# Operation Manual

**SMART DYNAMIC STRAIN RECORDER**

# DC-204R/204Ra

Tokyo Measuring Instruments Lab.

# NOTICE

This manual describes instructions and procesures to operate our smart dynamic strain recorder DC-204R/ smart dynamic strain recorder with analogue output DC-204Ra

Please read this operation manual thoroughly to familiarize yourself with the functions and operating procedures of this product, and to measure accurately. It will enable you to make maximum use of all its functions.

Please keep this manual always ready to use.

■When you read this manual

This manual uses following symbols to describe important items. Please read carefully.

| ⚠ Danger | If you ignore this indication and use this system in an improper way, it may cause danger which will result in death or serious injury. |
|---|---|

| ⚠ Warning | If you ignore this indication and use this system in an improper way, it may cause danger which will result in injury. |
|---|---|

| ⚠ Caution | If you ignore this indication and use this system in an improper way, it may cause the occurrence of physical obstacles. |
|---|---|

| Note | This indication shows any attention or supplement to avoid erroneous operation etc. |
|---|---|

| ✍ | This indication shows any matters to understand this content deeply and the useful information. |
|---|---|

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The contents of this instruction manual are subject to change without notice for the purpose of product improvement.

If you have any questions or comments regarding contents of this manual such as misdescription, inaccuracy and missing items, please feel free to contact us.

The company and product names referred to in this manual represent trade names or registered trademarks.

This operation manual applies to the DC-204R/DC-204Ra: software version 2.0x and DC-7204: software version 1.0x.

# ◎Protective measures for safety

⚠ **Danger**
Do not operate the system in a place where there is flammable gas or flammable steam. This may cause fire.

⚠ **Danger**
It is not recommended for the user to disassemble or remodel the system. Such a do-it-yourself action may cause an electric shock or a malfunction.

⚠ **Danger**
Never connect the grounding cable to a gas pipe. In addition, make it a rule to disconnect the power supply cable before connecting or disconnecting the grounding cable. There is danger of a fire and the electric shock.

⚠ **Warning**
Powder or dust inside the system may cause poor contact or a lowered insulation effect in the connector. Pay special attention, during use and

⚠ **Warning**
This case has ventilation holes to prevent overheating.
Do not close these holes nor insert the metallic object through these holes.

⚠ **Caution**
Operate the system at a specified temperature. If the operating site is exposed to direct sunlight or an extremely low temperature, arrange for shade or a thermal insulating material.

⚠ **Caution**
Operate the system at a relative humidity less than 85%. Do not expose it to rain or extreme humidity. When water poured into the system or it is flooded, dry it sufficiently before turn on power. If it doesn't start normally, it might be out of order. Please contact us.

⚠ **Caution**
The system may malfunction if either the unit or its wiring is placed near such machines as a large motor, crane, transformer, or welding machine. When extending the sensor to a place subject to a strong electric field, such as near

⚠ **Caution**
The system is vulnerable to the dielectric effect of thunderbolts. Take preventive measures against thunderbolts where applicable. Contact your dealer or Tokyo Measuring Instruments Laboratory for details.

⚠ **Caution**
Operate the system at a specified power supply voltage. Ootherwise it may cause failuresDo not contact the enclosure of this equipment with body frame of vehicle when + (plus) terminal is grounded

# INDEX

# Chapter 5 Specifications

# Chapter 1

## GENERAL

# 1.1 GENERAL

This instrument is a high-speed and small-sized dynamic strain gauge with a 4-channel configuration using a compact flash card for data recording. A high-speed sampling at 200 KHz can be made in the one-channel mode, and by cascading eight units, simultaneous sampling of 32 channels at maximum is possible. This instrument is connected to a personal computer using the USB port and controlled by the attached software.

Measurement can be started and stopped by pressing the START-STOP button on the front panel. It is also possible to start measurement by trigger setting or to control by an external trigger or external start/stop signal.

Measured data are stored in DADiSP format in a compact flash card. This data can be processed using a software conforming to DADiSP or the attached software. In addition, the data can be converted into the CSV format using the attached software and be processed by a spreadsheet software such as EXCEL.

DC-204Ra provides the analogue output function (0V±5V) for each channel, which can be connected to your recorder via the supplied cable (CR-3610).

# 1.2 FEATURES

- ・Miniature size in 84(W)×42(H)×157(D)mm with 4-channel construction
- ・200kHz sampling (in 1channel mode, at maximum speed)
- ・simultaneous 50kHz sampling in four channels
- ・Large strain up to 80000μ can be measured (when 0.5V carrier is used)
- ・Simultaneous sampling of 32 channels at maximum by connecting eight units in parallel
- ・Supports CF card up to 2GB available for saving massive amount of data
- ・Measured data are compliant with DADiSP format
- ・External start/stop and external trigger
- ・Open check of connected sensor available
- ・USB interface on board, control software bundled
- ・UPS (uninterruptible power supply sytem) circuit installed in preparation for possible　trouble due to unexpected power supply break down
- ・±5V analogue output (DC-204Ra only)

# 1.3　SYSTEM BLOCK DIAGRAM

❏ Front panel
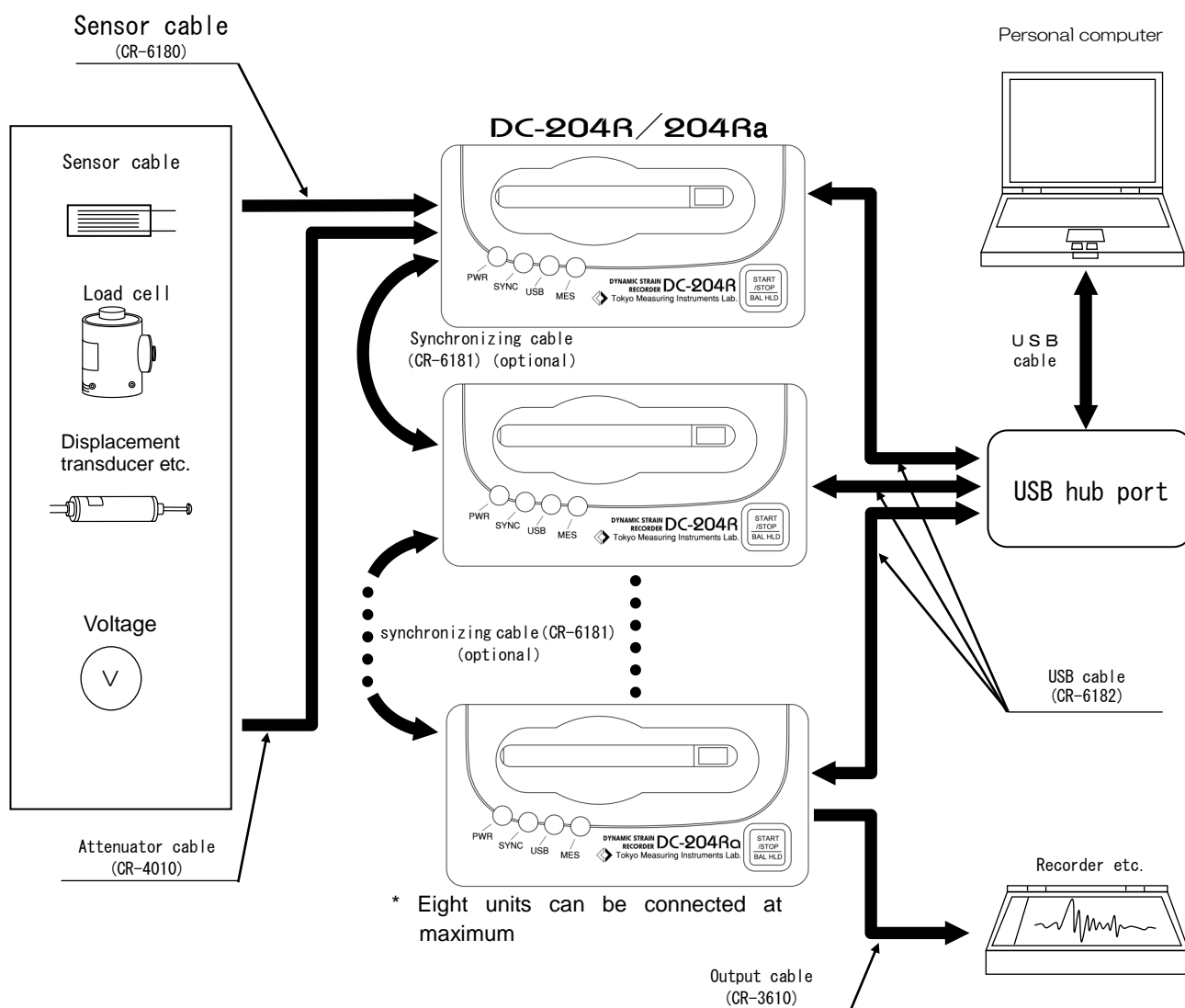


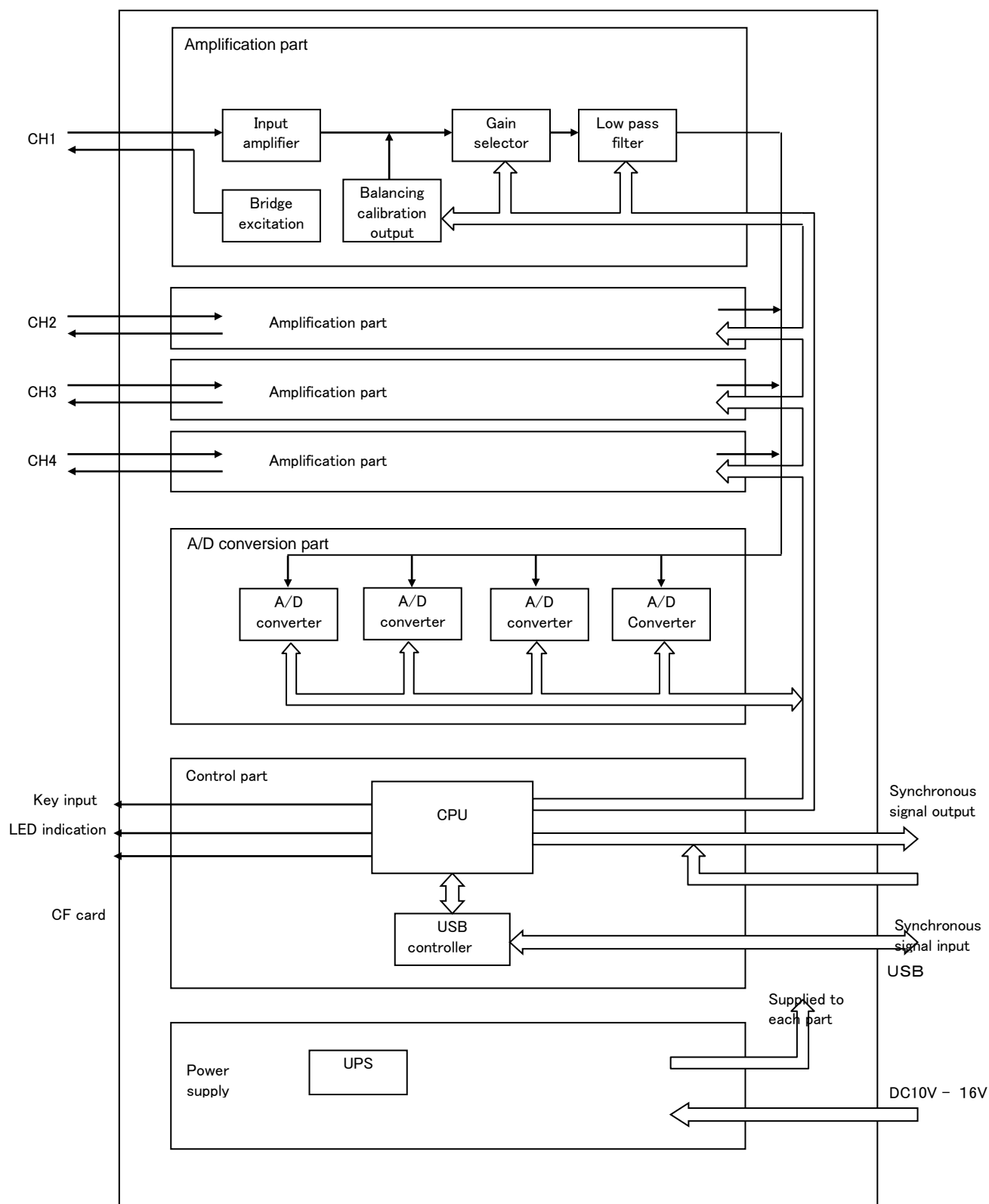* When synchronizing cable (option) is connected, master / slave relation between connected instruments is automatically determined.
  Refer to **2.6 CONTROL CABLE CONNECTION** of this manual for the details of synchronizing cable connection.

> ✍ DC-204R/204Ra and DC-104R/104Ra can be connected using synchronizing cables. In that case, the setting of DC-204R/204Ra and DC-104R/104Ra needs to be the same.

# 1.4 INTERNAL BLOCK DIAGRAM

【DC-204R Internal Block Diagram】

Amplification part

Input amplifier

Gain selector

Low pass filter

CH1

Bridge excitation

Balancing calibration output

CH2 — Amplification part

CH3 — Amplification part

CH4 — Amplification part

A/D conversion part

A/D converter

A/D converter

A/D converter

A/D Converter

Control part

Key input

LED indication

CPU

Synchronous signal output

CF card

USB controller

Synchronous signal input

USB

Supplied to each part

Power supply

UPS

DC10V - 16V

【DC-204Ra Internal Block Diagram】

Amplification part

Output buffer

Input amplifier

Gain selector

Low pass filter

Bridge excitation

Balancing calibration output

CH1

Analogue Output

CH2    Amplification part

CH3    Amplification part

CH4    Amplification part

A/D conversion part

A/D converter    A/D converter    A/D converter    A/D converter

Control part

Key input

LED indication

CF card

CPU

Synchronous signal output

Synchronous signal input

USB controller

USB

Supplied to each part

Power supply

UPS

DC10V - 16V

## 1.5 NAME AND FUNCTION OF EACH PART

【DC-204R】

Front panel

Rear panel

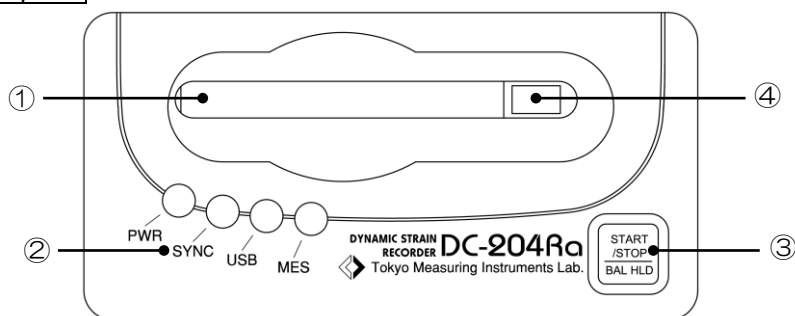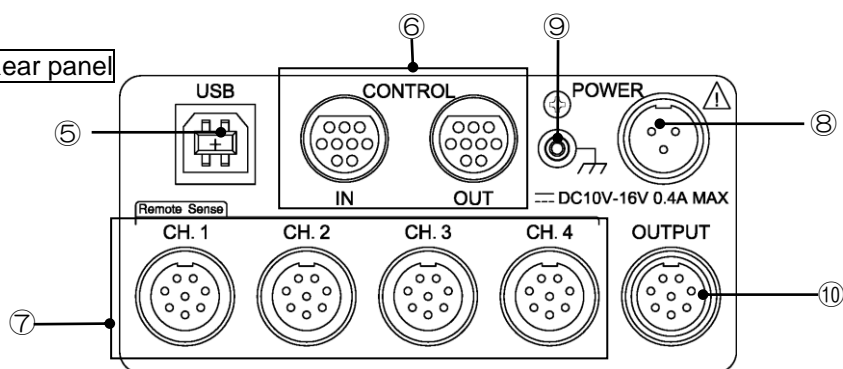| | Function | |
|---|---|---|
| 1 Loading slot of compact flash card | This is a slot to insert compact flash card. | |
| 2 Status LED | PWR | This LED indicates power supply condition. Green light is emitted in normal condition and red light when power voltage is lowering. |
| | SYNC | This LED blinks red or green light when the instrument is synchronized with other instrument. |
| | USB | This LED emits green light when it is transmitting signal and red light when receiving signal. |
| | MES | This LED indicates measurement condition, and emits red light when in stand-by for trigger and green light when recording data. |
| 3 Key switch | START /STOP BAL HLD | This is a key for measurement start and stop. Balancing or open check can be done by pushing for 3 seconds. |
| 4 EJECT button | This is a button to take out compact flash card. | |
| 5 USB connector （TYPE B） | This is a connector for USB cable connection. | |
| 6 CONTROL connector | This is a connector for synchronizing cable (optional) connection. | |
| 7 CH1 - CH4 connector | These are connectors to connect cable from sensors (remote sense supported). | |
| 8 POWER connector | This is a connector for power cable connection. | |
| 9 Earth terminal | This is a terminal for frame earth connection.(functional earth terminal) | |

【ＤＣ－２０４Ｒａ】

Front panel



Rear panel



| | | Function |
|---|---|---|
| 1 Loading slot of compact flash card | | This is a slot to insert compact flash card. |
| 2 Status LED | PWR | This LED indicates power supply condition. Green light is emitted in normal condition and red light when power voltage is lowering. |
| | SYNC | This LED blinks red or green light when the instrument is synchronized with other instrument. |
| | USB | This LED emits green light when it is transmitting signal and red light when receiving signal. |
| | MES | This LED indicates measurement condition, and emits red light when in stand-by for trigger and green light when recording data. |
| 3 Key switch | START /STOP BAL HLD | This is a key for measurement start and stop. Balancing or open check can be done by pushing for 3 seconds. |
| 4 EJECT button | | This is a button to take out compact flash card. |
| 5 USB connector （TYPE B） | | This is a connector for USB cable connection. |
| 6 CONTROL connector | | This is a connector for synchronizing cable (optional) connection. |
| 7 CH1 - CH4 connector | | These are connectors to connect cable from sensors.(remote sense supported) |
| 8 POWER connector | | This is a connector for power cable connection. |
| 9 EARTH terminal | | This is a terminal for frame-earth connection.(Functional earth terminal) |
| 10 OUTPUT connector | | This is a connector for output cable connection. |

⚠ Caution  If a foreign material such as metal piece is put in the compact flash card slot, it may cause instrument failure. Please be careful.

✎memo

# Chapter 2

## VARIOUS CABLE CONNECTIONS

This chapter describes basic operation as follows:

      ○ Basic precautions
      ○ Connection of power supply and how to start
      ○ Connection of various cables
      ○ Connection of earth cable

These procedures are preparatory measures to perform various operations successfully.

## 2.1  PRECAUTIONS

Please be careful about following items when use this instrument.

| ⚠ Caution | Do not subject the instrument to excessive vibration while in operation.  Do not subject it to strong impacts, such as by dropping, during transportation.  Strong impacts or vibrations may cause malfunctioning of the instrument. |
|---|---|

| ⚠ Caution | When transporting the instrument, use the packaging materials that were used in delivery or equivalent to protect it from vibration and impacts. |
|---|---|

| ⚠ Caution | Do not place a heavy object on the instrument. |
|---|---|

| ⚠ Caution | Do not place the instrument with the front side or the rear side down.  Otherwise, the switches and/or connectors may be damaged. |
|---|---|

| ⚠ Caution | When the housing of this instrument needs cleaning, wipe it with a soft cloth soaked in a dilute solution of neutral detergent, then dry it well with a cloth.  Never use strong solvents such as thinner, which may melt or change the color of the surface coating. |
|---|---|

| ⚠ Caution | Keep the eject button of card slot pushed in. If it is protruded, it can be broken with external force. Don't insert any materials other than CF card in the card slot. |
|---|---|

| Note | When you insert or pull out CF memory card, wait for 5 seconds or more to make it identified successfully. Be sure not to pull it out or power off during writing data in it (LED indicator lit). |
|---|---|

## 2.2　POWER CABLE CONNECTION

❏ Power supply

Power supply specification of this instrument is DC 10-16V. Use the supplied power cable (CR-1310).
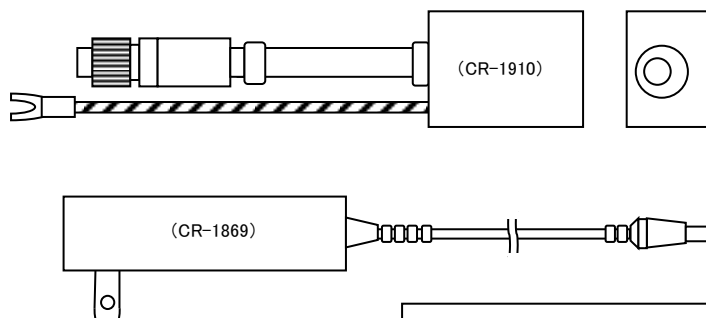Always check power supply voltage before connecting the cable to the instrument.



To DC power supply
10 – 16V

Green/Yellow spiral

Red

Black

Power cable
(CR-1310)

A

C

B
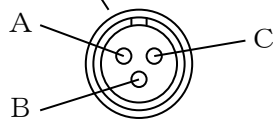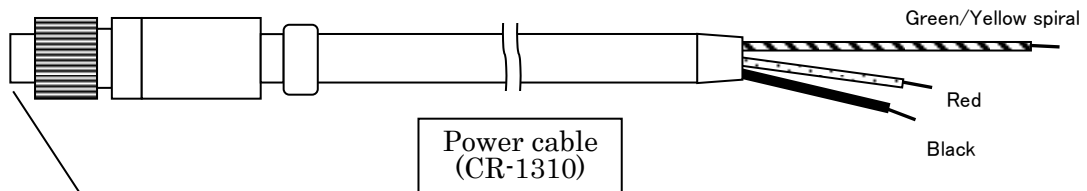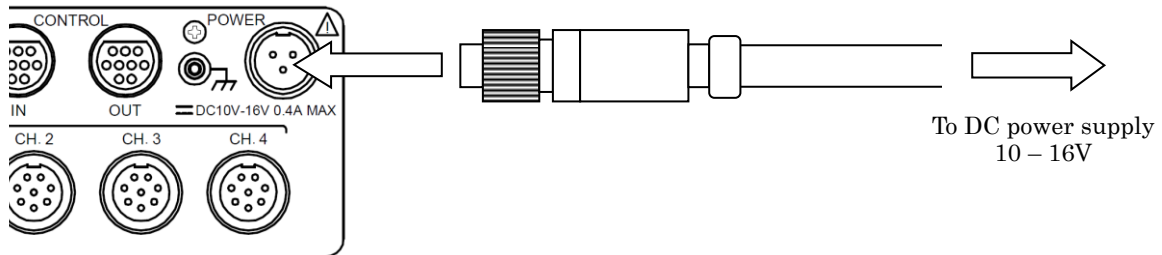
R03-PB3F
Tajimi Electronics Co., Ltd

| Pin No. | Wire color | Connection point |
|---------|------------|------------------|
| A | Red | ＋input |
| C | Black | －input |
| B | Green/Yellow spiral | Ground |

AC adapter set
(CR-1868)(option)

(CR-1910)

(CR-1869)

Contents of AC adapter set
AC adapter connecting cable (CR-1910)　　1
AC adapter (CR-1869)　　　　　　　　　　1

**Note**　　AC 100V-240V can be used.

2-3

## 2.3  USB CABLE CONNECTION

This instrument can be connected to a personal computer through USB cable.
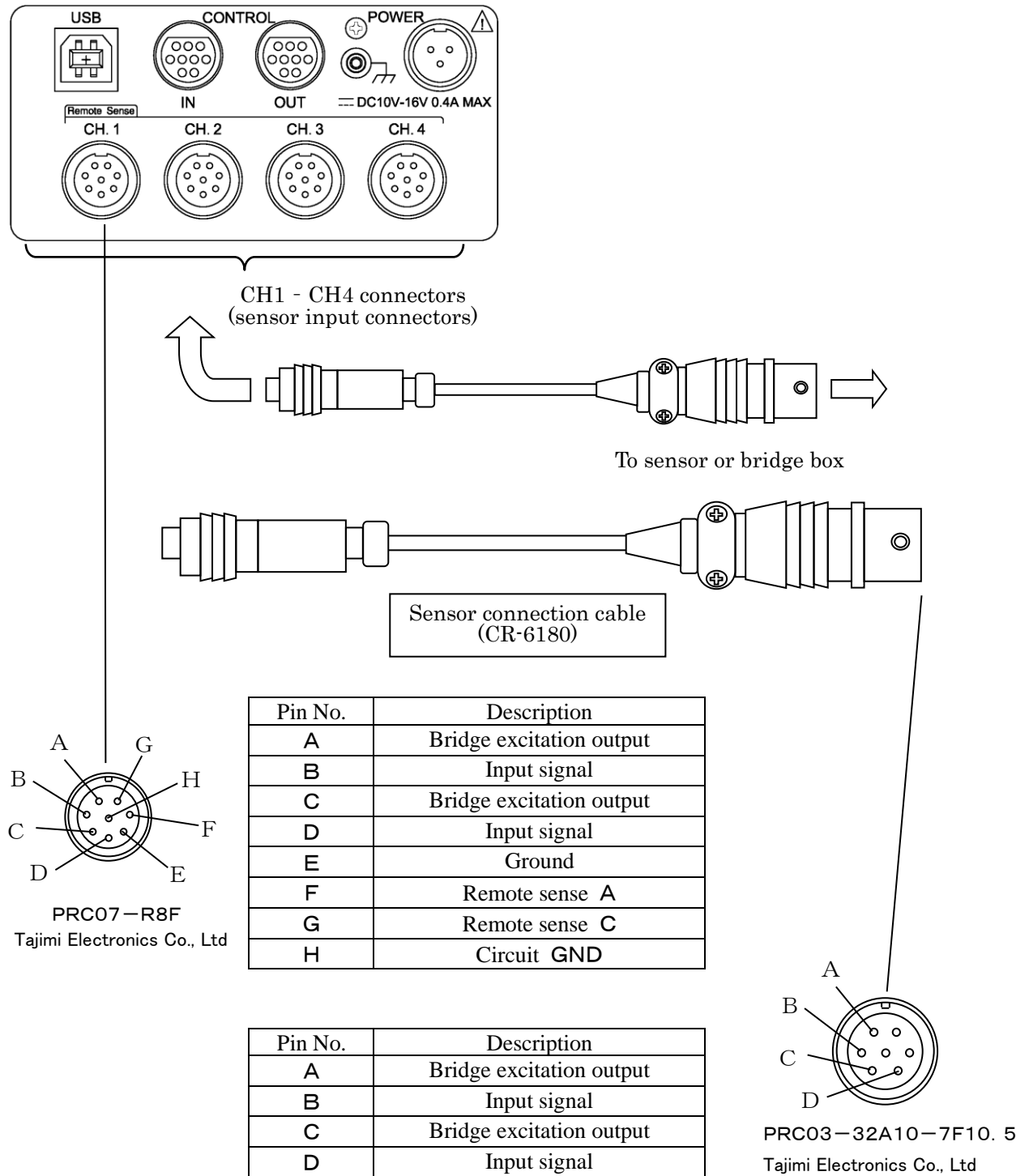The USB cable connector of this instrument is TYPE B.

⚠ **Caution**    Never disconnect USB cable during the instrument is communicating with computer or the computer reading data, or Windows OS may hang up.

to personal computer

USB cable
(CR-6182)
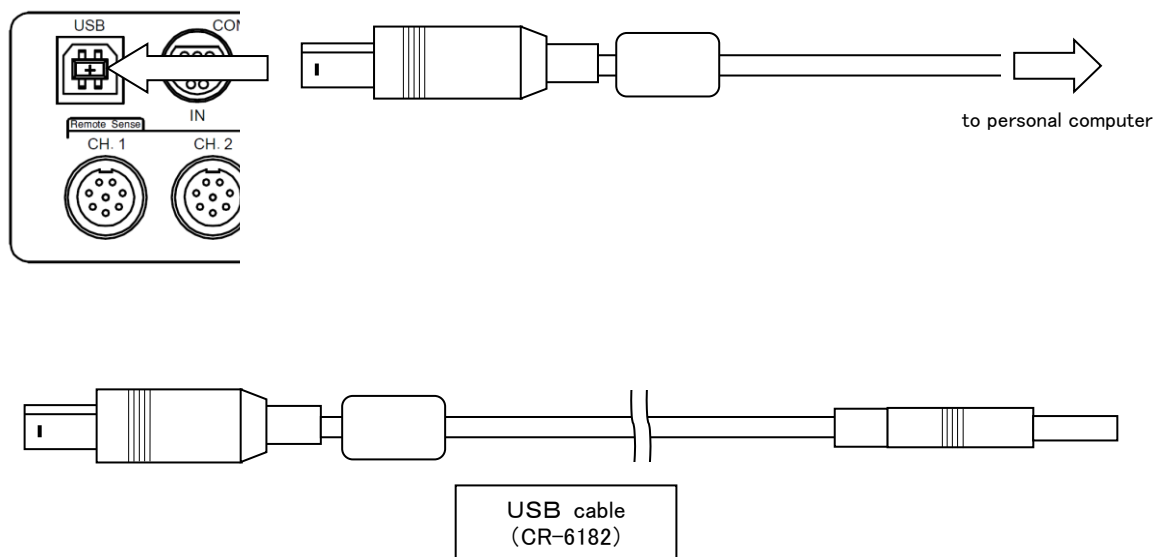
## 2.4  SENSOR CABLE CONNECTION

Four sensor input connectors are provided on this instrument.
Use supplied sensor connection cable (CR-6180) to connect TML's sensor or bridge box.
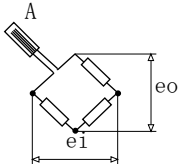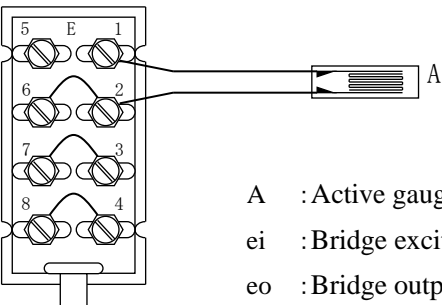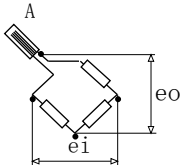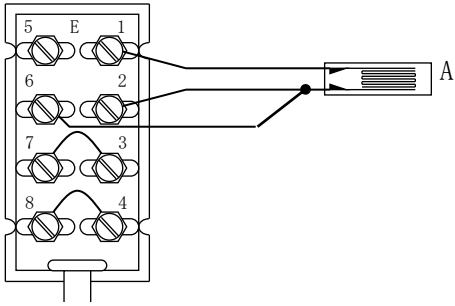
❏ Sensor cable connection

CH1 - CH4 connectors
(sensor input connectors)

To sensor or bridge box

Sensor connection cable
(CR-6180)

| Pin No. | Description |
|---------|-------------|
| A | Bridge excitation output |
| B | Input signal |
| C | Bridge excitation output |
| D | Input signal |
| E | Ground |
| F | Remote sense A |
| G | Remote sense C |
| H | Circuit GND |

PRC07－R8F
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| Pin No. | Description |
|---------|-------------|
| A | Bridge excitation output |
| B | Input signal |
| C | Bridge excitation output |
| D | Input signal |

PRC03－32A10－7F10.5
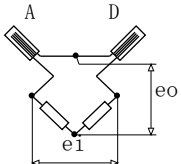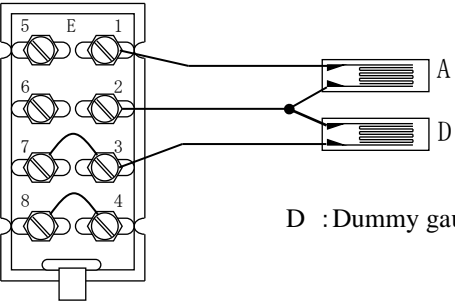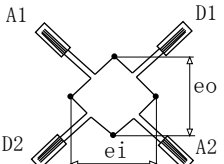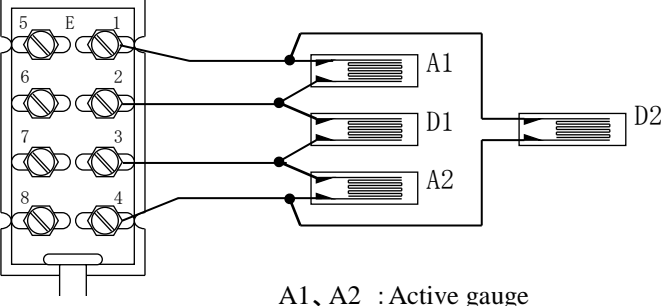Tajimi Electronics Co., Ltd

Note  Sensor input transformation cables for remote sensing or with an extended length are available. Please contact us.
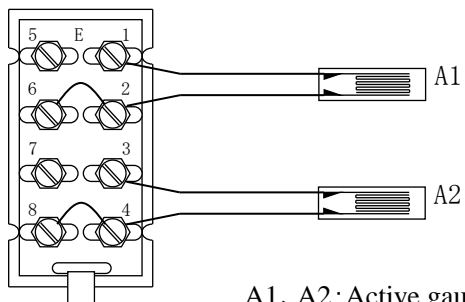
❏ Connection via bridge box

Strain gauge can be connected to this instrument via bridge box. Connection cable between the strain gauge and the bridge box should be made as short as possible.
Half bridge and full bridge circuits should be configured near the strain gauges.

Terminal connection diagram

| Gauge connection | Terminal connection diagram |
|---|---|
| Quarter bridge 2-wire method | A : Active gauge<br>ei : Bridge excitation voltage<br>eo : Bridge output<br>☐ : Internal bridge resistor |
| Quarter bridge 3-wire method | |
| Half bridge method | D : Dummy gauge |
| Full bridge method | A1、A2 : Active gauge<br>D1、D2 : Dummy gauge |

When shielded cables are used, connect the shield to No.5 (E) terminal.
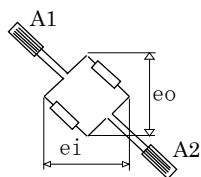
| Opposite half bridge | <br><br>A1、A2：Active gauge<br>　ei　：Bridge excitation<br>　eo　：Bridge output voltage<br>　□　：Internal bridge resister |
| --- | --- |
| Opposite half bridge<br>with 3-wire |  |
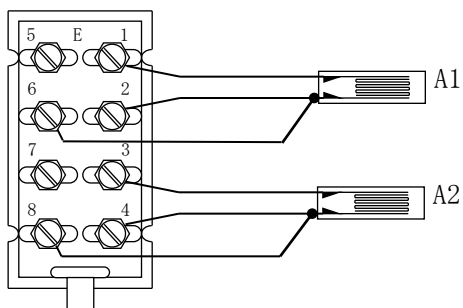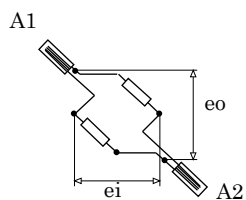
When shielded cables are used, connect the shield to No.5 (E) terminal.

❏ Connection via dedicated bridge box

The products mentioned below are bridge boxes for ultra-compact strain recorders DC-204R／204Ra/104R/104Ra (optional). They can be easily connected through one-touch operation and the ultra-compact size provides space-saving.
With the "SB-120DD-1R", a 120Ω strain gauge can be measured by the 1 gauge 3-wire method, and 120Ω and 350Ω strain gauges can be measured by the 2 gauge method.
With the "SB-350DD-1R", a 350Ω strain gauge can be measured by the 1 gauge 3-wire method, and 120Ω and 350Ω strain gauges can be measured by the 2 gauge method.
The "SB-120DD-4R" is used for measurement by the 4 gauge method. 120Ω and 350Ω strain gauges can be connected.

| Measuring method | Bridge box | Strain gauge resistance value(Ω) |
|---|---|---|
| Quarter bridge 3-wire | SB-120DD-1R SB-350DD-1R | 120 350 |
| Half bridge | SB-120DD-1R SB-350DD-1R | 120、350 120、350 |
| Full bridge | SB-120DD-4R | 120、350 |

[Name of each part]
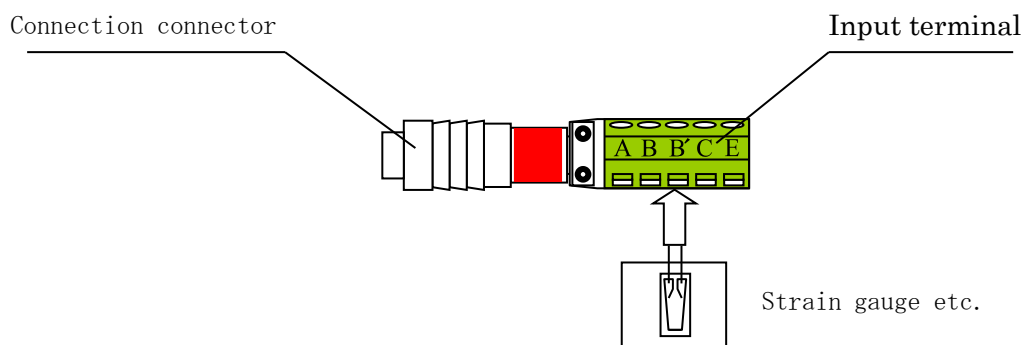


[Example of connection]

[Gauge connection]

See the figure below for the connecion to terminals.

## SB-120DD-1R/SB-350DD-1R

Quarter bridge 3-wire



Strain gauge
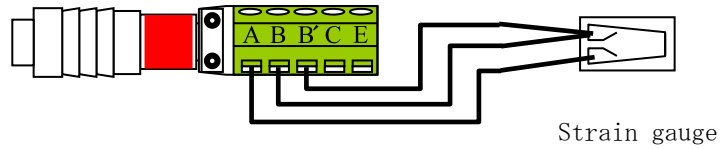
Quarter bridge 2-wire
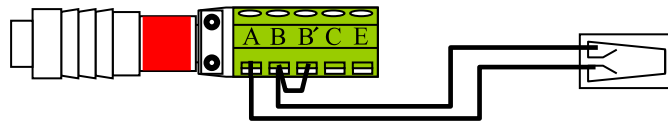


＊ Short between terminal B and B' with lead wire etc.
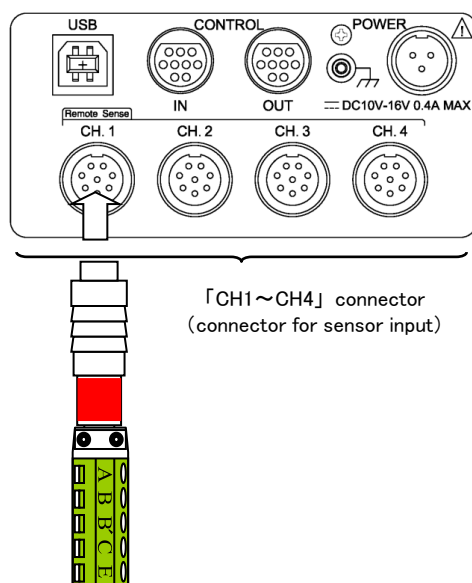
Half bridge

Strain gauge



D1

A1

## SB-120DD-4R

Full bridge



A1,A2 : Active gauge
D1,D2 : Dummy gauge

D1
A1
A2
D2

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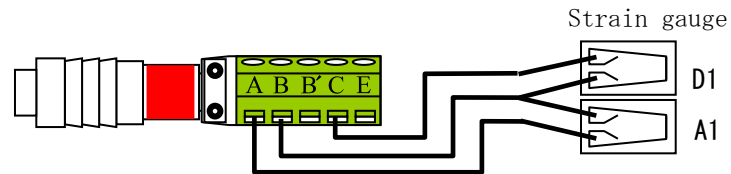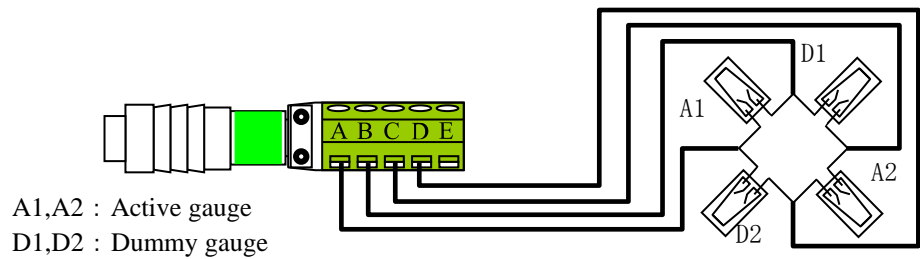
⚠ **Caution**
Wires having a diameter of AWG30 to 14 can be connected to the bridge boxes. Do not use any wire having a diameter other than AWG30 to 14.
If shielded wires are used in each connection method, they must be connected to the "E terminal".

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**Note** In order to make a connection cable between the strain gauge to be measured and the bridge box as short as possible, the sensor cable for the bridge box that extends the bridge box, CR-6184 (for remote sensing) is available. Please contact us.

## 2.5 ATTENUATOR CABLE CONNECTION

The attenuator cable (CR-4010: option) is used for voltage signal input to the instrument. Input voltage range of the attenuator cable is ±20V. This cable attenuates the input voltage signal to 1/1000 level and sends it to the instrument.

When measuring voltage signal using the attenuator cable, refer to "Examples of amplifier and physical unit / coefficient settings" in DC-7204 Operation Manual for the details of setting method.



