts.



Calculation function

- 5 When spectrum is detected in trigger monitoring area, the measured data is automatically saved in CSV file. Status is still "RUN". The measurement restarts automatically after CSV file is saved.



- 6 In order to escape from the repeat mode, click FFT trigger single mode button  to switch to single mode, or click FFT trigger button to terminate the FFT trigger process.

- 7 The number of save generations can be selected from among the following four choices. The setting is performed by the combo box under the repeat mode button .

| | |
|----------------------------|--------------|
| Number of save generations | 10、20、50、100 |
|----------------------------|--------------|

Calculation function

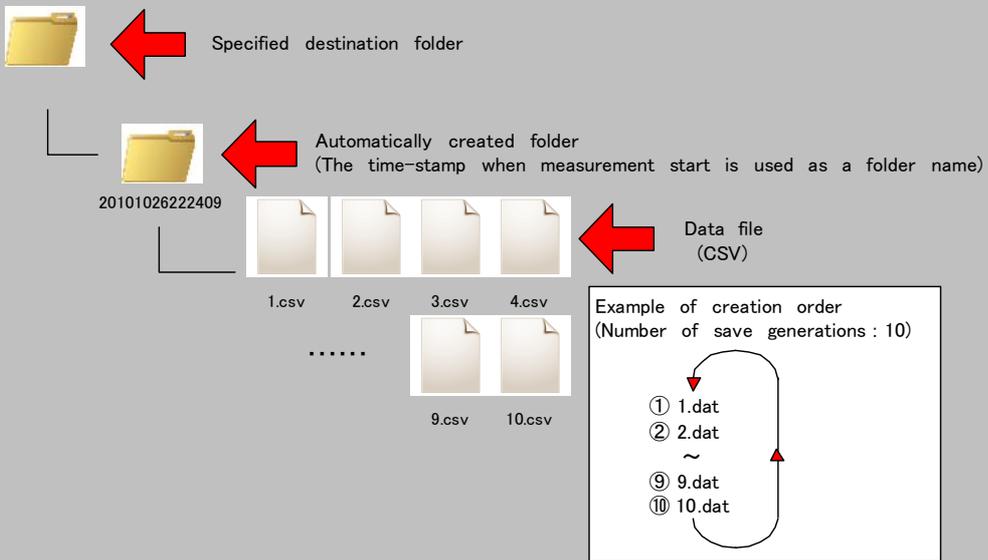


Destination to save data file in repeat mode

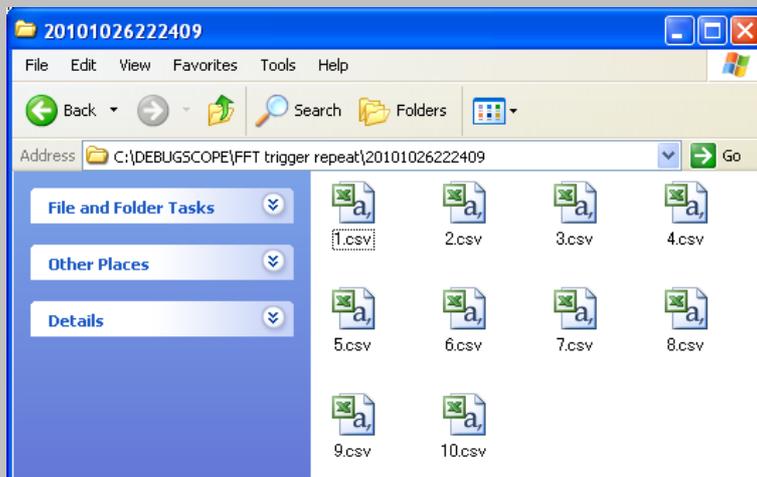
Select the folder to save and click the "OK" button before starting a repeat measurement. The data file is generated automatically as follows.

e.g.) Example of specifying folder "C:\DEBUGSCOPE\FFT trigger repeat"

When the date and time when the measurement was started are "October 26th 2010, 22:24:09".



The data file is saved as follows.



Calculation function

Use of X-Y display

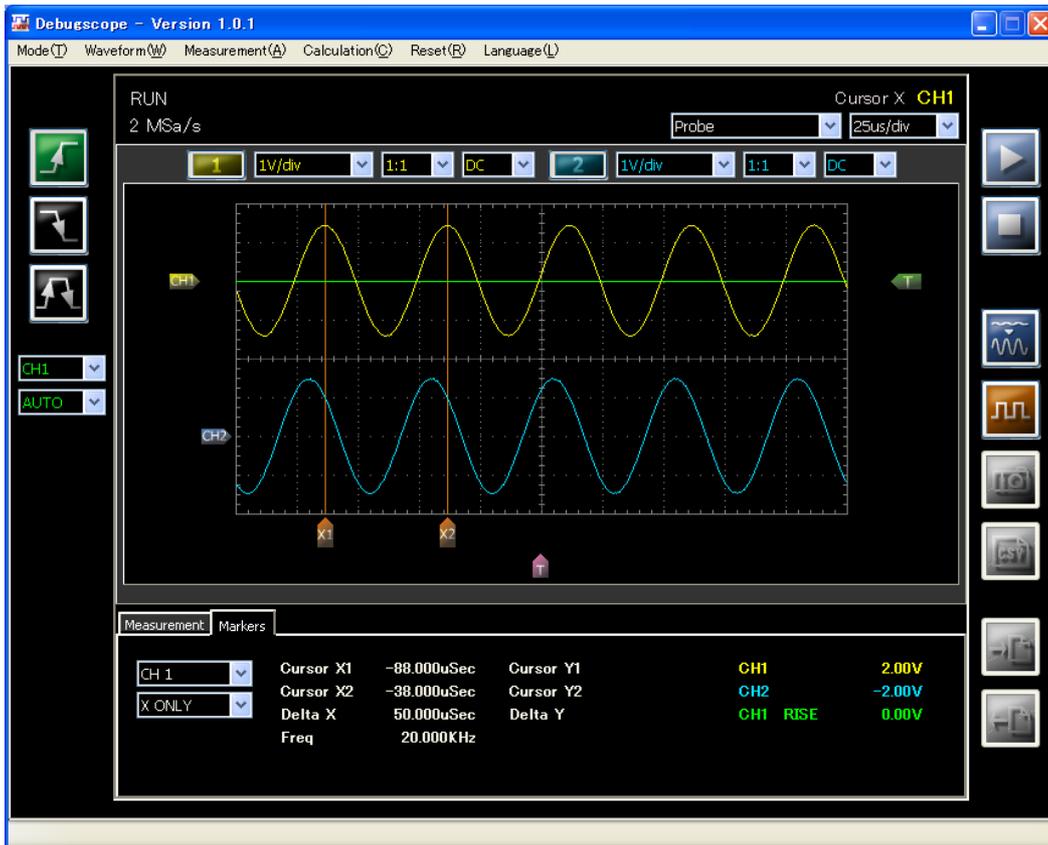
Operation procedure

Click "Calculation" -> "X-Y" in menu. Or hold "Shift" and press "F10" and X-Y display of input signal is shown.

