KYOWA

IM-A-1283K January 2024

INSTRUCTION MANUAL

CTRS-100A

Compact Recorder

【HARDWARE】

Thank you for purchasing this KYOWA's product.
Read this instruction manual carefully in order to make full use of the high-performance capabilities of the product. Do not use the product in methods other than described in this instruction manual.
Note that this instruction manual mainly describes how to handle the hardware.
For details on the software, see the control software instruction manual.

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CONTENTS

CONTENTS

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STANDARD ACCESSORIES

The standard accessories below are enclosed with each unit.

After unpacking the box, make sure the following parts are enclosed:

Compact Recorder: CTRS-100A

Name	Quantity
"READ BEFORE USING THE PRODUCT" document	1
"Terms and Conditions of New Product Warranty" document	1
P-78 Ground wire	1
P-79 CTRS DC power cable(1.8m)	1
SD card (4GB) *1	1
USB cable	1
Ballpoint screwdriver	1
Stack-connector caps (for female) *1	2
Input connector cap *1	4

*1 It is mounted on CTRS-100A at the time of shipment.

Remote Control Unit: CTRS-RCU010A

Name	Quantity
"READ BEFORE USING THE PRODUCT" document	1
"Terms and Conditions of New Product Warranty" document	1

Strain/Voltage Unit: CTRS-CDV010A

Name	Quantity
READ BEFORE USING THE PRODUCT" document	1
"Terms and Conditions of New Product Warranty" document	1
Stack-connector caps (for female) *2	1
Stack-connector caps (for male) *2	1
Input connector cap *2	4

*2 It is mounted on CTRS-CDV010A at the time of shipment.

Voltage Unit: CTRS-CVPS010A

Name	Quantity
READ BEFORE USING THE PRODUCT" document	1
"Terms and Conditions of New Product Warranty" Document	1
Stack-connector caps (for female) *2	1
Stack-connector caps (for male) *2	1
Input connector cap *2	4

*2 It is mounted on CTRS-CVPS010A at the time of shipment.

Thermocouple Unit: CTRS-CTA010A

Name	Quantity
READ BEFORE USING THE PRODUCT" document	1
"Terms and Conditions of New Product Warranty" document	1
Stack-connector caps (for female) *3	1
Stack-connector caps (for male) *3	1
CT-3A-4 Temperature measuring adapter *3	1

*3 It is mounted on CTRS-CTA010A at the time of shipment.

Synchronization Unit: CTRS-SYNC010A

Name	Quantity
"READ BEFORE USING THE PRODUCT" document	1
"Terms and Conditions of New Product Warranty" document	1
Stack-connector caps (for female) *4	1
Stack-connector caps (for male) *4	1

*4 It is mounted on CTRS-SYNC010A at the time of shipment.

Battery Unit: CTRS-BATT010A

Name	Quantity
"READ BEFORE USING THE PRODUCT" document	1
"Terms and Conditions of New Product Warranty" document	1
Stack-connector caps (for male) *5	1

*5 It is mounted on CTRS-BATT010A at the time of shipment.

Wireless LAN Unit: CTRS-WLAN010A/011A/012A

Name	Quantity
"READ BEFORE USING THE PRODUCT" document	1
"Terms and Conditions of New Product Warranty" document	1
Stack-connector caps (for female) *6	1
Stack-connector caps (for male) *6	1

*6 It is mounted on CTRS-WLAN010A/011A/012A at the time of shipment.

CAN Unit: CTRS-CAG010A

Name	Quantity
"READ BEFORE USING THE PRODUCT" document	1
"Terms and Conditions of New Product Warranty" document	1
Stack-connector caps (for female) *7	1
Stack-connector caps (for male) *7	1

*7 It is mounted on CTRS-CAG010A at the time of shipment.

CAN/GPS Unit: CTRS-CAG011A

Name	Quantity
"READ BEFORE USING THE PRODUCT" document	1
"Terms and Conditions of New Product Warranty" document	1
Stack-connector caps (for female) *8	1
Stack-connector caps (for male) *8	1
GPS connector caps *8	1
GPS antenna (cable length 5m)	1

*8 It is mounted on CTRS-CAG011A at the time of shipment.