CH1- CH4 connectors
（sensor input connectors）

Attenuator cable
（CR-4010）

To voltage signal source
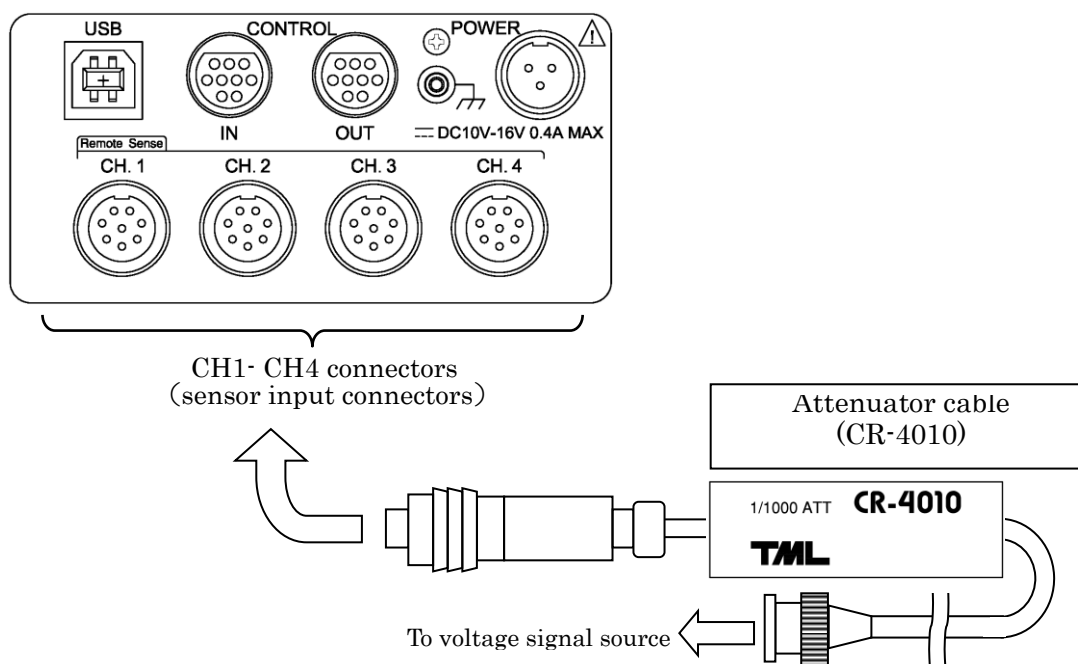
※ Connector used for voltage source side of attenuation cable : BNC plug
Mating connector : BNC receptacle and jack

Note    Attenuator cable CR-4020 which attenuates to 1/100 is provided.

## 2.6  CONTROL CABLE CONNECTION

"Control" connectors provided on this instrument are used for the connections of the synchronizing cable (CR-6181) and control cable for control signal input from outside (start, stop, trigger signals from equipment outside). The explanation of these cable connection methods is given in the following subsections:

❏ Synchronizing cable connection

The synchronizing cable is used when multiple numbers of DC-204R/204Ra are used for simultaneous sampling measurement. The synchronizing cable connection method, usable connectors, connection example and master/slave relation are explained in the following paragraphs:

**[Synchronizing cable connection method]**



To DC-204R/204Ra
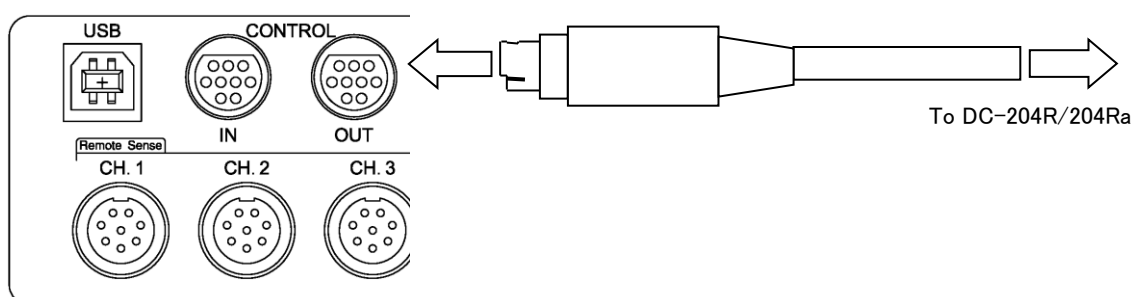
**[Cable and mating connector]**



Synchronizing cable
(CR-6181)
(Option)
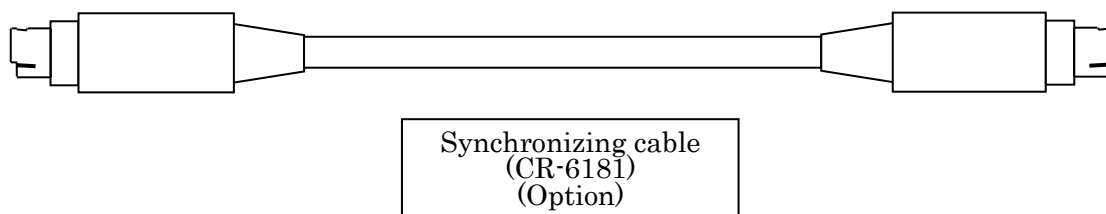
"Control" connectors
    Connector used : TCS7709-29-218 (Hoshiden Corporation)
    Mating connector : TCP8939-29 (Hoshiden Corporation)

⚠ **Caution**

When two or more units of DC-104R/104Ra are connected using synchronizing cables, the version of MAIN ROM of those DC-104R/104Ra need to be same each other.
Otherwise errors will be generated with the instruments set to Slave.

**[Connection example and master / slave relation]**



When connecting multiple numbers of DC-204R/204Ra using synchronizing cables, connect cables to " OUT " and " IN " connectors as shown in the above figure. When the instrument is connected in this way, the instrument whose "IN" terminal is vacant becomes the master.
Connect "OUT" connector of the master DC-204R to "IN" connector of the slave DC-204R/204Ra. When connecting three or more instrument, connect them in a manner "master OUT → slave 1 IN, slave 1 OUT → slave 2 IN …and so on".
Confirm that power of all instruments are turned off before you connect them.
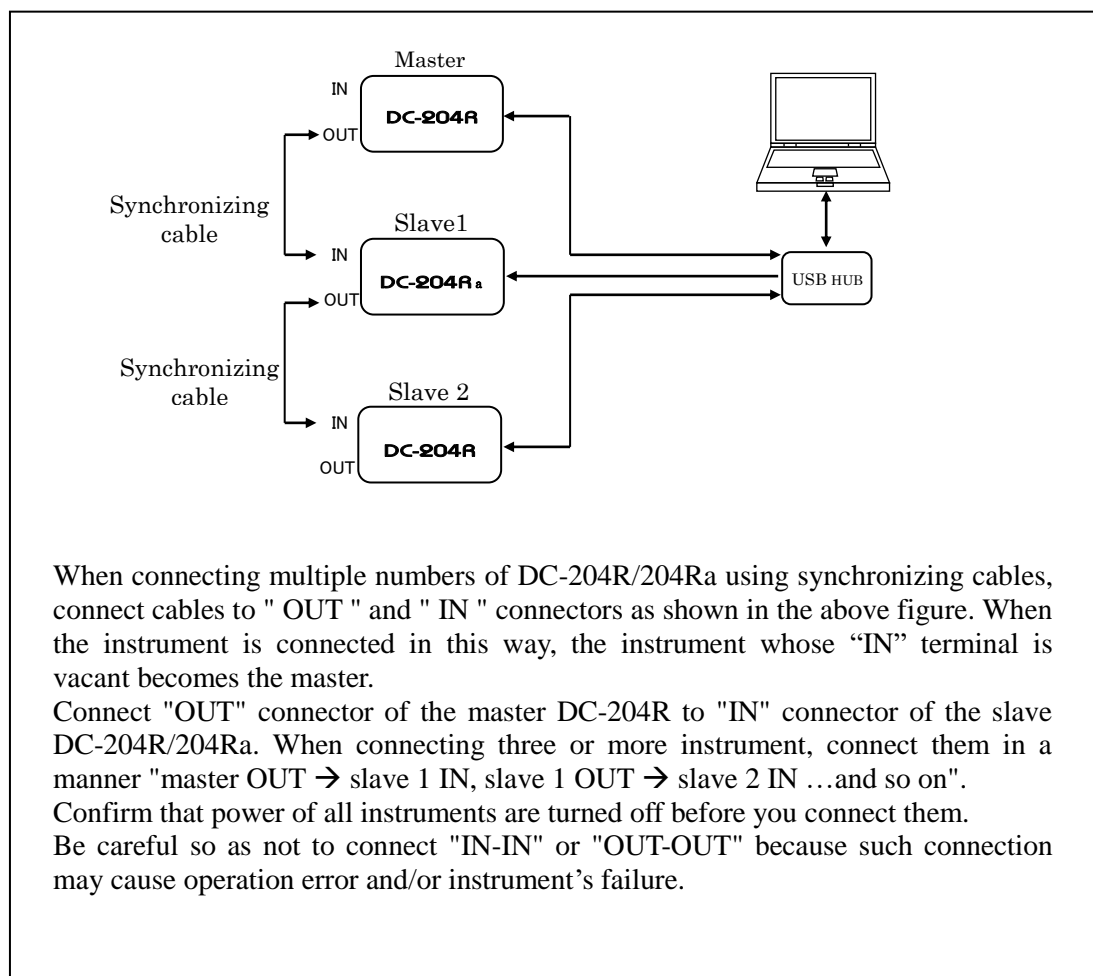Be careful so as not to connect "IN-IN" or "OUT-OUT" because such connection may cause operation error and/or instrument's failure.

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✎  DC-204R/204Ra and DC-104R/104Ra can be connected using synchronizing cables. In that case, the setting of DC-204R/Ra and DC-104R/Ra needs to be the same.

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⚠ **Caution**   When two or more units of DC-204R/204Ra are connected using synchronizing cables, be sure to supply power source to all units. If power is not supplied to any one of the units, all units do not operate correctly.

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⚠ **Caution**   When sampling speed of master is set to 5 - 20μ and DC-104R/104Ra is connected to slave, USB communication is disabled because the internal operation of DC-104R/104Ra can not catch up with.
In this case, disconnect synchronization cable and then reconnect it after setting each equipment.
When use DC-204R/204Ra and DC-104R/104Ra together, setting DC-104R/104Ra to master is recommended.

❏ External control signal

External start, external stop and external measurement trigger are available as external control signals. These signals are input through "IN" of "CONTROL" connector.

See the figure below for each pin No. description. When inputting external control signal generated by a mechanical contact switch etc., input the signal with reference to the circuit diagram below in order to prevent chattering influence.

**[Input of external control signal]**

USB  CONTRO

External control signal

Remote Sense
CH. 1  CH. 2
IN
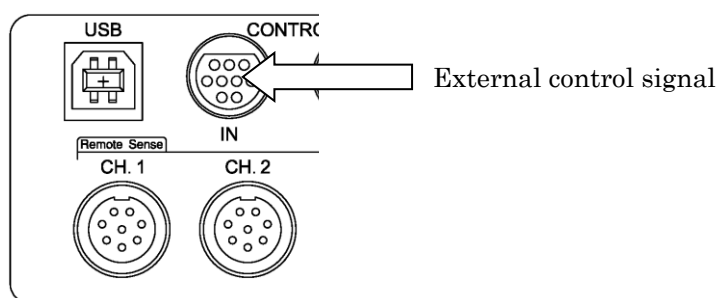
**["CONTROL" connector pin No.]**

| Pin No. | Signal description |
|---------|--------------------|
| 1 | External start/stop |
| 6 | External trigger |
| 8 | Power supply |
| 9 | GND |

Do not use pins other than those indicated in the left table.

**["CONTROL" connector pin layout]**

8 7 6
5 9 4 3
2 1
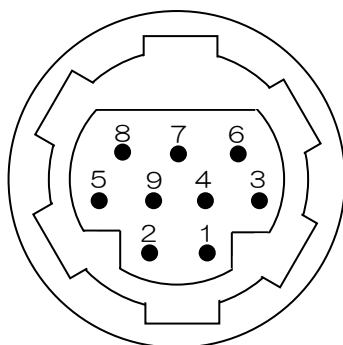
TCS7709-29-218

⚠ Caution  Do not use No.8 pin in "CONTROL" connector (power source) for other purpose than external control signal. This may cause failure.

Pin No., color of wire and assigned control signal of external control cable are as follows.



External control cable(CR-6183)
(Option)
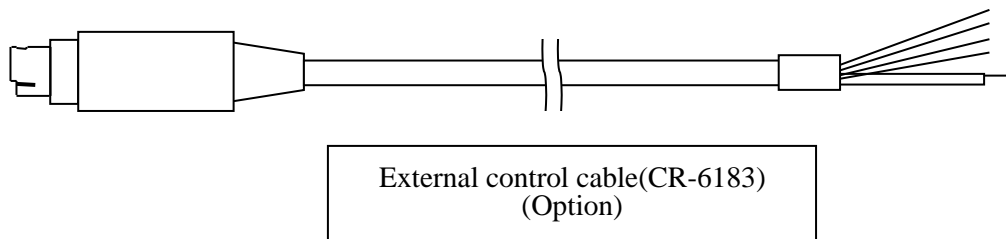
| Pin No. | 1 | 6 | 8 | 9 | |
|---|---|---|---|---|---|
| Lead wire color | Red | Green | Grey | Orange | Green/Yellow Spiral |
| Signal | External start/stop | External trigger | Power source | GND | Shield |



Chattering prevention circuit

Grey

red

Green

Orange

R

R

SW1

SW2

C C
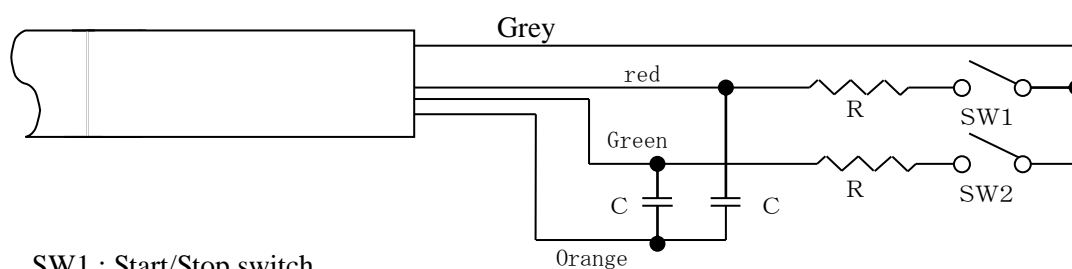
SW1 : Start/Stop switch
SW2 : Trigger switch
R : 10kΩ
C : 1nF

## 2.7 OUTPUT CABLE CONNECTION (for DC-204Ra)

The output connector is a 4-channel connector. Use the supplied output cable, (CR-3610).



"output" connector
(Connectorfor voltage output)

Output cable
(CR-3610)

to recorder etc.

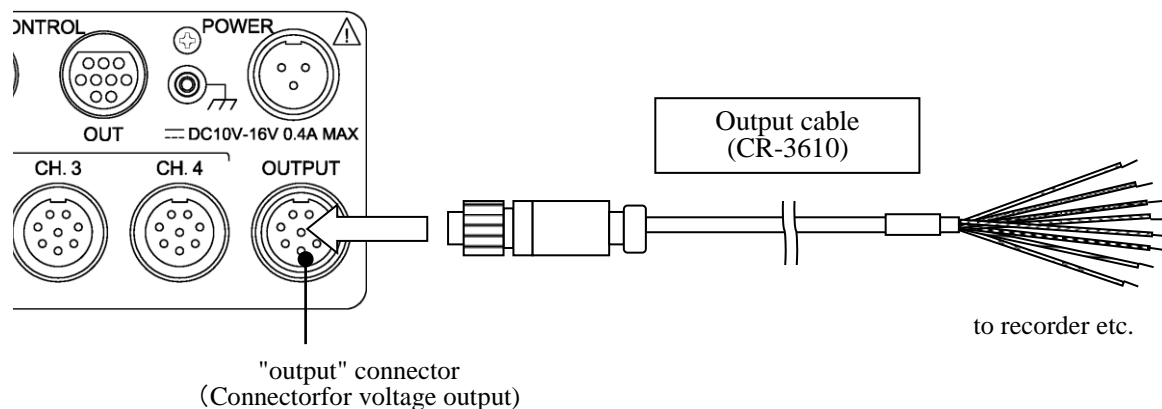| Connector pin number | Wire color * | Signal name |
|---|---|---|
| A | Orange (Red) | CH1_OUT |
| B | Orange (Black) | CH1_GND |
| C | Gray (Red) | CH2_OUT |
| D | Gray (Black) | CH2_GND |
| E | White (Red) | CH3_OUT |
| F | White (Black) | CH3_GND |
| G | Yellow (Red) | CH4_OUT |
| H | Yellow (Black) | CH4_GND |

 * Wire Color: the color described in () is the color of dotted mark.

 * OUTPUT connector
    Connector used: R27-R8F (Tajimi El;ectronics Co., Ltd.)
    Mating connector: R27-PB8M (Tajimi Electronics Co., Ltd.)

BNC output cable (CR-3620: option)



BNC output cable
(CR-3620)
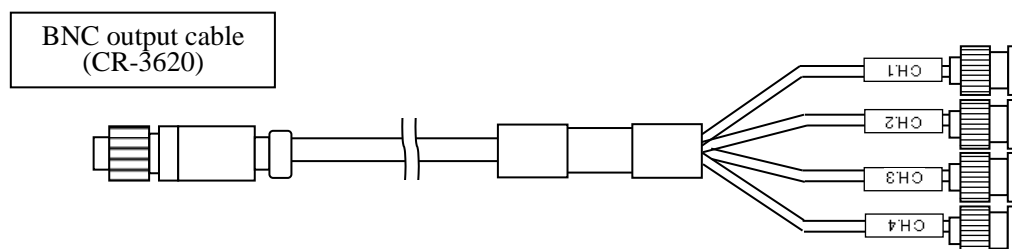
⚠ **Caution**    Never connect a cable other than the cable that comes with the product or that we specify.

## 2.8  EARTH CONNECTION

Before measuring, make sure you properly ground the unit to prevent noise and hum from the input line.

**[Grounding Example 1. The specimen is insulated from the ground]**
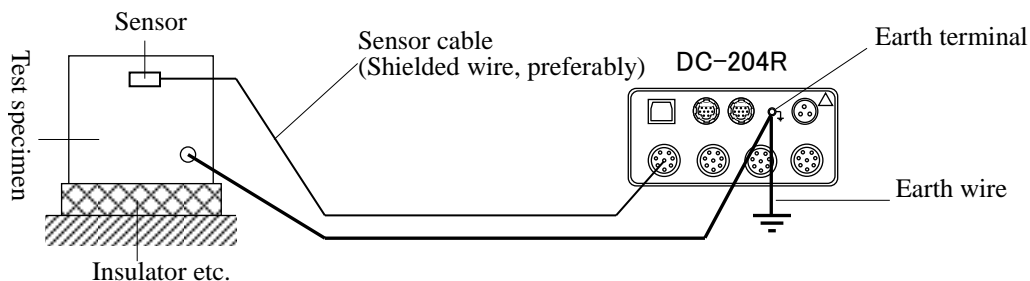


**[Grounding Example 2. The specimen is installed directly on the ground]**
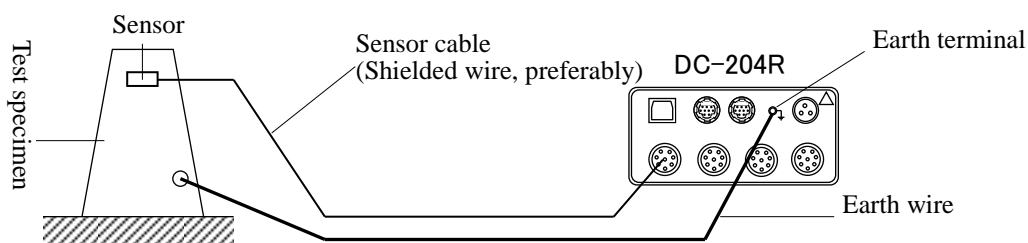


**[Grounding Example 3. The specimen is insulated from the ground]**



**[Grounding Example 4. The specimen is installed directly on the ground]**

# Chapter 3

## OTHER  FUNCTIONS

# 3.1 LED OPERATIONS

Four LEDs are provided to this instrument. They are PWR, SYNC, USB and MES.
The name and operation of these LEDs are as follows:

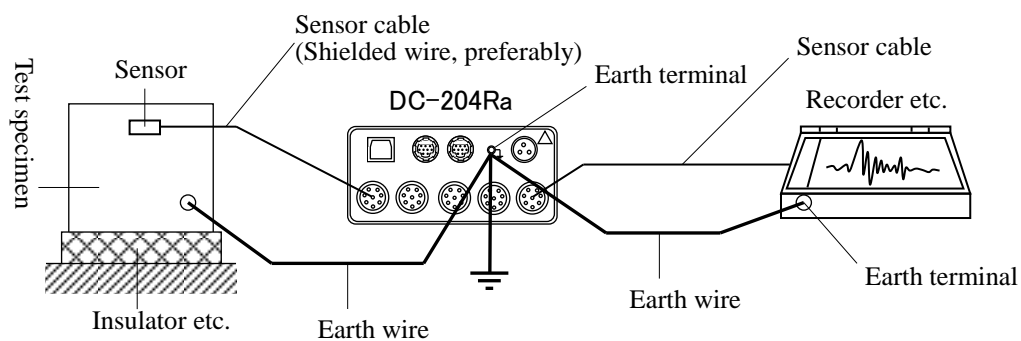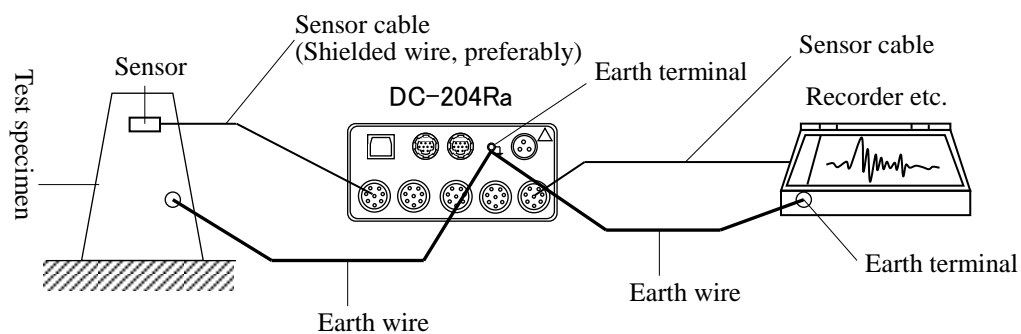| LED name | Status | LED color | Operating condition |
|---|---|---|---|
| PWR | Turn On | Green | Power voltage is normal. |
| | | Red | Power voltage is lowering. Check power supply condition. |
| | Blinking | Green | Error is occurring inside.<br>Measurement cannot be implemented in this condition. Check error details using the control software. |
| | | Red | Slow blinking: The instrument is now on standby for power down by the UPS operation.<br>(Data protection has been completed.) |
| SYNC | Turn On | Green | Synchronizing error is occurring. Check synchronizing cable connection and data logging conditions (sampling speed, pre-area setting etc.) |
| | | Red | |
| | Blinking | Green | The instrument is operating as a master. |
| | | Red | The instrument is operating as a slave. |
| USB | Turn On | Red | The instrument is now receiving signals. |
| | | Green | The instrument is now transmitting signals. |
| | | Orange | The instrument is now transmitting and receiving signals. |
| MES | Turn On | Red | The instrument is now in pre-trigger status. |
| | | Green | The instrument is now in trigger ON status. |
| | Blinking | Red | The instrument is now processing treatment after measurement stop. (It may take about 10 seconds.) |
| | | Green | The capacity of compact flash card is full. Replace with a new card or initialize the card. |

## 3.2  COMPACT FLASH CARD

This equipment stores data in a compact flash card. Usable compact flash card is a card meeting the following requirements. Always check flash card specification before use.

◎Usable flash card

　Capacity : 32M - 2G bytes (designated by TML)（available from TML）

| ⚠ Caution | When using a new type compact flash (CF) card or a card having different storage size for the first time, implement CF Card Check in the control software.<br>Many cards on the market may not pass the CF Card Check. When purchasing a compact flash (CF) card, be sure to purchase a card from TML.<br>(Refer to "6.1  INSTRUMENT CHECK" in DC-7204 Operation Manual for the details of CF Card Check method.) |
|---|---|

| ⚠ Caution | Do not format a CF card using a personal computer or digital camera. If a CF card is formatted, this instrument may not recognize the card or the writing speed may be lowered. |
|---|---|

## 3.3 UPGRADE OF DC-204R/204Ra

The Flash ROM of this instrument can be rewritten. The program for upgrading is available in website of TML (http://www.tml.jp/e/). Method to download program and upgrade DC-240R/204Ra is as follows:

| ⚠ Caution | ○ This instrument can be upgraded 100 times at maximum. Over 100 upgrading may cause malfunction. <br> ○ Before upgrading, remove the CF card. During upgrading, the power of the CF card becomes unstable. |
| --- | --- |

**[Operation procedure]**
1. Make sure that the DC-204R/Ra is switched off and that the control software DC-7204 has not been started.
2. Download the upgrading program from TML website (http://www.tml.jp/e/).
3. Press and hold the START/STOP key on the front panel of DC-104R/Ra, and then supply the power source. After confirming the SYNC LED and MES LED blink, release the START/STOP key.
4. Start the control software DC-7204. "Version Up" window opens just after the start. Click "OK" button to continue upgrading.
5. The following Version Up window opens. Click "Next" button to continue upgrading.
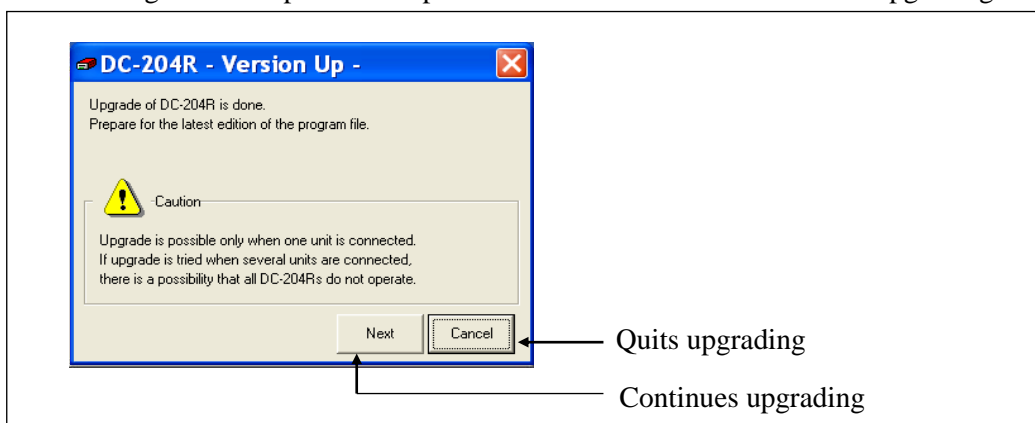


6. Message is indicated as "Specify the place of the program file". Click "File designation" button to continue.
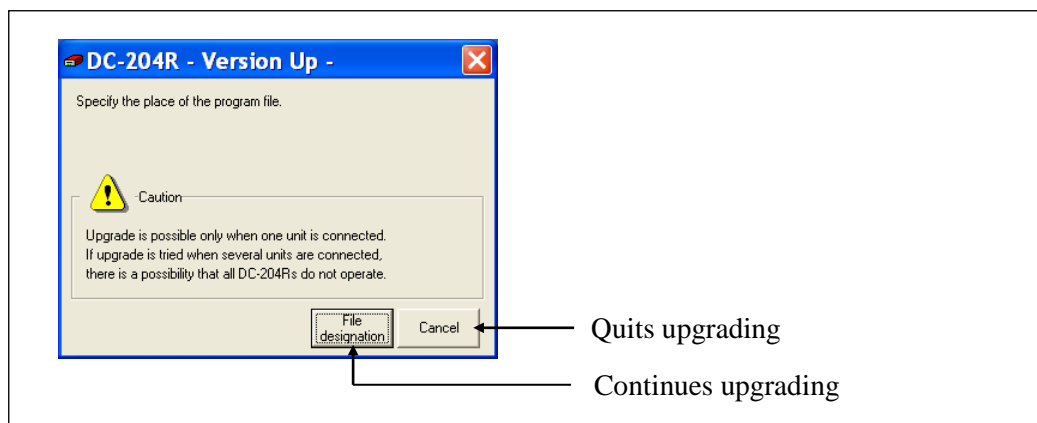
7. By clicking "File designation" button in 6., "Read File" dialog opens.
Select the downloaded upgrading program and click "Open" button.

Opens designated file
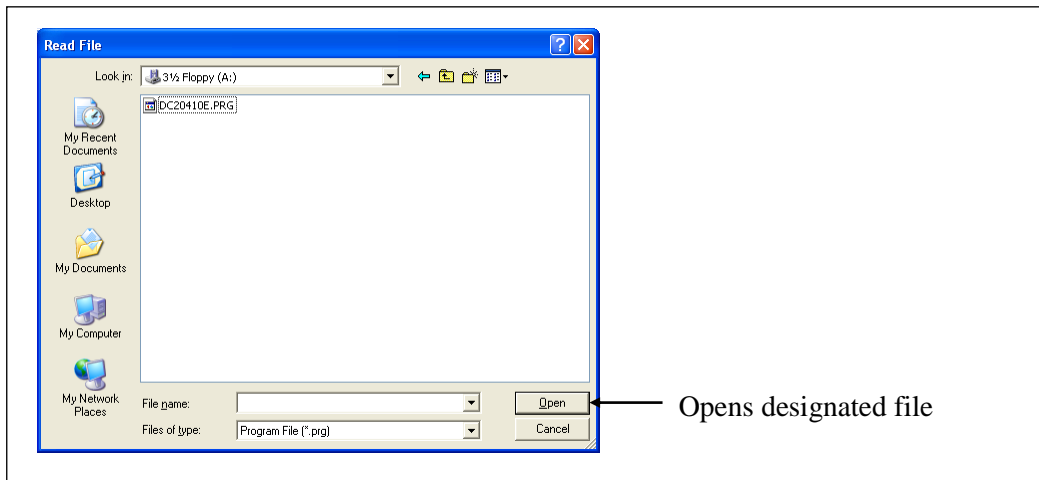
8. After the file is selected, message is indicated as "Program file has been read." Click "Run"
button to perform upgrading.
It takes approximately 40 seconds to upgrade.

Quits upgrading

Performs upgrading
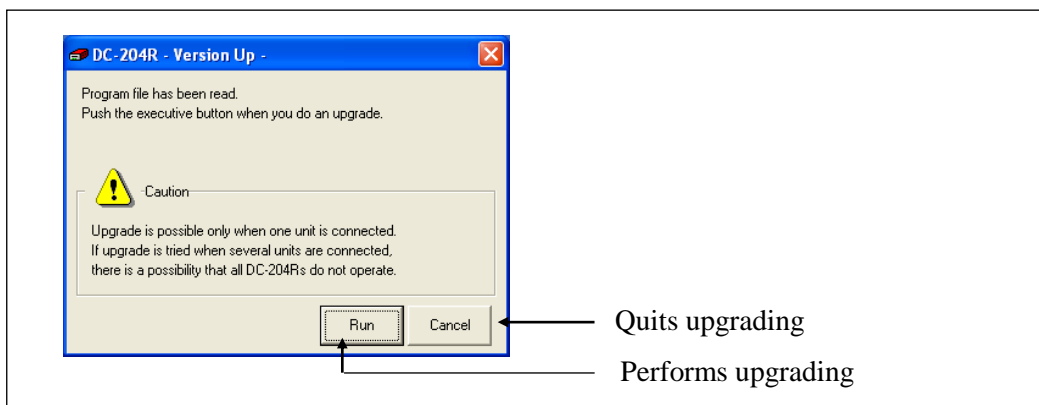
9. After the upgrading is finished completely, the following message is indicated. Click "Cancel"
button to end.
In case of measurement after upgrading, switch on the DC-104R again.

Ends upgrading
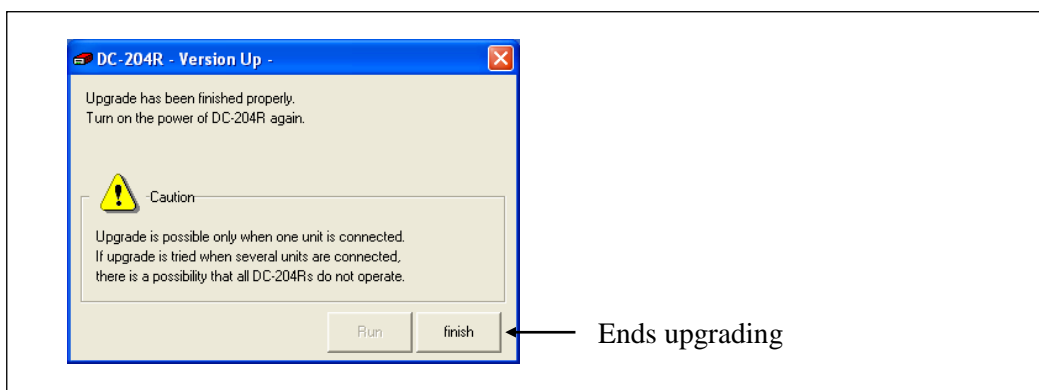
✎memo

# Chapter 4

## MEASUREMENT

## 4.1 PREPARATION BEFORE MEASUREMENT

❏ Built-in rechargeable battery

A built-in rechargeable battery is provided in DC-104R/Ra for the purpose of back-up power supply to memories and real-time clock. The time required to fully charge the battery and its effective back-up period are as follows:

> Time required to charge the battery full : About 5 minutes
> Back-up effective period : About one (1) week

When using DC-204R/Ra for the first time or after passing the effective back-up period without supplying power source, always charge the battery before starting the measurement. You can charge the battery by connecting the power cable to DC-204R/Ra and supplying power.
Check date and time of DC-204R/Ra (see "6.2 CONFIRMATION OF SETTING CONDITIONS" in DC-7204 Operation Manual). If the date and/or time indicated are shifting from the actual date and/or time, charge the battery as it considered being empty. Reset correct date and time after the charge (see "5.2   SETTING OF DATE / TIME" in DC-7204 Operation Manual for the details of date/time setting).

❏About driver and control software installation

For using DC-204R/Ra by connecting it to a personal computer, it is necessary to install the driver program and control software in the computer. Refer to "2 OPERATION ENVIRONMENT AND SETUP METHOD" in DC-7204 Operation Manual before installing program the program.
As for method of installing the driver program, refer to "2.3   HOW TO INSTALL DRIVER " in DC-7204 Operation Manual. Also refer to "2.2   HOW TO INSTALL   DC-7204" for the method of installing control software.

## 4.2   ACTIVATING AND SETTING

### ❏ Activating

**[Operation Procedure]**
1. Connect all necessary cables to DC-204R/Ra and turn on the power of DC-204R/Ra.
2. Insert a compact flash card in the DC-204R/Ra slot.
3. Turn on the power of DC-204R/Ra.
4. Connect the DC-204R/Ra to a personal computer.
5. Start the control software dedicated for use with DC-204R/Ra (hereinafter called "the control software").The main menu of the control software appears on the screen (refer to "4. SCREEN CONFIGURATION AND MENU SYSTEM" in DC-7204 Operation Manual).
6. Confirm that the connected DC-204R/Ra is correctly recognized by checking the serial number in the status button on the main menu.

### ❏ Setting

The setting of measurement conditions of DC-204R/Ra is implemented through the control software. Set and/or confirm measurement conditions before starting measurement.

**[Operation Procedure]**
1. Implement various checks of the DC-204R/Ra using check functions in the control software and confirm that no abnormality exists. (See "6. INSTRUMENT CHECK AND CONFIRMATION OF SETTING CONDITIONS" in DC-7204 Operation Manual for the details of various checks.)
2. Let the measuring equipment memorize set measurement conditions by using the control software. (See "5. SETTINGS REQUIRED BEFORE MEASUREMENT" in DC-7204 Operation Manual for the details of this setting.) Main settings are explained in the following paragraphs:

**[Data Size]**
The data size stored in a compact flash card is as follows.
[Measuring data size × the number of channels used]

[Example]   When measuring conditions are set to the following channel mode and data size:
　　　　Channel mode: 4 channels
　　　　Data size       : 64k (data),
　　　　 the data size recorded in one time measurement is
　　　　64k (data) × 4(ch) =256k(data).

**[Sampling Speed]**
Recording time of waveform data is as follows.
　　[Sampling speed (sec) × Data size (data)].

［Example]   When measuring condition is set to the following sample speed and data size:
　　　　Sampling speed : 0.5 (msec)
　　　　Data size          : 64k (data),
　　　　the recording time of waveform data is
　　　　0.5 [msec] × 64k [data] = 33[msec].

See Sampling Speed/Recording speed (Sampling Interval) section in "5. SPECIFICATIONS" of DC-204R/Ra Operation Manual for the details of these setting values.

**[Pre-area]**

Size occupied by the pre-area data in the total data size is

[Measurement data size (data) × Pre-area percentage (%)].

〔Example〕 When measuring conditions are set to the following sampling speed, data size and pre-area:

Sampling speed: 0.5 (msec), Data size: 64k (data), Pre-area: 30%,

Size occupied by the pre-area data in the total data size is

[64k (data) × 30 (%) = about <u>19.7k (data)</u>,

and its recording time is

33 (sec) ×30 (%) = <u>9.9 (sec)</u>.

(See "5. SETTINGS REQUIRED BEFORE MEASUREMENT" in DC-7204 Operation Manual for the details of the above settings.)

⚠
**Caution**
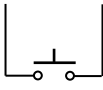
Please note that the following combination can not be set.

| Sampling speed | Recording Data Size |
|---|---|
| 5 μ sec | 1k～32k |
| 10 μ sec | 1k～16k |
| 20 μ sec | 1k～8k |
| 50 μ sec | 1k～2k |
| 100 μ sec | 1k |

## 4.3   START OF MEASUREMENT

❏ Measurement start / stop and Manual trigger

The explanations of button operations for measurement start, stop and manual trigger etc. are given in this section.

| | START | STOP | MANUAL TRIGGER |
|---|---|---|---|
| Control software *1 (DC-7204) | ▷ | ■ | ▷▷ |
| Front panel switch | START /STOP BAL HLD<br>ON, first time | START /STOP BAL HLD<br>ON, second time | ———— |
| External *2 START / STOP | ⌐o o⌐<br>ON, first time | ⌐o o⌐<br>ON, second time | ———— |
| External trigger *2 | ———— | ———— | ⌐o o⌐<br>ON |

Note 1. For the operation details of each button in "Control software" line in the above table, see the explanation about start button, stop button and manual trigger button in "4. SCREEN CONFIGURATION AND MENU SYSTEM" of DC-7204 Operation Manual.

Note 2. See "2.6 VARIOUS CABLE CONNECTIONS" in DC-204R/Ra Operation Manual for the operation of external start, external stop and external trigger in the above table.

⚠ **Caution**   With the DC-104R/104Ra, you can store the measurement condition settings in the instrument using the control software and then perform measurement from the main unit using the front panel switches and other features without the personal computer being connected.

❏ Various measurement examples

Various measurement examples are taken up and explained in this section. As the term "Start", "STOP" and "MANUAL TRIGGER" in the example figures correspond to those in the table in the previous section "Measurement Start, Stop and Manual Trigger", read this section with reference to that table.

[(1) Measurement example in each trigger mode (Pre-area setting: 0%)]

1. SINGLE Mode
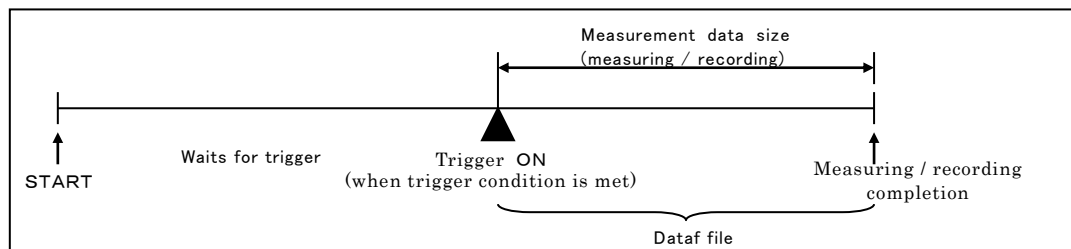


When SINGLE mode is used, the instrument waits for trigger after START and measures / records a set size of measurement data upon receiving "TRIGGER ON" signal. At the time of measuring / recording completion, a series of measurement operation in this mode is completed.

> ⚠ **Caution** START, STOP and MANUAL TRIGGER buttons are operable only by the unit set as master.

2. CONTINUE Mode
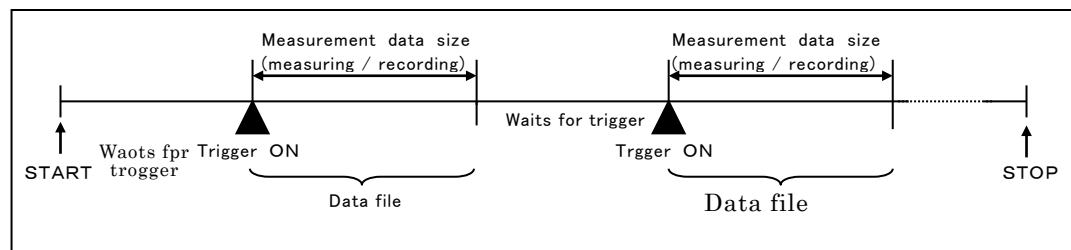


When CONTINUE mode is used, the instrument repeats the cycle "Waits for trigger" → "Trigger ON" → "Measuring / recording set size data" → "Waits for trigger" … after the START, and stops measurement when STOP button is pushed or the compact flash card is filled full with collected data.