CH1 shows horizon (X-axis) and CH2 shows vertical (Y-axis).

The following signals are measured.

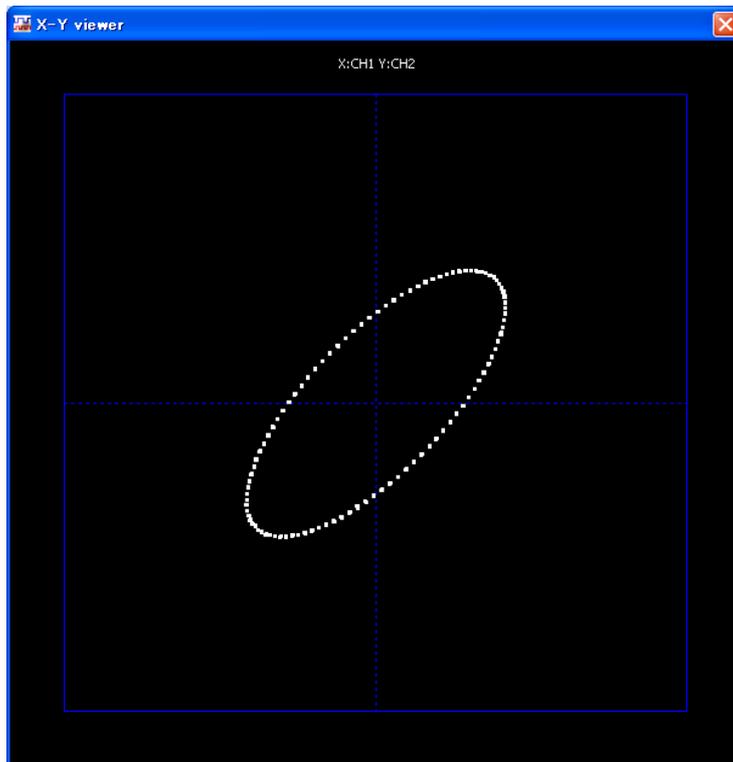
- CH1: Frequency 20kHz, sine wave, phase difference 0°, offset 0V
- CH2: Frequency 20kHz, sine wave, phase difference 45°, offset 0V



Calculation function

Click "Calculation" -> "X-Y" in menu, or hold "Shift" and press "F10" in the main screen to show "X-Y viewer".

The following figure shows "X-Y" with input signals which were described in the previous page.



"X-Y" function

- Even though either CH1 or CH2 is shown by setting of waveform display, "X-Y" shows CH1 (X-axis) and CH2 (Y-axis).
- If there is offset in input waveform, the center position of "X-Y" is shifted.
Select "AC coupling" in order to move the center of "X-Y viewer".
-> Refer to "Setting of voltage range and others" in P40

Calculation function

Use of spectrogram display

If spectrogram display is used, temporal variation and characteristics of frequency can be observed. Horizontal axis shows frequency, vertical axis shows time, and brightness shows spectrum intensity. If spectrum intensity is strong, brightness gets higher logarithmically.

Operation procedure

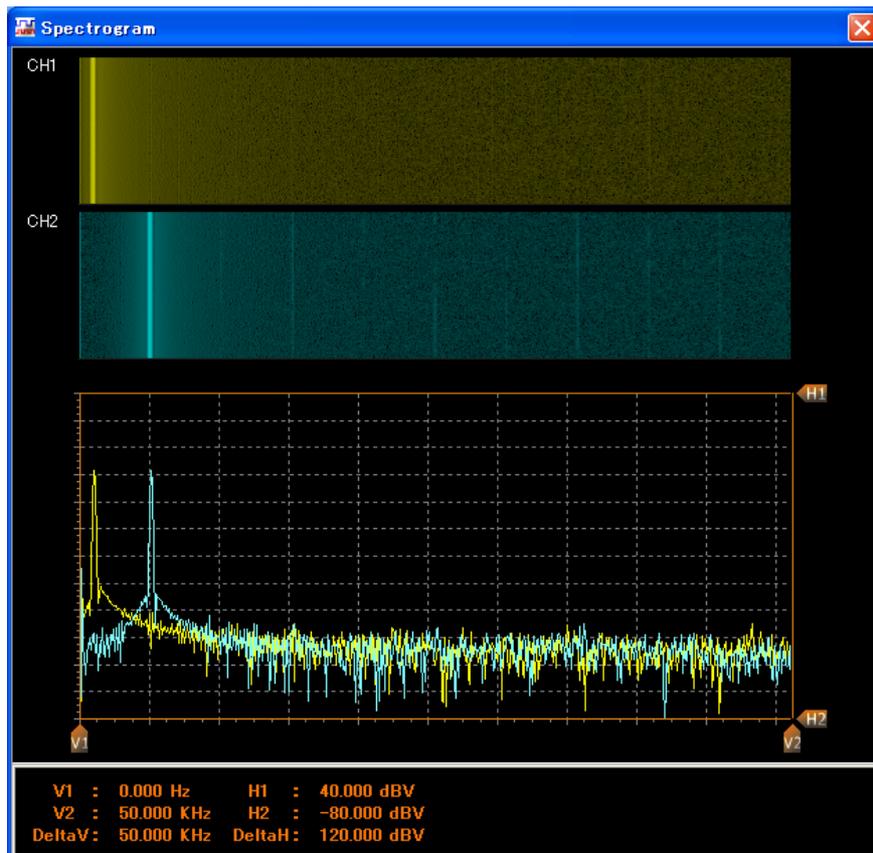
Click "Calculation" -> "Spectrogram" in menu and spectrogram is shown.

Frequency and amplitude can be measured by cursor. -> Refer to "Use of cursor" in P49

Graph cannot be zoomed when spectrogram is used.

The following figure shows spectrogram with the following setting.

- CH1: Frequency 1kHz, sine wave
- CH2: Frequency 5kHz, sine wave



Calculation function

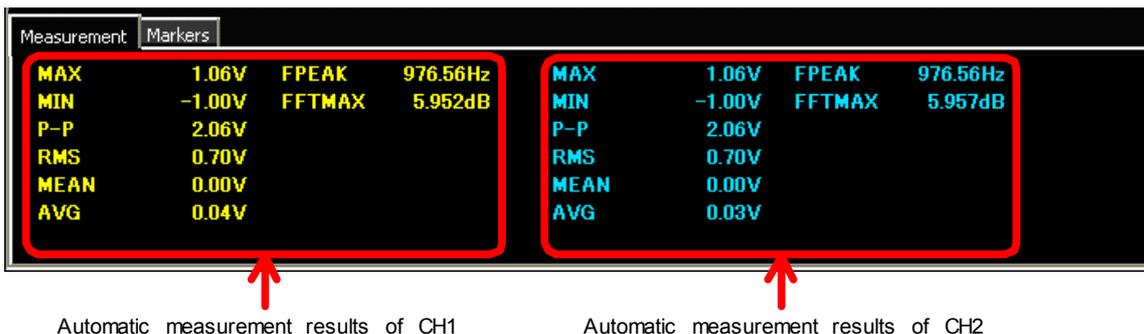
Use of automatic measurement function

MAX (maximum value), MIN (minimum value), P-P (peak to peak), RMS(Root Mean Square value), MEAN (average), AVG (average), FPEAK(peak frequency) and FFTMAX(peak spectrum value) of waveform data which is shown in the screen can be automatically measured per channel.