OPTIONAL ACCESSORIES

The optional accessories are listed below.

Compact Recorder: CTRS-100A

CTRS AC adapter	UIA345-12-L-JP
CTRS AC adapter (for US)	UNI345-1238-L-US
Various measuring units	
Various expansion units	
Remote control unit	CTRS-RCU010A
SD card	4 GB, 16 GB
EXTERNAL I/O cable	U-133
Connector cap (For the remote control connector / external I/O connector)	BRA.0B.200.PCSG
Connector cap (For the power connector)	BRA.1B.200.PCSG
4109P-S32-7(6-conductor shilded) (0.2 m)	U-136
4109P-BNC plug (1.5 m)	U-137
4109P-BNC jack (0.2 m)	U-129
4109P-R05JACK (0.2 m)	U-138
Dynamic Data Acquisition Software	DCS-100A

Strain/Voltage Unit: CTRS-CDV010A

Voltage Unit: CTRS-CVPS010

Input connector cap	
4109P-4 core shielded bagworm clip	U-130
4109P-S32-7(6-conductor shilded) (0.2 m)	U-136
4109P-BNC plug (1.5 m)	U-137
4109P-BNC jack (0.2 m)	U-129
4109P-R05JACK (0.2 m)	U-138

Synchronization Unit: CTRS-SYNC010A

CTRS Communication cable (3 m)	N-131
CTRS Sync cable (2 m)	N-130
Connector cap (For the synchronous input connector / synchronous output connector)	BRA.1B.200.PCSG

Battery Unit: CTRS-BATT010A

CTRS DC power cable (1.8 m)	P-79
CTRS AC adapter	UIA345-12-L-JP
CTRS AC adapter (for US)	UNI345-1238-L-US
Connector cap (For the power connector)	BRA.1B.200.PCSG

Wireless LAN Unit: CTRS-WLAN010A/011A/012A

Network utility software	CTRS Network Utility

CAN Unit: CTRS-CAG010A

CTRS CAN cable 9-pin male D-sub	U-135

CAN/GPS Unit: CTRS-CAG011A

CTRS CAN cable 9-pin male D-sub	U-135
GPS connector caps	SMA(J)CAP
GPS antenna (cable length 5m)	DAM1595A4I1LC01_XW03_J5M

SAFETY PRECAUTIONS

This product complies with the specifications listed in "8.PRODUCT SPECIFICATIONS" on page 8-1.
Avoid using the product in environments that depart from the applicable specifications. Failure to observe this precaution may result in malfunctions.

Prior to use

To ensure safe use of this product, be sure to read the safety precautions before use. Kyowa Electronic Instruments Co., Ltd., assumes no liability for any damage resulting from the user's failure to comply with the safety precautions.
The following symbol is used to help ensure safe use of the product:

	Indicates the [GND] terminal. Be sure to connect the product's [GND] terminal to ground.
	Indicates the operator must refer to an explanation in the INSTRUCTION MANUAL in order to avoid the risk of injury or death of personnel or damage to the instrument.

Warning and Caution indicators

The following symbols are used to draw attention to important issues and to help ensure safe use of the product:

⚠ **WARNING**	Improper use of the system may result in death or severe injury.
⚠ **CAUTION**	Improper use of the system may result in injury and/or damage to the system.