3. FREE RUN Mode
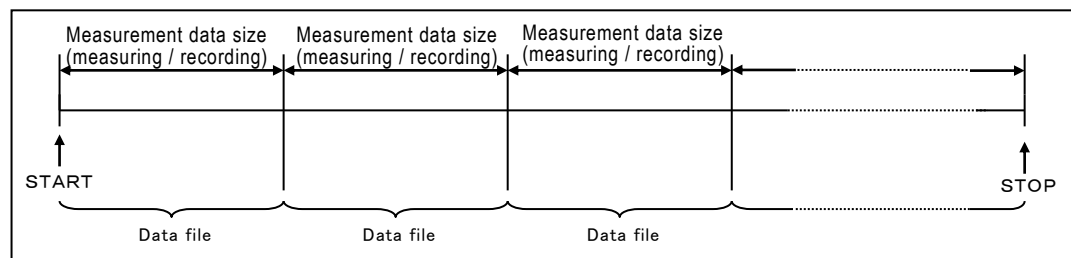
When FREE RUN mode is used, the instrument measures and records set size data just after the START and repeat next measurement after completing previous measurement, and stops it when STOP button is pressed or the compact flash card is filled full with collected data.

When compact flash card becomes full with data on the middle way to collect set size data, the data already collected before stop is maintained.

[(2) Measurement Example with Pre-area Setting]
(See "4.2  ACTIVATING AND SETTING  Activation" in this manual for details.)

1. When pre-area is set to 30 %:
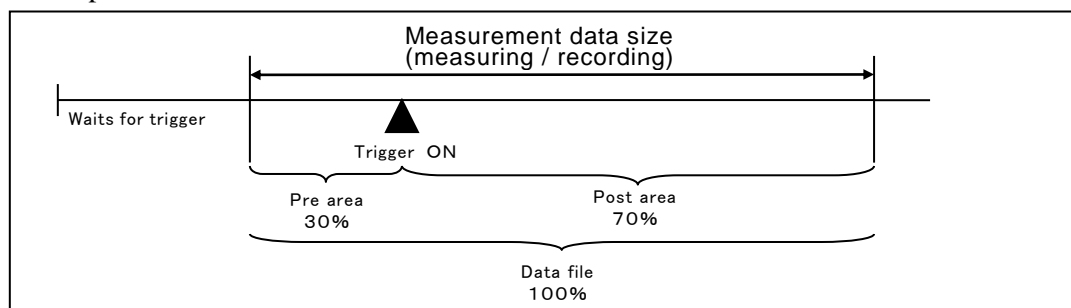


Pre-area setting is available in SINGLE mode, CONTINUE mode and manual trigger mode. There is a case in which trigger becomes ON just after the START and pre-area capacity is insufficient for a set time value, or post-area of previous measurement data overlaps with pre-area of the next data. This instrument and the control software handle such situation by the methods described in the following paragraph.

2. For a case where trigger becomes ON just after the START and pre-area capacity is insufficient for set value:
When trigger becomes ON just after the START and pre-area capacity is insufficient for set measurement time, such insufficient amount of time is added to the end of post-area.
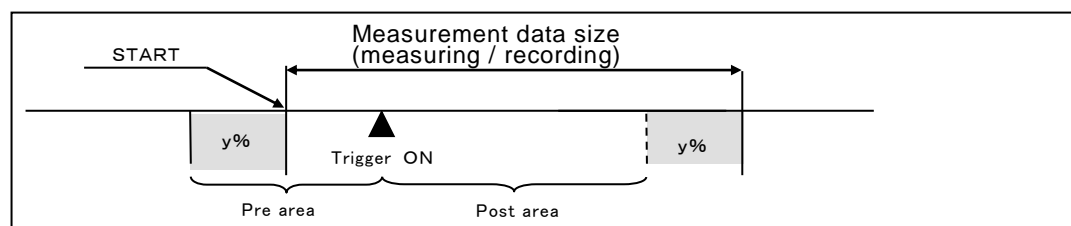


3. For a case where previous data's post-area overlaps with pre-area of the next data:
Such overlapped measuring time is added to the end of the next data's post-area.
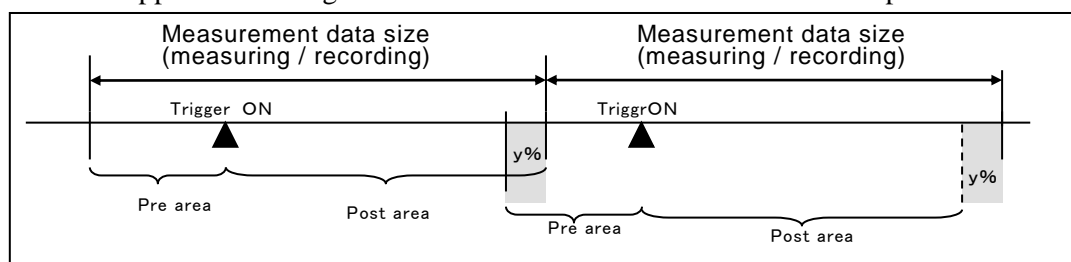
[(3)Measurement Example Using Manual Trigger]

Measurement data size
(measuring / recording)

Waits for
triggr

START

MANUAL
TRIGGER

STOP

Data file
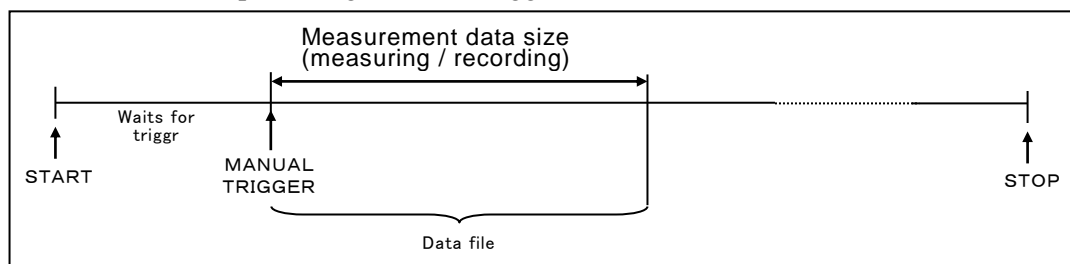
Manual trigger generated by Manual Trigger Button in the control software or external source can be used. After the START, you can measure and record data at any optional timing by performing manual trigger to the instrument in waiting condition. However, when the instrument is in usual "Trigger ON" condition, the manual trigger cannot be used.

❏ Operations for data reading, storing and waveform data processing

You can read the data from this instrument during measurement by restricting the sampling speed.

| Number of measuring point | Sampling speed |
|---|---|
| 4 channel mode | 2 msec or more |
| 2 channel mode | 1 msec or more |
| 1 channel mode | 0.5 msec or more |

⚠ Caution | It requires more time to read data during measurement compared to usual data reading.

The details of data processing procedure after measurement are described in DC-7104 Operation Manual.
Location of the information is as follows. Please refer to these sections:

| | Section (in DC-7204 Operation Manual) |
|---|---|
| Data reading | 8.1 WAVEFORM INDICATION FROM COMPACT FLASH CARD OR STORAGE DATA<br>8.3 METHOD OF INDICATING WAVEFORM FROM THE COMPACT FLASH CARD INSERTED INTO DC-204R/Ra |
| Data storage | 8.6 PROCESSING METHOD OF MEASURED DATA |
| Waveform data processing | 8.7 SAVING THE MEASURED DATA |

❏ Power failure during measurement

This instrument is equipped with the UPS (Uninterruptible Power Supply) circuit for an unexpected power failure.

When an instantaneous power interruption or power failure occurs, the instrument stops measurement and stores data in a CF card automatically. If the trigger mode is CONTINUE or FREERUN, measurement will resume after the power supply is restored.

| ⚠ Caution | Power failure on just one DC-204R/204Ra will cause all the DC-204R/204Ras to work improperly if they are connected with a sync cable. |
|---|---|

❑ Balance and open check operations with the panel key

Pressing the front panel key of the DC-204R/204Ra for more than three seconds enters the balance mode of the balance operation. Pressing the key again starts balancing. In this case, all the channels will be balanced; channels cannot be specified.

If the front panel key is pressed for more than three seconds and is not pressed again in the balance/open check mode, the open check operation will start in three seconds. All the LEDs blink red when the operation is in the balance/open check mode and the result of the open check will be indicated by the colors of the LEDs.

**[Operation Procedure]**

Press the front panel key      Release the front panel Key

3 Sec          approx 1 Sec          approx. 3-6 Sec

| Start measurement | Balance mode | Open check period | File delete | Normal condition |

Period 1     Period 2     Period 3     Period 7     Period 5     Period 6

Press the key

Pressing the key again during Period 3 starts balancing

approx. 4sec          approx. 3-6sec

| Balance period | File delete | Normal condition |

Period 4     Period 5     Period 6

The following pages describe the operation procedure.

⚠ **Caution**   [For the situation where multiple instruments (sync operation) are used]
Balancing using the panel key should be done for each instrument

1. Keep pressing the [START/STOP] key (for about three seconds). All the LEDs blink red, which means the operation is in the balance/open check mode.

    ・ Buzzer sounds twice to alert that the instrument has entered into the balance/open check mode.

    ・ If you release the key before three seconds elapse, the instrument will back to the regular measurement operation.

    ・ Measurement will be done for three seconds but the file will be deleted later.

    ・ If you start pressing the key during measurement, the measurement will be stopped immediately and the operation will enter into the balance mode after three seconds. During this period, measurement will not be done. Therefore, Period 5 will be skipped.

    ・ Measurement in the slave state causes an error (buzzer sounds three times).
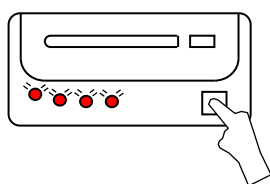
Press for longer than 3 sec and all LEDs blink red. (balance and open check mode)

2. All the LEDs remain blinking red until you release the [START/STOP] key.

3. Press the [START/STOP] key within three seconds after you release the key to start balancing of all channels.
   Buzzer sounds once to alert that balancing is started.
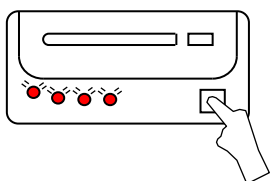
Press the key again to start balancing.

If there is no key input for more than three seconds, the instrument will exit the balance mode and back to the measurable state (regular state). The LEDs will back to the regular state.
Buzzer sounds three times to alert that the instrument has exited the balance mode.
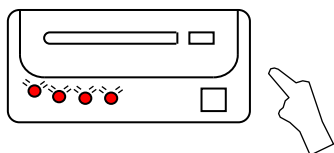
No key input for more than 3 seconds leads to exit

4. Once balancing is started, the instrument sequentially balances channels from Channel 1 through Channel 4.

- The LEDs indicate the results for those channels that has been balanced.
- Normal: remained balance is within the range of ±0.5%F, which is indicated by a green LED.
- Abnormal: remained balance is out of the range of ±0.5%F, which is indicated by a red LED.
- The LEDs correspond to CH1, CH2, CH3, and CH4 as shown in the table below. ・
- LEDs of DC-204R/204Ra during balancing

| Label on Panel | PWR | SYNC | USB | MES |
|---|---|---|---|---|
| Corresponding Channel | CH1 | CH2 | CH3 | CH4 |



Balancing started → CH1 balanced → CH2 balanced

CH3 balanced → CH4 balanced → 3 to 6 seconds later after CH4 balanced, the LEDs return to usual
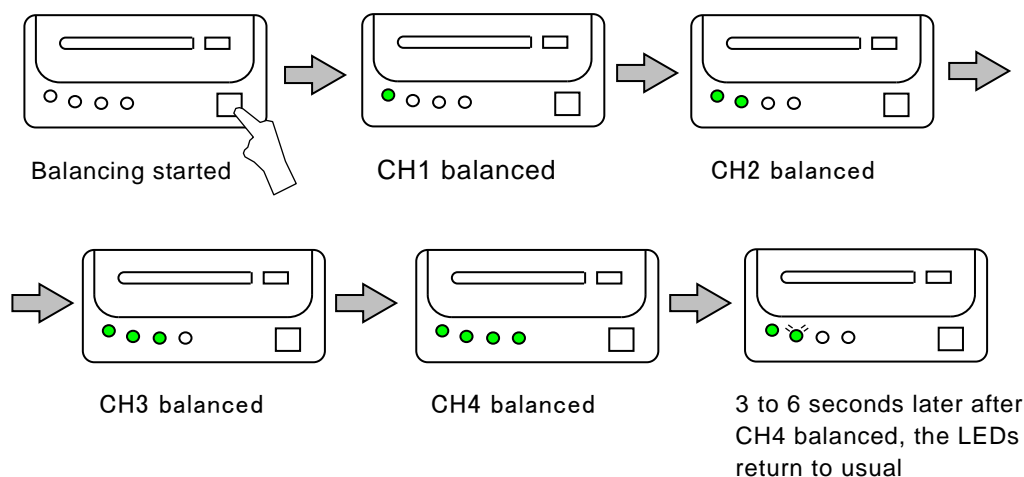
5. The unnecessary data for the three seconds is deleted.

It will take three to six seconds to delete the file.

・ If the file is deleted after balancing is performed, the result of balancing will be displayed.

・If the file is deleted without performing balancing, all LEDs light red.

6. The LEDs will back to regular state.

7. Once open check is started, the instrument checks Channels 1 through 4 for open.
   ・Open check is started and the result is indicated by LED.
   ・Connected: The LED lights in green.
   ・Open: The LED lights in red.
   ・The LEDs correspond to CH1, CH2, CH3 and CH4 from the left in the same way for balancing.

✎memo

# Chapter 5

## SPECIFICATIONS

# 5.1 SPECIFICATIONS

❏ DC-204R

Measurement

| Number of measuring points | 4 |
|---|---|
| Inputs | Strain, Voltage (Using option device CR-4010) |

Strain measurement

| Gauge resistance | 120Ω - 1000Ω(Full bridge) |
|---|---|
| Bridge excitation | DC2V, 0.5V, ON/OFF control |
| Measuring range | 5 ranges : 1000, 2000, 5000, 10000, 20000×10⁻⁶strain (2V bridge) |
| Maximum range | $20000\times10^{-6}$strain (2V bridge power source) <br> $80000\times10^{-6}$strain (0.5V bridge power source) |
| Accuracy | ±0.2%FS |

Voltage measurement（When using option attenuator cable CR-4010）

| Measuring range | 5 ranges : 1, 2, 5, 10, 20V |
|---|---|
| Maximum range | ±20V |
| Accuracy | ±0.3%FS |

| Low pass filter | 10、30、100、300、1k、3k、10kHz （Bessel type） | |
|---|---|---|
| Frequency response | DC～10kHz(-3dB±1dB) | |
| Stability | on zero | $\pm1\times10^{-6}$strain/℃(at max. sensitivity) |
| | on span | ±0.01%FS/℃(at max. sensitivity) |
| Balancing method | Electronic | |
| Balancing range | $\pm10000\times10^{-6}$strain | |
| Balancing accuracy | ±0.06%FS | |
| Balancing speed | Approx. 1sec/CH | |
| A/D converter | 16 bit Successive approximation type | |
| Resolution | 1or0.1×10⁻⁶strain in 1000×10⁻⁶strain | |
| | 1or0.1×10⁻⁶strain in 2000×10⁻⁶strain | |
| | 1×10⁻⁶strain in 5000×10⁻⁶strain | |
| | 1×10⁻⁶strain in 10000×10⁻⁶strain | |
| | 1×10⁻⁶strain in 20000×10⁻⁶strain | |
| Sampling | Simultaneous sampling | |
| Sampling speed | Highest speed in 1-channel mode 5μsec(200kHz) | |
| | Highest speed in 2-channel mode 10μsec(100kHz) | |
| | Highest speed in 4-channel mode 20μsec(50kHz) | |
| Measuring functions | Start | Can be operated by the front panel key, external and personal computer |
| | Stop | Can be operated by the front panel key, external signal and personal computer |
| | Balancing | Can be operated by the front panel key, external signal and personal computer |
| | Open check | Can be operated by a personal computer |
| | Manual trigger | Can be operated by external signal and personal computer. |
| Synchronized measurement | Simultaneous sampling with 8 units 32 channel or less <br> * Synchronized measurement with DC-104R/104Ra is available by setting equally. | |
| Display functions | LED | Power supply condition, synchronizing condition, USB transmission condition and measurement condition are indicated |

Setup

| Setting method | Setting through USB communication (using dedicated type software attached) | |
|---|---|---|
| Channel setting | 1, 2, and 4 channel mode | |
| Trigger setting | Trigger mode | SINGLE, CONTINUE, FREERUN |
| | Trigger level | ± (0% - 100%) of the full scale by 0.1% step |
| | Slope | UP, DOWN |

Recording

| Recording medium | Compact flash memory card  32M～2GB<br>* CF card compliant with high speed sampling is 128 - 2GB (TML supplies). |
|---|---|
| Recording format | Conforms to DADiSP |
| Recording Speed | $5\mu s^{※1}$, $10\mu s^{※2}$, 20μs, 50μs, 100μs, 200μs, 500μs, 1ms, 2ms, 5ms, 10ms, 20ms, 50ms, 100ms, 200ms, 500ms, 1s<br>*1: Only when one channel mode is used<br>*2: Only when one or two channel mode is used<br>Other sizes are available up to four channel mode |
| Recording size | 1k, 2k, 4k, 8k, 16k, 32k, 64k, 128k, 256k, 512k, 1M, 2M, 3M, 4M, 6M, 8M, 12M, 16M, 24M, 32M, 48M, 60M, $120M^{※1}$, $240M^{※2}$[Data]<br>※1Only when one or two channel mode is used<br>※2Only when one or two channel mode is used<br>Other sizes are available up to four channel mode<br>* Recording size is 64k or more when high speed sampling is used. |
| Pre-area | Can be extended to (0 - 100%) of the full data size by 10% step<br>the maximum limit is 256k [Data] (1 channel) |
| Number of files executable | Maximum 255 files |

General specifications

| Power source | 10 - 16V DC   0.4A at maximum |
|---|---|
| Environment | 0 - +50℃  85%RH or less (no condensation) |
| Vibration tolerance | $49m/s^2$(5G)(5-55Hz) in 3 directions |
| Dimensions | 84(W)×42(H) ×157(D)mm (excluding projected parts) |
| Weight | Approx. 450g |

■ Specifications subject to change without prior notice.

■ Products conforming to CE marking are provided separately.

## ❏ DC-204Ra

### Measurement

| | |
|---|---|
| Number of measuring points | 4 |
| Inputs | Strain, Voltage (Using option device CR-4010) |

### Strain measurement

| | |
|---|---|
| Gauge resistance | 120Ω - 1000Ω(Full bridge) |
| Bridge excitation | DC2V, 0.5V, ON/OFF control |
| Measuring range | 5 ranges : 1000, 2000, 5000, 10000, 20000×10$^{-6}$strain (2V bridge) |
| Maximum range | 20000×10$^{-6}$strain　(2V bridge power source) 80000×10$^{-6}$strain　(0.5V bridge power source) |
| Accuracy | ±0.2%FS |

### Voltage measurement （When using option attenuator cable CR-4010）

| | |
|---|---|
| Measuring range | 5 ranges : 1, 2, 5, 10, 20V |
| Maximum range | ±20V |
| Accuracy | ±0.3%FS |

| | | |
|---|---|---|
| Low pass filter | 10、30、100、300、1k、3k、10kHz （Bessel type） | |
| Frequency response | DC～10kHz(-3dB±1dB) | |
| Stability | on zero | Stability |
| | on span | |
| Balancing method | Electronic | |
| Balancing range | ±10000×10$^{-6}$strain | |
| Balancing accuracy | ±0.06%FS | |
| Balancing speed | Approx. 1sec/CH | |
| A/D converter | 16 bit Successive approximation type | |
| Resolution | 1or0.1×10$^{-6}$strain in 1000×10$^{-6}$strain | |
| | 1or0.1×10$^{-6}$strain in 2000×10$^{-6}$strain | |
| | 1×10$^{-6}$strain in 5000×10$^{-6}$strain | |
| | 1×10$^{-6}$strain in 10000×10$^{-6}$strain | |
| | 1×10$^{-6}$strain in 20000×10$^{-6}$strain | |
| Sampling | Simultaneous sampling | |
| Sampling speed | Highest speed in 1-channel mode　5μsec(200kHz) | |
| | Highest speed in 2-channel mode　10μsec(100kHz) | |
| | Highest speed in 4-channel mode　20μsec(50kHz) | |
| Measuring functions | Start | Can be operated by the front panel key, external and personal computer |
| | Stop | Can be operated by the front panel key, external signal and personal computer |
| | Balancing | Can be operated by the front panel key, external signal and personal computer |
| | Open check | Can be operated by a personal computer |
| | Manual trigger | Can be operated by external signal and personal computer. |
| Synchronized measurement | Simultaneous sampling with 8 units 32 channel or less ＊ Synchronized measurement with DC-104R/104Ra is available by setting equally. | |
| Display functions | LED | Power supply condition, synchronizing condition, USB transmission condition and measurement condition are indicated |

Setup

| Setting method | Setting through USB communication (using dedicated type software attached) | |
|---|---|---|
| Channel setting | 1, 2, and 4 channel mode | |
| Trigger setting | Trigger mode | Trigger setting |
| | Trigger level | |
| | Slope | |

Recording

| Recording medium | Compact flash memory card 32M〜2GB<br>* CF card compliant with high speed sampling is 128 - 2GB (TML supplies). | |
|---|---|---|
| Recording format | Conforms to DADiSP | |
| Recording Speed | 5μs※1, 10μs※2, 20μs, 50μs, 100μs, 200μs, 500μs, 1ms, 2ms, 5ms, 10ms, 20ms, 50ms, 100ms, 200ms, 500ms, 1s<br>*1: Only when one channel mode is used<br>*2: Only when one or two channel mode is used<br>Other sizes are available up to four channel mode | |
| Recording size | 1k, 2k, 4k, 8k, 16k, 32k, 64k, 128k, 256k, 512k, 1M, 2M, 3M, 4M, 6M, 8M, 12M, 16M, 24M, 32M, 48M, 60M, 120M※1, 240M※2[Data]<br>※1Only when one or two channel mode is used<br>※2Only when one or two channel mode is used<br>Other sizes are available up to four channel mode<br>* Recording size is 64k or more when high speed sampling is used. | |
| Pre-area | Can be extended to (0 - 100%) of the full data size by 10% step<br>the maximum limit is 256k [Data] (1 channel) | |
| Number of files executable | Maximum 255 files | |

Analogue output

| Output level | ±5V (5kΩload)m ±1mA | |
|---|---|---|
| Output voltage accuracy | ±0.3%FS | |
| Output voltage balancing accuracy | ±5mV or less (in 5000×10⁻⁶strain range) | |
| Zero stability | ±2mV/℃ (at max. sensitivity) | |
| Calibrated output | ±1V (overlaps with input value) | |
| Low pass filter | 10, 30, 100, 300Hz, 1k, 3k, 10kHz, PASS<br>(Bessel type) | |
| SN ratio | DC〜100Hz | 53dB or more (in 1000×10-6 strain range) |
| | DC〜1kHz | 46dB or more(in 1000×10-6 strain range) |
| | DC〜10kHz | 38dB or more(in 1000×10-6 strain range) |

General specifications

| Power source | 10 - 16V DC   0.5A at maximum |
|---|---|
| Environment | 0 - +50℃  85%RH or less (no condensation) |
| Vibration tolerance | 49m/s$^2$(5G)(5-55Hz) in 3 directions |
| Dimensions | 84(W)×42(H) ×157(D)mm (excluding projected parts) |
| Weight | Approx. 500g |

■ Specifications subject to change without prior notice.
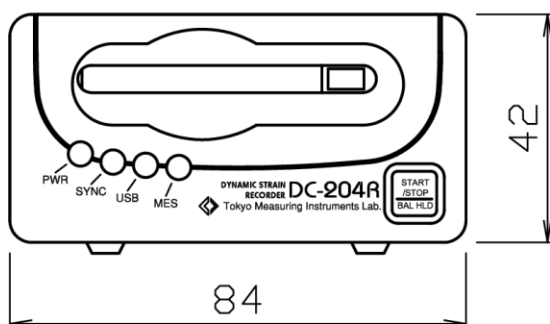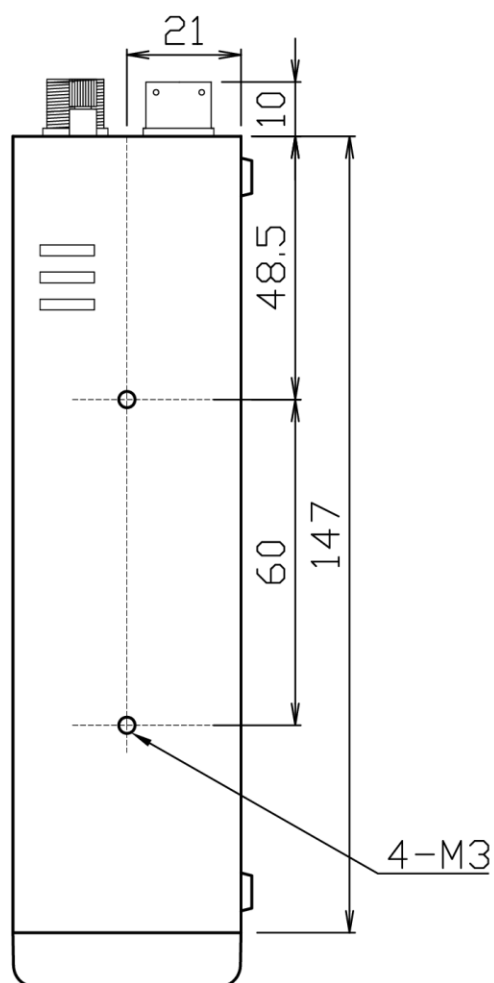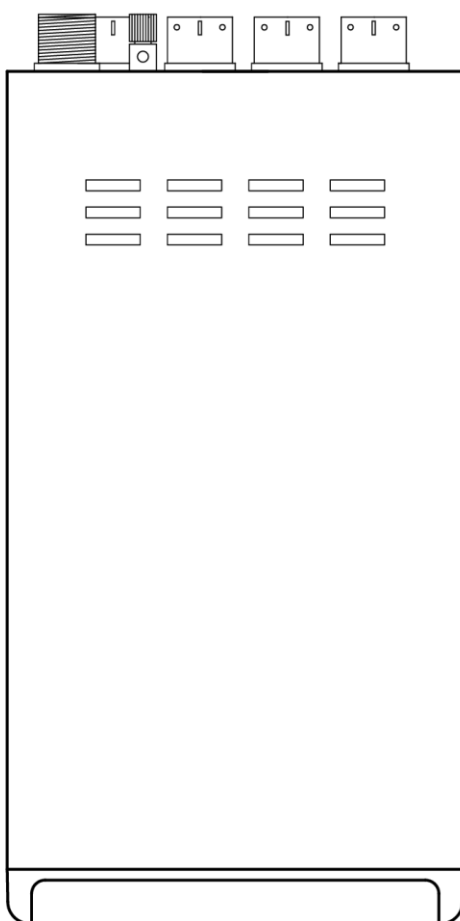
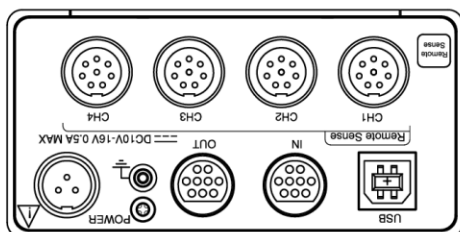■ Products conforming to CE marking are provided separately.

# 5.2  STANDARD ACCESSORIES

❑ DC-204R/204Ra

| Operation manual | | 1 |
|---|---|---|
| Power cable | CR-1310 | 1 |
| Sensor connection cable | CR-6180 | 4 |
| USB cable | CR-6182 | 1 |
| Compact flash memory card (high speed type) | 512MB | 1 |
| Controller CD-ROM | DC-7204 | 1 |
| Output cable   *DC-204Ra only | CR-3610 | 1 |

## 5.3  OUTSIDE DRAWING

❏ DC-2O4R
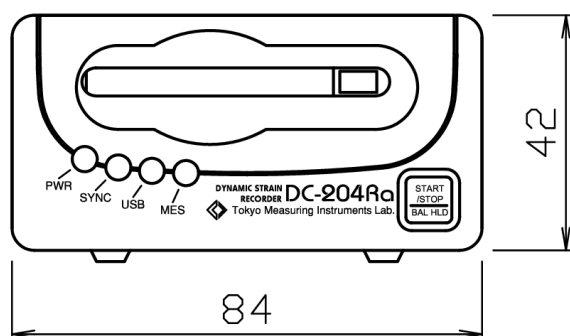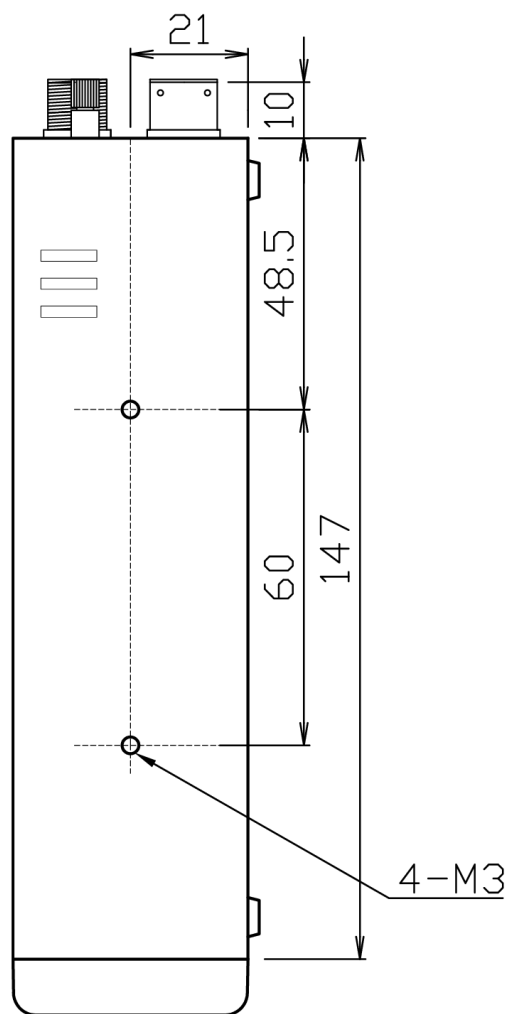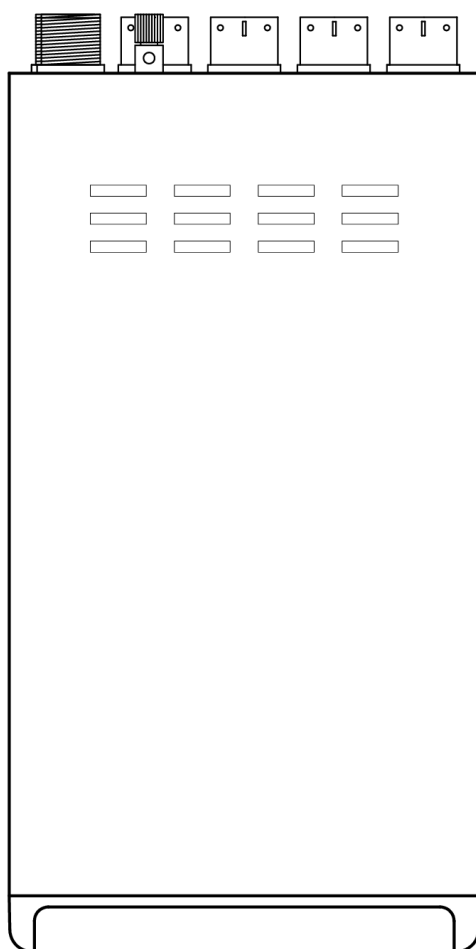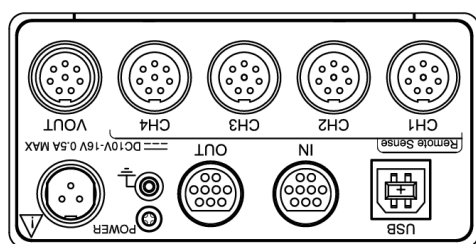
❏ DC-204Ra

# Operation Manual

DC-204R/204Ra CONTROLLER
## DC-7204

Tokyo Measuring Instruments Lab.

# Index

# 7. MEASUREMENT

# 8. WAVEFORM DISPLAY, CONVERSION AND SAVING OF MEASURED DATA

# 9. ERROR CODE TABLE

# 10. SPECIFICATIONS

# Chapter 1

## GENERAL

## 1.1　GENERAL

This software is measurement control software dedicated for DC-204R/204Ra. By using this software, you can check monitoring data through numerical monitor, waveform monitor or X-Y monitor display, and process recorded data using data indication and clip-out functions etc. in binary or CSV-converted format.

Although data format recorded by DC-204R/204Ra conforms to DADiSP, you can convert it to CSV format on this software when you like to process those data using CSV format.

You can also implement other functions using this control software such as measuring condition setting, measurement start / stop control, manual trigger operation, balancing and various instrument checks.

## 1.2　FEATURES

- Measurement data display and clip-out functions, enabling the search of maximum and minimum values in the data red.
- Enabling measurement data file merged.
- Measurement data saving in binary or CSV-converted format (with file segmenting function).
- Data indication through numerical monitor, waveform monitor, X-Y monitor, BAR monitor and Circle monitor displays.
- Enabling the input of start, stop and manual trigger signals from the control software.
- Indication of instrument status.
- Optional settings of measurement conditions.
  Providing functions for balancing and other various checks.

✍  This software is also capable of controlling DC-104R/DC-104Ra.

# Chapter 2

## OPERATION ENVIRONMENT AND

## SETUP METHOD

## 2.1  OPERATION ENVIRONMENT

❏ Connectable instrument to this software

> DC-204R/DC-204Ra/DC-104R/DC-104Ra          : up to 8 units

Instrument other than the above can not be connected to this software.

❏ Personal computer

| | |
|---|---|
| ・OS | : Windows Vista (SP1) / 7 / 8 / 8.1 / 10 |
| ・CPU | : Pentium4, 1.6GHz or higher frequency |
| ・Memory | : 256M byte or more is recommended |
| ・Hard disk | : Necessary free space for installaeion is 10M bytes or more |
| ・Display | : Resolution 1024 X 768 dots or more |
| ・Peripherals | : CD-ROM Drive, USB Port |

※Windows Vista, Windows 7, Windows 8, Windows 8.1 and Windows 10 are trademarks owned by U.S.A. Microsoft Corporation registered in U.S.A and other countries.
※Pentium is a trademark owned by Intel Corporation registered in U.S.A and other countries.

## 2.2 HOW TO INSTALL DC-7204

Method of DC-7204 installation is described in this section.

**[Operation Method]**
1. Insert the CD-ROM containing DC-7204 in the CD-ROM drive of the personal computer.
   Make sure that the DC-204R/204Ra is not connected to the personal computer.

2. Execute [English] – [Setup.exe] in the CD-ROM.
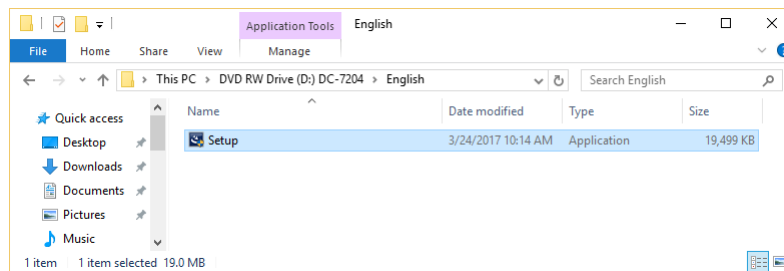
3. The user account control may be displayed depending on the setting of OS.
   Click [Yes] button.
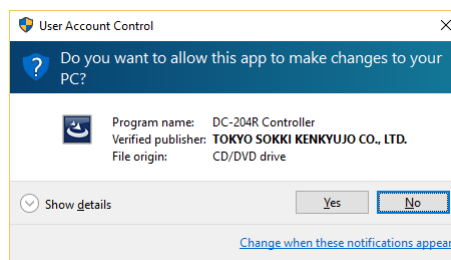
4. Start the installation of this software.
   Click [Next>] button.
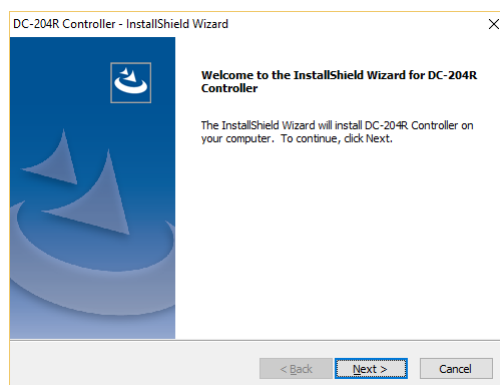
5. [Choose Destination Location] is displayed.
   If you want to change the destination, click [Change...] button and choose the destination.
   If you do not change the destination, click [Next >] button.
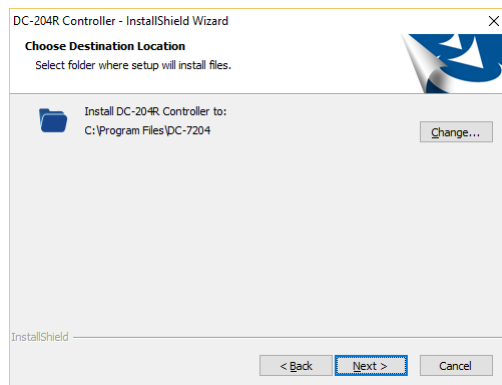


6. [Ready to Install the Program] is displayed.
   Click [Install] button.
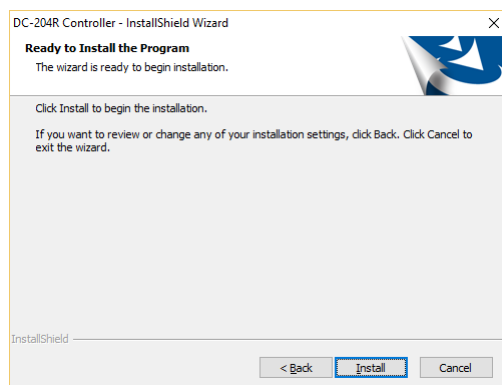


7. New window is opened, and [Start of the installation Wizard of the USB driver] is displayed.
   Click [Next >] button to start the install of USB driver.
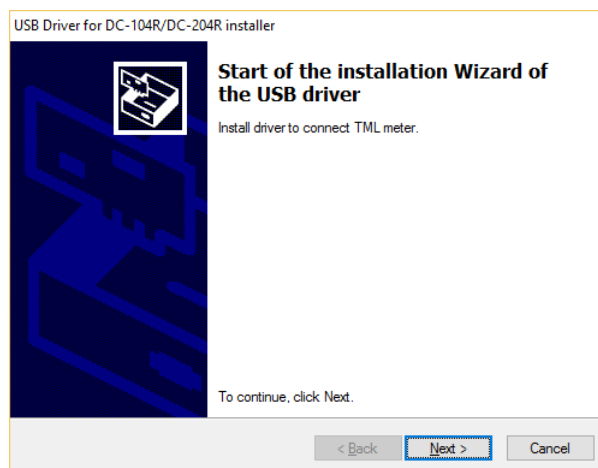
8. The Windows Security dialog box may be displayed depending on the setting of OS.
   Click [Install] button.
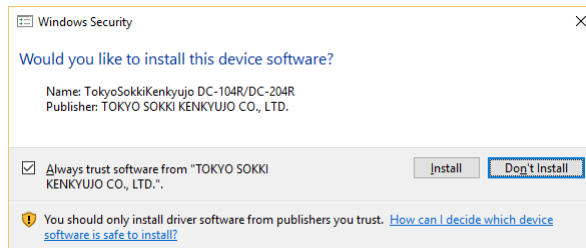
9. [Completing the Device Driver Installation Wizard] is displayed.
   Click [Finish] button to return to the installation of this software.
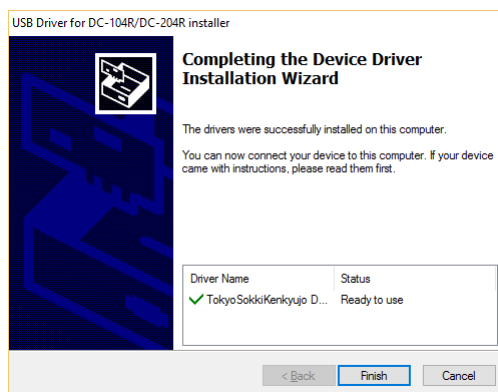
10. [InstallShield Wizard Complete] is displayed.
    Click [Finish] button to complete the installation.
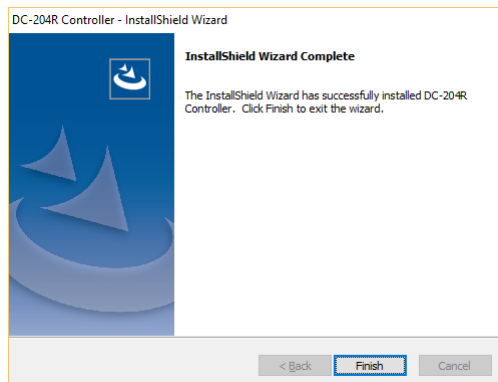
## 2.3  HOW TO CONNETCT TO DC-204R/204Ra

   Method of connecting the DC-204R/204Ra and the computer and method of confirming the connection are described in this section.