Operation procedure

- 1 To use automatic measurement in CH1 and CH2, click "Measurement" -> "BOTH" in menu.
 - If only CH1 uses automatic measurement, click "Measurement" -> "CH1" in menu.
 - If only CH2 uses automatic measurement, click "Measurement" -> "CH2" in menu.
 - If automatic measurement is not used, click "Measurement" -> "None" in menu.

- 2 Change the tab to "Measurement".



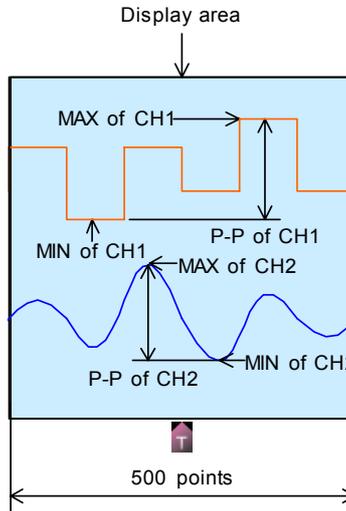
| | |
|--------|---|
| MAX | Show maximum voltage value of displayed waveform |
| MIN | Show minimum voltage value of displayed waveform |
| P-P | Show amplitude (peak-to-peak voltage) of displayed waveform |
| RMS | Show RMS (Root Mean Square) value per data unit * |
| MEAN | Show average voltage value of displayed waveform |
| AVG | Show average voltage value calculated from 128 data units. |
| FPEAK | Show maximum spectral frequency of FFT |
| FFTMAX | Show maximum value of FFT spectrum |

* 1024 points per data unit

Calculation function

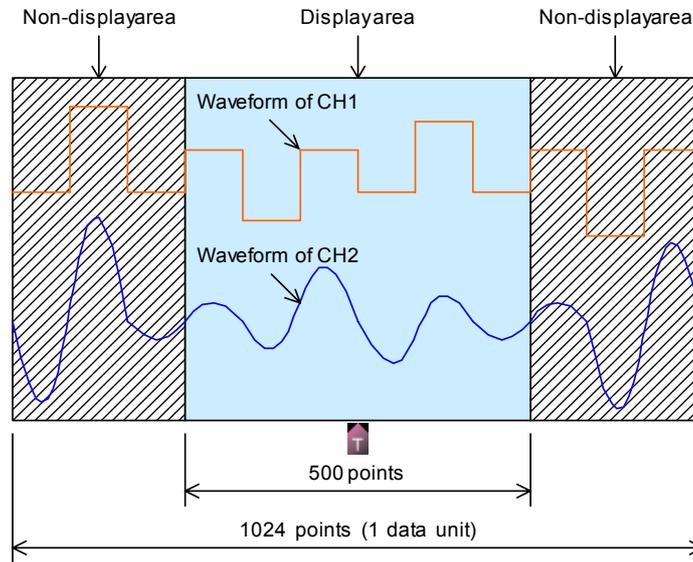
"MAX", "MIN", "P-P", "MEAN"

The maximum/minimum value, amplitude, and average of the displayed waveform (500 points) are displayed.



"AVG", "FPEAK", "FFTMAX"

"AVG" shows the average voltage value calculated from 128 data units.