**[Connecting to computer]**
1. Connect the DC-204R/204Ra to the computer by using USB cable.

2. When the DC-204R/204Ra is connected for the first time, the applicable device driver for the DC-204R/204Ra is automatically installed.
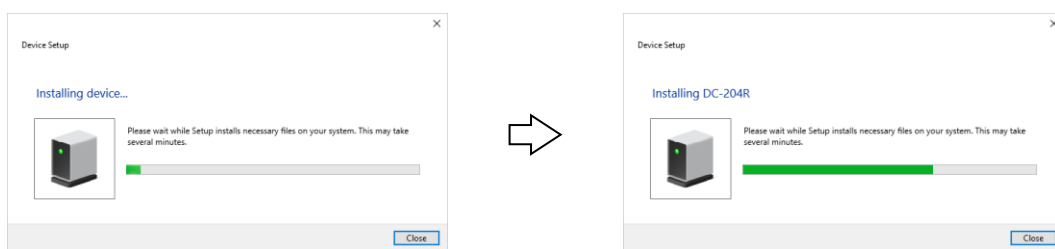


**[Confirming of connection]**
1. Open [Control Panel]-[Hardware and Sound]-[Device Manager].

2. If you find [DC-104R/DC-204R] in the [TML_Meters], installation has been normally finished.
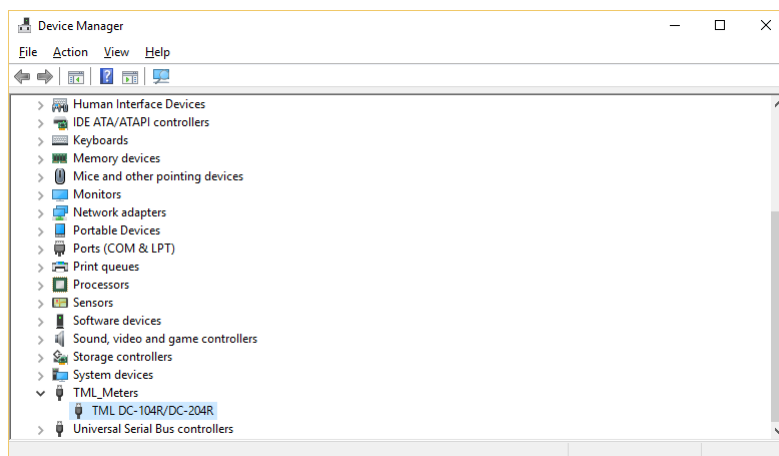
## 2.4  HOW TO UNINSTALL DC-7204

Method of uninstalling the DC-7204 is as follows.

**[Operation Method]**
1. Open [Control Panel]-[Programs]-[Uninstall a program].

2. Select [DC204R Controller].
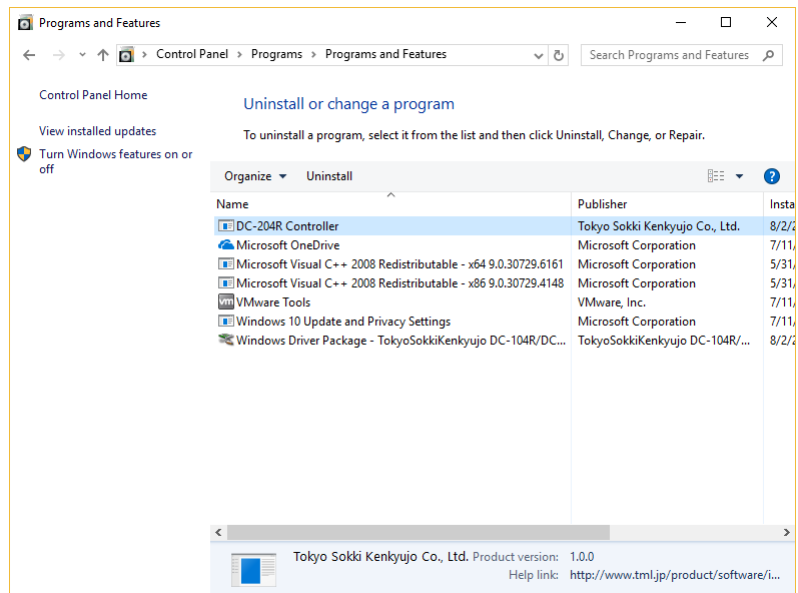


3. Click [Uninstall].
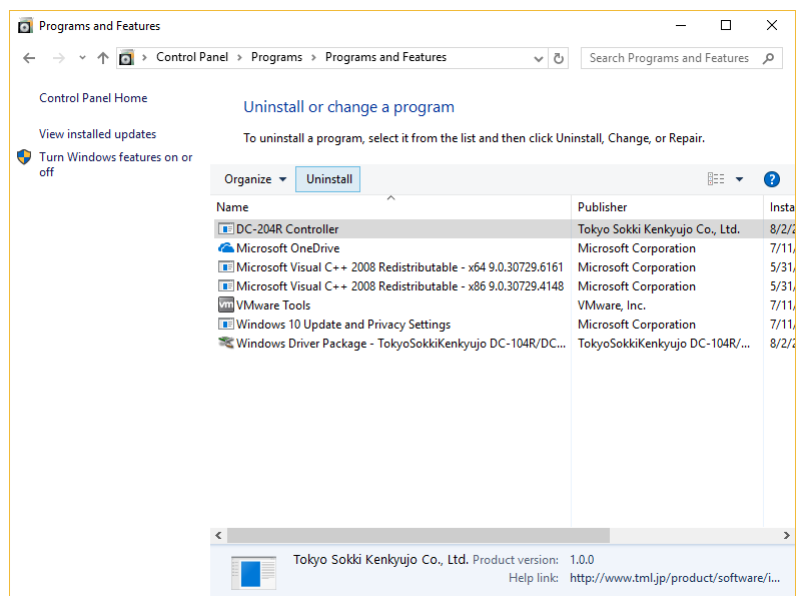
4. Dialog box is displayed for confirmation.
   Click [Yes] button to complete the uninstallation.

DC-204R Controller - InstallShield Wizard                                    ×

Do you want to completely remove the selected application and all of its features?

Yes          No
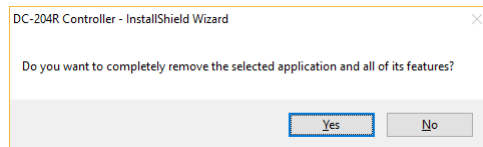
# Chapter 3

## RUNNING AND ENDING THE PROGRAM

## 3.1 RUNNING THE PROGRAM

This control software can control DC-204R/204Ra.

[Operation Procedure]
1. When you run this control software, a window indicating software version number, the time of DC-204R/204Ra internal timer and instrument connection situation appears.
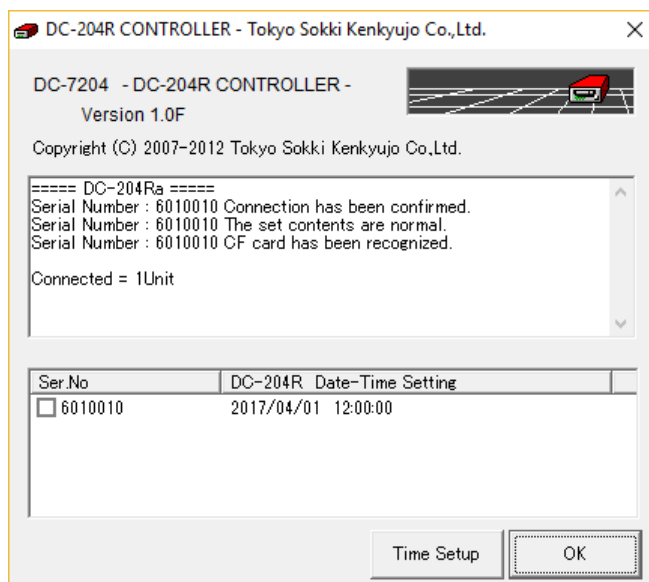
In the event of the message "DC-204R is not connected." being indicated as shown in the figure below, check the connection condition of power supply /USB.
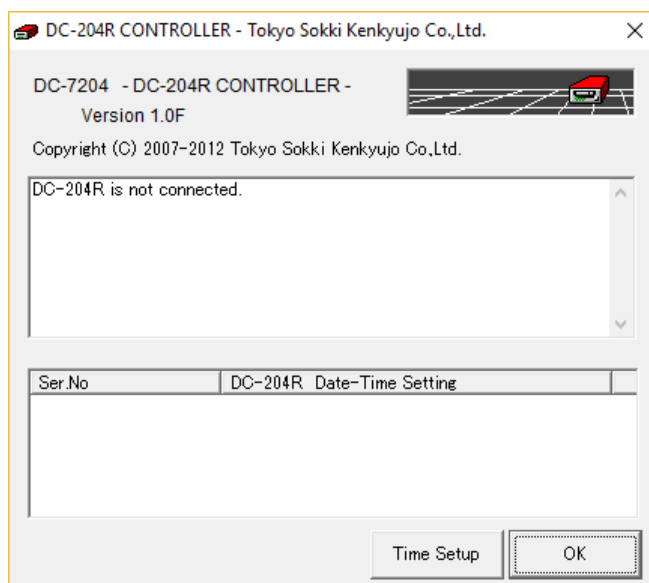
2. The indicated time shows the time of internal timer of DC-204R/204Ra that is connected to now. Make sure that the time shown is correct. If necessary, click on the checkbox of DC-204R/204Ra to be set, then click [Time Setup] button. The time of your PC is indicated and the internal timer of DC-204R/204Ra is set to that time.



[Time Setup] button

Click on the checkbox of DC-24R/204Ra to be set.
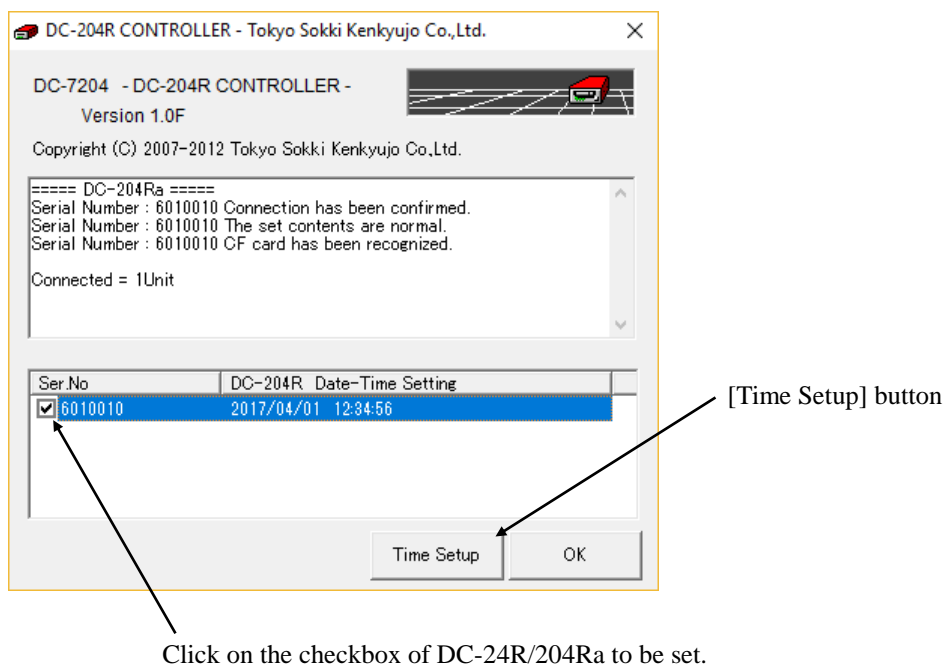
3. Upon your clicking on [OK] button, the following main menu title bar appears.
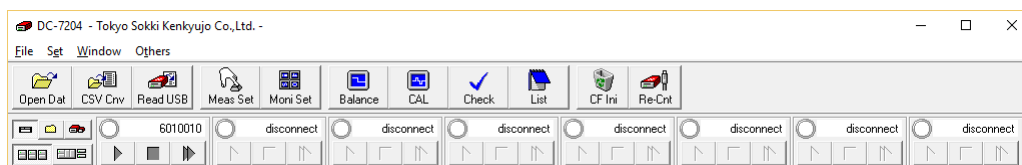


Please proceed to "4. SCREEN CONFIGURATION AND MENU SYSTEM" and then "5. SETTINGS REQUIRED BEFORE MEASUREMENT".

## 3.2 ENDING THE PROGRAM

**[Operation Procedure]**

Quit the program by clicking on [File] and selecting [Exit DC-204R CONTROLLER], or by clicking the exit button on the title bar.
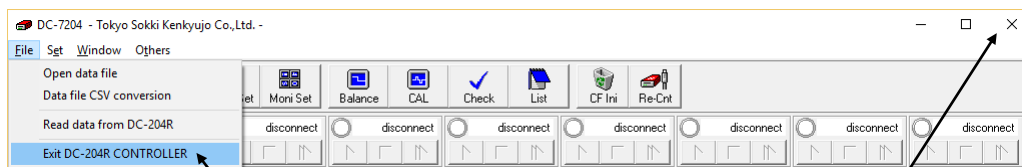


Ending instruction                                      Exit button

# Chapter 4

# SCREEN CONFIGURATION AND MENU SYSTEM

## 4.1 EXPLANATION OF EACH PART OF SCREEN

When you activate this control software, the following main menu bar appears after the indication of version information, instrument connection situation and the time of DC-204R/204Ra clock:
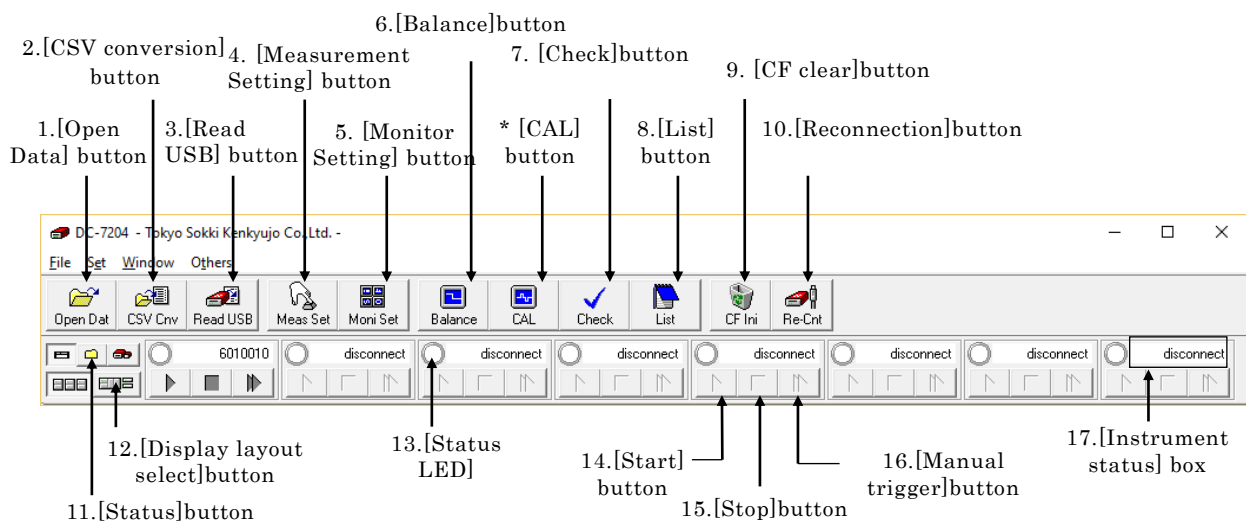


\* [CAL] button appears in DC-204Ra connected.

| | Function |
|---|---|
| 1. [Open Data] button | Reads data file in the computer and displays the waveform. |
| 2. [CSV Conversion] button | Converts optional number of data files in the computer into CSV format. |
| 3. [Read USB] button | Reads data file in the compact flash card inserted in the DC-204R slot and displays its waveform.<br>Reads optional number of data files in the compact flash card inserted in the DC-204R slot, converts them into DADiSP format (binary) or CSV format and saves. |
| 4. [Measurement Setting] button | Executes various settings such as amplifier setting, trigger setting, sampling setting and units / coefficient setting etc. |
| 5. [Monitor Setting] button | Selects Monitor window to display |
| 6. [Balance] button | Executes balancing of each channel / instrument or all channels / instruments. |
| 7. [Check] button | Checks sensor-open, compact flash card, LED and ROM / RAM. |
| 8. [List] button | Lists the settings and conditions of the instrument. |
| 9. [CF Clear] button | Initializes CF card inserted into DC-204R／204Ra. |
| 10. [Reconnection] button | When reconnecting or adding DC-204R／204Ra, click this button. |

Continued to the next page.

| | |
|---|---|
| 11. Status button | When clicked, indicates serial number(s) of connected DC-204R/204Ra(s), number of files in the compact flash card and master/slave status of instrument in the instrument situation boxes.<br><br>Serial number       Number of files       Master / slave |
| 12. Display layout select button | Changes the display layout of DC-204R／204Ra.<br><br>Displays 8 sets in equal size       Zoom in the selected one |

| 13. Status LED | Each color of Status LED shows the following condition: |  |
|---|---|---|
| | White | Stand-by |
| | Red | Pre-trigger status |
| | Green | Recording data |
| | Blue | Processing file after completing measurement |
| | Yellow | Measurement unable (Place mouse pointer on the status LED and check the situation.)<br> See "9.1 ERROR CODE TABLE". |

| 14. Start button | DC-204R operation when Start button is clicked is as follows: | |
|---|---|---|
| | Trigger Mode | Operation |
| | SINGLE | Waits for trigger |
| | CONTINUE | Waits for trigger |
| | FREE RUN | Records data |

| 15. Stop button | DC-204R/Ra operation when Stop button is clicked is as follows: | |
|---|---|---|
| | Measuring Condition | Operation |
| | In pre-area condition | Stops without recording data. |
| | In post-area condition | Stops with recording data collected up to the stop time. |
| | When not yet starting measurement | Shows error indication. |

| 16. Manual Trigger button | Starts measurement using manual trigger mode. | |
|---|---|---|

| 17. Instrument status Box | By clicking the Status button (11), serial number(s) of connected DC-204R/204Ra(s), number of files in the compact flash card and master / slave status of instrument etc. are indicated in these boxes. The following indication appears responding to each clicking. | |
|---|---|---|
| | Status Button Indication | Indication in Instrument Status Box |
| | Serial Number | Serial number of instrument is indicated. |
| | Number of Files | "The number of completed files / the remaining number of empty files available" are indicated. |
| | Master / Slave | Master / slave status is indicated. |

| * [CAL] button | Output calibration value on DC-204Ra. (This button appears in DC-204Ra connected |
|---|---|

## 4. 2  MENU SYSTEM

Top line menus in the main menu bar are explained in this section.

```
┌──────────┐   ┌──────────┐   ┌──────────┐   ┌──────────┐
│   File   │───│   Set    │───│  Window  │───│  Others  │
└──────────┘   └──────────┘   └──────────┘   └──────────┘
```
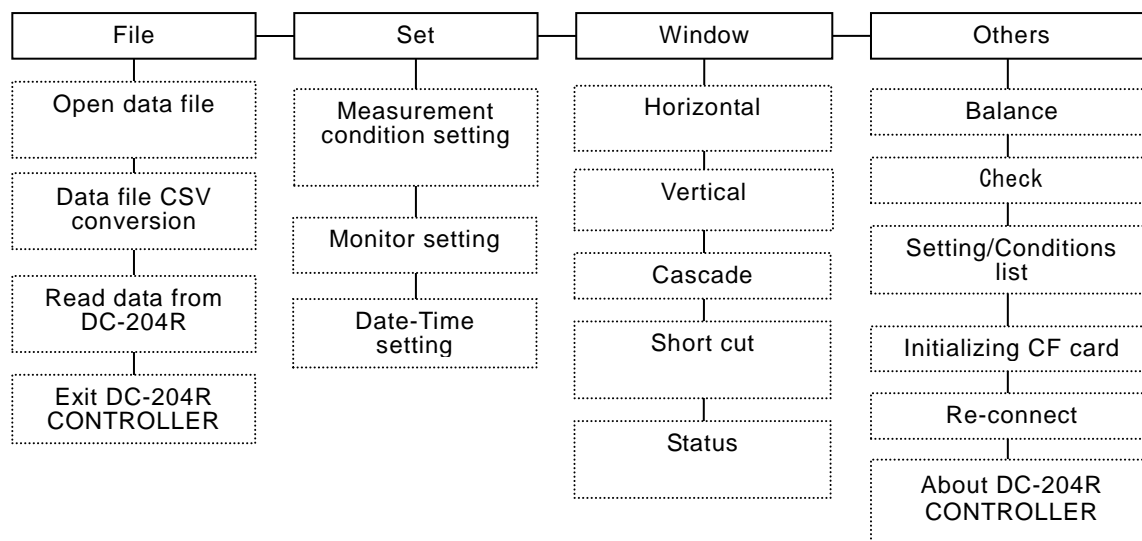
| File | Set | Window | Others |
|------|-----|--------|--------|
| Open data file | Measurement condition setting | Horizontal | Balance |
| Data file CSV conversion | Monitor setting | Vertical | Check |
| Read data from DC-204R | Date-Time setting | Cascade | Setting/Conditions list |
| Exit DC-204R CONTROLLER | | Short cut | Initializing CF card |
| | | Status | Re-connect |
| | | | About DC-204R CONTROLLER |

| Menu | | Function |
|------|------|----------|
| File | Open data file | Reads data file stored in the computer and displays the waveform data. |
| | Data file CSV conversion | Converts optional number of data files in the computer into CSV format en block. |
| | Read data from DC-204R | Reads data file in the compact flash card inserted in the DC-204R/Ra slot and displays its waveform. Reads optional number of data files in the compact flash card inserted in the DC-204R/204Ra slot, converts them into DADiSP format (binary) or CSV format and saves. |
| | Exit DC-204R CONTROLLER | Discontinues this control software. |
| Set | Measurement Condition setting | Executes various settings such as amplifier setting, trigger setting, sampling setting and units / coefficient setting etc. |
| | Monitor setting | Selects monitor window to display. |
| | Date - Time setting | Sets current date and time. |
| Window | Horizontal | Displays Monitor windows in the vertical direction. |
| | Vertical | Displays Monitor windows in the horizontal direction. |
| | Cascade | Displays Monitor windows in piles. |
| | Shortcut | Toggles display/hide shortcut bar. |
| | Status | Toggles display/hide status bar. |
| Others | Balance | Executes balancing of each or all channels / instruments. |
| | Check | Checks sensor-open, compact flash card, LED and ROM/RAM. |
| | Setting/Conditions list | Lists settings and conditions of the instrument. |
| | Initializing CF card | Executes formatting of compact flash card inserted in the DC-204R/204Ra slot. |
| | Re-connect | When reconnecting or adding DC-204R/204Ra, click this button. |
| | About DC-204R CONTROLLER | Indicates the version number of this software. |

# Chapter 5

## SETTINGS REQUIRED BEFORE
## MEASUREMENT

## 5.1 SETTING OF MEASUREMENT CONDITIONS

Open [Measurement condition setting] dialogue box and implement amplifier setting, trigger setting, sampling setting, units and coefficient settings on each instrument (DC-204R/DC-204Ra).

⚠

**Caution**

For the following items, give the same settings to all instruments (including master and slave):
- [Amplifier setting] : the number of channels used
- [Trigger setting] : trigger mode
- [Sampling setting] : all setting items

If the above settings are inconsistent among instruments used, error occurs in the slave instrument.

❏ Measurement condition setting dialogue

### [Operation procedure]

1. Click on [Set] in the menu and select [Measurement Condition],

   or Click on [Meas Set] button.
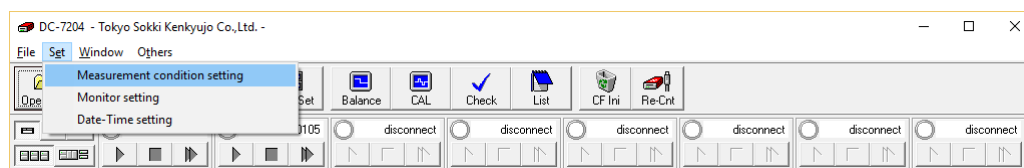


2. [Meter-Channel selection] dialogue box is indicated.
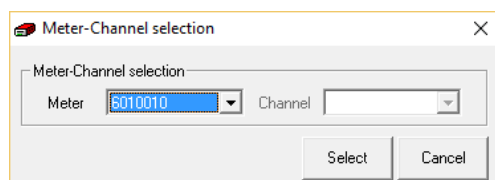


3. Click on [Meter] combo box and select instrument to be used.
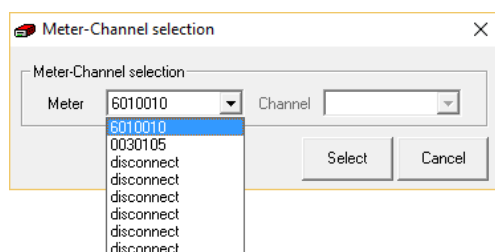


4. Click on [Selection] button to open [Measurement Condition Setting] dialog.

**[Setting items in Measurement condition setting dialogue box]**

Instrument to be set

Amplifier Setting

Trigger Setting

Sampling Setting

Unit/Coefficient Setting



| Description | | Function |
|---|---|---|
| Instrument to be set | Model | Indicates model name of instrument whose conditions to be set. |
| | Serial Number | Indicates serial number of instrument whose conditions to be set. |
| Amplifier Setting<br><br>(See "5.1 SETTING OF MEASURE-MENT CONDITIONS, Examples of amplifier and physical unit/ coefficient settings".) | Number of Channels<br>(Set the same number to all instruments.) | Select the number of channels to be used.<br>When the number of channels is changed, [Sampling Settings] and other settings are automatically initialized. Set again those measurement conditions. |
| | | 1 — Only channel 1 can be used. |
| | | 2 — Channels 1 and 2 can be used |
| | | 4 — Channels 1 to 4 can be used. |
| | Range | Select measuring range for each channel. |
| | | $1000\mu\varepsilon$(mV) — Measurement range$\pm1000\mu\varepsilon$(mV)（resolution$1\mu\varepsilon$） |
| | | $2000\mu\varepsilon$(mV) — Measurement range$\pm2000\mu\varepsilon$(mV)（resolution$1\mu\varepsilon$） |
| | | $5000\mu\varepsilon$(mV) — Measurement range$\pm5000\mu\varepsilon$(mV)（resolution$1\mu\varepsilon$） |
| | | $10000\mu\varepsilon$(mV) — Measurement range$\pm10000\mu\varepsilon$(mV)（resolution$1\mu\varepsilon$） |
| | | $20000\mu\varepsilon$(mV) — Measurement range$\pm20000\mu\varepsilon$(mV)（resolution$1\mu\varepsilon$） |
| | | $1000.0\mu\varepsilon$(mV) — Measurement range$\pm1000\mu\varepsilon$(mV)（resolution$0.1\mu\varepsilon$） |
| | | $2000.0\mu\varepsilon$(mV) — Measurement range$\pm2000\mu\varepsilon$(mV)（resolution$0.1\mu\varepsilon$） |
| | Carrier volatge | Select the volatge of carrier every channel |
| | | 0.5V — Set carrier voltage to 0.5V. |
| | | 2.0V — Set carrier voltage to 2.0V. |

⚠ **Caution** — If the voltage is input using an attenuator cable, set the carrier voltage at 2V. If the carrier voltage is set at 0.5V, the measurement value is quadrupled.

Continues to the next page

| Amplifier Setting (See "**5.1 SETTING OF MEASURE-MENT CONDITION S**, Examples of amplifier and physical unit/ coefficient settings".) | Filter | Select cut-off frequency of low-pass filter for each channel. | |
|---|---|---|---|
| | | 10Hz | Sets the cut-off frequency to 10Hz.。 |
| | | 30Hz | Sets the cut-off frequency to 30Hz. |
| | | 100Hz | Sets the cut-off frequency to 100Hz. |
| | | 300Hz | Sets the cut-off frequency to 300Hz. |
| | | 1kHz | Sets the cut-off frequency to 1kHz. |
| | | 3kHz | Sets the cut-off frequency to 3kHz. |
| | | 10kHz | Sets the cut-off frequency to 10Hz. |
| | Balance | Determine whether subtracting value measured at the time of balancing implementation from measured value. | |
| | | ON | Measurements are obtained values minus the value measured at the time of balancing implementation. |
| | | OFF | Measurements are obtained values with no subtraction. However, after balancing operation, this setting is automatically changed to ON. |

| ⚠ Caution | As the balance setting (ON or OFF) is reflected on recorded data, set it considering actual measurement situation given. |
|---|---|

| Trigger Setting<br><br>(See "5.1 SETTING OF MEASURE-MENT CONDITIONS, Examples of trigger setting") | Mode<br>(<u>Set the same number of channels to all instruments</u>) | Set trigger mode for each instrument. | |
|---|---|---|---|
| | | SINGLE | When first reaching triggering condition, measures / records (one time) data of which size is designated by [Data Size] combo box.<br>Stops measurement after data logging.<br>(Implements one time the above measurement / recording each time "Start" button is clicked.) |
| | | CONTINUE | When reached triggering condition, measures / records data of which size is designated by [ Data Size] combo box.<br>After the above operation, repeats the cycle, stand-by for trigger → trigger ON → measurement / recording until compact flash card becomes full with collected data or Stop button is pushed. |
| | | FREE RUN | From the time of measurement start, measures / records data of which size is designated by [Data Size] combo box.<br>Composing the above one time measurement / recording into one file, repeats the same measurement / recording until compact flash card becomes full with collected data or Stop button is pushed. |
| | Slope | Select trigger slope for each channel. | |
| | | UP | When the <u>rising slope</u> of a channel input signal cross up the triggering level, starts measurement / recording. |
| | | DOWN | When the <u>dropping slope</u> of a channel input signal cross down the triggering level, starts measurement / recording. |
| | | OFF | Does not judge channel trigger. |
| | Level | Set trigger level to each channel within the range of $\pm$ (1% - 100%) of [Amplifier Setting] Range by 1% step. | |

⚠ **Caution**  When one channel meets triggering conditions, the measurement / recording of all channels starts (including other instrument connected).

Continues to the next page.

| | | |
|---|---|---|
| Sampling Setting (Set the same number of channels to all instruments) (See "5.1 SETTING OF MEASURE-MENT CONDITIONS, Examples of trigger setting".) | Speed | Select measurement sampling speed from the table below<br>5※1、10※2、20、50、100、200、500(μsec)、1、2、5、10、20、50、100、200、500 (msec)、1(sec)<br>※1 When 1 channel is used only<br>※2 When 1 or 2 channels are used only.<br>Othe speed can be used up to 4 channels. |
| | Data Size | Select measurement data record size from the table below:<br>1k、2k、4k、8k、16k、32k、64k、128k、256k、512k、1M、2M、3M、4M、6M、8M、12M、16M、24M、32M、48M、60M、120M※1、240M※2(Data)<br>※1 When 2 channels are used only.<br>※2 When 1 channels is used onlly.<br>Other speed can be used to4 channels. |

**Sampling Setting** (Set the same number of channels to all instruments)

(See "5.1 SETTING OF MEASUREMENT CONDITIONS, Examples of trigger setting".)

**Speed**

Select measurement sampling speed from the table below

5※1、10※2、20、50、100、200、500(μsec)、1、2、5、10、20、50、100、200、500 (msec)、1(sec)

※1 When 1 channel is used only

※2 When 1 or 2 channels are used only.

Othe speed can be used up to 4 channels.

**Data Size**

Select measurement data record size from the table below:

1k、2k、4k、8k、16k、32k、64k、128k、256k、512k、1M、2M、3M、4M、6M、8M、12M、16M、24M、32M、48M、60M、120M※1、240M※2(Data)

※1 When 2 channels are used only.

※2 When 1 channels is used onlly.

Other speed can be used to4 channels.

Data size for each CF card capacity are as follows:

| | |
|---|---|
| 512Mbyte | 120M（1 channel）, 60M（2 channels）, 48M（4 channels） |
| 256Mbyte | 60M（1 channel）, 48M（2 channels）, 24M（4 channels） |
| 128Mbyte | 48M（1 channel）, 24M（2 channels）, 12M（4 channels） |

**Time**

Indicate recording time.
Recording time = (Sampling speed) x (Data size)

**Pre-area**

Select pre-area size within 0% - 100% range of the data size designated by [Data Size] combo box by 10% step.(Data size includes Pre-area.)

Maximum available range of pre-area is as follows.

| Data size (Data) | 1 channel (%) | 2 channels (%) | 4 channels (%) |
|---|---|---|---|
| 1k | 100(99%) | 100(99%) | 100(99%) |
| 2k | 100(99%) | 100(99%) | 100(99%) |
| 4k | 100(99%) | 100(99%) | 100(99%) |
| 8k | 100(99%) | 100(99%) | 100(99%) |
| 16k | 100(99%) | 100(99%) | 100(99%) |
| 32k | 100(99%) | 100(99%) | 100(99%) |
| 64k | 100(99%) | 100(99%) | 100(99%) |
| 128k | 100(99%) | 100(99%) | 50 |
| 256k | 100(99%) | 50 | 20 |
| 512k | 50 | 20 | 10 |
| 1M | 20 | 10 | Set to maxumum |
| 2M | 10 | Set to maximum | Set to maxumum |
| 3M | Set to maximum | Set to maximum | Set to maxumum |
| 4M | Set to maximum | Set to maximum | Set to maxumum |
| 6M | Set to maximum | Set to maximum | Set to maxumum |
| 8M | Set to maximum | Set to maximum | Set to maxumum |
| 12M | Set to maximum | Set to maximum | Set to maxumum |
| 16M | Set to maximum | Set to maximum | Set to maxumum |
| 24M | Set to maximum | Set to maximum | Set to maxumum |
| 32M | Set to maximum | Set to maximum | Set to maxumum |
| 48M | Set to maximum | Set to maximum | Set to maxumum |
| 60M | Set to maximum | Set to maximum | Set to maxumum |
| 120M | Set to maximum | | |
| 240M | Set to maximum | | |

**Time**

Indicate pre-area time.
Pre-area time = (Recording time) × (Pre-area / 100)

Continues to the next page.

⚠ **Caution**

○If you use enlarged data size with increased number of channels, such large total data size may exceed compact flash card capacity.
○Check the remaining available capacity of compact flash card through "Boxes for  instrument situation". (See 4.1 EXPLANATION OF EACH PART OF SCREEN)
○Note that the following sizes cannot be set depending on the sampling speed.

| Samling Speed | Data Size |
|---|---|
| 5μsec | 1k～32k |
| 10μsec | 1k～16k |
| 20μsec | 1k～8k |
| 50μsec | 1k～2k |
| 100μsec | 1k |

○If DC-204R/204Ra is connected to the slave unit concurrently when the sampling speed of the master unit is set at 5 to 20 μ, the internal operation on the side of DC-204R/204Ra cannot catch up, and communications through USB cannot be conducted.
 In this case, remove the synchronous cable, conduct the settings separately on each unit, and then reconnect the synchronous cable.

| | | Select physical unit for each channel. | | | |
|---|---|---|---|---|---|
| Physical unit / Coefficient Setting (See "5.1 SETTING OF MEASURE-MENT CONDITIONS, Examples of amplifier and physical unit/ coefficient settings".) | Unit | Unit | Indication | Unit | Indication |
| | | $\mu\ \varepsilon$ | ue | mA | mA |
| | | mm | mm | A | A |
| | | cm | cm | Ω | Ohm |
| | | m | m | MΩ | Mohm |
| | | ℃ | C | Hz | Hz |
| | | F | F | G | G |
| | | deg | deg | % | % |
| | | gf | gf | Rpm | Rpm |
| | | kgf | kgf | Ppm | Ppm |
| | | tf | tf | Tor | Tor |
| | | N | N | (none) | |
| | | kN | kN | Nm | Nm |
| | | MN | MN | ### | ### |
| | | kgf/mm$^2$ | kg/mm2 | kΩ | Kohm |
| | | kPa | kPa | m/S$^2$ | m/S2 |
| | | MPa | Mpa | kgf/cm$^2$ | kg/cm2 |
| | | kgm | kgm | hPa | hPa |
| | | mV | mV | $\mu$ | u |
| | | V | V | N/mm$^2$ | N/mm2 |
| | Coefficient | Set calibration coefficient to each channel within the rage ± (0.000010 - 9999999). Seven digits are effective. (Physical quantity) = (Coefficient) × (Input strain value) | | | |

⚠ **Caution**

Convert the measuring range of Range and the trigger level according to use the set coefficient.

❏ Setting, saving and reading of measurement conditions
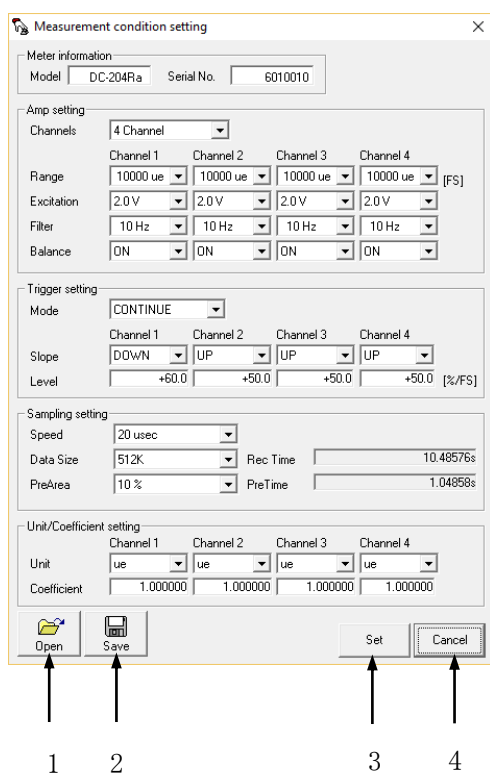
**[Setting Measurement Conditions]**
When you changed measurement condition(s) in Measurement condition setting dialogue in "5.1 SETTING OF MEASUREMENT CONDITIONS" or read a setting file (.set) from computer folder into the dialogue box, always click [Set] button in order to update the measurement condition of the instrument (DC-204R/204Ra) to set condition.

**[Saving Measurement Conditions]**
You can save the content of [Measurement condition setting] dialogue box in the computer hard disk as a setting file (.set). Click on [Save] button and save it in an appropriate folder using an appropriate file name.

**[Reading Measurement Conditions]**
You can read a setting file into [Measurement condition setting] dialogue box and indicate it on the box. Click on [Open] button, and read a setting file (.set) to be used into [Measurement condition setting] dialogue box and indicate conditions saved in the file.

| Button | Operation |
|---|---|
| 1 [Open] | Reads the setting file saved in the hard disk into [Measurement condition setting] dialogue box and indicates conditions in the box. |
| 2 [Save] | Saves the content of [Measurement condition setting] dialogue box in the hard disk as a setting file (.set). |
| 3 [Set] | When you are going to change equipment setting(s), click on this button. Updates setting(s) of the instrument (DC-204R/204Ra), then closes [Measurement condition setting] dialogue box. |
| 4 [Cancel] | Closes [Measurement condition setting] dialogue box without changing the measurement conditions of the instrument. |

⚠ **Caution**
Even if you red the setting file into [Measurement condition setting] dialogue box by clicking [Open] button, the instrument settings are not updated if you close the dialog box by [Cancel] button without clicking [Set] button.
In such case, open the [Measurement condition setting] dialogue box again, reset measurement condition(s) by reading required setting file etc., then click on [Set] button before closing the dialogue box.

❏ Examples of amplifier and physical unit / coefficient settings

Examples of [Amp setting] and [Unit - Coefficient] in [Measurement condition setting] dialogue are shown in the following examples:

**[Setting example of compensating strain gauge reading by the gauge factor]**
**[Setting example of directly reading acceleration loaded on acceleration transducer]**
**[Setting example of converting sensor output voltage to applicable physical quantity]**

**[Setting example of compensating strain gauge reading by the gauge factor]**
When specifications of strain gauge used are;

Expected maximum strain = 5000με or less
Connection = Quarter bridge 3-wire method
Gauge factor = 2.12

set the measurement conditions as follows:

| Setting item | Setting details |
|---|---|
| Range | Select 5000, which covers the expected maximum strain. |
| Excitation | Select 2.0V. |
| Filter | Select frequency considering the phenomenon to be measured. |
| Balance | Select ON |
| Unit | Select "ue" |
| Coefficient | Set to (2.00) ÷ (2.12) = 0.943396. * For the compensation by the gauge factor, data are multiplied by coefficient determined by (2.00) ÷ (applicable gauge factor). |

**[Setting example of directly reading acceleration loaded on acceleration transducer]**
When specifications of acceleration transducer used are;

Capacity＝50m/s$^2$
Rated output＝1000$\mu$ ε

set the measurement conditions as follows:

| Setting item | Setting details |
|---|---|
| Range | Select 5000, which covers the rated output. |
| Excitation | Select 2.0V |
| Filter | Select frequency considering the phenomenon to be measured. |
| Balance | Select ON |
| Unit | Select "m/S2". |
| Coefficient | Set (50)÷(1000) = 0.050000 . *For the conversion of strain to physical quantity, data are multiplied by a coefficient determined by (Capacity) ÷ (Rated output). |

**[Setting example of converting sensor output voltage to applicable physical quantity]**
   When specifications of laser displacement transducer used are:

> Capacity = 2mm
> Rated output = 10 V

 Voltage measurement is made using attenuator cable (CR-4010 : optional item).
 Set the measurement conditions as follows:

| Setting item | Setting details |
|---|---|
| Range | Select 10000, which covers the rated output.<br>* For measurement by voltage input, the voltage is attenuated to 1/1000 level by using the attenuator cable and measured in μV unit.<br>　10V = 10000000μV<br>　　10000000μV / 1000 = 10000μV |
| Excitation | Select 2.0V |
| Filter | Select frequency considering the phenomenon to be measured. |
| Balance | Select ON. |
| Unit | Select "mm". |
| Coefficient | Set to (2)÷(10000) = 0.000200 .<br> *For the conversion of voltage to physical quantity, data are multiplied by coefficient determined by<br>　　(Capacity) ÷ (Rated output / 1000). |

Channel 1

| | |
|---|---|
| Range | 10000 ue |
| Excitation | 2.0 V |
| Filter | 10 kHz |
| Balance | ON |

Channel 1

| | |
|---|---|
| Unit | mm |
| Coefficient | 0.00020 |

❏ Examples of trigger setting

Examples of [Trigger Setting] in [Measurement Condition Setting] dialogue are shown in the following examples:

**[Examples of trigger mode setting]**
**[Examples of slope and level settings]**
The measurement and recording is triggered based on OR operation (logical add) among all the channel set.
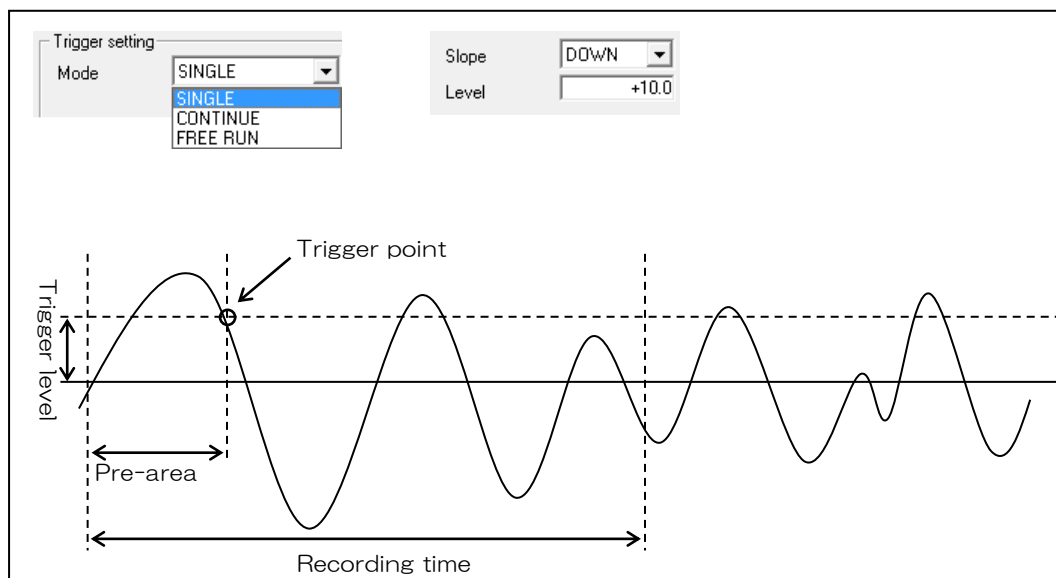
**[Examples of trigger mode setting]**
Set the same trigger mode to all measuring equipment (including master and slave). 1 [SINGLE], 2 [CONTINUE] and 3 [FREE RUN] operations are explained in the following paragraphs.
Also refer to "Measurement condition setting dialogue in 5.1 SETTING OF MEASUREMENT CONDITIONS".

**1. [SINGLE]** mode operation



When you select [SINGLE] trigger mode and click [Start] button, the equipment measures one time data of the size (including pre-area) set by [Sampling Setting] procedure, starting from the moment when triggering condition is met, as shown in the above figure.

If trigger becomes ON while pre-area capacity is insufficient for set time, such insufficient amount of time is added to the end of recording time. (See 5.3 (2) 2. in DC-204R operation manual.)
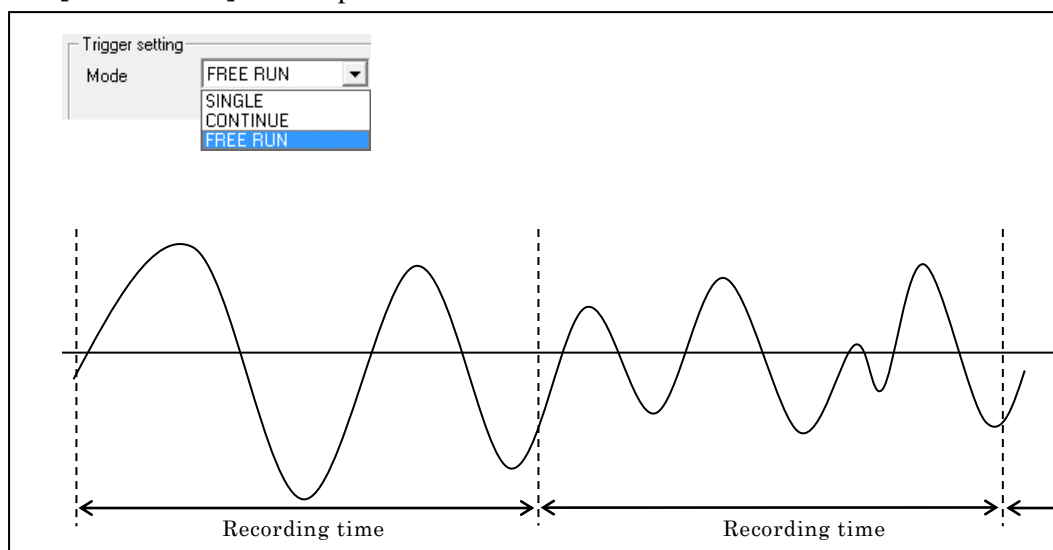
**2. [CONTINUE]** mode operation
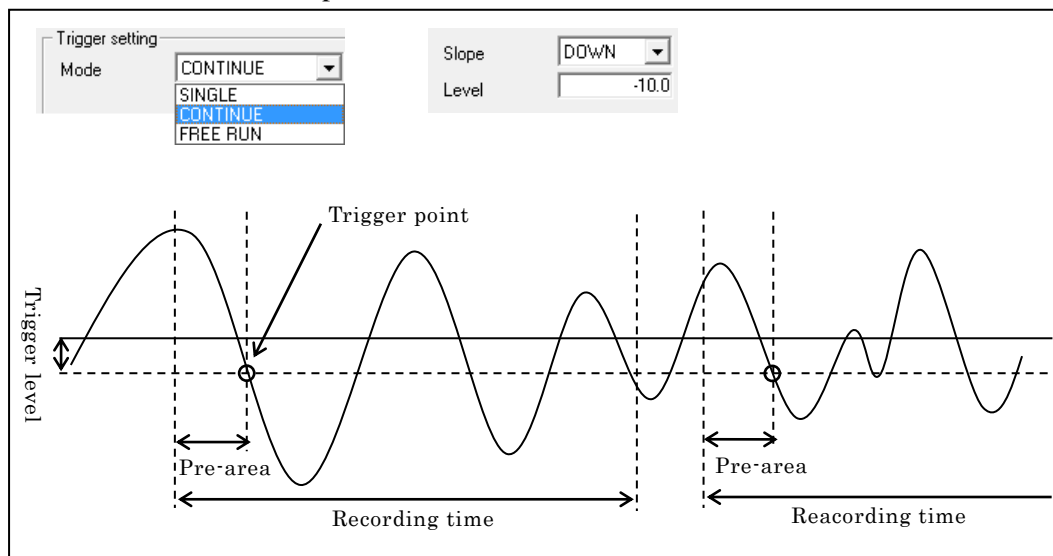


When you select [CONTINUE] trigger mode and click [Start] button, the instrument measures data of the size (including pre-area) set by [Sampling Setting] procedure, starting from the moment when triggering condition is met, as shown in the above figure.

After completing one time measurement / recording, the instrument is in stand-by until next time the triggering condition is met. When the triggering condition is met again, the instrument implements measurement / recording in the same conditions as in the above.

If trigger becomes ON while pre-area capacity is insufficient for set time, such insufficient amount of time is added to the end of recording time. (See 5.3 (2) 2. in DC-204R operation manual.)

**3. [FREE RUN]** mode operation



When you select [FREE RUN] trigger mode and click [Start] button, the instrument continuously measures data of the size (including pre-area) set by [Sampling Setting] procedure.

**[Examples of slope and level settings]**
The examples of slope and level settings are shown in this paragraph. Set [Slope] as an incline direction of input signal waveform and [Level] as a ratio (%) to the range of [Amplifier Setting].
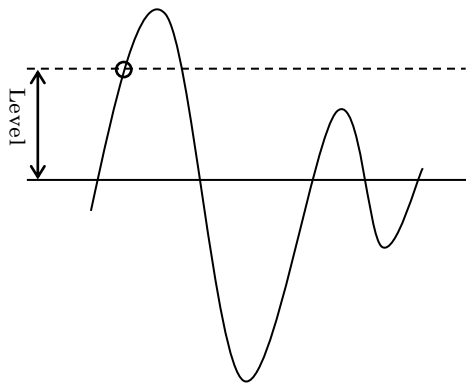
---

⚠
**Caution**    The polarity of [Coefficient] is not reflected on [Slope] and [Level] judgments. When a coefficient is set to minus value, monitors (numerical, waveform and X-Y) show data with reversed polarity. However, the instrument (DC-204R/204Ra) judges [Slope] and [Level] irrespective of the coefficient.
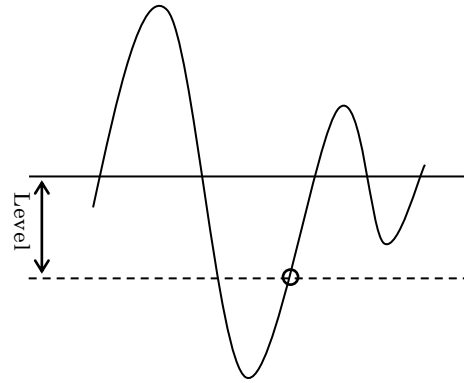    Therefore, set [Slope] and [Level] by always assuming plus polarity [Coefficient].

---

1. When Slope = UP and Level ≧ 0        2. When Slope = UP and Level ≦ 0

| Slope | UP ▼ |
|---|---|
| Level | +16.0 |

| Slope | UP ▼ |
|---|---|
| Level | -16.0 |



3. When Slope = DOWN and Level ≧ 0      4. When Slope = DOWN and Level ≦ 0

| Slope | DOWN ▼ |
|---|---|
| Level | +16.0 |

| Slope | DOWN ▼ |
|---|---|
| Level | -16.0 |
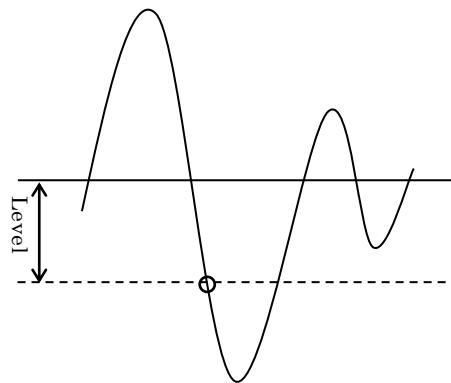


Continues to the next page

5. Setting example of triggering by the displacement of displacement transducer in its insertion

When displacement transducer's specifications are:

> Capacity = 25mm
> Rated output = 12500με

and when triggering by 4mm displacement amount in the device insertion direction after equipment balancing, then set measurement conditions as follows:

Range    20000 ue

| Setting item | Setting details |
|---|---|
| Range | Select 20000(με), which covers the rated output of the displacement transducer. |
| Slope | When using TML's displacement transducer, it outputs minus value for displacement in the insertion direction. Select DOWN for the Slope setting. |
| Level | TML's displacement transducer outputs minus value for displacement in the insertion direction. Therefore, –4mm (–2000) corresponds to –10% of the range value (20000). |

Slope    DOWN

Level    -10.0

Zero level after instrument balancing

Level corresponding to –4mm (–10%)
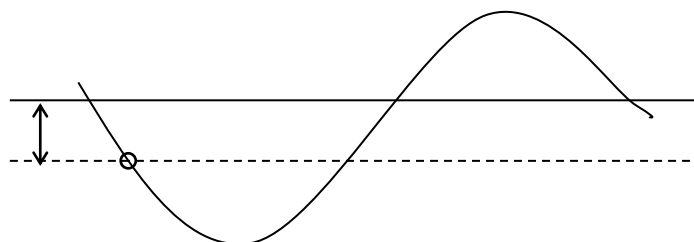
Level calculation for the above example:

・Strain amount at the level

$$\frac{\text{Displacement}}{\text{Capacity}} \times \text{Rated output} = \frac{-4\text{mm}}{25\text{mm}} \times (12500) = -2000\mu\varepsilon$$

・Level (ratio to range)

$$\frac{\text{Strain at the level}}{\text{Range}} \times 100 = \frac{-2000\mu\varepsilon}{20000\mu\varepsilon} \times 100 = -10\%$$

❏ Example of sampling setting

Apply the same sampling setting to all instruments (including master and slave).
Set the sampling condition considering the following subjects:

| Setting Irem | Condition to be considered |
|---|---|
| Sampling speed | Waveform cycle of phenomenon to be observed (frequency) |
| Measurement data size | Recording time of the phenomenon waveform (including pre-area) |
| Pre-area | Recording time of the phenomenon waveform before triggering condition is met |

⚠ **Caution** Please note that actual Pre-area data becomes 99% even if Pri-area is set to 100%. Otherwise data cannot be checked when triggered.  This enables the waveform of trigger condition can be checked when Pri-area is set to 100%.

❏ Record time of CompactFlash card

The data size recorded on the CompactFlash card

Storage capacity   =   Measurement data size   ×   Number of channels   ×   2Byte

The capacity that I calculated by the above becomes the aim.

（Record time to have set sampling speed to one millisecond）

| CF Card | CH | Measurement data size (Number of files that can be made) | Total record time |
|---|---|---|---|
| 128MB | 4CH | 12M[Data] × (   1 file ) | Approx   12500 seconds ( 3.4 hours) |
|  |  | 1M[Data] × ( 14 files) | Approx   14600 seconds ( 4.0 hours) |
| 256MB | 4CH | 24M[Data] × (   1 file ) | Approx   25100 seconds ( 6.9 hours) |
|  |  | 1M[Data] × ( 28 files) | Approx   29300 seconds ( 8.1 hours) |
| 512MB | 4CH | 48M[Data] × (   1 file ) | Approx   50300 seconds (13.9 hours) |
|  |  | 1M[Data] × ( 57 files) | Approx   59700 seconds (16.6 hours) |
| 1GB | 4CH | 60M[Data] × (   1 file ) | Approx   62900 seconds (17.4 hours) |
|  |  | 1M[Data] × (115 files) | Approx 120500 seconds (33.4 hours) |
| 2GB | 4CH | 60M[Data] × (   3 files) | Approx 188700 seconds (52.4 hours) |
|  |  | 1M[Data] × (229 files) | Approx 240100 seconds (66.7 hours) |

⚠ **Caution** When the measurement data size is greatly set, the capacity of the card might not be able to be used effectively.
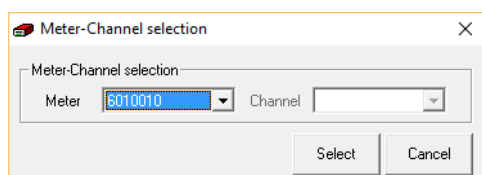
## 5.2 SETTING OF DATE / TIME

When you are using this measuring equipment for the first time or not turning on instrument's power for a time period of one week or longer, date / time set in the instrument may have been erased. Open [Date-Time Setting] dialogue box and set date and time one by one for instrument (DC-204R/204Ra).

**[Operation procedure]**
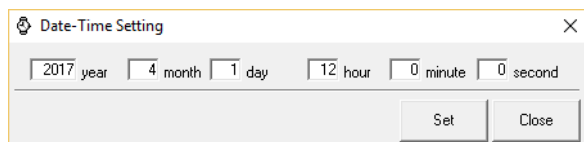1. Click on [Set] in the menu and select [Date-Time Setting].
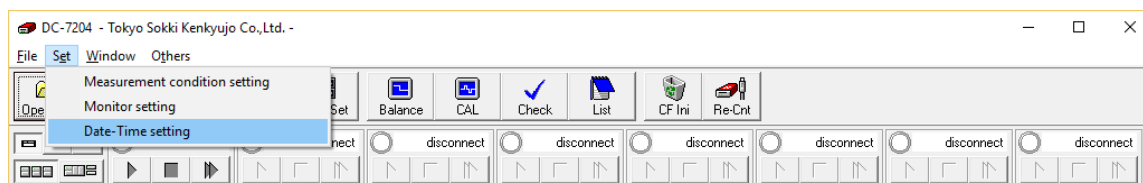


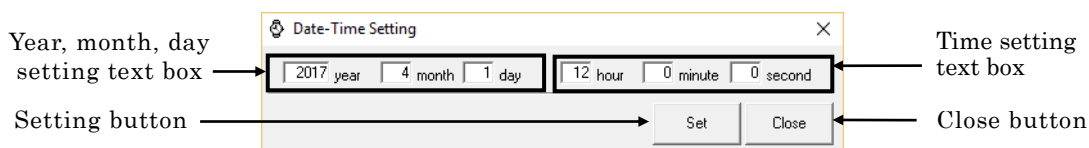2. [Meter-Channel selection] dialogue box is indicated.



Click on [Meter] combo box and select instrument.

3. [Date-Time setting] dialogue box is indicated.



**[Setting items of Date-Time setting dialogue box]**



| | Description |
|---|---|
| Year, month, date setting text box | Used to set current year, month and day. |
| Time setting text box | Used to set current time. |
| Setting button | Used to set the above year, month day and time to the internal timer of DC-204R/204Ra. |
| Close button | Used to close Date-Time setting window. When closed without clicking Set button, year, month, day and time in DC-204R/204Ra are not updated. |

⚠ **Caution** Date/time indicated on the Date-Time setting dialogue box just after opened is the date/time of the personal computer. Date/time of DC-204R/204Ra can be checked in Setting/Condition List.

# 5.3 CLEARING FILE (FORMATTING)

When formatting a compact flash card (CF card) or intending full use of its capacity, implement the clear file operation.

> ⚠️ **Caution**
>
> A compact flash card (CF card) in which other files (text file etc.) are stored by personal computer or a card in which files are partially deleted by personal computer cannot be used for DC-204R/204Ra. Also, a compact flash card in which data files recorded by DC-204R/Ra are mixing with other type files cannot be used.
> The operations allowed to personal computer to be performed on CF card are limited only to reading (copying) data file recorded by DC-204R/204Ra and deleting all files in CF card.
> Before using a CF card for DC-204R/Ra, delete all files in the card using personal computer function, or initialize the card using this control software.

**[Operation Procedure]**

1. Click on [File Clear] button in the main menu bar to open [Meter-Channel selection] dialogue box.
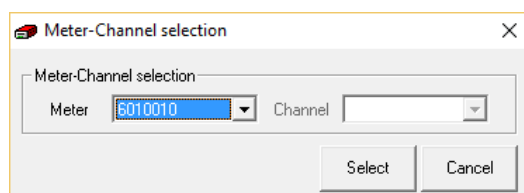


2. Click [Meter] combo box, select instrument and click on [Select] button.

3. [CF card initialize] dialog is indicated.
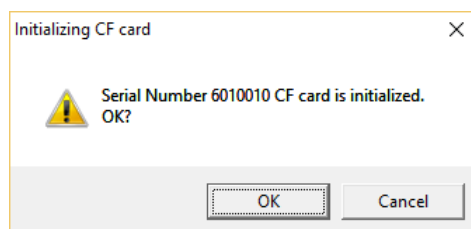


4. Click on OK to clear files.

✎memo

# Chapter 6

## INSTRUMENT CHECK AND
## CONFIRMATION OF SETTING CONDITIONS

## 6.1 INSTRUMENT CHECK

After completing the measurement condition settings according to "5. SETTINGS REQUIRED BEFORE MEASUREMENT", implement various equipment check and confirmation of setting conditions stated in this chapter.

The following check functions are provided in this instrument:

| Check Function | Description |
|---|---|
| Open Check | Checks sensor connection condition of each channel. |
| LED Check | Checks LED operation on the instrument front panel. |
| ROM / RAM Check | Checks ROM and RAM operations in the instrument. |
| CF Card Check | Checks writing speed of compact flash card (CF card). |

❏ Check dialogue

**[Operation Procedure]**

1. Click on [Check] button in the main menu bar to open [Meter-Channel selection] dialogue box.

   or Click on [Check] button.
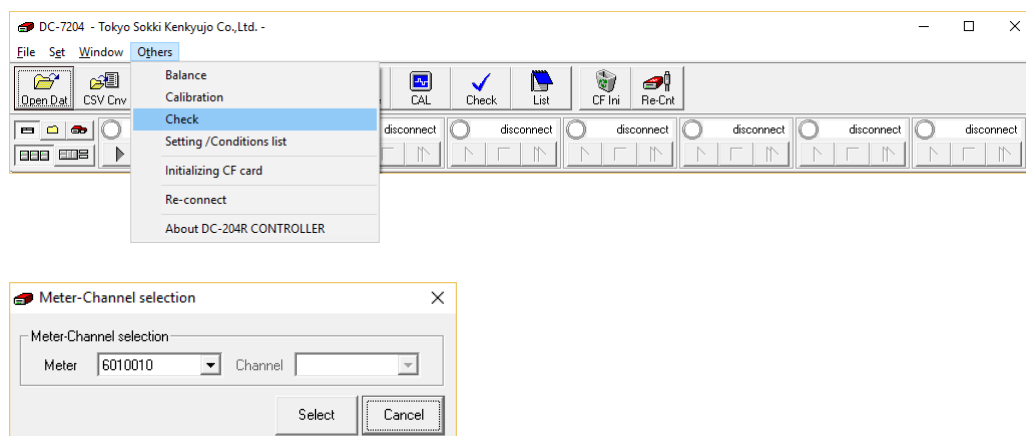


2. Click [Meter] combo box, select the instrument and click on [Select] button.
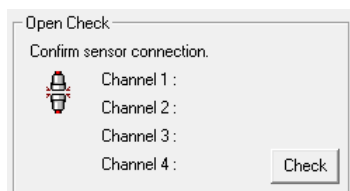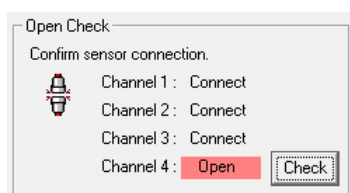3. [Check] dialogue box is indicated.
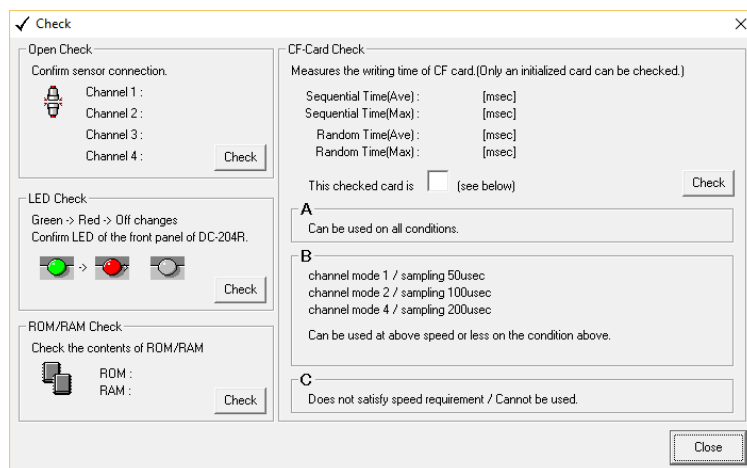
❏ Open check

This function checks sensor connection condition of each channel. Also you can check sensor wire-break or wiring mistake.

**[Operation Procedure]**
1. Click on [Check] button on the [Open Check] field in the above dialogue box.



2. The sensor connection condition of each channel is indicated.



**[Judgment and Corrective Action]**
Sensor wire-break or wiring mistake may be occurring in the channel of which connection condition is indicated as being Open. Check the sensor installation condition etc.

❏ LED check

This function checks operation condition of LEDs on the front panel of the instrument (DC-204R/204Ra). You can verify that LEDs are correctly indicating instrument operation conditions using this function.

**[Operation Procedure]**
1. Click on [Check] button on the [LED Check] field in the above dialogue box.
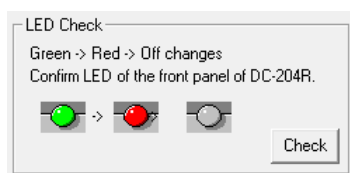


2. The light color of LEDs on the instrument front panel changes "green" → "red" → "color showing current instrument condition".

**[Judgment and Corrective Action]**
In the event LED light color does not change in the above sequence, please contact us.

❏ ROM / RAM check

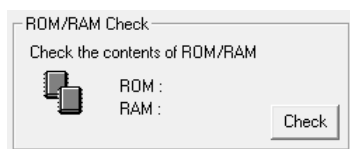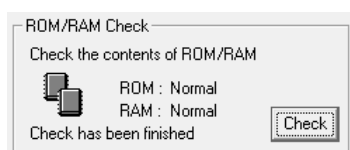This function checks ROM and RAM operation of the instrument (DC-204R/204Ra).

**[Operation Procedure]**
1. Click on [Check] button on the [ROM / RAM Check] field in the above dialogue box.

```
ROM/RAM Check
Check the contents of ROM/RAM
        ROM :
        RAM :          Check
```

2. This function checks ROM / RAM operation and indicates the check results.

```
ROM/RAM Check
Check the contents of ROM/RAM
        ROM : Normal
        RAM : Normal   Check
Check has been finished
```

**[Judgment and Corrective Action]**
In the event of "Normal" not being indicated, please contact us.

❏ CF card check

This function checks the writing speed of compact flash card.
You can judge whether the compact flash card can be used for the instrument (DC-204R/204Ra).
This instrument writes waveform data in CF card on real time base. Therefore, you have to use CF card that can be operated within specified writing time length.
A CF card whose writing time (sequential average time, sequential maximum time, random average time and random maximum time) checked by the CF Card Check function is less than the time specified in the table below cannot be used:

DC-204R／204Ra

| Operation time | Writing time required for DC-204R/204Ra |
|---|---|
| Sequential Average Time | 0.6 msec |
| Sequential Maximum Time | 82 msec |
| Random Average Time | 0.9 msec |
| Random Maximum Time | 82 msec |

DC-104R or equivalent sampling speed
（less than 200μsec/4ch, 100μsec/2ch, 50μsec/1ch）

| Operation time | Writing time required for DC-204R/204Ra |
|---|---|
| Sequential Average Time | 5.1  msec |
| Sequential Maximum Time | 107  msec |
| Random Average Time | 5.1  msec |
| Random Maximum Time | 107  msec |

**[Operation Procedure]**
 1. CF Card Check can be operated only on the file-cleared card. For a card in which files are remaining, clear those files referring to "5.3  CLEARING FILE (FORMATTING)".
 2. Click on [Check] button on the [CF-Card Check] field in the above dialogue box.

```
┌─ CF-Card Check ──────────────────────────────────────────────┐
│  Measures the writing time of CF card.(Only an initialized card can be checked.)  │
│                                                                │
│    Sequential Time(Ave) :           [msec]                     │
│    Sequential Time(Max) :           [msec]                     │
│      Random Time(Ave) :             [msec]                     │
│      Random Time(Max) :             [msec]                     │
│                                                                │
│    This checked card is  □  (see below)          ┌─ Check ─┐  │
│  ┌─ A ────────────────────────────────────────────────────┐   │
│  │  Can be used on all conditions.                         │   │
│  └────────────────────────────────────────────────────────┘   │
│  ┌─ B ────────────────────────────────────────────────────┐   │
│  │  channel mode 1 / sampling 50usec                       │   │
│  │  channel mode 2 / sampling 100usec                      │   │
│  │  channel mode 4 / sampling 200usec                      │   │
│  │                                                         │   │
│  │  Can be used at above speed or less on the condition above. │
│  └────────────────────────────────────────────────────────┘   │
│  ┌─ C ────────────────────────────────────────────────────┐   │
│  │  Does not satisfy speed requirement / Cannot be used.   │   │
│  └────────────────────────────────────────────────────────┘   │
└────────────────────────────────────────────────────────────────┘
```

 3. The function checks writing time of the CF card and indicates the check results.
　　・CF card check result "A" can be used under every condition.
　　・CF card check result "B" can be used with some limitations in sampling speed.
　　・CF card check results "C" cannot be used.

```
┌─ CF-Card Check ──────────────────────────────────────────────┐
│  Measures the writing time of CF card.(Only an initialized card can be checked.)  │
│                                                                │
│    Sequential Time(Ave) :      0.168  [msec]                   │
│    Sequential Time(Max) :      8.416  [msec]                   │
│      Random Time(Ave) :        0.530  [msec]                   │
│      Random Time(Max) :       35.328  [msec]    Check has been finished │
│                                                                │
│    This checked card is  │A│  (see below)        ┌─ Check ─┐  │
│  ┌─ A ────────────────────────────────────────────────────┐   │
│  │  Can be used on all conditions.                         │   │
│  └────────────────────────────────────────────────────────┘   │
│  ┌─ B ────────────────────────────────────────────────────┐   │
│  │  channel mode 1 / sampling 50usec                       │   │
│  │  channel mode 2 / sampling 100usec                      │   │
│  │  channel mode 4 / sampling 200usec                      │   │
│  │                                                         │   │
│  │  Can be used at above speed or less on the condition above. │
│  └────────────────────────────────────────────────────────┘   │
│  ┌─ C ────────────────────────────────────────────────────┐   │
│  │  Does not satisfy speed requirement / Cannot be used.   │   │
│  └────────────────────────────────────────────────────────┘   │
└────────────────────────────────────────────────────────────────┘
```

**[Judgment and Corrective Action]**
Do not use CF card whose writing time exceeds the time required for the instrument.
Please contact us for information about recommended CF cards.

| ⚠ Caution | If a CF card judged as A is checked by the CF Card Check function on DC-104R, it is judged as B. |
|---|---|

| ⚠ Caution | Any CF card that has not been checked by the CF Card Check function cannot be used. Depending on the result of CF card check, an error may be caused by the high-speed sampling setting. Use a CF card having required writing time. |
|---|---|

# 6.2 CONFIRMATION OF SETTING CONDITIONS

This function indicates the list of current instrument setting conditions. You can confirm setting conditions of each instrument by this list.
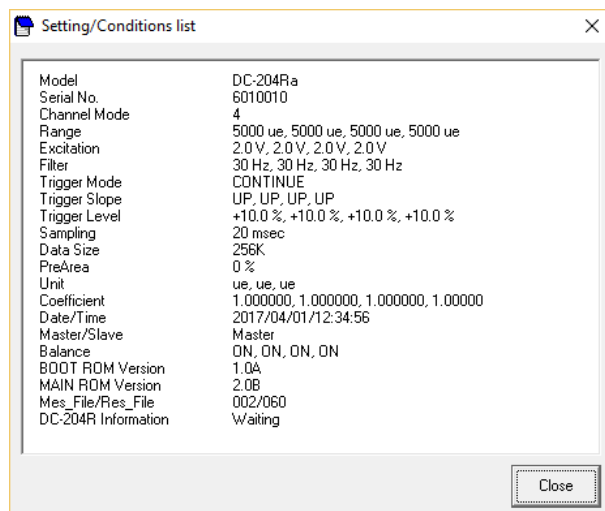
❏Setting / Condition list dialogue

**[Operation Procedure]**

1. Click on [List] button in the main menu bar to open [Meter-Channel selection] dialogue box.
   or Click on  button.
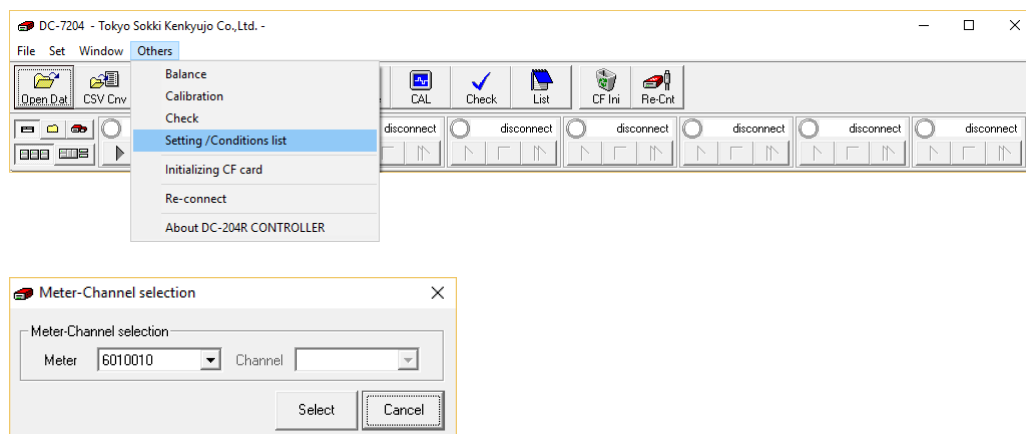


2. Click [Meter] combo box, select instrument and click on [Select] button.
3. [Setting/Condition List] dialogue box is indicated.



When there is setting error in the list, correct such wrong setting by referring to "5. SETTINGS REQUIRED BEFORE MEASUREMENT".

| ⚠ Caution | For the following items, apply the same setting condition to all instruments connected (including master and slave) to synchronize multiple instruments. |
|---|---|

[Amplifier Setting]: The number of channels used
[Trigger Setting]: Trigger mode
[Sampling settings]: All items
If the above settings are inconsistent among instruments used, error occurs

# Chapter 7

## MEASUREMENT

# 7.1 MONITORS

You can measure and monitor the phenomenon waveform. The following three types are available for monitors. However, the waveform monitor data are not automatically recorded. In order to record the phenomenon waveform, start measurement by referring to "7.4 STARTING AND STOPPING MEASUREMENT".

| Monitor | Description |
|---|---|
| Numerical Monitor | Indicates monitor data of each channel in numerical form. |
| Waveform Monitor | Indicates monitor data of each channel in timeline waveform. |
| X-Y Monitor | Indicates the correlation between measurement data of any two optional channels in X-Y graph form. |
| BAR Monitor | Indicates the measurement data of each channel in BAR graph form. |
| CIRCLE Monitor | Indicates the measurement data of each channel in CIRCLE graph form. |

❏ Setting Monitor screen

Set the Monitor screen to be displayed.

**[Operation Procedure]**

1. Click [Monitor setting] button in the Menu to display [Monitor Setting Window] screen.

or Click on  button.
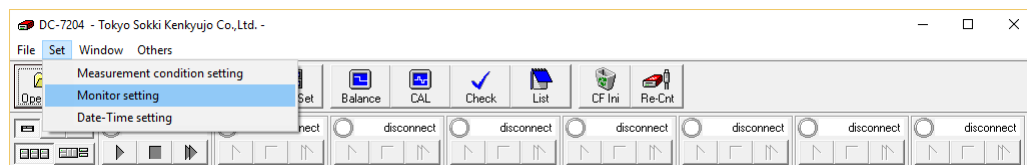


2. Check the monitor to display
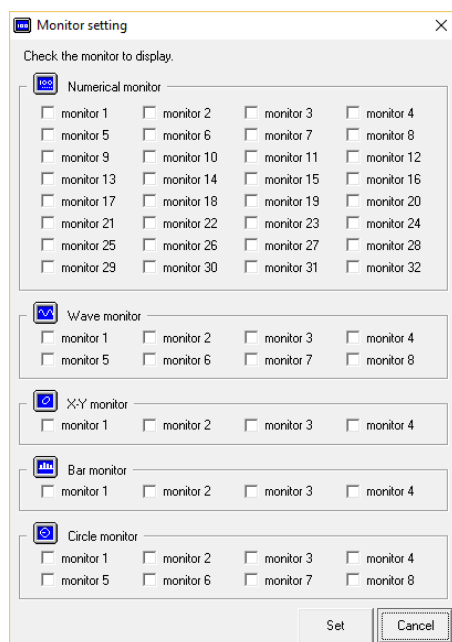
❏ Numerical monitor

The numerical monitor displays measurement data in numerical form.
Data displayed on numerical monitor screens are values calculated using coefficients set in the section, "5.1   SETTING OF MEASUREMENT CONDITIONS". Also they are average values of measurements of average number of times set by [Configuration] dialogue described in this section.
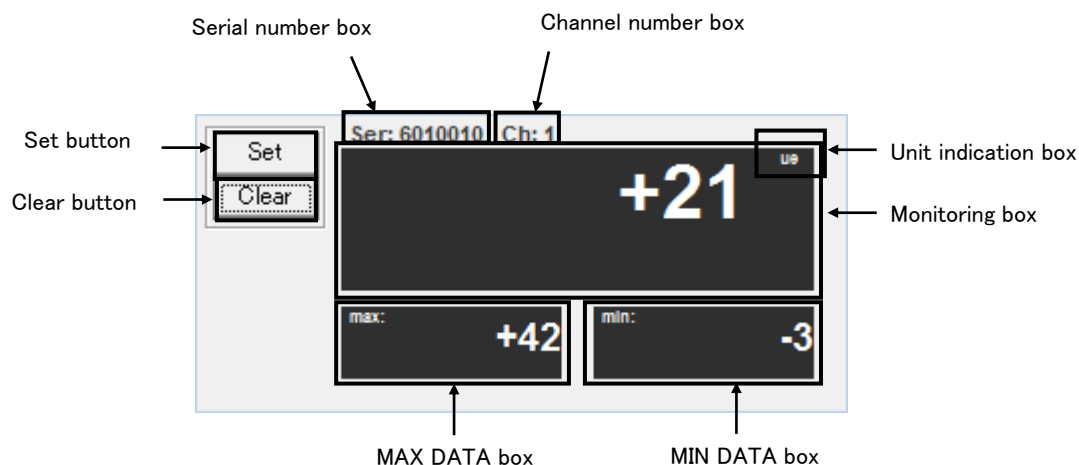You can change back and letter colors of [Numerical Monitor] window by referring to "Numerical monitor setting" in this section"

【Operation Procedure】
1. Click on [Monitor setting] button to select [Numerical Monitor] checkbox.
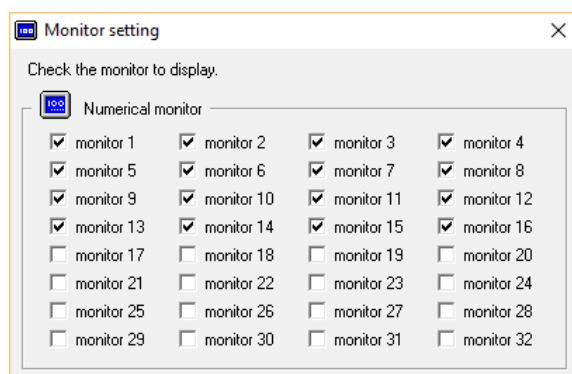
2. When you end the [Numerical Monitor], click the quit button on the [Numerical Monitor] window.