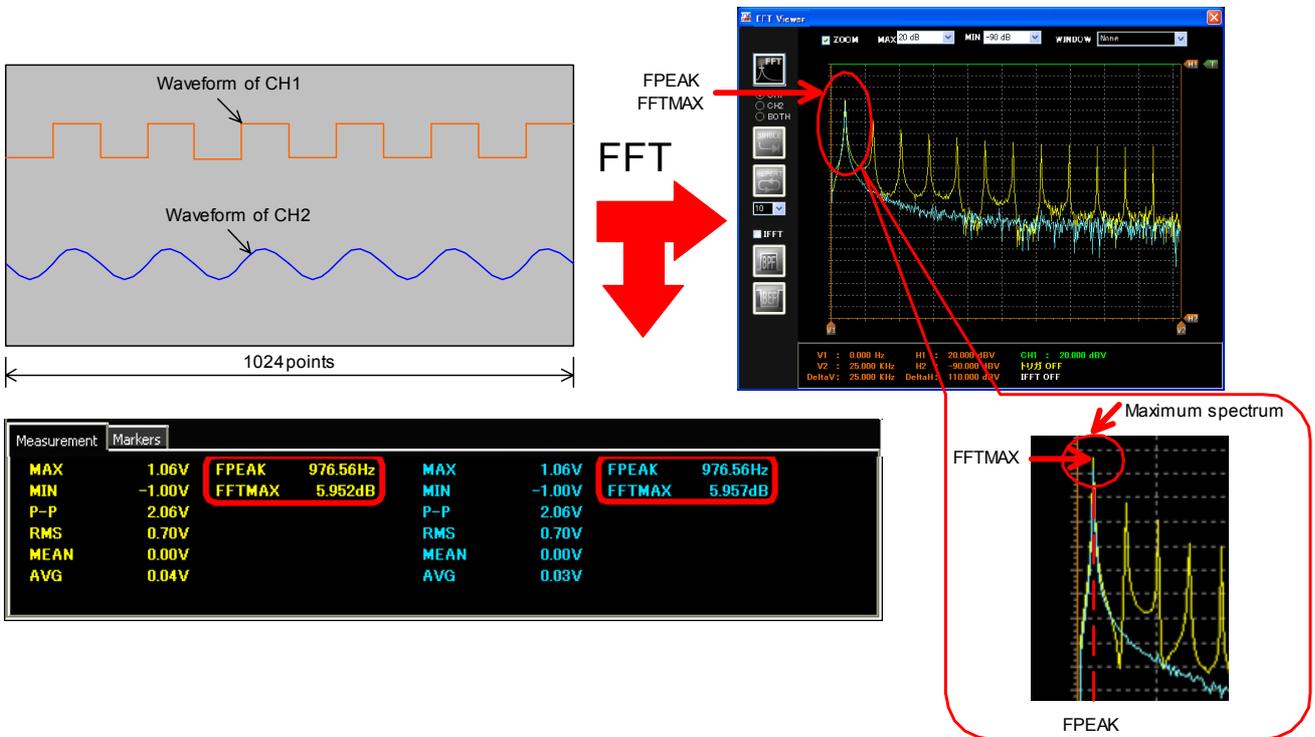


$$AVG1 = \frac{\text{Voltage total of 1024 points}}{1024} \text{ [V]}$$

$$AVG = \frac{(AVG1+AVG2+ \dots +AVG128)}{128} \text{ [V]}$$

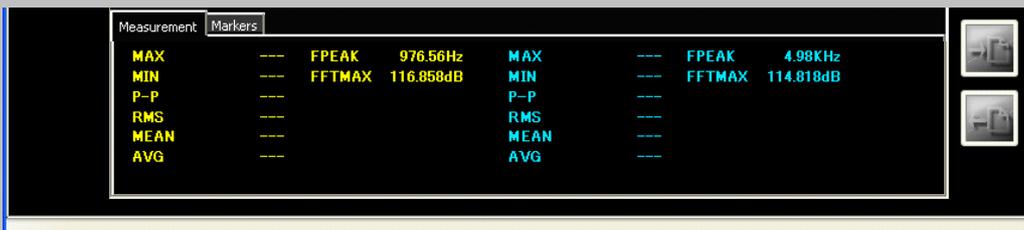
Calculation function

- "FFTMAX" displays the maximum value of the spectrum data obtained by carrying out FFT operation of waveform data per data unit (1024 points).
- "FPEAK" displays the frequency that the spectrum reaches the maximum value.



Automatic measurement function

- Only when "FFT" or "Spectrogram" is shown, value of "FPEAK" and "FFTMAX" is shown.
- If either CH1 or CH2 is displayed by setting of waveform display, value of automatic measurement is shown for the one of displayed channel.
- If IFFT or BOTH is selected by Waveform selection when FFT filter is used, the measurements other than the frequency are not performed.



Maintenance, adjustment

Adjustment of probe

Lack of probe compensation brings measurement error. In case of the followings, adjustment should be made before use.

- In case the probe is connected to the main body for the first time
- In case that the probe is attached and removed

Even though if it is not the case mentioned above, it is recommended that the probe be adjustment periodically.

Procedure to adjust the probe

- 1 Attach the "CAL/Trigger cable" to "FUNCTION" terminal which is located on the front of the main body.
*Attach it so that the red cable (Pressure terminal is attached) may be on the upper side(Black cable is the lower side).
- 2 Select mode "Oscilloscope". Click "CAL" button  in the main screen.
- 3 Connect the probe to "CAL terminal", as below. Set damping ratio of the probe to x10.

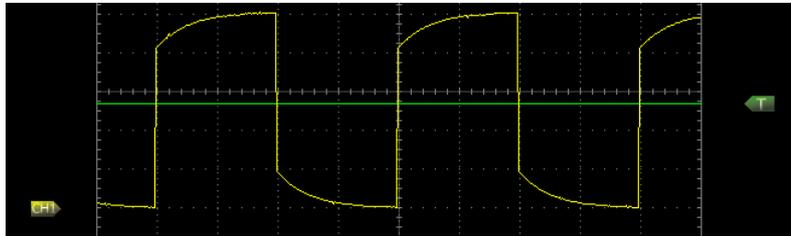


Maintenance, adjustment

3

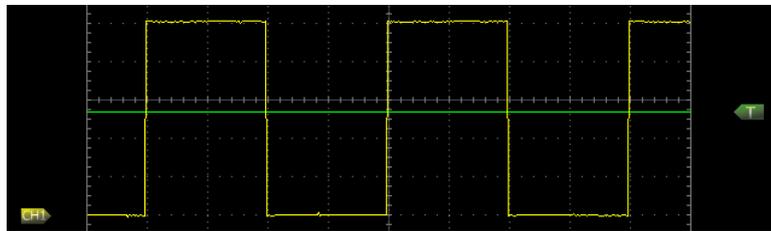
Square wave (approx. 1V, 1kHz) is displayed on the screen. Set voltage range and the voltage position so that whole waveform can be observed.

If square wave is warped as shown below, adjust the probe.



4

Adjustment is made by an adjusting trimmer so that angle of waveform is squared up.



5

After adjustment is completed, click "CAL" button  again and stop output of waveform.



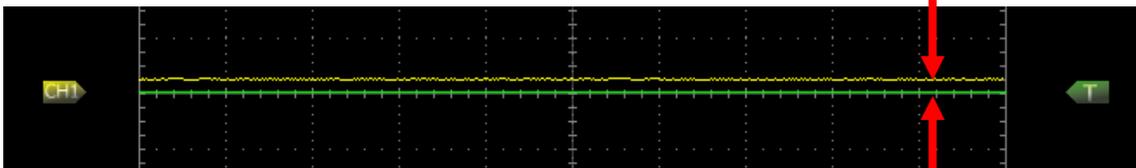
CAL

- It can be used during oscilloscope mode only.
- CAL output stops after auto scale execution, after mode change and after termination of the software.

Maintenance, adjustment

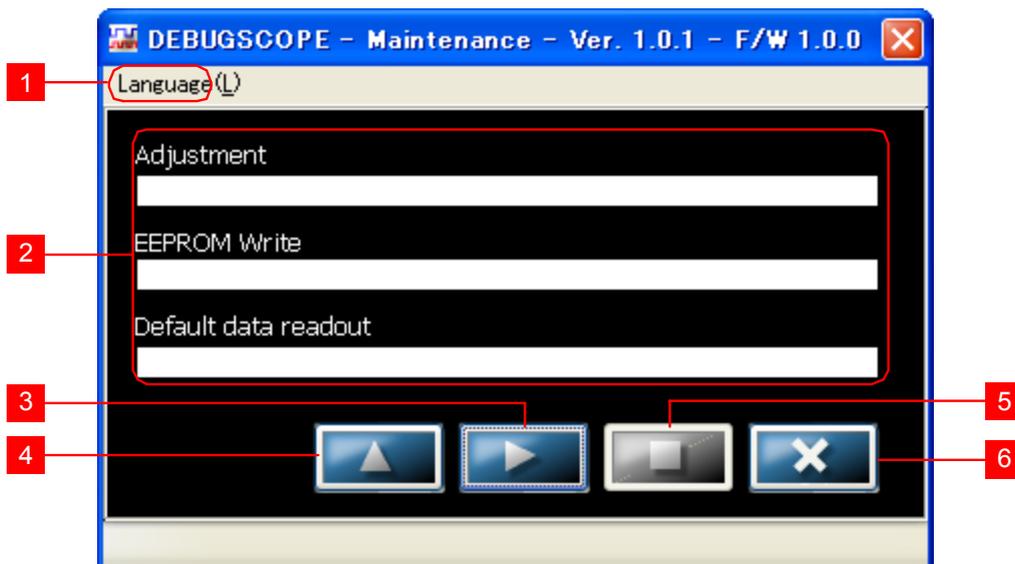
Execution of maintenance function

As for this product, the voltage position may shift due to a change with the lapse of time or an ambient temperature. In that cases, that may cause a measurement error. When difference between the voltage position and measured waveform is confirmed as shown below, execute self-maintenance function. (Required time for maintenance is varied in accordance with PC in use.)



Procedure

- 1 Select "Start" -> "All programs" -> "DEBUGSCOPE" -> "Maintenance".
The following screen is shown.