**[Explanation of each part of numerical monitor window]**



| | Description |
|---|---|
| Serial Number box | Indicates the serial number of selected instrument. When non-connection is selected, this box is blank. |
| Set button | Set the Numerical Monitor. |
| Clear button | Initializes data in [MAX DATA] box and [MIN DATA] box. |
| Channel Number box | Indicates the channel number currently monitored. |
| Unit indication box | Indicates the physical unit selected in the measurement condition setting (see "5.1 SETTING OF MEASUREMENT CONDITIONS"). |
| Monitoring box | Indicates the monitored measurement data in numerical form. The figure displayed in the numerical monitor box is a value calculated using the coefficient set in the section "5.1 SETTING OF MEASUREMENT CONDITIONS". Also it is an average value of measurements of average number of times set by "Color setting of monitor screen and Setting of numerical monitoring average times" in 7.1 section. |
| MAX DATA box | Indicates the maximum value in monitored data in numerical form. Indicated figure is a value calculated using the coefficient set in the section "5.1 SETTING OF MEASUREMENT CONDITIONS". (However, it is not an average value.) Closing [Numerical Monitor] window resets this value. |
| MIN DATA box | Indicates the minimum value in monitored data in numerical form. Indicated figure is a value calculated using the coefficient set in the section "5.1 SETTING OF MEASUREMENT CONDITIONS". (However, it is not an average value.) Closing [Numerical Monitor] window resets this value. |

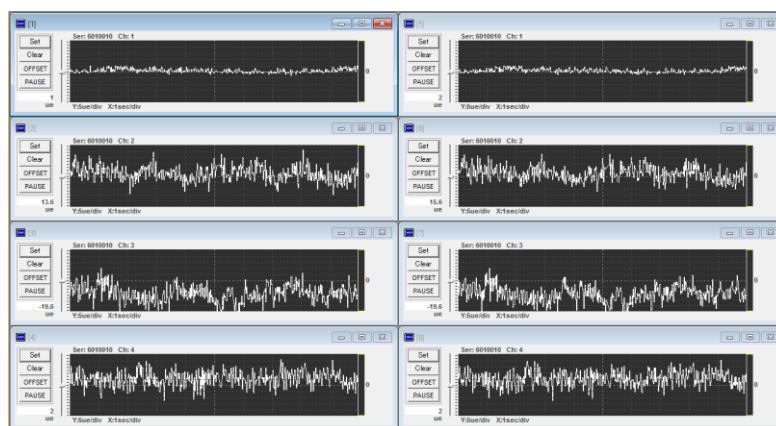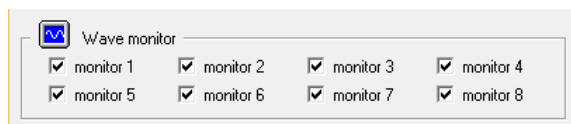[Explanation of Each Part of Numerical Monitor Window]

| Setting Items | | Description |
|---|---|---|
| Basic setting | Serial No. | Selects the serial number of the instrument to display in [Numerical monitor] window. |
| | Channel | Selects the channel number to monitor. |
| | Average count | Sets the average number of numerical monitoring 1 to 10 times. |
| | Caption | Sets the title displayed in [Numerical monitor] window. |
| | Enable abnormal display | When the abnormal value setting is enabled, the color and background color of the monitoring value exceeding the upper limit (lower limit) set in the abnormal value display setting are changed. |
| Display setting | Back color | Selects the background color of numerical monitor screen. |
| | Fore color | Selects the font color of numerical monitor screen. |
| | Display digit | When setting a coefficient smaller than the decimal place in the measurement condition setting (See "5.1 SETTING OF MEASUREMENT CONDITIONS"), set the number of decimal places. The display setting range depends on the number of decimal places of the set coefficient. |
| Abnormal display setting | Upper limit value | Sets the upper limit value of abnormal value |
| | Lower limit value | Sets the lower limit value of abnormal value |
| | Back color | Selects the background color of numerical monitor screen when displaying abnormal value |
| | Fore color | Selects the font color of numerical monitor screen when displaying abnormal value |

## ❏ Waveform monitor

The waveform monitor displays measurement data in timeline waveform.
The waveform and the figure displayed in the waveform monitor screen are values calculated using coefficients set in the section "5.1 SETTING OF MEASUREMENT CONDITIONS". You can change the back and the waveform colors of [Numerical Monitor] window by referring to "Waveform monitor setting."
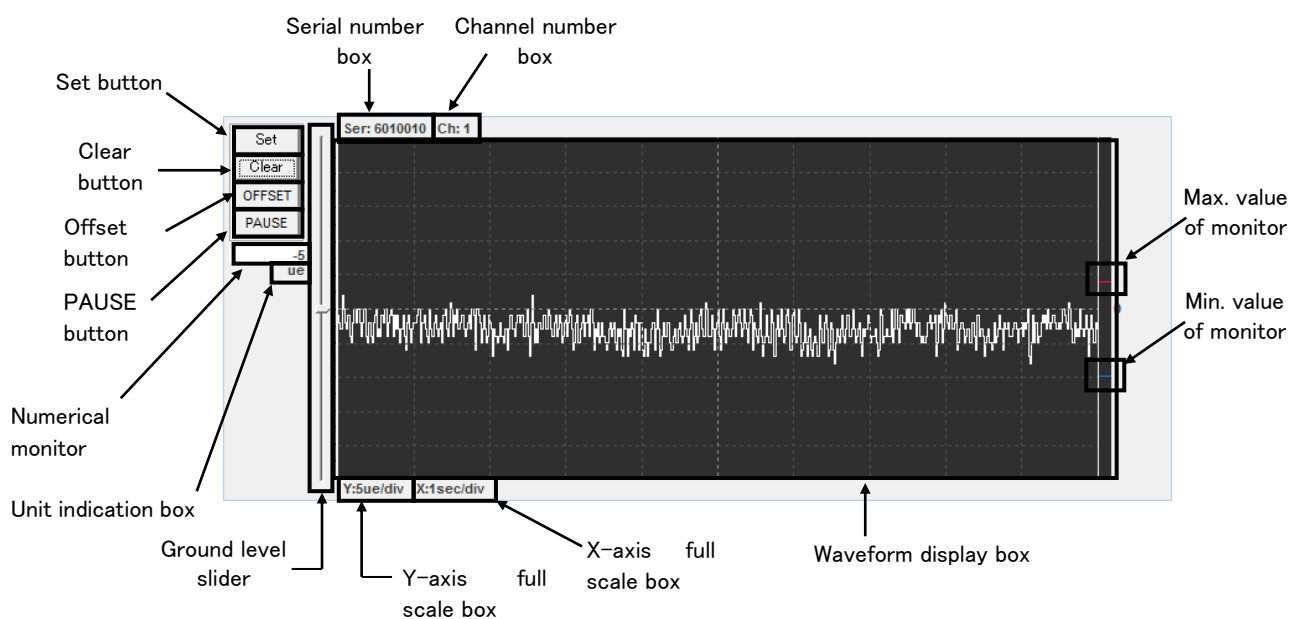
【Operation Procedure】

1. Click on [Monitor Setting] button and check [Waveform Monitor].

2. When you end the [Waveform Monitor], click the quit button on the [Waveform Monitor] window.

**[Explanation of Each Part of Waveform Monitor Window]**

The explanation is shown in the following table:

| | Description |
|---|---|
| Serial Number box | Indicates the serial number of selected instrument. When non-connection is selected, this box is blank. |
| Channel Number box | Indicates the channel number currently monitored. |
| Set button | Sets waveform monitor |
| Clear button | Clears waveform monitor |
| Offset button | Deducts the value monitored when this button is clicked, from following monitor value. Click again to cancel this offset. This function is only for waveform display, therefore doesn't affect the measurement and recorded data |
| PAUSE button | Pauses waveform monitor. Click this button again to restart waveform monitor. |
| Waveform display box | This is a box to indicate measured waveform. Currently monitored value is displayed in the box in lower right corner. |
| Monitor value box | Indicates monitor value being monitored |
| Unit indication box | Indicates the physical unit selected in the measurement condition setting (see "5.1 SETTING OF MEASUREMENT CONDITIONS"). |
| Y-axis ground level shift slider | By moving up and down the ground level shift slider, the ground level position of the waveform display can be changed. |
| X(Y)-axis full scale box | Displays the full scale of X (Y)-axis. |

**[Explanation of Each Part of Waveform Monitor Window]**
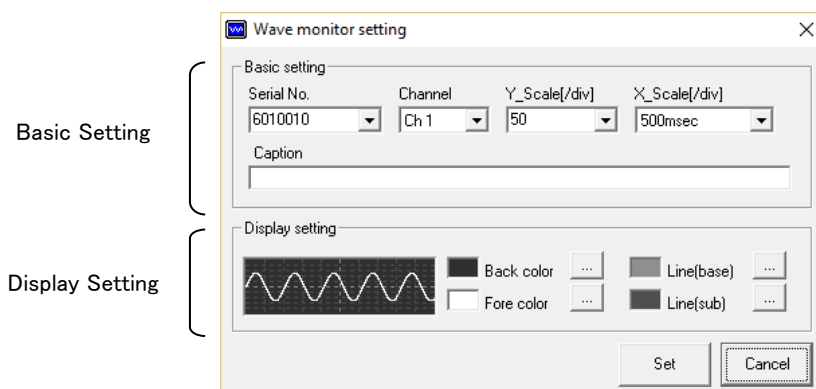


| Setting Items | | Description |
|---|---|---|
| Basis Setting | Serial No. | Selects the serial number of instrument to display in [Waveform monitor] window |
| | Channel | Selects the channel number to monitor |
| | Y-axis scale | Sets the Y-axis full scale |
| | X-axis scale | Sets the X-axis full scale |
| | Title | Sets the title of monitor to display in [Waveform monitor] window |
| Display Setting | Back color | Selects the background color or waveform monitor screen |
| | Fore color | Selects the font color of waveform monitor screen |
| | Line(base) | Selects the reference line color of Waveform monitor screen |
| | Line(sub) | Selects the auxiliary line color of Waveform monitor screen |

⚠ **Caution**

The full scale setting by the full scale shift slider and the monitor speed setting by the monitor speed combo box are irrespective of [Range], [Level] or [Sampling] setting in the measurement condition setting (see "5.1 SETTING OF MEASUREMENT CONDITIONS"). Please be careful.
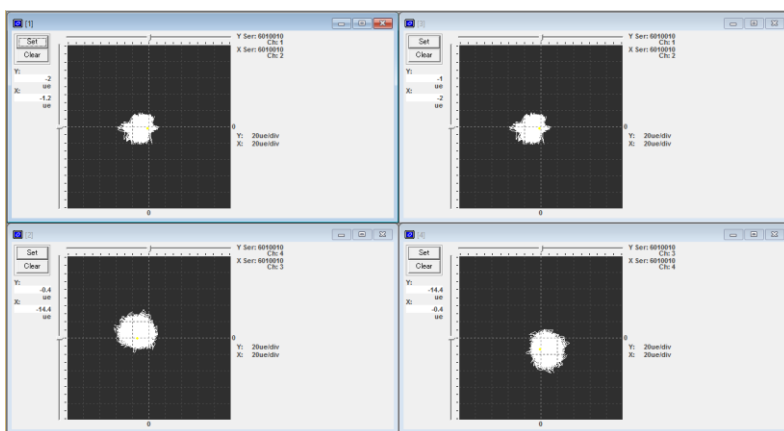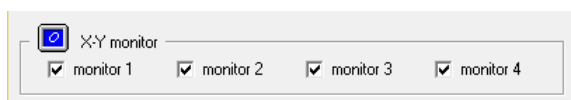
❏ X-Y monitor

The X-Y monitor displays the correlation between measurement data of any two optional channels in X-Y graph form.

Data displayed on the X-Y monitor screen are values calculated using coefficients set in the section, "5.1 SETTING OF MEASUREMENT CONDITIONS". You can change back and waveform colors of [X-Y Monitor] window by referring to "Color setting of monitor screen and Setting of numerical monitoring average times" in 7.1 section.
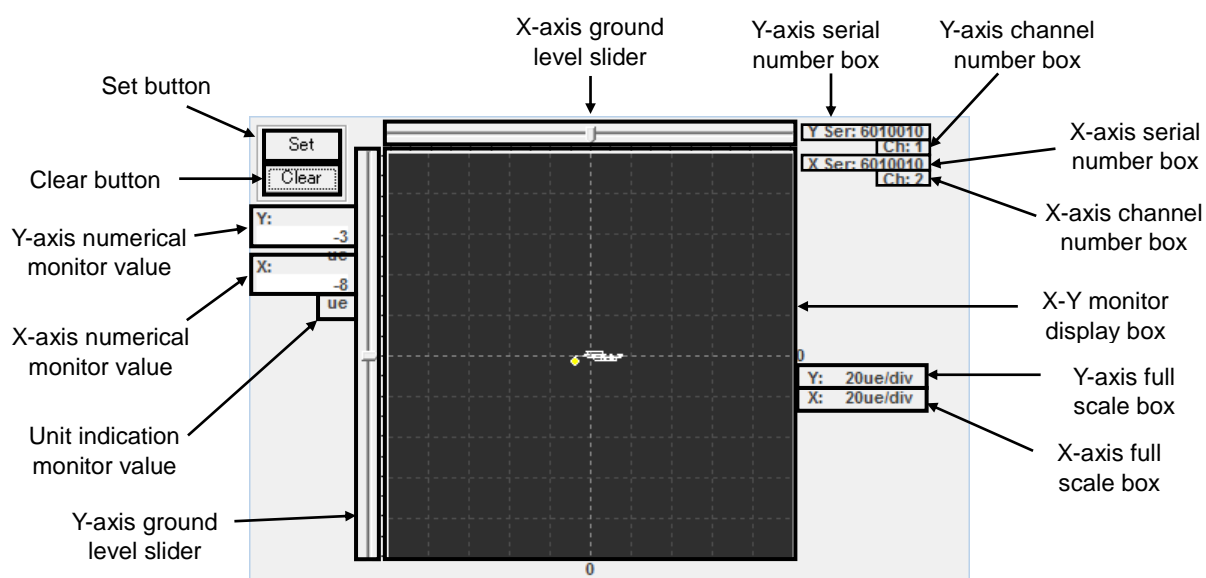
**[Operation Procedure]**

1. Click on [X-Y] button and check [X-Y Monitor].



2. When you end the [X-Y Monitor], click the quit button on the [X-Y Monitor] window.

**[Explanation of Each Part of X-Y Monitor Window]**

| | Description |
|---|---|
| Set button | Sets X-Y monitor |
| Clear button | Clears the X-Y graph drawn in [X-Y monitor display] window |
| X(Y)-axis serial number box | Indicates the serial number of the selected instrument. When non-connection is selected, this box is blank. |
| X(Y)-axis channel number box | Indicates the channel number currently monitored. |
| X(Y)-axis numerical monitor box | Indicates the monitored measurement data of X (Y) axis. |
| X(Y)-axis full scale box | Indicates the X(Y) axis full scale |
| Unit indication box | Indicates the physical unit selected in the measurement condition setting (see "5.1 SETTING OF MEASUREMENT CONDITIONS"). |
| X(Y)-axis ground level shift slider | Ground position of waveform display can be changed by moving the ground level shift slider |

**[Explanation of Each Part of X-Y Monitor Setting Window]**
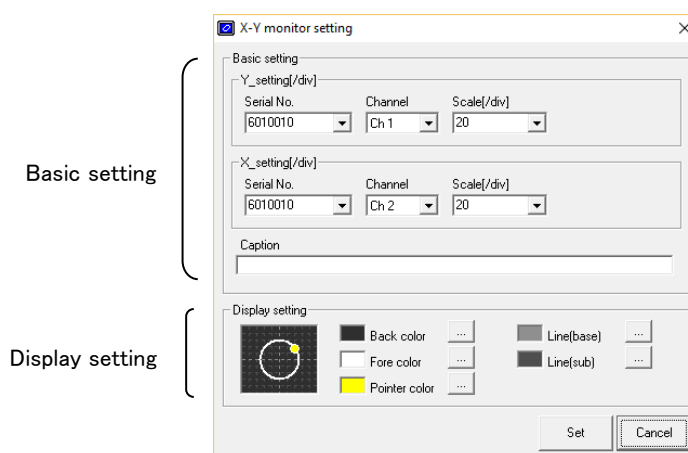


| Setting Items | | Description |
|---|---|---|
| Basic setting | X(Y)-axis Serial No. | Selects the serial number of instrument to display in [X-Y monitor] window |
| | X(Y)-axis Channel | Selects the channel number to monitor |
| | X(Y)-axis Scale | Sets the X(Y)-axis full scale |
| | Caption | Sets the title of monitor to display in [X-Y monitor] window |
| Display setting | Back color | Selects the background color of X-Y monitor screen |
| | Fore color | Selects the font color of X-Y monitor screen |
| | Pointer color | Selects the pointer color of X-Y monitor screen |
| | Line(base) | Selects the reference line color of X-Y monitor screen |
| | Line(sub) | Selects the auxiliary line color of X-Y monitor screen |

⚠ **Caution**

When waveforms in the X-Y monitor box exceeds full-scale range and can not be normally displayed, "OVER" message appears in the channel number box.

Full scale setting by this full scale shift slider is irrespective of [Range] or [Level] setting in the measurement condition setting (see "5.1 SETTING OF MEASUREMENT CONDITIONS"). Please be careful.
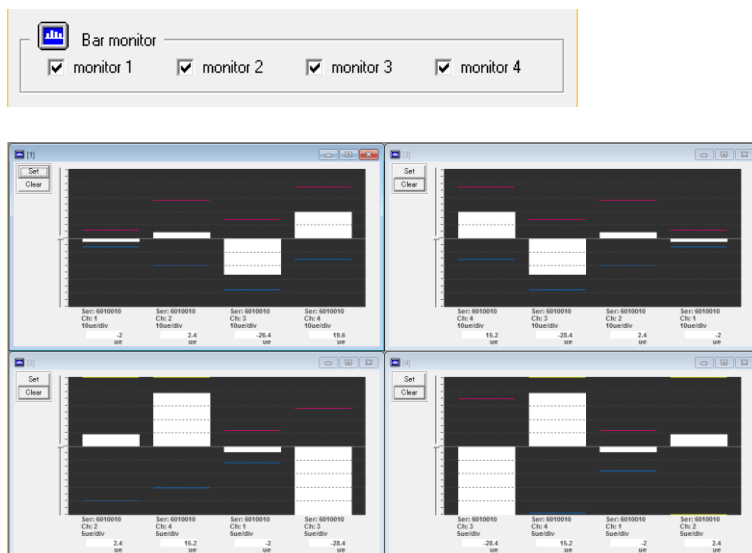
## ❏ BAR monitor

The monitor measurement data in each channel are displayed using BAR.

Data displayed in the BAR monitor are the results calculated using coefficients set in the section "5.1 SETTING OF MEASUREMENT CONDITIONS". The background and letter colors of [BAR Monitor] window can be changed on "BAR Monitor Setting Window".
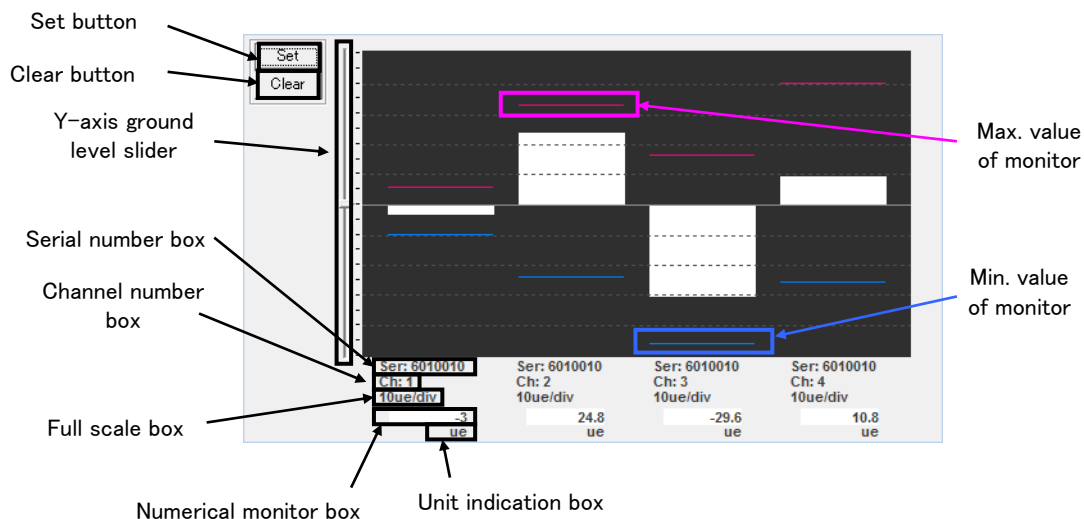
**[Operation Procedure]**

1. Click on [Monitor Setting] button and check [BAR Monitor].



2. When you end the [BAR Monitor], click the quit button on the [BAR Monitor] window.

**[Explanation of Each Part of BAR Monitor Window]**

| | Description |
|---|---|
| Set button | Sets BAR monitor |
| Clear button | Clears BAR graph drawn in BAR monitor window |
| Y-axis ground level shift slider | The ground position of waveform display can be changed by moving ground level shift slider to the left, right, top and bottom |
| Serial number box (1st to 4th) | Indicates the serial number of the selected instrument. When non-connection is selected, this box is blank. |
| Channel number box (1st to 4th) | Displays the channel number being monitored now |
| Numerical monitor box (1st to 4th) | Displays the Y-axis monitor measurement data numerically |
| Full scale box (1st to 4th) | Displays the Y-axis full scale |
| Unit indication box (1st to 4th) | Indicates the physical unit selected in the measurement condition setting (see "5.1 SETTING OF MEASUREMENT CONDITIONS"). |

**[Explanation of Each Part of BAR Monitor Window]**
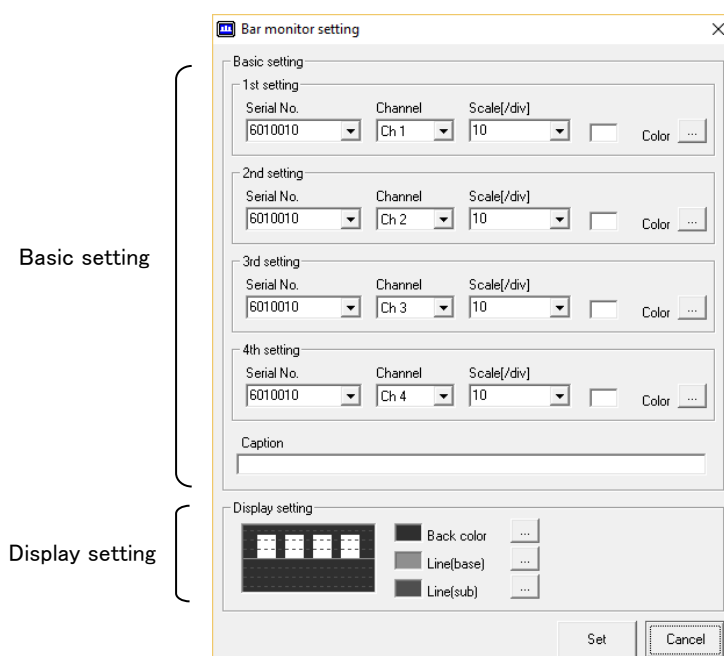


| Setting Items | | Description |
|---|---|---|
| Basic setting | Serial No. (1st to 4th) | Selects the serial number of instrument to display in [BAR monitor] window |
| | Channel (1st to 4th) | Selects the channel number to monitor |
| | Scale (1st to 4th) | Sets the full scale |
| | Color (1st to 4th) | Selects the bar color |
| | Caption | Sets the title of monitor to display in [BAR monitor] window |
| Display setting | Back color | Selects the background color of BAR monitor screen |
| | Line(base) | Selects the reference line color of BAR monitor screen |
| | Line(sub) | Selects the auxiliary line color in BAR monitor screen |

## ❏ CIRCLE Monitor

The monitor measurement data in each channel are displayed by circle graphs.
Data displayed by the CIRCLE monitor are the results calculated using coefficients set in the section
"5.1 SETTING OF MEASUREMENT CONDITIONS". The background and letter colors of [CIRCLE
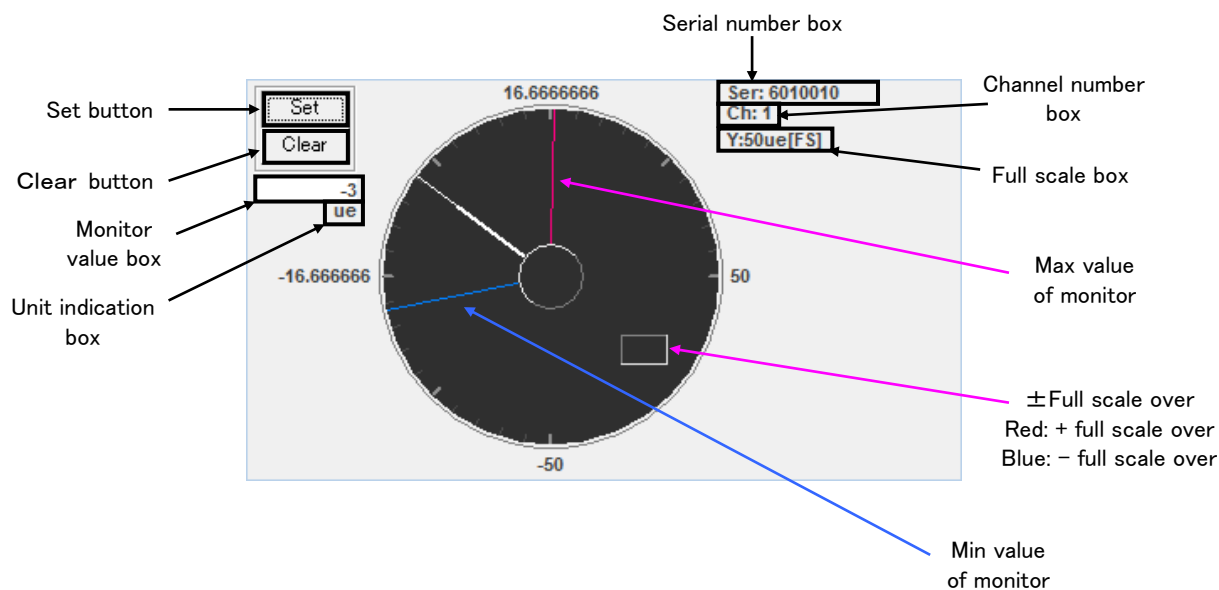Monitor] window can be changed on "CIRCLE Monitor Setting Window".

**[Operation Procedure]**

1. Click on [Monitor setting] button and check [CIRCLE Monitor].
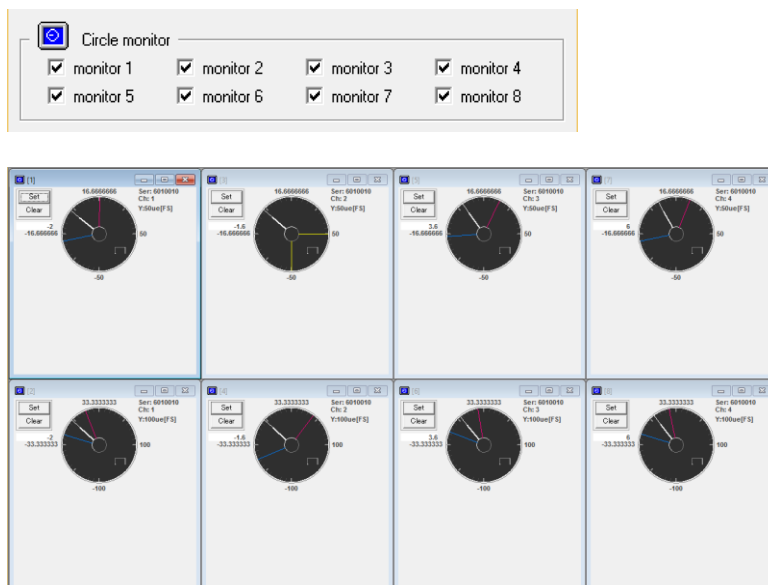
2. When you end the [CIRCLE Monitor], click the quit button on the [CIRCLE Monitor] window.

**[Explanation of Each Part of CIRCLE Monitor Window]**

| | Description |
|---|---|
| Set button | Sets CIRCLE monitor |
| Clear button | Clears CIRCLE graph drawn in CIRCLE monitor window. |
| Serial number box | Indicates the serial number of the selected instrument. When non-connection is selected, this box is blank. |
| Channel number box | Indicates the channel number currently monitored. |
| Monitor value box | Box to display the value of monitor measurement data |
| Full scale box | Box to show full scale |
| Unit indication box | Indicates the physical unit selected in the measurement condition setting (see "5.1 SETTING OF MEASUREMENT CONDITIONS"). |
| ±Full scale over | Indicates the status of current value<br>Red: Current value is above + full scale<br>Blue: Current value is below – full scale |

**[Explanation of Each Part of CIRCLE Monitor Setting Window]**
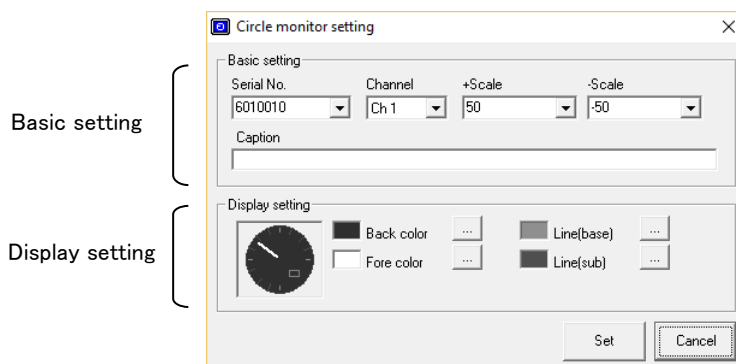


| Setting Items | | Description |
|---|---|---|
| Basic setting | Serial No. | Selects the serial number of the instrument to display in [CIRCLE monitor] window |
| | Channel | Selects the channel number to monitor |
| | +Scale | Sets + full scale |
| | -Scale | Sets - full scale |
| | Caption | Sets the title of monitor to display in [CIRCLE monitor] window |
| Display setting | Back color | Selects the background color of CIRCLE monitor screen. |
| | Fore color | Selects the waveform color of CIRCLE monitor screen |
| | Line(base) | Selects the reference line color of CIRCLE monitor screen |
| | Line(sub) | Selects the auxiliary line color of CIRCLE monitor screen |

## 7.2 BALANCING

Strain gauges or strain gauge type transducers has an initial unbalance value. Before starting measurement, implement balancing operation in order to subtract the initial unbalance value from the measured values.
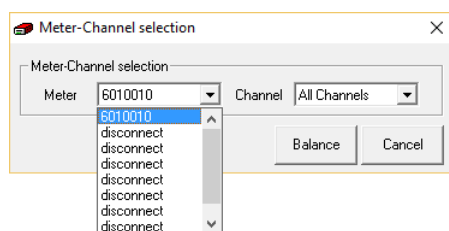
**[Operation Procedure]**

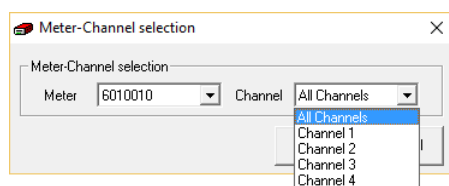1. Click on [Balance] button to open [Meter-Channel selection] dialog box.
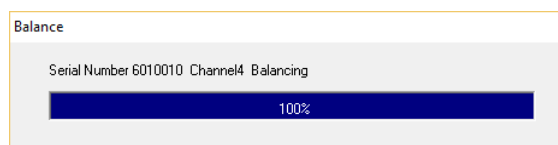
or Click on  button.
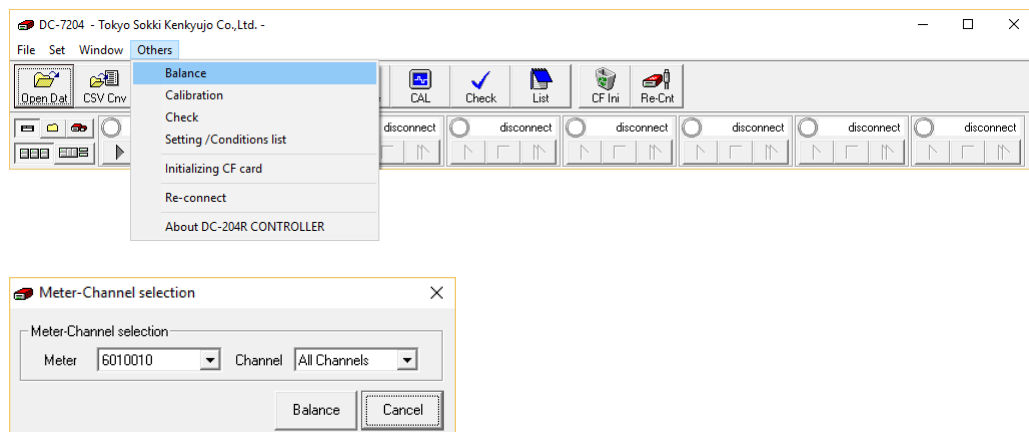


2. Click [Meter] combo box and select the instrument.



3. Click [Channel] combo box and select the channel to be balanced.



4. Click on [Balance] button to implement the balancing operation.



5. Check the measured value on the monitor.

⚠ **Caution** [Balance] in the measurement condition setting is automatically turned to ON for the channel to which balancing operation is performed. If it is required to turn it to OFF, again set it by referring to "Measurement condition setting dialogue" in "5.1 SETTING OF MEASUREMENT CONDITIONS".

## 7.3 OUTPUT OF THE CALIBRATION VALUE

Only the DC-204Ra can output the calibration value that yields constant output voltage. The output voltage value can be +1V, 0V, or -1V for each channel. The calibration output is superposed on the input value to make output.
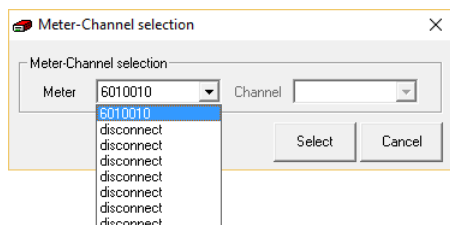
**[Operation Procedure]**

1. Click on [Calibration Output] button to open [Select Measuring Instrument/Channel] dialog.
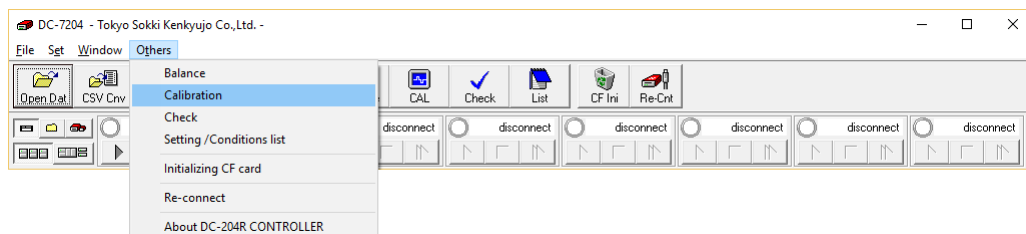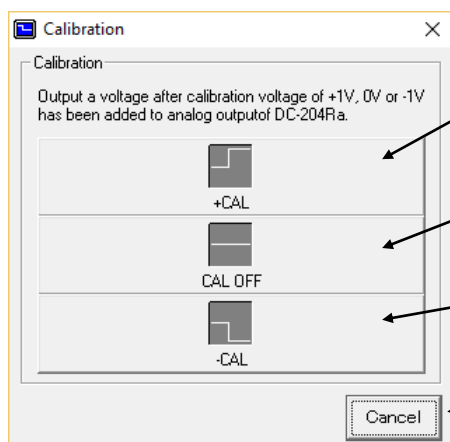
or Click on [CAL] button.
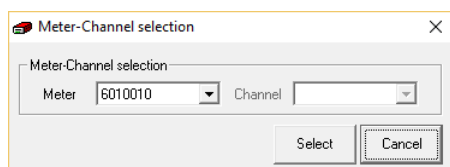
2. Click on [Measuring Instrument] combo box and select a measuring instrument for the DC-204Ra.

3. [Calibration Output] dialog appears.

[+Calibration Output] button
Outputs voltage of +1V to each channel.

[Calibration Output OFF] button
Outputs voltage of 0V to each channel.

[-Calibration Output] button
Outputs voltage of -1V to each channel.

[Cancel] button
Cancels output and exits Calibraion Output.

4. Confirm the output value with your recorder or other devices.

5. Press [Cancel] button to finish the output calibration.

## 7.4 STARTING AND STOPPING MEASUREMENT

When you have completed the procedures in "5. SETTING REQUIRED BEFORE MEASUREMENT", "6. INSTRUMENT CHECK AND CONFIRMATION OF SETTING CONDITIONS" and "7.2 BALANCING", now you can start measurement.
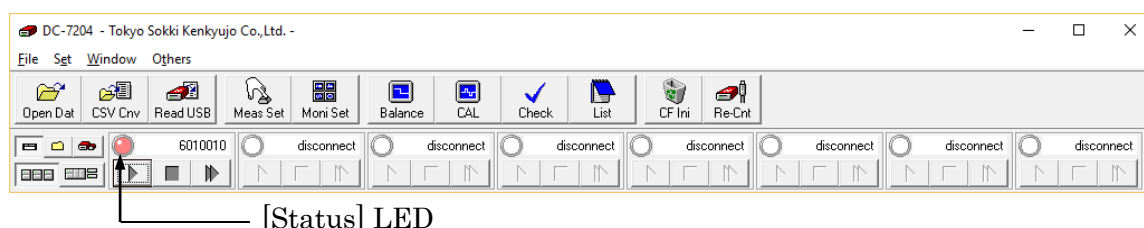
❏ Starting measurement

**[Operation Procedure]**

1. Click on [Start] button in the main menu bar of the master instrument.

[Start] button
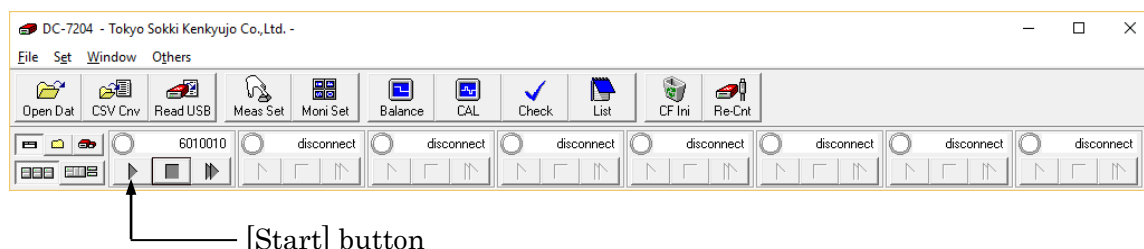
2. Instruments connected (master and slaves) start measurement. The color of [Status] LED

[Status] LED

| [Status] LED | Condition |
|---|---|
| White | Standby |
| Red | Pre-trigger status |
| Green | Recording data |
| Blue | Processing file after measurement completion |
| Yellow | Measurement unable (Place mouse pointer on the Status LED and check the situation.) |

3. When you want to manually start the data recording before the triggering condition is met during the pre-trigger status (Status LED light is red), click on [Manual Trigger] button.

[Manual Trigger] button
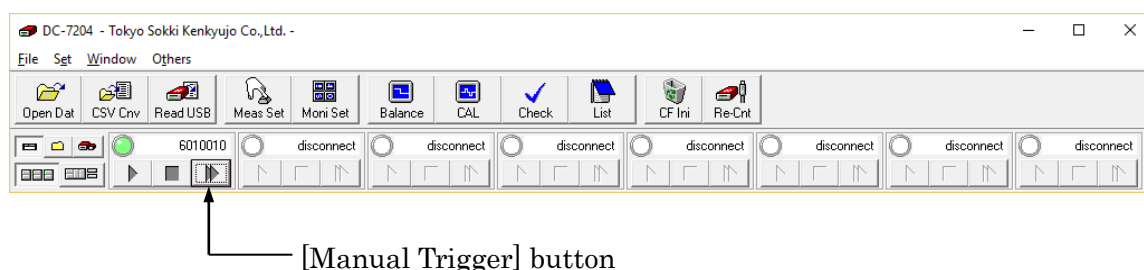
❏ Stopping measurement

Measurement / Recording is discontinued in the following three cases.

|  | Trigger Setting Mode | Description |
|---|---|---|
| Automatic stop | SINGLE | Instrument stops measurement when [Measurement Time] in the measurement condition setting is reached. |
| Stop by clicking [Stop] button | SINGLE CONTINUE FREE RUN | Measurement is stopped by clicking [Stop] button. |
| Stop by the lack of remaining capacity of CF card | SINGLE CONTINUE FREE RUN | When remaining available capacity of compact flash card becomes smaller than [Measurement data size] designated in the measurement condition setting, the instrument stops measurement. |

**[Operation Procedure for Stopping Measurement by Stop Button]**
1. Click on [Stop] button in the main menu bar of the master instrument.



[Stop] button
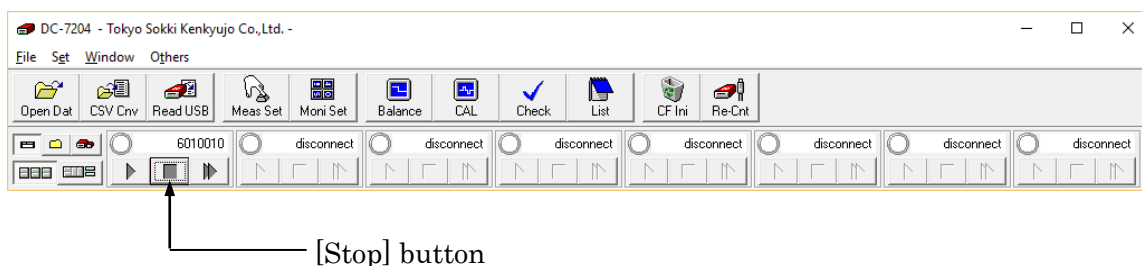
✎memo

# Chapter 8

## WAVEFORM DISPLAY, CONVERSION AND SAVING OF MEASURED DATA

## 8.1 WAVEFORM INDICATION FROM COMPACT FLASH CARD OR STORED DATA, AND MERGING FILES
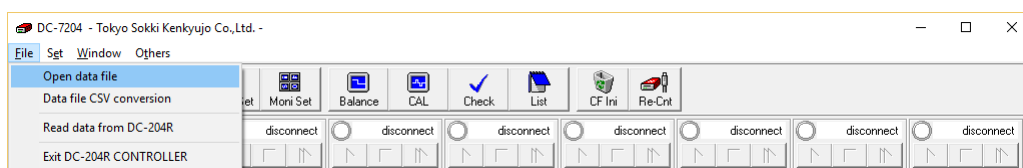
Method of indicating the wave form of the data stored in a compact flash card or a hard disk of a computer is described here.

Refer to "8.7 SAVING THE MEASURED DATA" for data saving method.

**[Operation Procedure]**

1. Click on [File] in the main menu bar and select [Open Data File],

   or click [Open Dat] button.



2. The [Open Data File] dialog appears.

   Click on the […] button to specify the folder in which measurement data files are stored. As many tabs as the number of the measurement data files in the specified folder appear.

As many tabs as the number of the measurement data files appears.



Selected folder path

Folder selection button
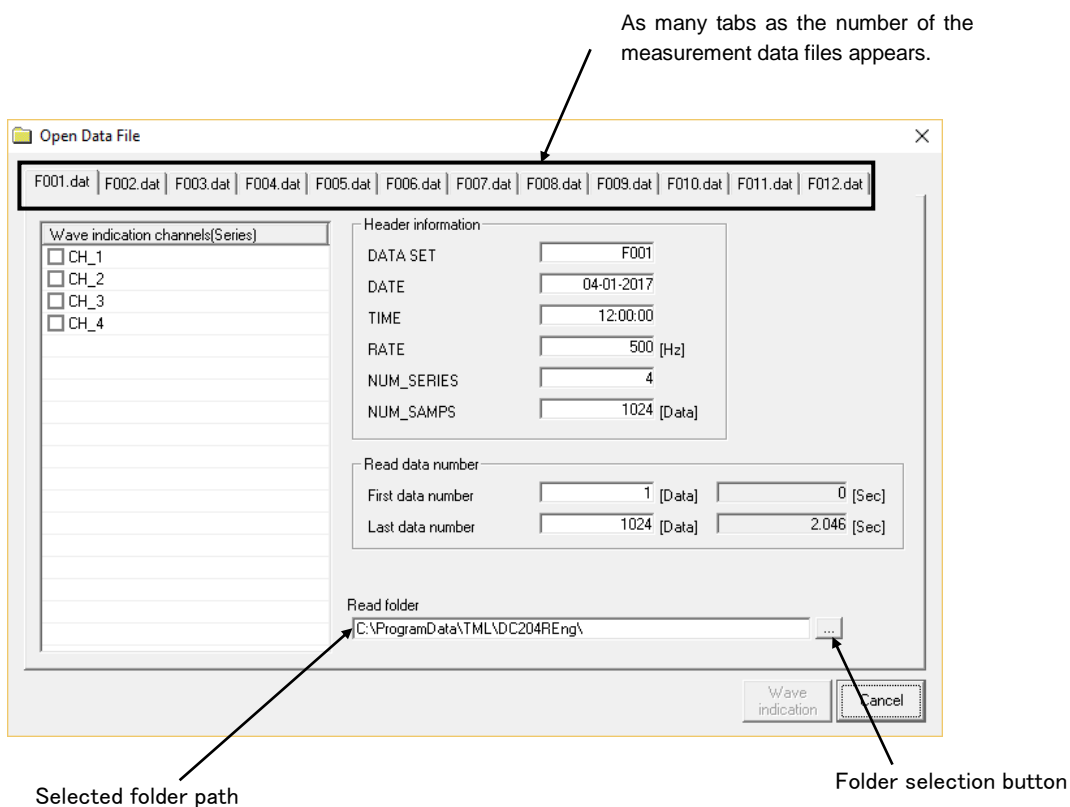
3. Select a tab for a measurement data file to display the channel names, header information, and reading conditions (containing data numbers) of the file. To display the waveform, check on the box for the channel you want to see and click on the [Wave indication] button.

Channel name

Header information

Data number

[Wave indication] button
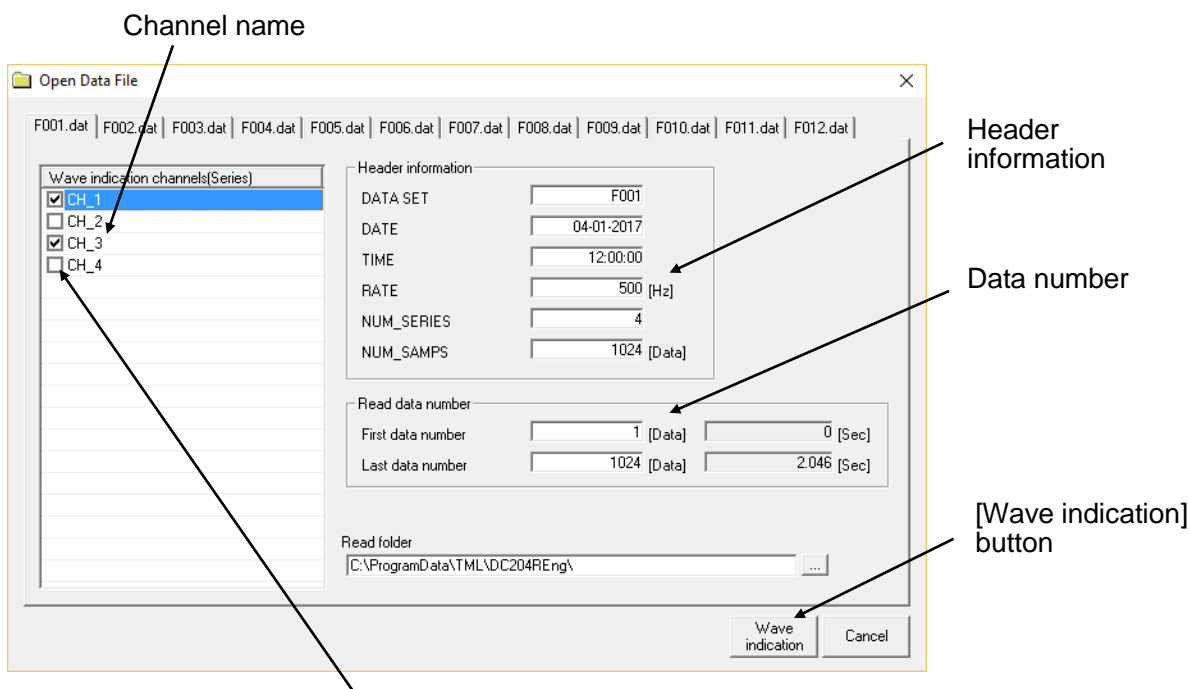
Check on the box for the channel to see.
You can select any of the channel.

4. If a measurement data file is large, you can choose to display a portion of the data. Enter data numbers in the [First data number] and the [Last data number] of the reading conditions and click on the [Wave indication] button. Measuring time corresponding to the number of the data is displayed right to the data number.
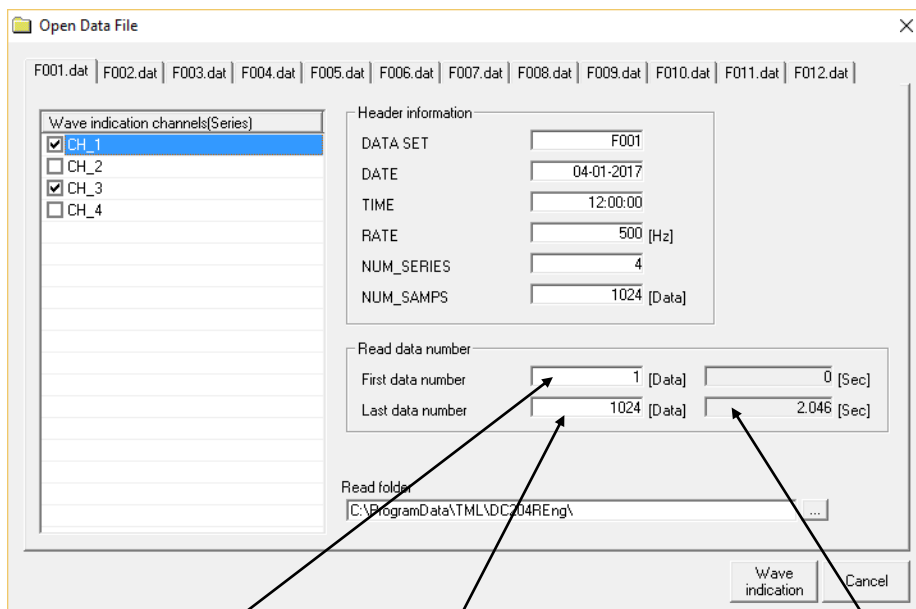
Data number to start reading.
(1 data in this figure).

Data number to end reading.
(1024Data in this figure)》

Measuring time corresponding to the data number.

8-3

5. If the data sizes and the samplings of the files stored in the same folder are the same, you can merge them and display the waveform. To display a merged waveform:

Store files that you want to merge in the same folder and select the folder.
To merge all files, right-click on an area of the channel name list and select the [All file/channel selection]. Deselecting all at once is also possible.
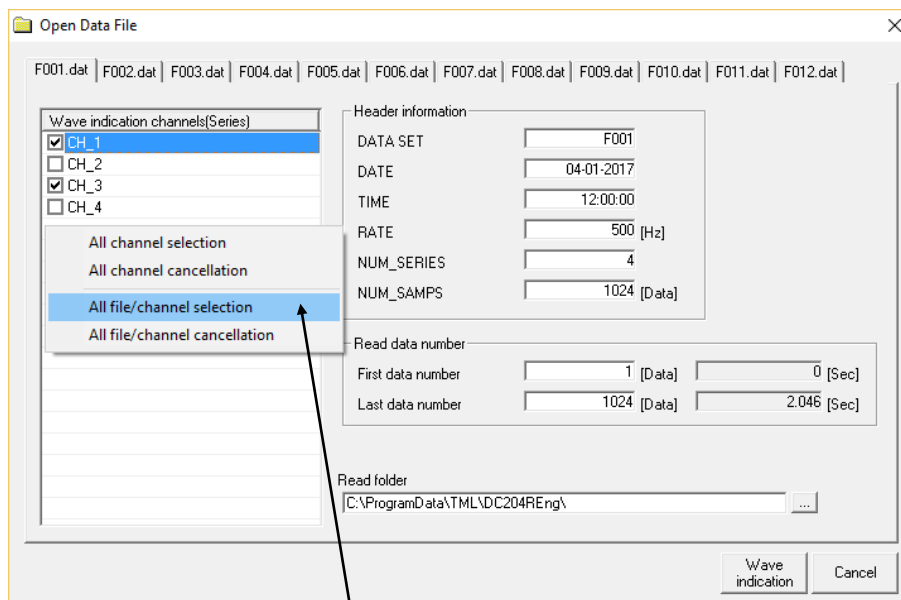


Use [All file/channel selection] to select all channels for all files in the folder.
If you select [All channel selection], all channels for the selected files will be selected.

To merge selected files or files for selected channels, manually select the files and check on the channels.

Selected files can all be merged as long as data sizes and samplings of them are the same, but if not, the [Wave indication] button will be disabled. In this case, review the header information of the files and uncheck files that are not applicable.

4 channels x 4 files = 16 channels (for more information on displaying wave forms, refer to "8.5 DISPLAYING THE MEASURED DATA".)
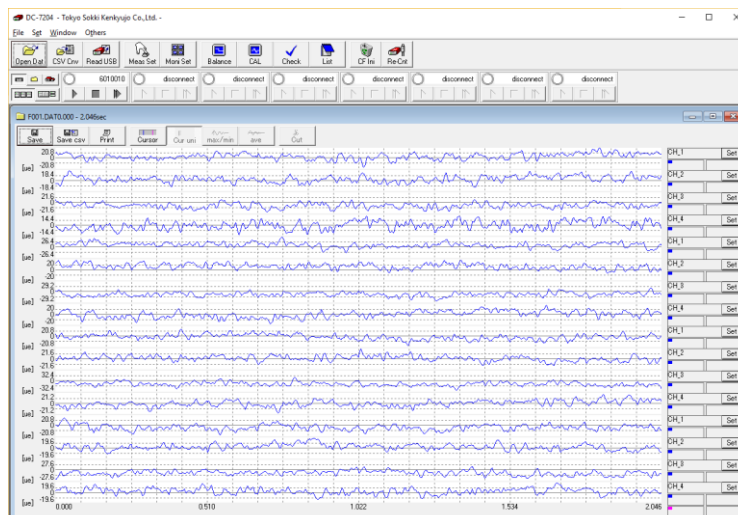
⚠️
**Caution**

○ If one of the measurement data files is too large, the waveform may not be displayed because of memory shortage. In this case, specify the [First data number and Last data number] of the reading conditions to read the file by portions.

○ Up to 64 channels can be merged. Cannels more than the limit cannot be merged.

○ Up to 255 measurement data files can be stored in the folder that you want to use for file merge. If more measurement data flies than the limit are stored in the folder, you cannot merge the files.

○ For files merged through selecting channels from multiple files, DATE and TIME information of the header file changes automatically to the date and time when they are merged.

## 8.2 METHOD OF CSV CONVERSION FROM COMPACT FLASH CARD OR STORED DATA

A compact flash card storing the measured data or data files stored in a hard disk of a computer can be converted into CSV format. The conversion is available either for all data or for arbitrary number of files.

**[Operation Procedure]**
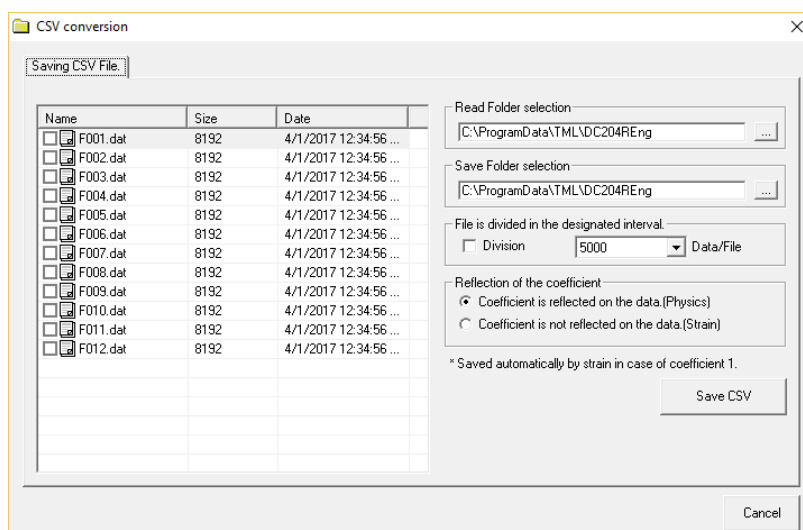1. Click on [File] in the main menu bar and select [Data file CSV conversion],
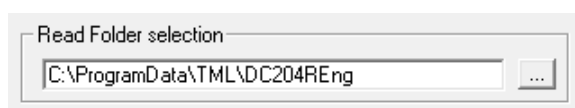
or click [CSV Cnv] button.
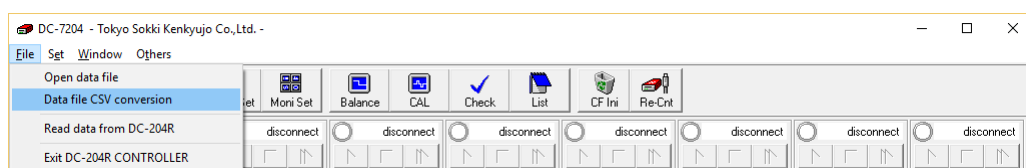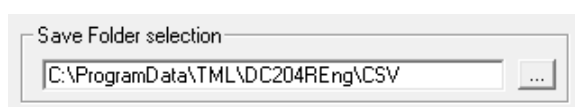


2. [CSV conversion] dialog box is opened.



3. Click on [...] button in [Read Folder selection] to select the folder where the data file to be converted is stored.
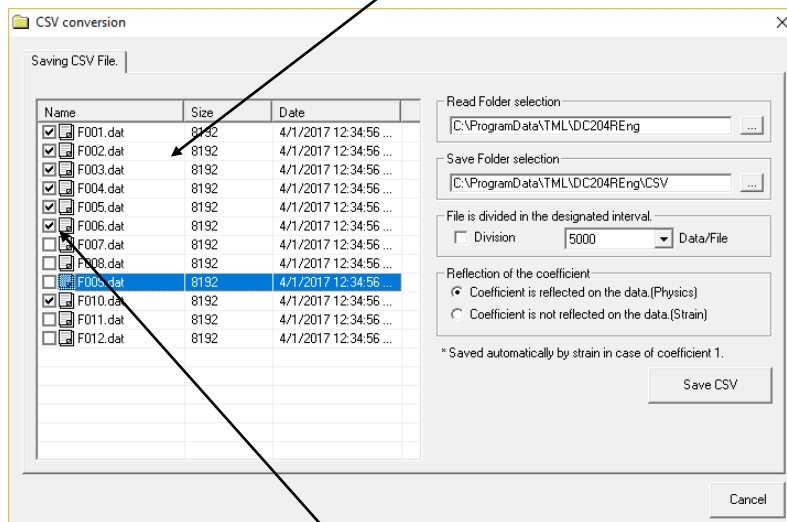


4. Click on [...] button in [Save Folder selection] to select the folder where the converted file is stored.

5. Data file is listed in the list box by selecting the read folder. Click the check box of the file to be converted to check the box.

Data files listed in the list box



Check the file to be converted

All select
All cancel
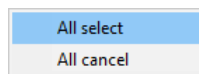
Right-click within the list box to display the [All cancel] menu.

6. Data can be divided while CSV conversion. This function is used to avoid the data size being excessive because the file size is restricted in some software on the market.
Check the [Division] in the [File is divided in the designated interval] and select the number of data per one file.

7. Select the optional button in [Reflection of the coefficient].
When the [Coefficient is reflected on the data. (Physics)] is selected, recorded data is multiplied by the set coefficient and stored in the CSV file.
When the [Coefficient is not reflected on the data. (Strain)] is selected, recorded data is and stored in the CSV file as strain value without coefficient multiplication.

8. Click the [Save CSV] button. The selected file is CSV converted and saved.

## 8.3 METHOD OF INDICATING WAVEFORM FROM THE COMPACT FLASH CARD INSERTED INTO DC-204R/204Ra

Measured data stored in a compact flash card inserted into DC-204R/204Ra can be read via USB, and wave form of the data can be displayed.

> ⚠️
> **Caution**
>
> When the computer is reading/saving data from the instrument, do not disconnect the USB cable nor the synchronizing cable, nor eject the compact flash card. (If the compact flash card is mistakenly ejected, promptly return it to the instrument slot. Data files up to one step before will be recovered.)
> Also, do not turn off the power when computer is saving data. (If the power is turned off mistakenly, promptly turn it on. Data files up to one step before will be recovered.)

**[Operation Procedure]**

1. Click on [File] in the main menu bar and select [Read data from DC-204R],

   or click [Read USB] button.
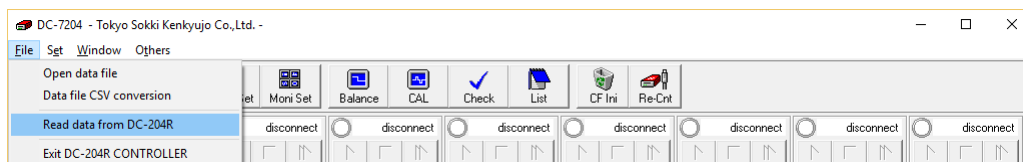


2. [Meter-Channel selection] dialog is opened. Select the serial number of the DC-204R/204Ra.
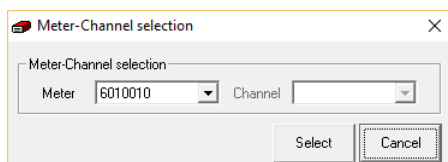


3. [File selection] dialog is indicated.
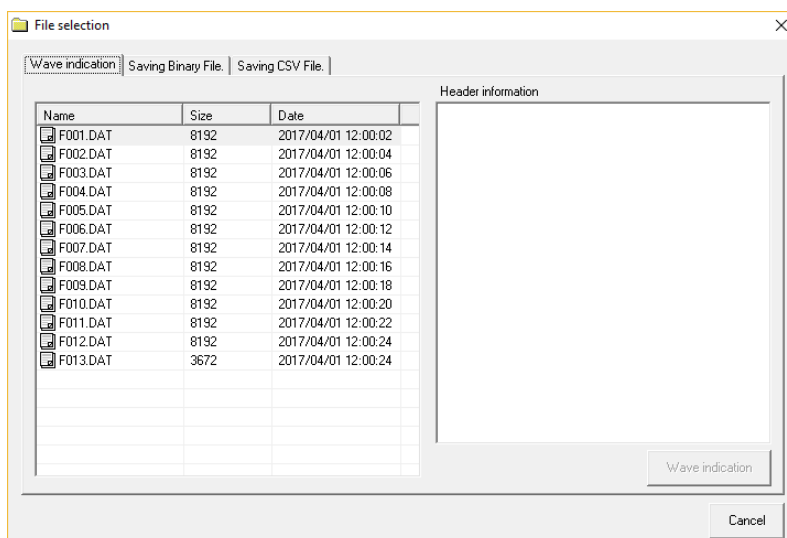
4. Click and select the file among the list in [File selection] dialog. Header information is indicated by selecting the file. Read the file by clicking the [Wave indication] button. Wave form data (refer to 8.5 DISPLAYING THE MEASURED DATA for detail) is indicated.
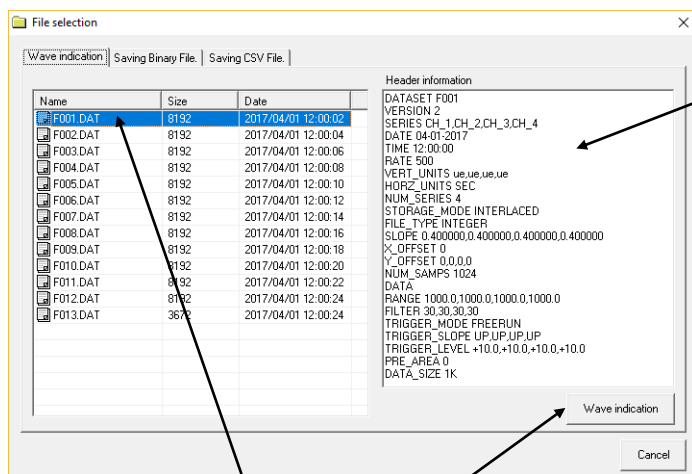


Header information is indicated by selecting the file.

Select the file and click the Wave indication button to read the file.

5. Click the [Cancel] button to close the dialog.

⚠ **Caution**

   A compact flash card (CF card) in which other files (text file etc.) are stored by a personal computer or a card whose files are partially deleted by a personal computer cannot be used for DC-204R/204Ra. Also, if data files recorded by DC-204R/204Ra are mixed with other type of files in a compact flash card, the card cannot be used for DC-204R/204Ra.

   The operations allowed for a personal computer to perform on a CF card are limited only to read the data files recorded by DC-204R/204Ra and to delete all files in the CF card.

   Before using a CF card for DC-204R/204Ra, delete all files in the card by a personal computer, or initialize the card using this control software.

   Refer to "5.3  CLEARING FILE (FORMATTING)".

## 8.4 METHOD OF DATA SAVING AND CSV CONVERSION FROM THE COMPACT FLASH CARD INSERTED INTO DC-204R/204Ra

Measured data stored in the compact flash card inserted into the DC-204R/Ra can be read via USB and saved by all data or by arbitrary number of files. Also it is possible to be converted into CSV format saved.

**[Operation Procedure]**

1. Click on [File] in the main menu bar and select [Read data from DC-204R],

   or click [Read USB] button.
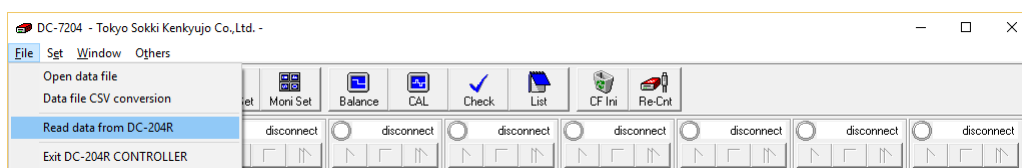


2. [Meter-Channel selection] dialog is opened. Select the serial number of the Meter.
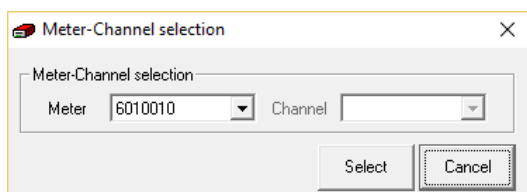


3. [File selection] dialog is indicated.
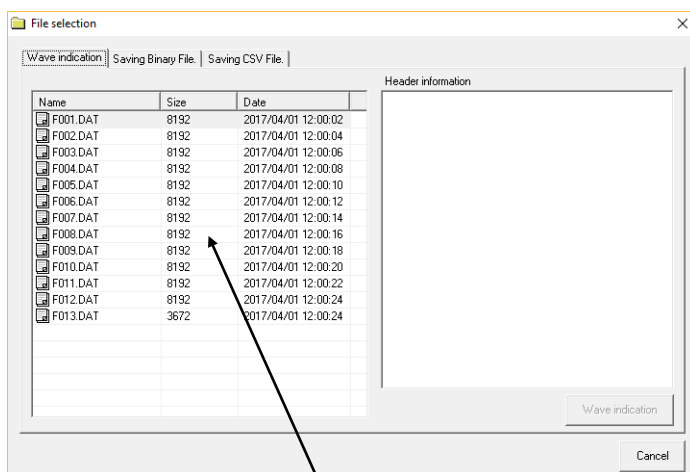


List of data files in the compact flash card of the DC-204R/204Ra.

4. Proceed to step 5. to save in DADiSP format (binary).
   Proceed to step 9. to save in CSV format.

5. Select the [Saving Binary File] tab.



Select the Saving Binary File
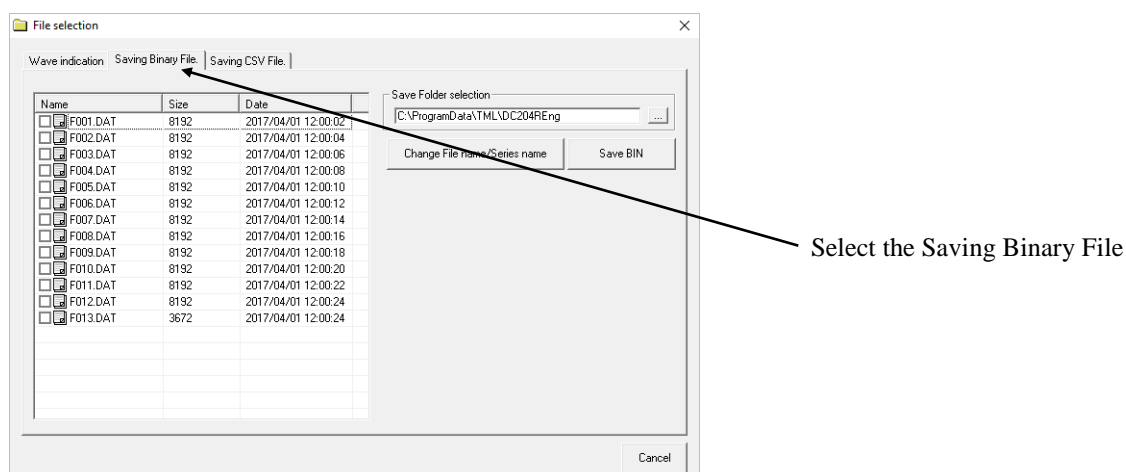
6. Click the [...] button in the [Save Folder selection] and select the folder to save the data read from the DC-204R/204Ra.
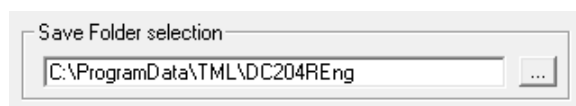


7. Click and check the check box of the file to be saved. Two or more files can be selected.



Check the file to be saved
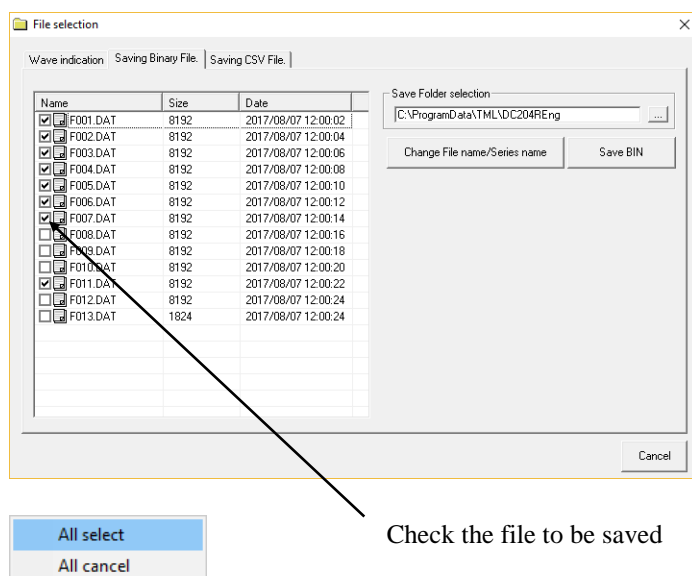
Right-click within the list box to display the [All cancel] menu.

8. Click the [Save BIN] button to save the selected file(s).

9. When saving binary files, the names of those files and channels (series) can be changed.
In this way, you can avoid duplication of the names of files that are stored in the same folder for file merge, as well as duplication of channel names that you use for file merge.
Check on the box for the file to which you want to make change and click on the [Change File name/Series name] button.
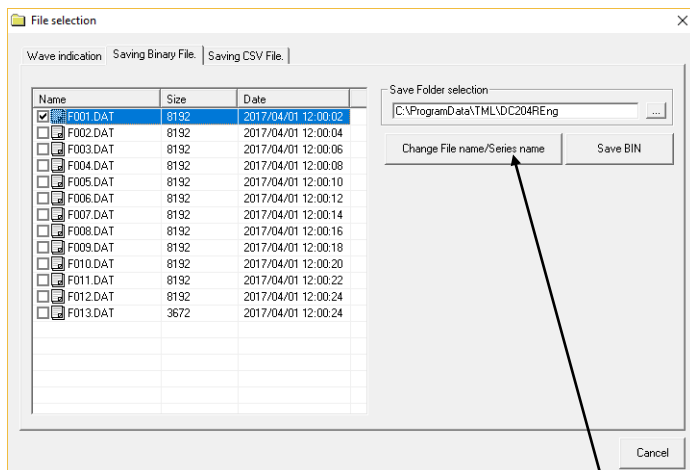


Check on the box for the file to change
and click on the [Change File name/Series name]

10. Select the file to which you want to make change, and the value appears in the [Change File name/Series name] field. Enter a new file name and press the return key. The new file name appears in the list. Similarly, enter a new channel (series) name and press the return key. The new channel (series) name appears in the list. When entering channel names, separate them with commas.
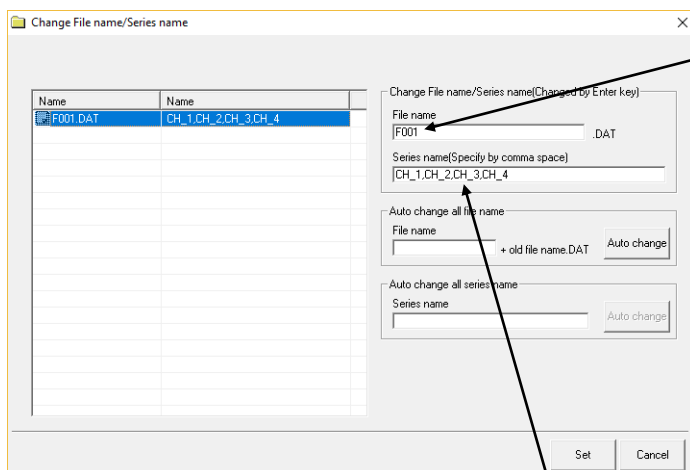


Enter a new file name and
press the return key.

Enter new channel names separating with commas and press the return key.

Use commas as indicated below:
For 1 channel:     ○○○○○
For 2 channel:     ○○○○○, ○○○○○
For 4 channel:     ○○○○○, ○○○○○, ○○○○○, ○○○○○
For 1 channel, no comma is required. There is no limit for the number of characters.

An example of changing file names and series names.



New file name          New series names
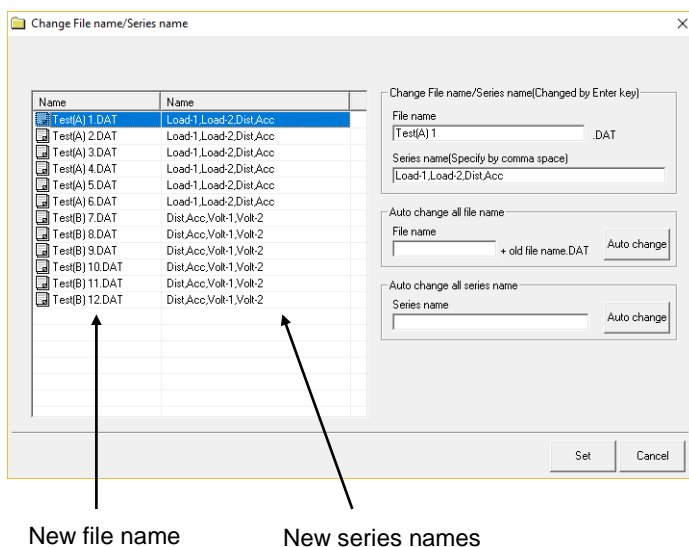
11. If you want to change all file names, enter a text in the [File Name] textbox in the [Auto change all file name]. This automatic change adds the text you enter to the old file names.



[Auto change] button

Enter a text to use for the automatic name change.
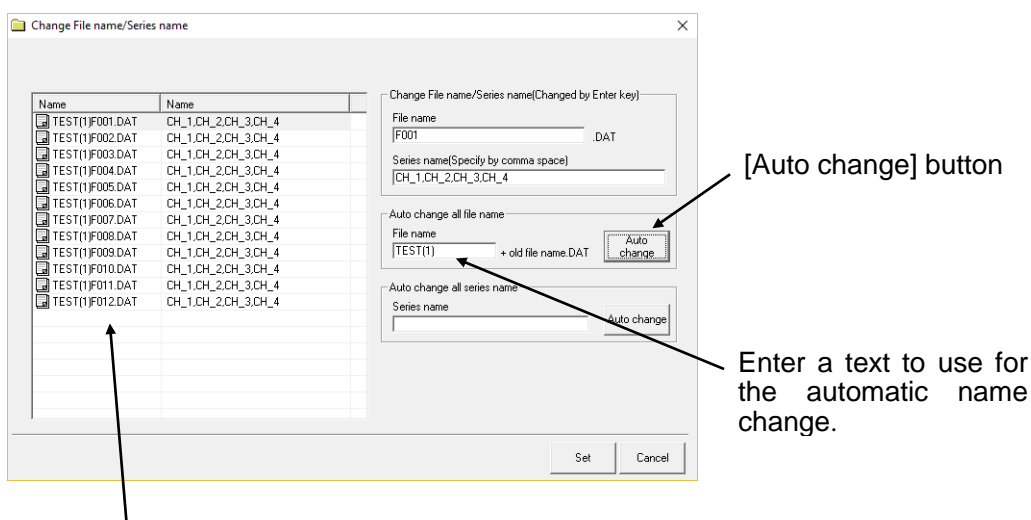
Automatically changed file names
In this figure, files F001.DAT - F007.DAT have been changed automatically to TEST(1)F001.DAT – TEST(1)F012.DAT.

12. If you want to change all channel (series) names, enter a new channel (series) names in the [Series name] textbox in the [Auto change all series name]. This automatic change cannot be performed unless all the files have the same number of channels.
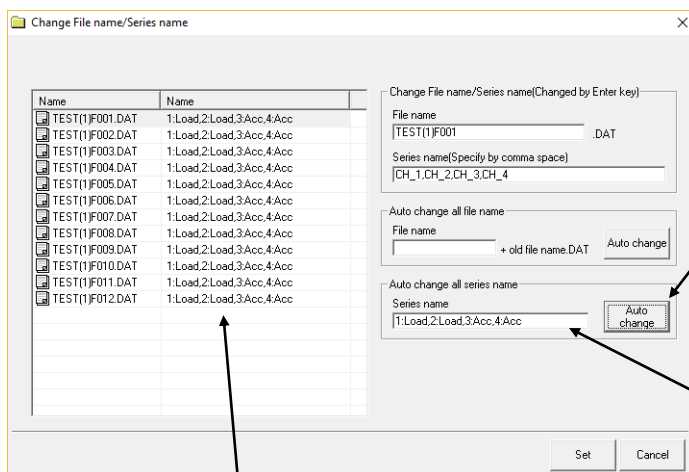


[Auto change] button

Enter new channel names used for the automatic change , separating with commas.

Automatically changed channel (series) names In this figure, channel names of F001.DAT - F012.DAT have been changed automatically to 1:Load,2:Load,3:Acc,4:Acc.

13. When the change is done, click on the [Save BIN] button. The files have not been saved at this point.

14. Select the [Saving CSV File] tab.
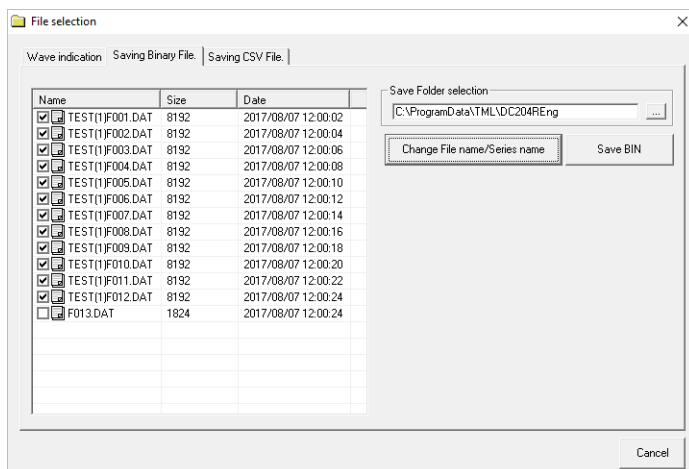


Select the Saving CSV File
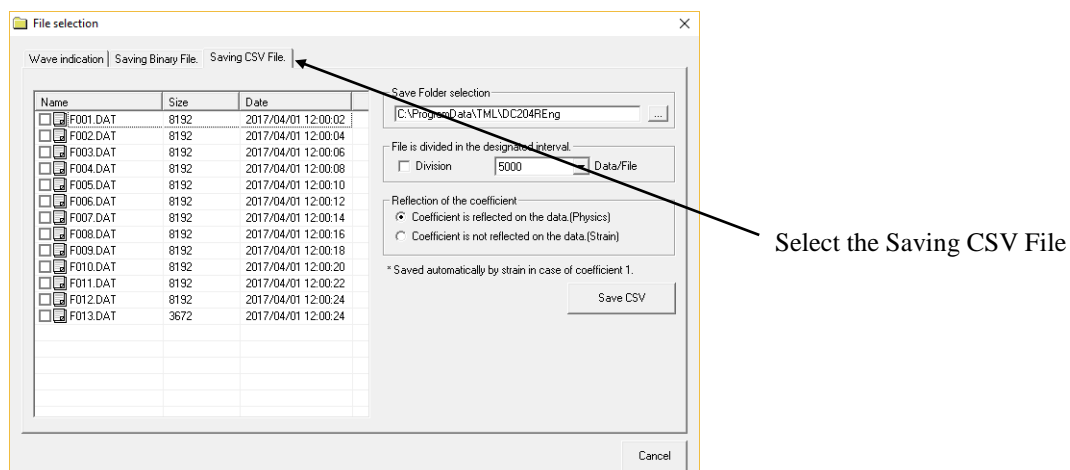
15. Click the [...] button in the [Save Folder selection] and select the folder to save the data read from the DC-204R.



16. Click and check the check box of the file to be saved. Two or more files can be selected.



Check the file to be saved

All select
All cancel
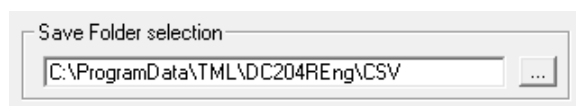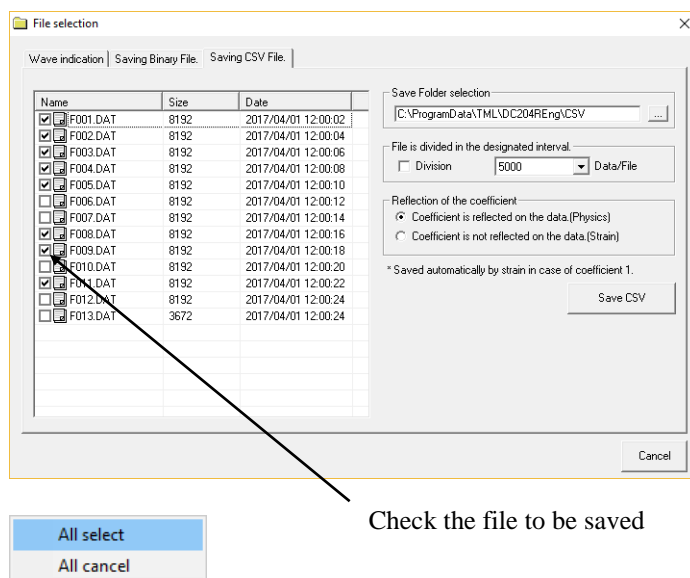
Right-click within the list box to display the [All cancel] menu.

17. Data can be divided while CSV conversion.
Data should be divided into some portions in order to avoid the data size becoming too large in case of the acceptable data size is restricted by the software used. Check the [Division] in the [File is divided in the designated interval] and select the number of data per one file.

18. Select the optional button in the [Reflection of the coefficient].
When the [Coefficient is reflected on the data. (Physics)] is selected, each value is multiplied by the set coefficient and saved in the CSV file.
When the [Coefficient is not reflected on the data. (Strain)] is selected, each value is saved in the CSV file as strain value without coefficient multiplication.