- | | |
|--|--|
| <p>1 • Setting of language Change languages</p> <p>2 • Progress bar Show progress when maintenance is performed</p> <p>3 • "Automatic adjustment" button Offset is automatically adjusted</p> | <p>4 • "Reset" button Return to settings which were originally made at shipment.</p> <p>5 • "Stop" button Stop maintenance</p> <p>6 • "Termination" button Terminate the software</p> |
|--|--|

Maintenance, adjustment

- 2 Connect the attached probe in accordance with the following picture. Set the probe damping ratio to x1. Short-circuit the head of probe and GND. Turn the face back as shown below and perform self-maintenance.



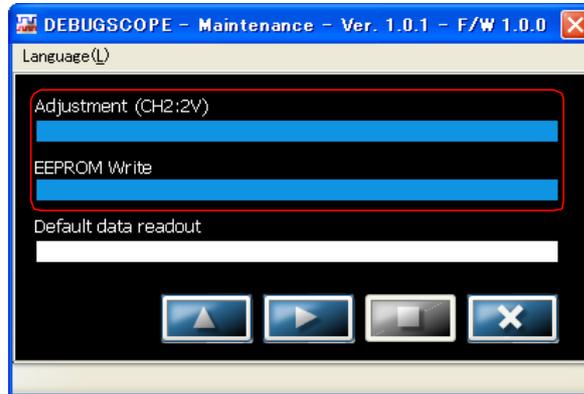
- 3 Click  and the following screen is shown.



Click "OK" and self-maintenance starts. Click "NO" when you stop the self-maintenance. In case of aborting, click .

Maintenance, adjustment

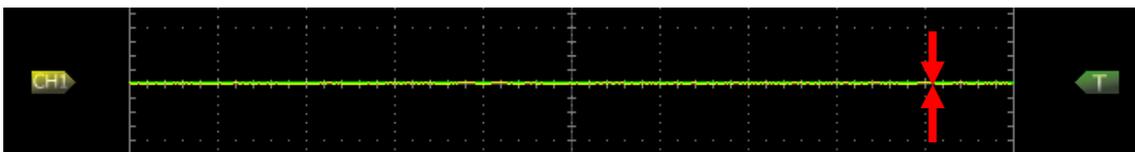
- 4 Wait until progress bars of "Adjustment" and "EEPROM Write" reach maximum.



- 5 When the following message is shown, click "OK".
Self-maintenance is completed.



- 6 The following is measured waveform after completion of self-maintenance. The voltage position and measured waveform are aligned.



Self-maintenance

- Offset is shifted due to ambient temperature in some cases.
In case that offset is shifted, self-maintenance should be done before using this product.

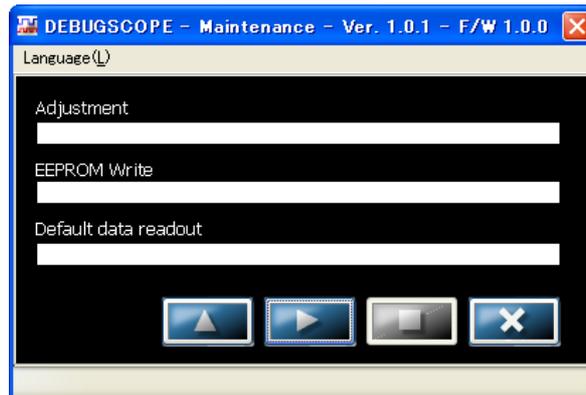
Maintenance, adjustment

Return offset adjustment data to default

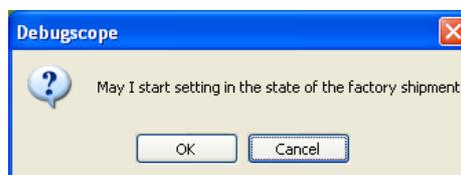
Offset adjustment data can be returned to the setting which was originally set at shipment.

Procedure

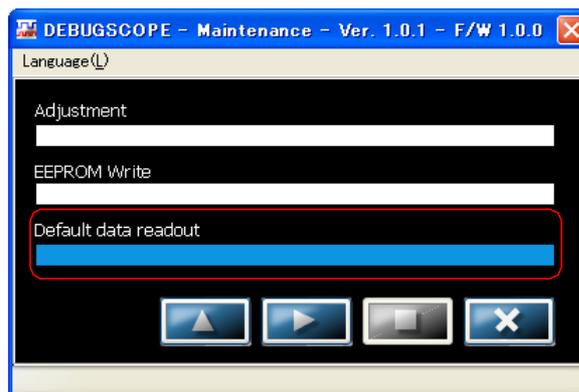
- 1 Select "Start" -> "All programs" -> "DEBUGSCOPE" -> "Maintenance".
The following screen is shown.



- 2 Click . When the following message is shown, click "OK".



- 3 Wait until progress bar of "Default data readout" reaches maximum.



- 4 The following message is shown. Click "OK".



Maintenance, adjustment

Warning and error (maintenance and adjustment)

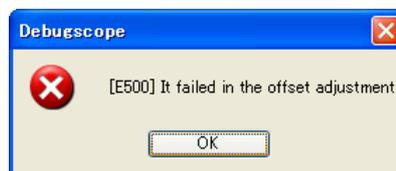
When the following error is shown, please reconfirm the method and the procedure and do maintenance again in a low-noise environment because self-maintenance is not completed.

When an error screen is displayed again, contact a nearest distributor listed in the warranty certificate.

- The USB cable should not be taken out or the power for the main body should not be turned off during self-maintenance.

If the USB cable is taken out or the power for the main body is turned off during self-maintenance, the following error is shown.

In this case, the main body and the software should be rebooted.

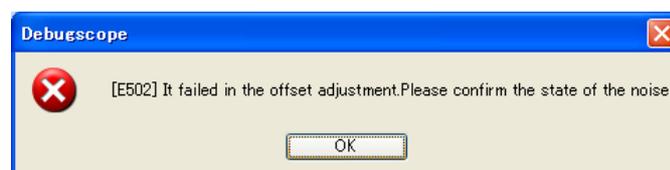


- When self-maintenance is executed with inputting voltage signal to input terminal (BNC connector), the following error is shown. Voltage signal should not be input to input terminal (BNC connector) during self-maintenance.

Confirm the connection and perform self-maintenance again.



- The following error is shown in accordance with circumstances where this product is used. The main body and the probe are kept away from the noise source and perform self-maintenance again.



Maintenance, adjustment

- The program cannot be terminated while resetting the factory shipment state. When the program is terminated while resetting the factory shipment state, the following caution is displayed.

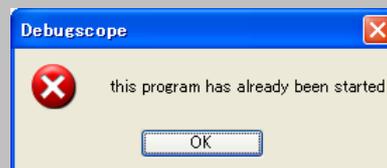


- Please do not perform the act of pulling out the USB cable or of turning off the power supply of the main body while resetting the factory shipment state. If the USB cable is pulled out or the power supply of the main body is turned off while resetting the factory shipment state, the following error is displayed. In this case, please restart the main body and software.