19. Click the [Save CSV] button to convert the selected file(s) into CSV format and save.

# 8.5 DISPLAYING THE MEASURED DATA

**[Operation Procedure]**

1. After the measured data are read according to the procedure in "8.1 WAVEFORM INDICATION FROM COMPACT FLASH CARD OR STORED DATA" or "8.3 METHOD OF INDICATING WAVEFORM FROM THE COMPACT FLASH CARD INSERTED INTO DC-204R/204Ra", [Measurement data] window is opened and the measured data is indicated in wave form graph.
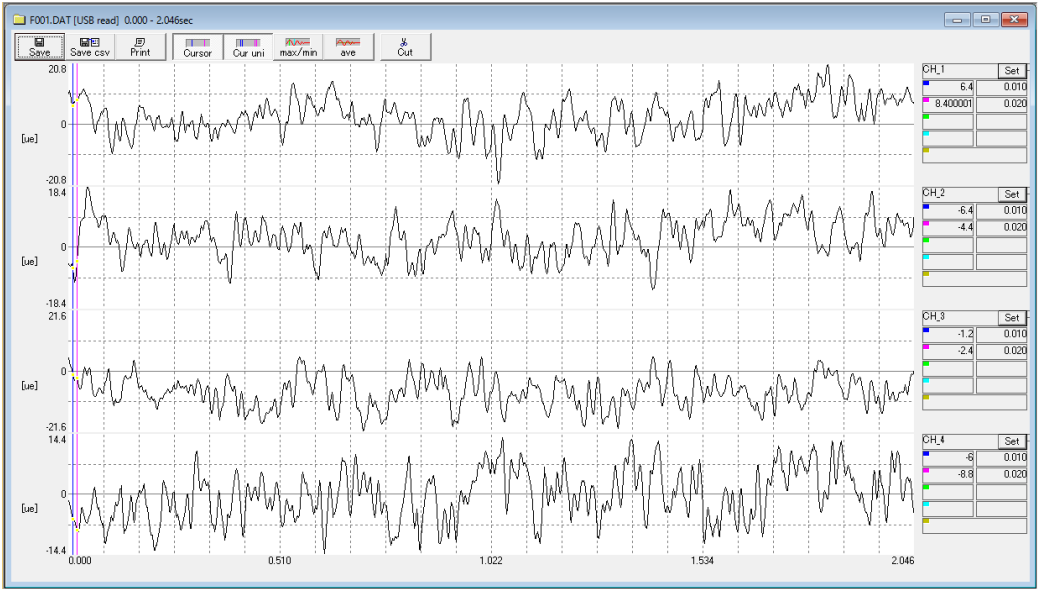


[Explanation of each part of measured data display window]



Cursor 2 Text box · Cursor 1 Text box · Channel name · Set button · Waveform display · Maximum / Minimum value box · Average value box
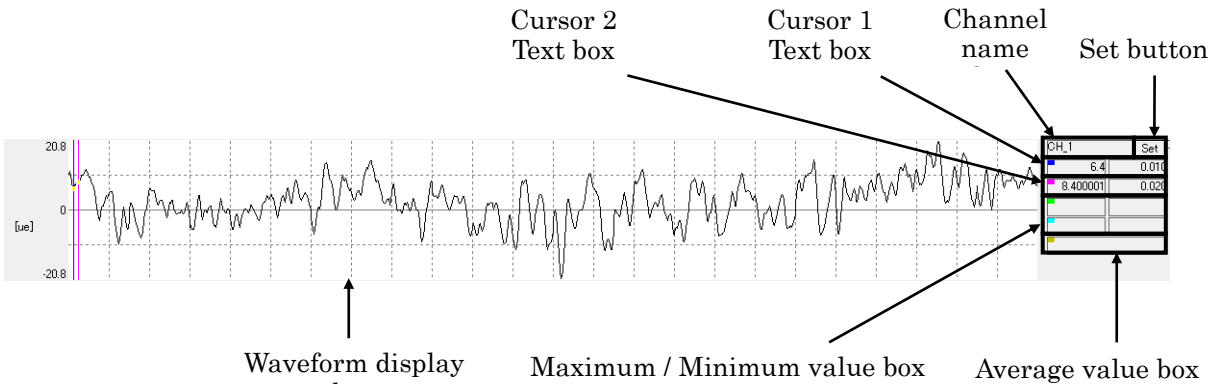
The explanation is shown in the following table:

| | Function |
|---|---|
| Channel name box | This is the channel name to indicate its wave form. |
| Waveform display box | Displays waveform data read. The horizontal axis of waveform indicates time [second] and the vertical axis indicates the scale value (whose unit is set by the measurement condition setting). You can change "Cursor 1" and "Cursor 2" positions in the waveform display box by dragging them. |
| Maximum / Minimum value box | The maximum and minimum value between "Cursor 1" and "Cursor 2" are indicated. The maximum value is indicated on the upper part and the minimum value on the lower part. The box in the left is for indicating maximum or minimum value and the box in the right is for indicating the time between the start of measurement and the appearance of maximum or minimum value. Its unit is [sec]. The color of the upper left part of this box corresponds to the color of the cursor. |
| Average value box | The average value of the data between "Cursor 1" and "Cursor 2" is indicated. |
| Set button | Sets scale offset. |
| Cursor 1 (Cursor 2) Text box | The box in the right in each text box for cursor 1 and 2 indicates the time between the start of measurement and the cursor. The box in the left indicates the measured value at the cursor position. You can change the cursor position by inputting the time into the box in the right from the keyboard. The color of the upper left part of this text box corresponds to the color of the cursor. |

[Explanation of Each part of scale offset setting window]
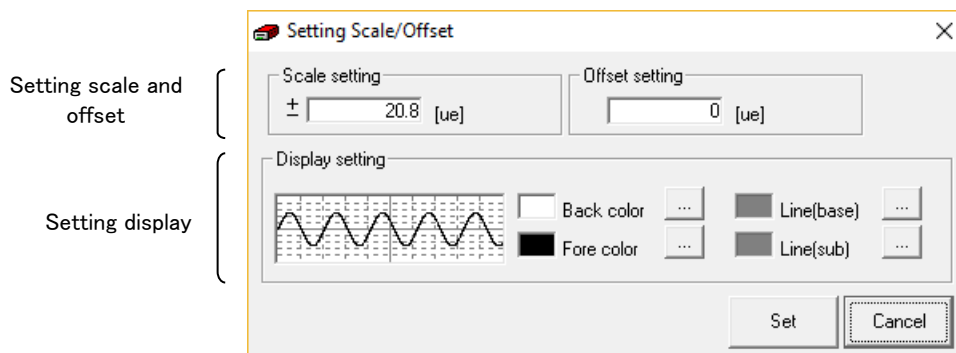


| Setting Items | | Description |
|---|---|---|
| Setting scale and offset | Setting scale | Changes the full-scale value of waveform data display. (For detail, see "Setting full scale and offset values" in 8.6 PROCESSING OF MEASURED DATA.) |
| | Setting offset | Changes the off-set value of waveform data display.    (For detail, see "Setting full scale and offset values" in 8.6 PROCESSING OF MEASURED DATA.) |
| Setting display | Back color | Selects the background color of waveform monitor screen |
| | Font color | Selects the font color of waveform monitor screen |
| | Reference line color | Selects the reference line color of waveform monitor |
| | Auxiliary line color | Selects the auxiliary line color of waveform monitor |

## 8.6  PROCESSING METHOD OF MEASURED DATA

Measured data displayed in "8.5   DISPLAYING THE MEASURED DATA" can be processed using the procedure described in this section.

❏ Waveform data processing menu

The following menu appears in the waveform display box.

| Process | Reference |
|---|---|
| Save | Saves displayed measurement data in binary file format（for detail, see "8.7 SAVING THE MEASURED DATA Saving binary file"） |
| Save CSV | Saves displayed measurement data in CSV file format（for detail, see "8.7 SAVING THE MEASURED DATA   Saving CSV file"） |
| Print | Prints the displayed measurement data (for detail, see "8.8 PRINTING THE MEASURED DATA"） |
| Cursor | Click this button to show cursor. Click again to hide cursor. |
| Cur uni | When this button is clicked and a cursor is selected, cursors of all channels are aligned in the same position and made common. If the cursor is moved, cursors of the same color of all channels are moved. When this button is clicked again, the unification of cursors is canceled and a cursor of each channel can be moved separately. |
| max/min | Searches the maximum and minimum values in the range between the cursor 1 and the cursor 2 in the waveform display where the pop-up menu is opened. The maximum value is indicated by green line and the minimum value by light-blue line.<br>When [Cur uni] is selected, this function searches the maximum and minimum values in the same range of all channels displayed. When [Cur uni] is not selected, the maximum and minimum values of only one channel are indicated.<br> (See "Search for maximum / minimum values" in this section for the details.) |

Continue to next page

| Process | Reference |
|---|---|
| ave | Calculates the average value in the range between the cursor 1 and the cursor 2 in the waveform display where the pop-up menu is opened. The average value is indicated by white line in the waveform display box.<br>When [Cur uni] is selected, average values of all displayed channels are indicated. When [Cur uni] is not selected, the average value of only one channel is indicated.<br>(See "Calculation of average value" in this section for the details.) |
| Cut | Cuts out and displays data in the area between the cursor 1 and the cursor 2.<br>When [Cur uni] is selected, the same ranges of all channels displayed are cut out.<br>When [Cur uni] is not selected, the range of only one channel selected is cut out.<br>(See "Cut-out of measured data" in this section for details.) |

❏ Cut-out of measurement data

In this subsection, you cut-out and display measurement data in the area between the cursor 1 and 2 displayed in "8.5   DISPLAYING THE MEASURED DATA". You can further slice out a part of the cut-out data display.

**[Operation Procedure]**
1. Determine the data range to be cut (data between the cursors 1 and 2) by moving the cursors 1 and cursor 2. When data in all channels are cut in the same range, select [Cur uni] in the waveform processing menu. (See "Waveform data processing method" in 8.6 PROCESSING OF MEASURED DATA.)
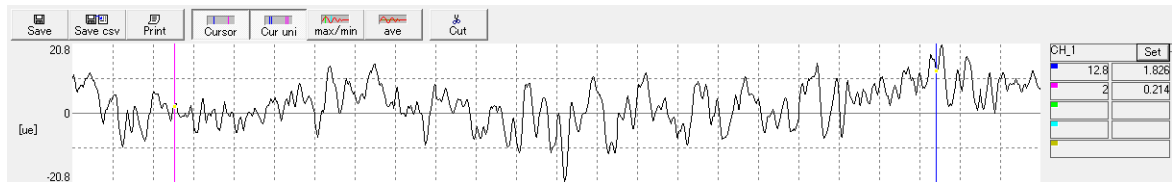
2. Select [Cut] in the waveform processing menu.

[Cut]
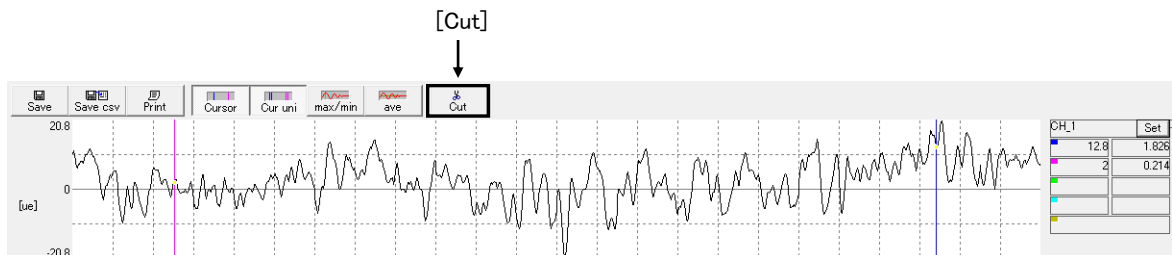
3. Select the cut-out channel.
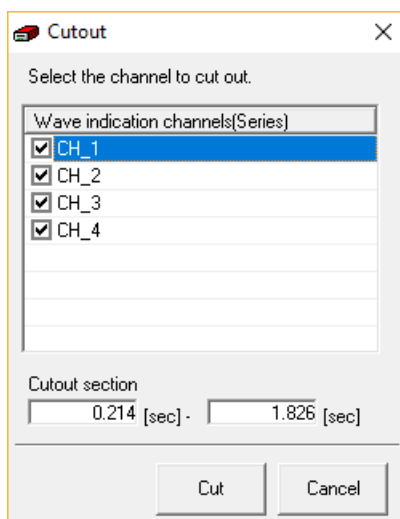
4. After the software processing waveform image, the cut-out part of waveform data is displayed on the full screen.

Display when 1 channel is selected
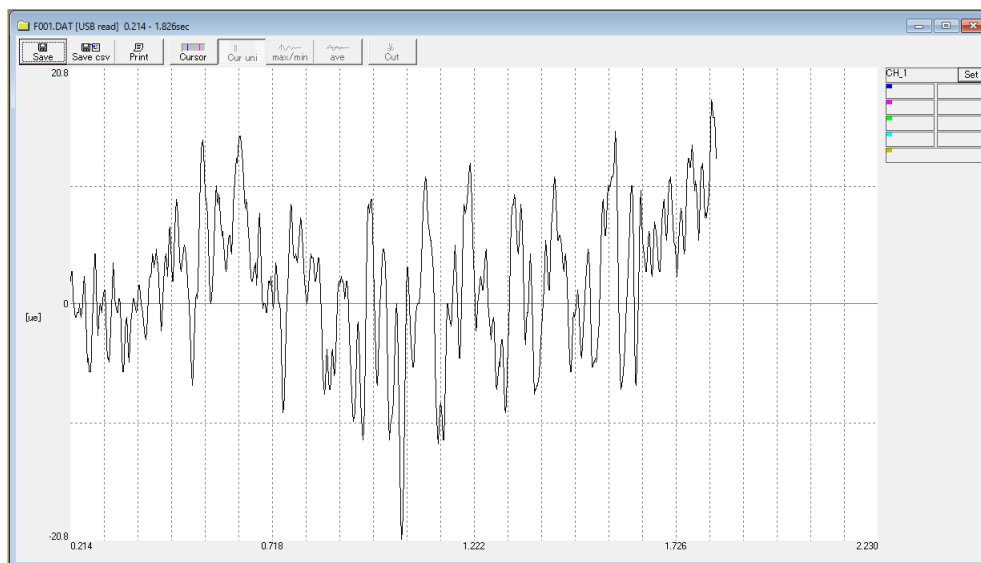


Display when 4 channels are selected
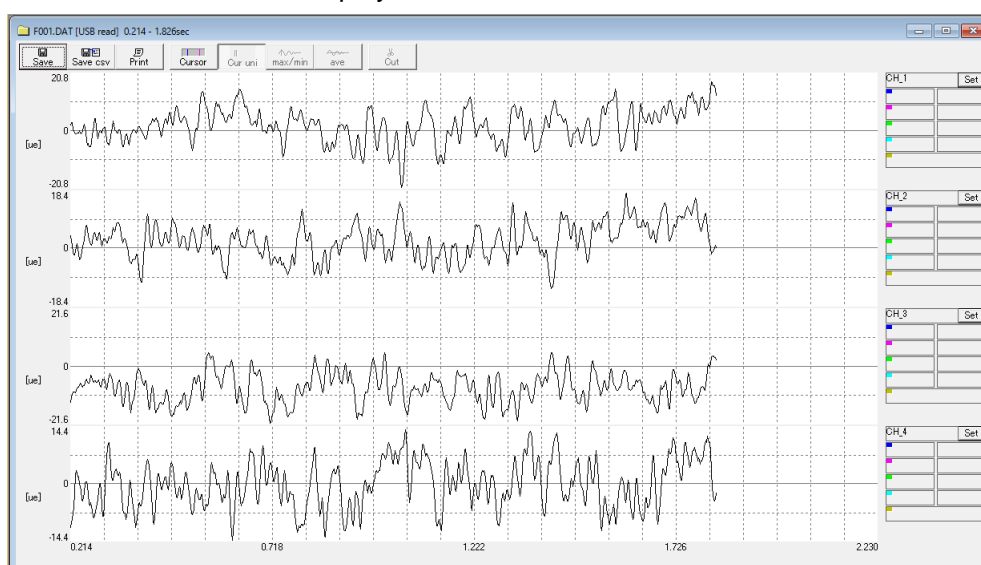


5. Save the data if necessary (See "8.7　SAVE OF MEASUREMENT DATA").

❏ Searching maximum ╱ minimum values

This function searches the maximum and minimum values in the range between the cursor 1 and 2 of the measurement data displayed in "8. 5　DISPLAYING THE MEASURED DATA" or "8. 6 PROCESSING METHOD OF MEASURED DATA".

**[Operation Procedure]**
1. Determine the data range to search the maximum/minimum values by dragging the cursor 1 and cursor 2, or changing the values in the cursor text boxes.
   When searching all channels, select "Make cursor common" in the waveform processing pop-up menu (see explanation in "Waveform data processing pop-up menu" the previous page).

2. Click [max/min] in the waveform processing menu.

[max/min]

3. The maximum value (green line) and minimum value (light blue line) are displayed in the waveform display box. Also, the maximum ╱ minimum values, and their time positions from the measurement start are indicated in Max ╱ Min boxes.
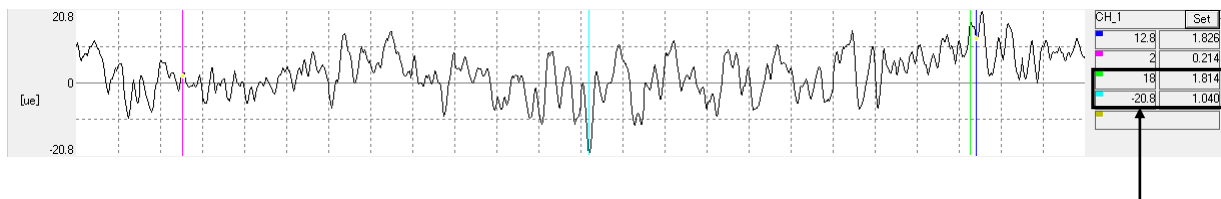
Maximum ╱ minimum values

4. If you click [max ╱ min] in the waveform processing menu again, the green line (maximum) and the light blue line (minimum) disappear. The maximum and minimum values and their time indicated in the maximum/minimum value box remain displayed.

❏ Searching average value

   This function calculates the average value in the range between the cursor 1 and 2 of the measurement data displayed in "8.5    DISPLAYING THE MEASURED DATA" or "8.6 PROCESSING METHOD OF MEASURED DATA".

   **[Operation Procedure]**
   1. Determine the data range to calculate the average value by dragging the cursor 1 and cursor 2.
      When calculating all channels, select "Make cursor common" in the waveform processing pop-up menu (see explanation in "Waveform data processing pop-up menu" the previous page).

   2. Select [ave] in waveform processing menu.



   3. The average value (white line) is displayed in the waveform display box. Also, the average value is indicated in Ave box.
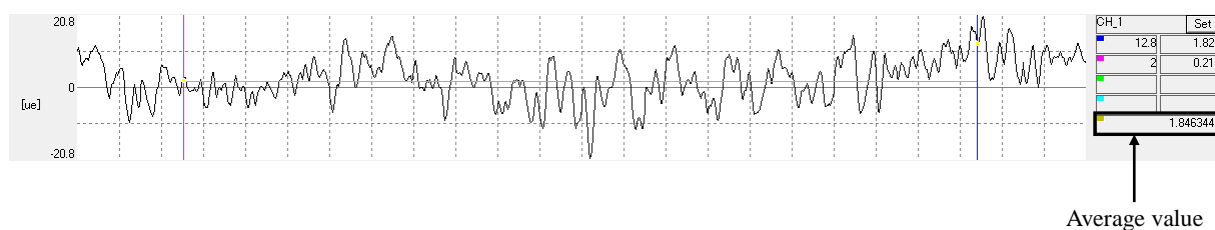


Average value

   4. If you click [max / min] in the waveform processing menu again, the green line (maximum) and the light blue line (minimum) disappear. The maximum and minimum values and their time indicated in the maximum/minimum value box remain displayed.

❏ Setting full scale and offset values

You can change Y-axis full scale and offset values of measured data displayed.

**[Operation Procedure]**
1. Click [Set] button within the waveform display box for which you want to change the full scale and offset values to open the "Full scale/Offset settings" dialogue. (Refer to "Waveform data processing pop-up menu" in "8.6　PROCESSING METHOD OF MEASURED DATA".)

[Set]
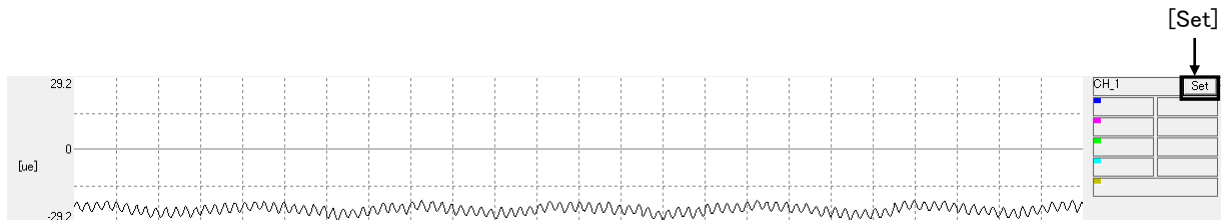
2. The [Full scale/Offset settings] dialog appears. Make desired changes and click the [Set] button
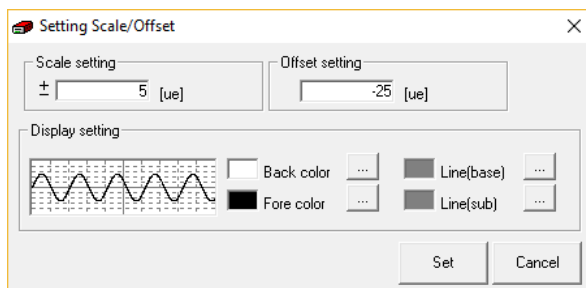
3. A new waveform reflecting the changes is displayed.
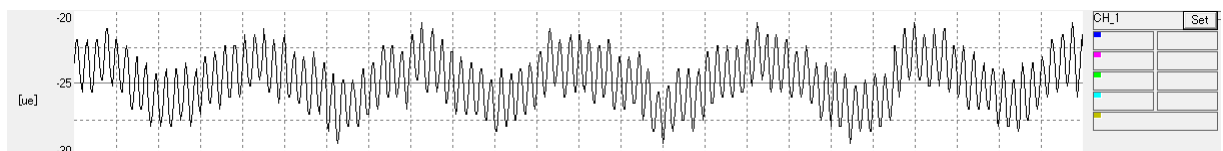
## 8.7 SAVING THE MEASURED DATA

In this section, you save the measurement data displayed in "8.5 DISPLAYING THE MEASURED DATA" or "8.6 PROCESSING METHOD OF MEASURED DATA". Select the saving format in accordance with the application software you are going to use for waveform analysis.

| Save Format | Description |
|---|---|
| Binary File | When DADiSP is used for waveform analysis, |
| CSV File | When spreadsheet software available in the market such as Excel is used for waveform analysis. |

❏ Saving binary file

When you use DADiSP for waveform analysis, save waveform data in binary format.

**[Operation Procedure]**
1. Display the measured data by referring to "8.5 DISPLAYING THE MEASURED DATA" or "8.6 PROCESSING METHOD OF MEASURED DATA Cut-out of measurement data".

2. Click on [Save] button in waveform processing menu.

[Save]



3. Specify the folder to save the data file in combo box.
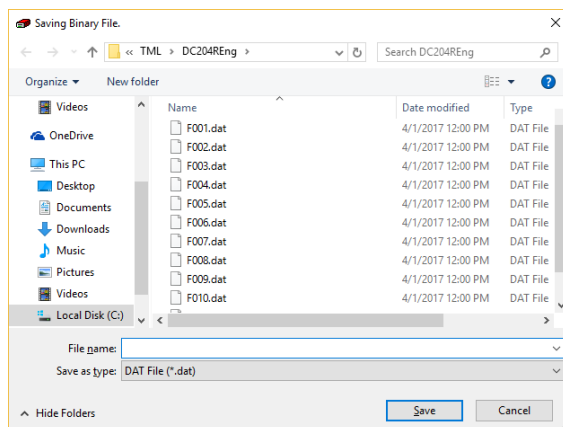


4. Enter the file name in [File Name :] text box.

5. Click on [Save] button to save the data.

⚠ **Caution**
When a binary file (extension: .dat) is stored, a header file (extension: .hed) having the same file name as the binary file is created at the same time.
When you change the name of the binary file, be sure to change the name of the header file having the same file name as the binary file.
If only either one is changed, that file cannot be read.

❏ Saving CSV file

When you examine and/or process waveform data using spreadsheet software available in the market such as Excel, save the data in CSV format file.

**[Operation Procedure]**
1. Display measured data by referring to "8.5  DISPLAYING THE MEASURED DATA" or "Cut-out of measurement data" in "8.6  PROCESSING METHOD OF MEASURED DATA".

2. Click on [Save csv] in waveform processing menu.

[Save csv]



3. [Saving CSV file] dialogue box appears. Specify the save condition.
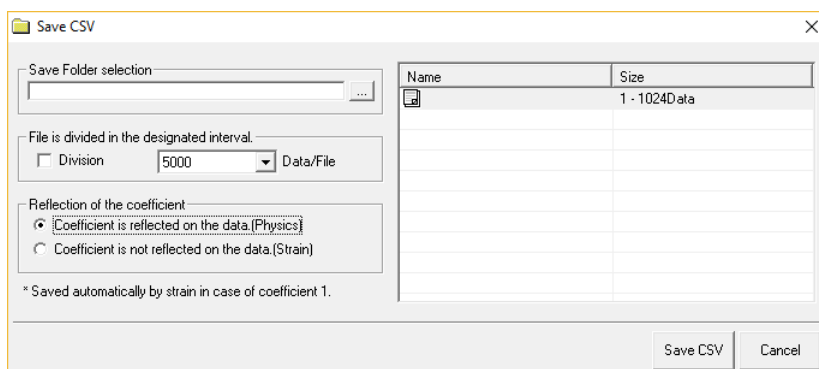


|  | Save Condition |
|---|---|
| Save as one file | Data are saved as one (1) CSV file. |
| File is divided in the designated interval | Select interval time (unit: [sec]) from the [saving segmentation] combo box. When [Segmentation] checked, names of segmented files to be saved are indicated. |
| Coefficient is reflected on the data. [Physics] | Data multiplied by coefficient are stored in the CSV file. |
| Coefficient is not reflected on the data [Strain] | Strain values are saved in the CSV file without coefficient multiplication. |

4. Click on [Save folder selection] and specify the folder to save the data file in combo box.

5. Enter the file name in [File Name :] text box. Click on [Save] button.

| Saving CSV File. | | | ✕ |
|---|---|---|---|
| ← → ∨ ↑ | « TML › DC204REng › CSV | ∨ ↻ | Search CSV 🔎 |
| Organize ▾   New folder | | | ⊟▾  ❓ |

| Name | Date modified | Type |
|---|---|---|
| No items match your search. | | |

- OneDrive
- 💻 This PC
- 🖥 Desktop
- 📄 Documents
- ⬇ Downloads
- 🎵 Music
- 🖼 Pictures
- 🎞 Videos
- 💾 Local Disk (C:)
- ➡ Network

File name: [                              ] ∨
Save as type: CSV File (*csv) ∨

∧ Hide Folders                    [ Save ]   [ Cancel ]
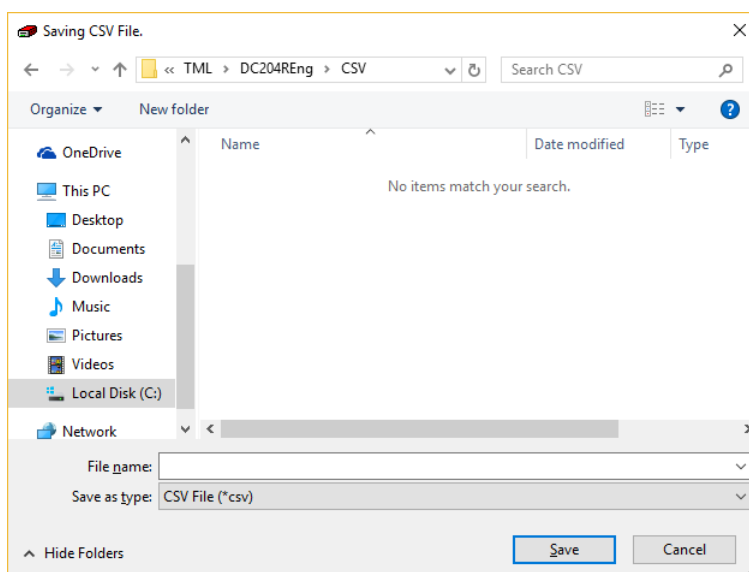
6. Click on [CSV Save] to save the data.

⚠ **Caution** — The operations allowed for a personal computer to perform on a CF card are to read the data files recorded by DC-204R/204Ra and to delete all files in the CF card. Other operation may cause failure in reading or writing the CF card.

## 8.8  PRINTING THE MEASURED DATA

In this section, you print the measurement data displayed in "8.5   DISPLAYING THE MEASURED DATA" or "Cut-out of measurement data" in "8.6   PROCESSING METHOD OF MEASURED DATA".

❏ Printing the waveform

Display the waveform according to the procedure in "8.5   DISPLAYING THE MEASURED DATA" or "Cut-out of measurement data" in "8.6   PROCESSING METHOD OF MEASURED DATA", and then click [Print] in waveform processing menu to select the printer for use and click [Print].
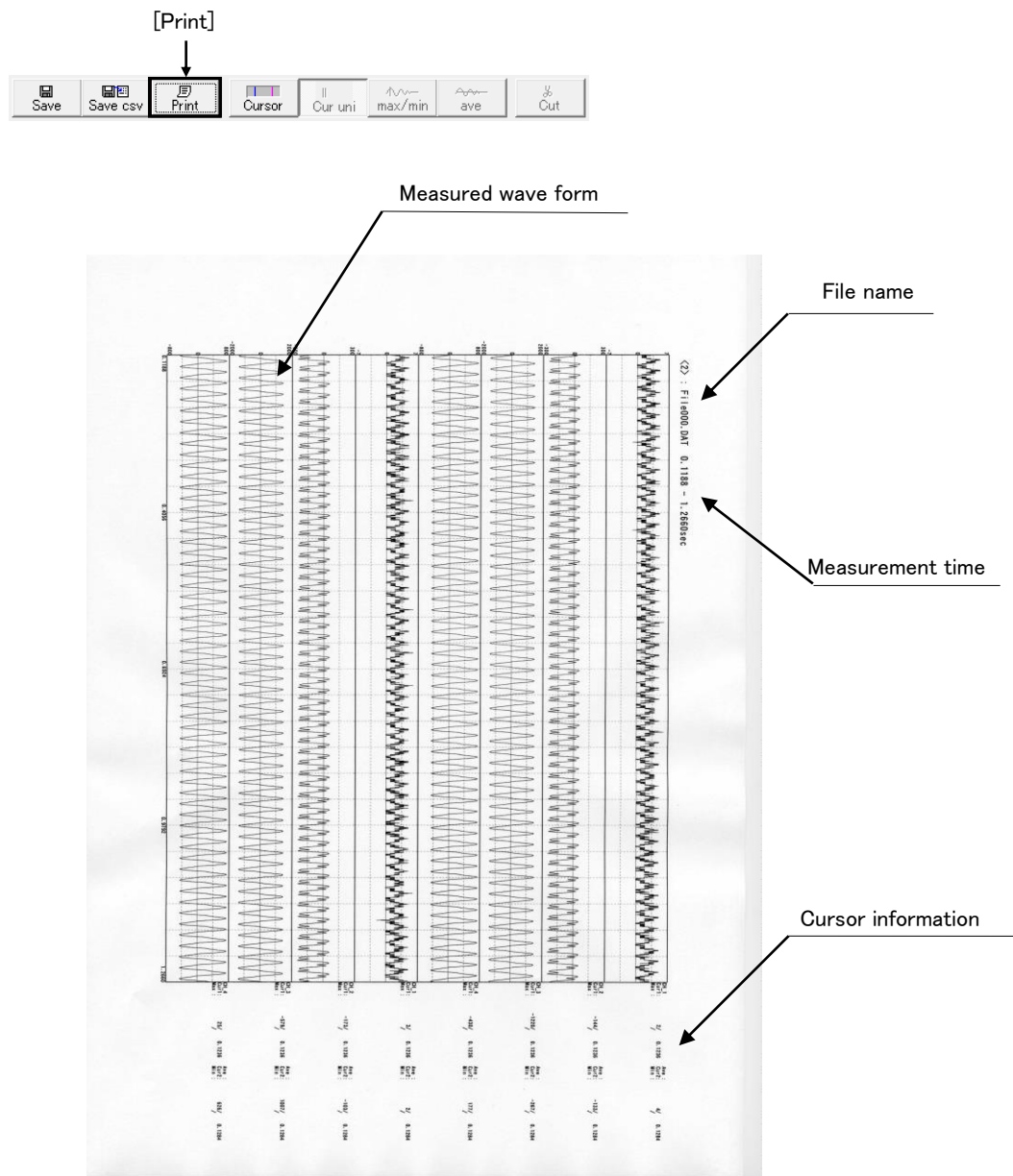
## 8.9 FILES WHEN POWER FAILURE OCCURS DURING MEASUREMENT

Data written to the CF card can be read, even if a power failure occurs during measurement. This section describes files when power failure occurs.

This instrument is equipped with the UPS (Uninterruptible Power Supply) circuit for an unexpected power failure. When an instantaneous power interruption or power failure occurs, the instrument stops measurement and stores data automatically. The file in the event of power down is processed in the same way as in the event of measurement stop.

# Chapter 9

## ERROR CODE TABLE

## 9.1  ERROR CODE TABLE

In this chapter, error codes appear on this control software are listed in the error code table.

| ERROR-No. | Error Situation | Corrective Action |
|---|---|---|
| 1 0 | Unable to implement setting or manual triggering etc. as presently engaging in measurement or recording. | Check whether the software is performing impossible operation during measurement    or recording. |
| 1 1 | Unable to implement stop or manual triggering as measurement has not been started. | Check whether the software is performing impossible operation during non-measurement or non-recording time. |
| 1 2 | Unable to implement the instruction as the instrument is in slave status. | Check whether you are operating start etc. to instrument set to slave status. |
| 1 3 | The instrument is in a condition unable to start measurement. | The instrument may be malfunctioning. Please contact us. |
| 1 4 | The instrument is in a condition unable to stop measurement. | The same as the above. |
| 1 5 | Unable to implement the instruction as the instrument is not in standby status for trigger signal. | The same as the above. |
| 1 6 | The instrument is in a condition unable to implement manual triggering. | The same as the above. |
| 2 0 | Parameter (argument) range error. | The same as the above. |
| 2 1 | RAM content range error. | The same as the above. |
| 2 2 | Command error. | The same as the above. |
| 3 0 | EEPROM program writing error. | The same as the above. |
| 3 1 | Serial EEPROM writing error. | The same as the above. |
| 3 2 | Error occurred in ROM check. | The same as the above. |
| 3 3 | Error occurred in RAM check. | The same as the above. |
| 34 - 39 | Error occurred in internal EEPROM. | The same as the above. |
| 4 1 | Monitor time out. | The same as the above. |
| 4 2 | The instrument is in a condition unable to implement balancing. | The same as in the above. |
| 4 3 | The content of root directory in the compact flash card is broken. | Clear the compact flash card by referring to "5.3 CLEARING FILE (FORMATTING)". |
| 4 4 | Error occurred in Open check. | The instrument may be malfunctioning. Please contact us. |
| 4 5 | Channel shift error. | The same as the above. |
| 4 6 | The power voltage of DC-104R/Ra is too low. | Check the power supply voltage. |
| 5 0 | Compact flash card is not inserted in the slot. | Insert a compact flash card. |
| 5 1 | Compact flash card read error. | Replace the compact flash card and check whether error occurs again. |
| 5 2 | Compact flash card read error. | Replace the compact flash card and check whether error occurs again. |
| 5 3 | Unable to implement because the compact flash card has not been initialized. | Clear the compact flash card by referring to "5.3 CLEARING FILE (FORMATTING)". |

| ERROR-No. | Error Situation | Corrective Action |
|---|---|---|
| 5 4 | Compact flash card write error. | Replace the compact flash card and check whether error occurs again. |
| 5 5 | A compact flash card different from the previous one which is not initialized is inserted. | Initialize the compact card inserted when the error occurred, or replace it with other initialized card. |
| 5 6 | Unable to use the inserted compact flash card. | Clear the compact flash card by referring to "5.3 CLEARING FILE (FORMATTING)". |
| 5 7 | Compact flash card read / write error. | Replace the compact flash card and check whether error occurs again. |
| 5 8 | Unable to use this compact flash card. | Unusable type of compact flash card. Insert the designated compact flash card. |
| 6 0 | Compact flash card capacity over. | Save data in the compact flash card into the hard disk by referring to "8.7 SAVING THE MEASURED DATA". Then clear the compact flash card by referring to "5.3 CLEARING FILE (FORMATTING)". |
| 6 1 | Setting content error. | The instrument may be out of order. Please contact us. |
| 6 2 | Instrument RAM content error. | The same as the above. |
| 6 3 | The speed check of CF card has not been conducted. | Conduct the CF Card Check according to "6.1 Check". |
| 6 4 | The CF card has no sufficient writing speed. | Conduct the CF Card Check according to "6.1 Check" and use a CF card having the required writing speed. |
| 7 0 | USB output time out error | Check the USB cable connection. |
| 8 1 | Synchronizing error between master and slave instrument. | Check the synchronizing cable connection. |
| 8 2 | Setting of the slave is different from that of the master. | Reset the instrument so that the following items are consistent among all instruments by referring to "5.1 SETTING OF MEASUREMENT CONDITIONS": <br>• [Amplifier Setting]:<br>The number of channels used<br>• [Trigger Setting]: Trigger mode<br>• [Sampling Setting]: All setting items |
| 8 4 | Firmware version of the slave is different from that of the master. | Be sure to upgrade each instrument to the same firmware version by referring to "3.3 UPGRADE OF DC204-R/204Ra". |
| 9 0 | The operation cannot be performed during balancing. | Perform the operation after the balancing is finished. |
| 1005 | USB communication error. | Check the USB cable connection. |
| 1006 | | |
| 1007 | | |
| 1008 | | |
| | Unexpected error occurred. | Restart the DC-7204. |
| | Remaining capacity of the card is insufficient. | Replace the card in the DC-204R/204Ra to a formatted card. |

✎memo

# Chapter 10

## SPECIFICATIONS

## 10.1 DC-7204 SPECIFICATIONS

### ❏ File Related

| Reading recorded data | Compact Flash Card<br>Directly from the instrument through USB cable |
|---|---|
| Saving recorded data | Saved in binary format file (based on DADiSP format)<br>Saved in CSV file (can be saved in divided files of optional size) |
| Setting data file reading | One (1) file / one (1) instrument |
| Setting data file saving | One (1) file / one (1) equipment |

### ❏ Data Record Processing Related

| Waveform data processing | Data cutting from optional channel display<br>Search of maximum and minimum values<br>Calculation of average value<br>Optional settings of full scale and offset value<br>Optional settings of back color, waveform color, cursor color and pointer color<br>Recorded data can be saved in binary and CSV format files |
|---|---|

### ❏ Setting Related

| Amplifier setting | Channel mode, range and filter settings |
|---|---|
| Trigger setting | Trigger mode:<br>SINGLE, CONTINUE and FREE RUN<br>Trigger slope: UP, DOWN and OFF<br>Trigger level: 0% to +/−100% by 1% step<br>Measurement data size (with measuring time indication)<br>Pre-area size (with measuring time indication) |
| Sampling setting | Sampling speed (See "6. SPECIFICATIONS" in [DC-204R/Ra Operation Manual].) |
| Unit setting | See the table below. |

| Unit | Indication | Unit | Indication | Unit | Indication | Unit | Indication |
|---|---|---|---|---|---|---|---|
| $\mu\varepsilon$ | ue | N | N | A | A | No unit | |
| mm | mm | kN | kN | $\Omega$ | ohm | ### | ### |
| cm | cm | MN | MN | $M\Omega$ | Mohm | $k\Omega$ | kohm |
| m | m | $kgf/mm^2$ | kgf/mm2 | Hz | Hz | $m/S^2$ | m/S2 |
| ℃ | C | kPa | kPa | G | G | $kgf/cm^2$ | kgf/cm2 |
| F | F | MPa | Mpa | % | % | hPa | hPa |
| deg | deg | kgm | kgm | Rpm | rpm | $\mu$ | u |
| gf | gf | mV | mV | Ppm | Ppm | $N/mm^2$ | N/mm2 |
| kgf | kgf | V | V | Tor | Tor | | |
| tf | tf | mA | mA | Nm | Nm | | |

| Coefficient setting | Can be set up to 7 digits |
|---|---|

❏ Monitor Related

| | |
|---|---|
| Numerical monitor | Maximum number of monitoring instrument: 4 (Any chosen instrument among eight (8)) Displaying measurement data, maximum and minimum values (with reset function of maximum / minimum value) Data average can be displayed (1 to 100 average monitoring times) Title can be set Optional decimal point positioning Display setting of abnormal value Back color and letter color selection |
| Waveform monitor | Maximum number of monitoring instrument: 2 (Any chosen instrument among eight (8)) Y axis full scale can be set to Offset value can be set to Y axis Caption can be set Back color and letter color selection |
| X-Y monitor | Maximum number of monitoring instrument: 2 (Optional instrument and channel combination among eight (8)) X axis full scale can be set to Offset value can be set to X axis Y axis full scale can be set to Offset value can be set to Y axis Caption can be set Back, waveform and pointer colors can be selected |
| BAR monitor | Maximum number of monitoring instrument: 2 (Optional instrument and channel combination among eight (8)) Y axis full scale can be set to (1 to 100000) Offset value can be set to Y axis Caption can be set Back, waveform and pointer colors can be selected |
| Circle monitor | Maximum number of monitoring instrument: 2 (Optional instrument among eight (8)) ± full scale can be set Caption can be set Back, waveform and pointer colors can be selected |

❏ Measurement Related

| Measurement related | Start, Stop , Manual trigger |
|---|---|
| Status | LED on Screen : Standby           / White<br>              Pre-trigger status    / Red<br>              On recording      / Green<br>              File processing after measurement /<br>Blue<br>              Unable to measure    / Yellow<br>Mater / Slave indication<br>Number of measured files / Available remaining files<br>Serial number indication |
| Balance | Balancing any optional channel of any optional instrument<br>Continual balancing of all instruments and all channels available |
| Check | Input open check<br>ROM / RAM check<br>Compact flash card check<br>LED turn-on check |
| Instrument settings / conditions list | |

❏ Upgrading Related

Rewriting function of the EEPROM of the instrument provided

❏ Operation Environment

| Instrument | DC-204R/DC-204Ra/DC-104R/DC-104Ra<br>(Up to eight (8) units can be connected) |
|---|---|
| Interface | USB |
| Computer | A personal computer, on which Windows Vista (SP1), Windows 7, Windows 8, Windows 8.1 or Windows 10 is installed |
| Hard Disk | Necessary free space for installation: 10M bytes or more |
| CPU | Pentium4, 1.6GHz or higher is recommended |
| Memory | 256M bytes or more is recommended |
| CRT | Resolution: 1024 × 768 dots or more |
| OS Environment | Windows Vista (SP1) / 7 / 8 / 8.1 / 10 |

   ＊ Windows Vista, Windows 7, Windows 8, Windows 8.1 and Windows 10 are trademarks owned by U.S.A. Microsoft Corporation and registered in U.S.A and other countries.

   ＊ Pentium is a trademark owned by Intel Corporation and registered in U.S.A and other countries.

■These specifications are subject to change without prior notice.

# Before Requesting for Maintenance and Service (repair)

If there should be any failure or malfunction of DC-204R / DC-204Ra, please contact your local representative or Tokyo Measuring Instruments Laboratory Co.,Ltd.

## ■When you send us the device for repair and maintenance service:

- For quick and precise repair and delivery service, please let us know the conditions of trouble or likely cause of such trouble.
- When packing the device to return it to us, use the packing material employed upon delivery of the device from us or the equivalent.
- If the device must be adjusted with accessory parts or element attached, make sure to deliver them to us at the same time.

## ■Guarantee

This product has been carefully examined by our in-house inspection division before delivery. If it malfunctions due to a manufacturing fault or an accident during shipment, please report on the condition to your nearest dealer or directly to Tokyo Measuring Instruments Laboratory Co.,Ltd.

The guarantee period of this product is twelve months from the date of delivery. If the product goes out of order or is broken during this period, we will repair it free of charge. However, this free guarantee repair service will not apply in the case of trouble or damage caused by improper handling of the product, remodeling or modification by the user, or an act of God.

Tokyo Measuring Instruments Laboratory Co.,Ltd. shall not take any responsibility for claims and guarantee of loss and/or damage arising from the operation of this product regardless of any misdescription, inaccuracy or missing items in the contents of this manual.

Smart  Dynamic  Strain  Recorder DC-204R / DC-204Ra

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