In case of use of "Maintenance"

- "Maintenance" software cannot be used with "DEBUGSCOPE" software at the same time. When the following error is shown, terminate "DEBUGSCOPE" software and restart "Maintenance" software.



Utility function

Utility function

Import/Export of setting file

It can be used during oscilloscope mode only.

Setting information such as voltage range and trigger level are output to file or read.

The following information is output to file.

| | | | |
|------------------|----------------|-----------------|-----------------|
| CH display | Voltage range | Probe ratio | Input coupling |
| Voltage position | Cursor display | Cursor position | Time range |
| Trigger position | Trigger level | Trigger edge | Trigger channel |

Export of setting file

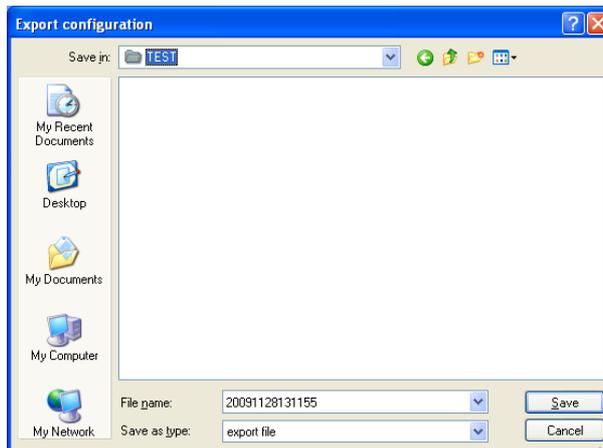
1

Select "Mode" -> "Oscilloscope" in menu, and click "STOP" button  to stop measurement.

Click "Export" button .

2

Name an export file and save it.



3

Click "OK".



Utility function

Import of setting file

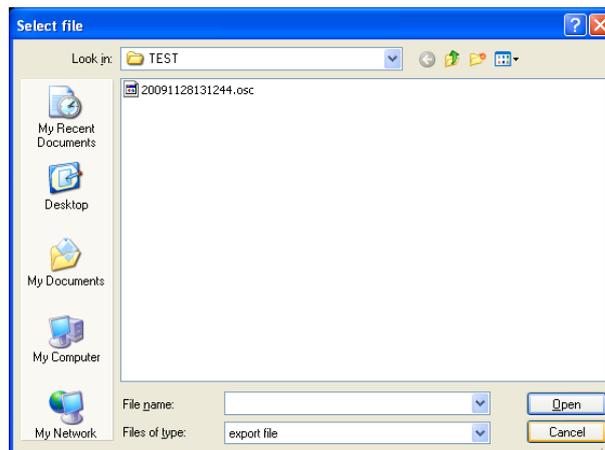
1

Select "Mode" -> "Oscilloscope" in menu, and click "STOP" button  to stop measurement.

Click "Import" button .

2

Select an export file.



3

Click "OK".

Setting information of file which was exported is read.

Status display changes from "STOP" to "RUN".



Import/Export of setting file

- It cannot be used when status is "RUN".
- It cannot be used when the type of trigger is "Single".
- The main body may make sound at import, but it is not malfunction.

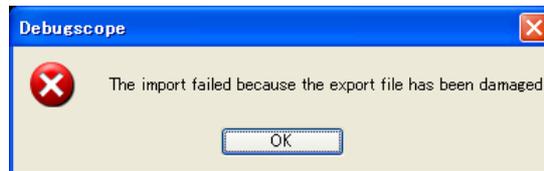
Utility function

When the following alarm or error is shown, check settings and data file.

- When an export file which has already been opened by other software is trying to be overwritten, the following alarm is shown. Save that file with different name.

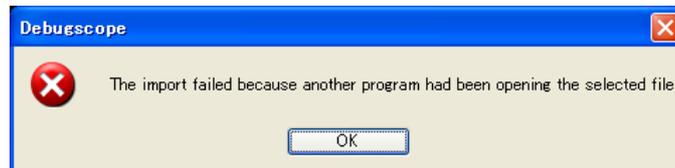


- After an export file is edited and that file is imported, the following error is shown in some cases. Data file should not be edited.



- When an export file is imported when it has been opened by other software, the following error is shown.

Data file should not be opened by other software.



Utility function

Output of CSV (comma-separated) file

It can be used during oscilloscope mode only.

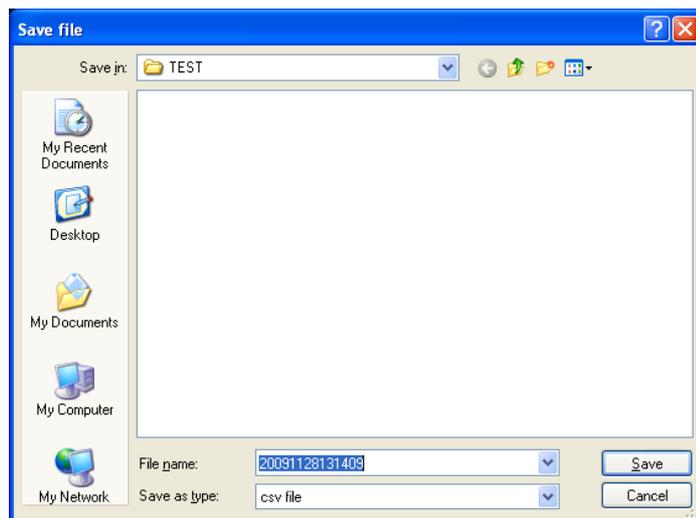
Screen data (500 data) and FFT data which is being shown is CSV output.

Operation procedure

1 Select "Mode" -> "Oscilloscope" in menu, and click "STOP" button  to stop measurement.

2 Click "CSV" button  in the main screen.

3 Name CSV file and save it.



4 Click "OK".



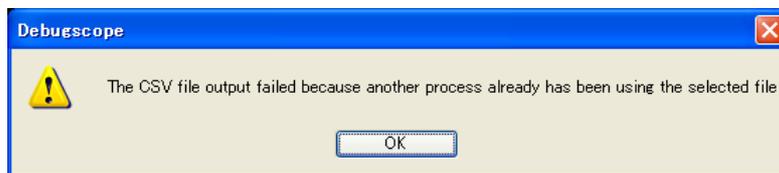
Utility function



CSV file output function

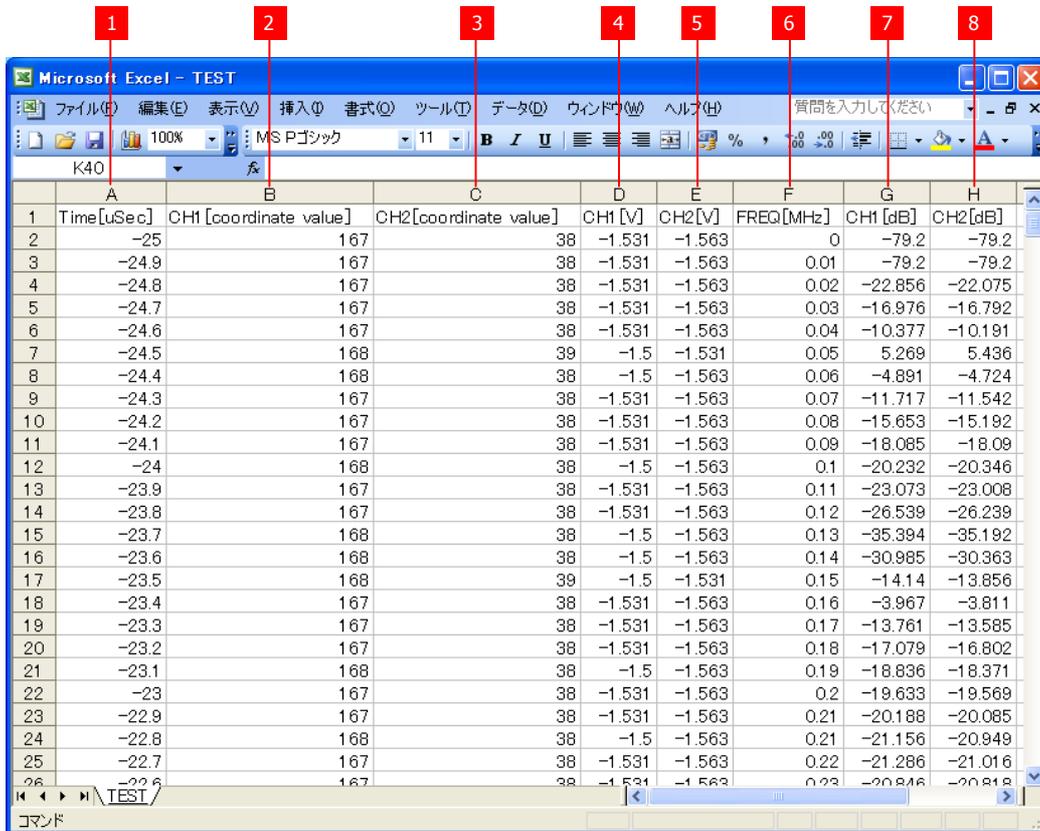
- When "FFT" or "Spectrogram" is shown, FFT data (512 points) is also CSV output.
- CSV file output function cannot be used when pre-trigger function and data logger function are used.
- When waveform is not shown in graph area, CSV file output function cannot be used.
- Only when data is saved by FFT trigger (repeat mode) automatically, the 1024-point data including non-display area is CSV output.

- When a CSV file which has been opened by other software is trying to be overwritten and saved, the following alarm is shown. Change the file name.



Utility function

The following shows when CSV file is read by Excel.



| | | |
|---|-----------------------|---|
| 1 | Time[***] | Time before and after trigger point are shown. Unit is shown at ***. Unit is varied in accordance with sampling setting. |
| 2 | CH1[coordinate value] | Coordinate value of CH1 Bottom in graph area is "0", top in graph area is "255" |
| 3 | CH2[coordinate value] | Coordinate value of CH2 Bottom in graph area is "0", top in graph area is "255" |
| 4 | CH1[V] | Voltage value of CH1 |
| 5 | CH2[V] | Voltage value of CH2 |
| 6 | FREQ[MHz] | Frequency of FFT |
| 7 | CH1[dB] | Spectrum value (decibel) of CH1 |
| 8 | CH2[dB] | Spectrum value (decibel) of CH2 |

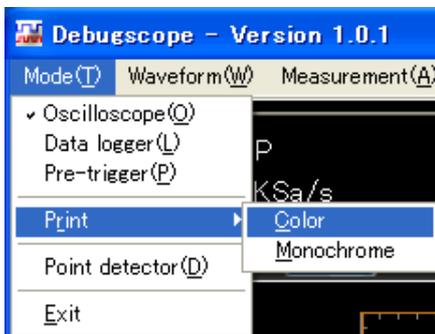
Utility function

Use of print function

Print function can be used during oscilloscope mode only.

Operation procedure

- 1 Click "STOP" button  to stop measurement.
- 2 Click "Mode" -> "Print" in menu.
- 3 "Color" or "Monochrome" can be selected.



Preview screen is shown. Enter comment.

When "FFT", or "X-Y", or "Spectrogram" of "Calculation" in menu is selected, the screen which

is being shown is shown in page 2 or after of preview screen. (Use "Previous page" 

"Next page"  button to change pages.)

- 4 Click "PRINT" button .
- 5 Click "CLOSE" button  to return to the main screen.

*** Please carry out neither operation of the mouse nor the keyboard after choosing "color" or "monochrome" until the preview screen is displayed.**

The image of the preview screen may not be normally displayed.

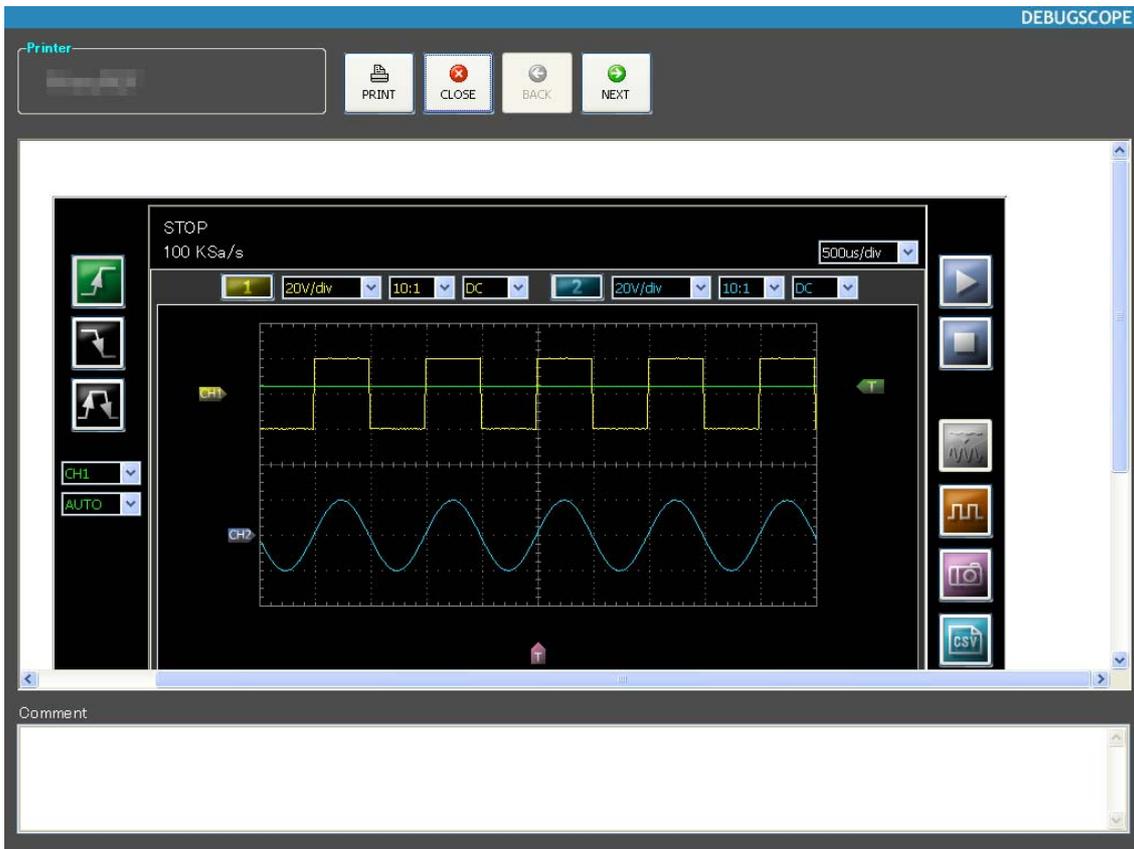
*** This product only supports that size of paper for printing is A4 and portrait orientation. Please note that it does not support landscape orientation, and size other than A4.**

In case that size other than A4 is set, setting should be changed to A4 size.

Setting of orientation for printing should be changed to "Portrait".

Utility function

The following figure shows a preview screen.



Print function

- Monochrome print is available if "Mode" -> "Print" -> "Monochrome" in menu is clicked.
- Set a printer which is usually used by clicking "Control panel" -> "Printers and Faxes".
- Print function cannot be used when pre-trigger function or data logger function is used.
- If a printer which is usually used is not set, print function is not available.

Utility function

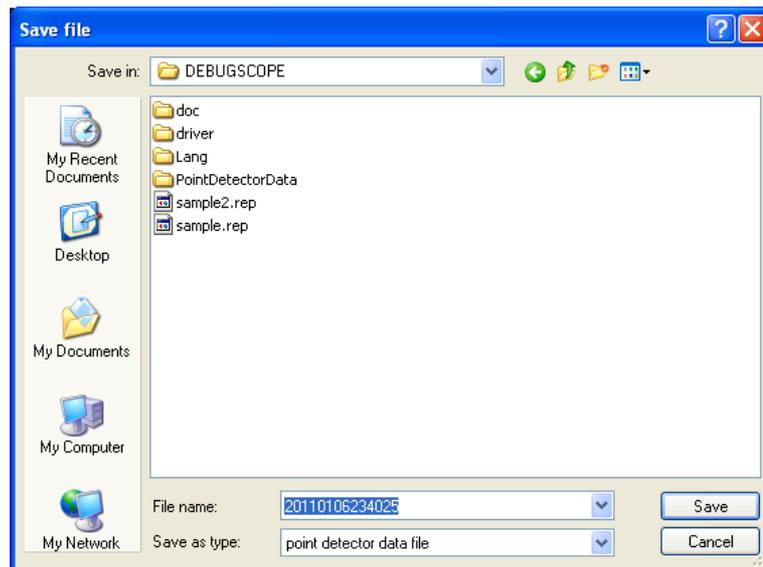
Data-file output for point detectors

It can be used only in the oscilloscope mode.

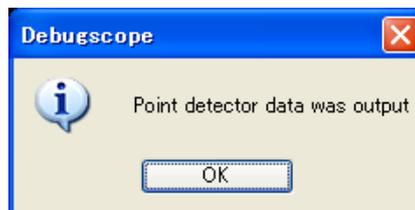
The output data can be used with the point detector. **(Refer to the point detector manual)**

Operation procedure

- 1 Select "Mode" -> "Oscilloscope" in menu, and click "STOP" button  to stop measurement.
- 2 Select "Mode" -> "Point detector" in menu.
- 3 Name the point detector data file and save it.



- 4 Click "OK".



Utility function

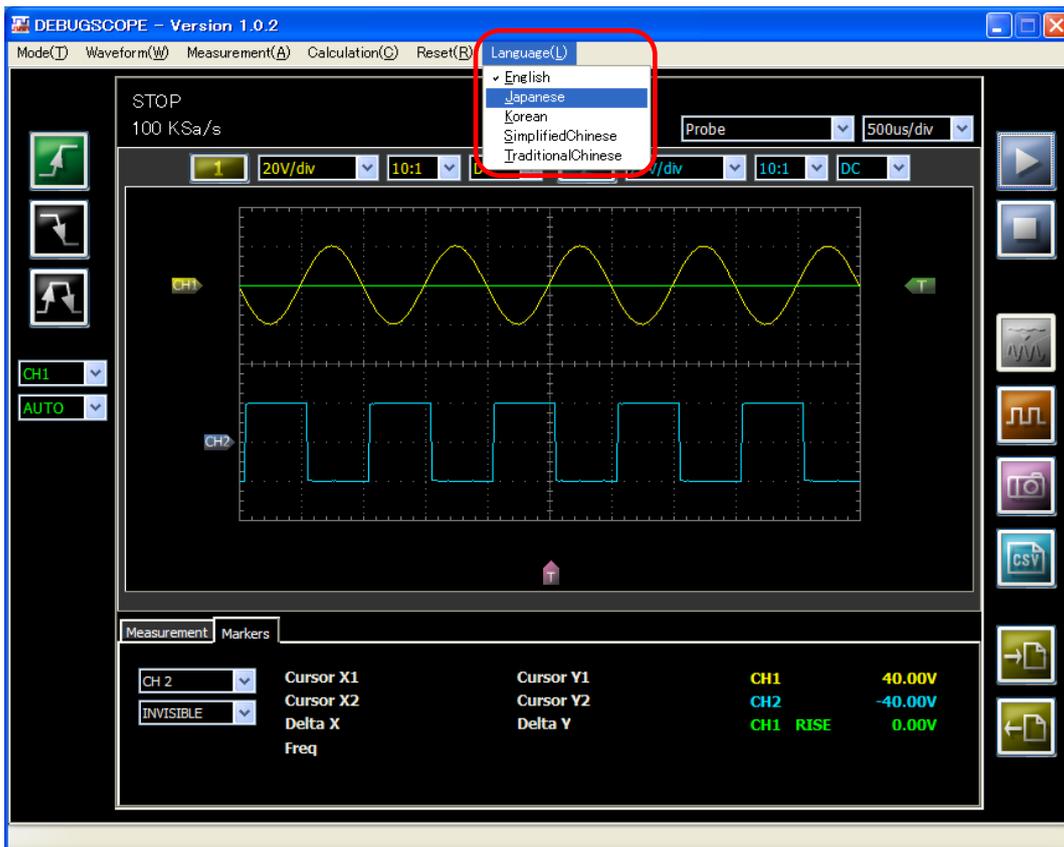
Change of language

Language which is used in the software can be changed.

Operation procedure

1

Select "Language" in menu.



2

The language which is currently used is ticked.

Tick the language which is going to be used.

The following message is shown. Click "OK".



3

Reboot the software.

Others

Extended communication terminal

“Extended communication terminal” which is located in the back side of the main body is terminal for expansion of this product. It can be used for connecting this product and measuring unit, and so on.



Note about connection

- Connection should not be made with a product which is not supported.
- Cables such as LAN cable should not be mistakenly connected because it causes damage, or performance degradation.

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