⚠WARNING

- **Power supply**
  - To prevent fire hazards, before turning on the product, make sure the power-supply voltage specified for the product matches the local line voltage
  - If using the CTRS DC power cable P-79, be careful about the wiring polarity.
    Connecting the power polarity in reverse may cause accidents or malfunctions.
    Be sure not to do this.
- **Ground**
  - Be sure to connect the [GND] terminal to ground. Failure to do so may result in electric shock, performance degradation, or malfunctions.
- **Environments containing inflammable substances.**
  - To prevent the risk of fire and/or explosion, do not use the product in environments containing inflammable gas, vapor, or dust.
- **In the event of problems**
  - If abnormalities such as smoke, abnormal odor, or abnormal noise occur, immediately turn off the power, disconnect the power cable from the main unit, and stop using it. Also, do not install the instrument on or near flammable materials to prevent a fire when an abnormality occurs.
- **Attaching and detaching the unit**
  - Be sure to turn off the power before attaching or detaching the unit. It may cause an electric shock or malfunction.
- **Fixing screws when connecting units**
  - When connecting units, be sure to tighten the fixing screws. If the screws are not fixed, the connection may be disconnected at an unintended time, resulting in unexpected damage as well as product damage or failure.
- **Connecting and disconnecting cables**
  - Before connecting/disconnecting cables, turn off the power to the instrument and connected devices and ground the GND terminal. Failure to do so may cause an electric shock, performance degradation, or malfunctions.
- **Concomitant use of conservation measures**
  - If there is a possibility that a secondary disaster may occur in the system due to a failure of the instrument, be sure to use another technical conservation measure.

⚠WARNING

● **Fever of the chassis**

・ Depending on your environment, the chassis may become very hot.

To prevent unexpected injuries and accidents, take measures such as heat dissipation when using in such an environment.

● **Do not disassemble or modify the product**

・ Failure to observe this precaution can result in electric shock or malfunctions. Attempting to disassemble or modify the product will invalidate the warranty.

● **About the utility nuts**

・ This instrument has utility nuts (screw holes) that customers can use freely. When using the product, carefully read "5-7. Utility Nuts" on page 5-18 and secure with the specified screw size and tightening torque. Use of screws outside the specified size or screwing outside the recommended tightening torque may cause inadequate fixing or damage to the screws, which may cause not only damage or malfunction of the instrument, but also unexpected injury. So never do it.

・ When using utility nuts, check the size and safety of the object to be installed before installing.

● A**bout External IO**

・ The external I/O connector inputs and outputs external triggers and external clocks. Before using the function, read "2-3-4. External I/O connector" on page 2-10 and "4-4. External I/O" on page 4-21 carefully and verify the operation of the entire system using the external I/O. Using the product in a manner that violates the precautions in the instruction manual may result in electric shock, reduced performance, or malfunction.

● **Supported input (CTRS-100A,CTRS-CDV010A)**

・ CTRS-100A and CTRS-CDV010A support strain/voltage measurement.

When measuring strain, connect only transducers and bridge boxes that use strain gauges. Do not input signals outside the input range.

Failure to do so may cause electric shock, performance degradation, or failure.Read "*"on page * for specification.

● **Supported input (CTRS-CVPS010A)**

・ CTRS-CVPS010A is a voltage-only measuring instrument. Please do not input outside the range of use. It may cause electric shock, deterioration of performance, or failure. For specifications, refer to "8-4. CTRS-CVPS010A Product Specifications" on page 8-8.

⚠ WARNING

- **Supported input (CTRS-CTA010A)**
  - CTRS-CTA010A is a measuring instrument dedicated to thermocouples. Do not connect anything other than a thermocouple. Failure to do so may cause electric shock, performance degradation, or failure.
- **Supported input (CTRS-CAG010A)**
  - CTRS-CAG010A is a CAN input-only measuring instrument. Connect to the CAN bus according to the wiring method described in section “2-8 CTRS-CAG010A Wiring Method” on page 2-26. If any input other than CAN is used, it may cause electric shock, deterioration of performance, or malfunction.
- **Supported input (CTRS-CAG011A)**
  - The CTRS-CAG011A is a dedicated CAN/GPS instrument.Connect the CAN bus and GPS antenna according to "2-9.CTRS-CAG011A Wiring Method" on page 2-27. Inputting signals other than CAN and GPS signals may cause electric shock, performance degradation, or failure.
- **About lithium-ion batteries**

  CTRS-BATT010A has a built-in lithium-ion battery. Observe the following as it may cause overheating, rupture or ignition.
  - Do not throw in fire or heat. Also, do not leave the battery in a hot place such as near a fire, near a stove, or under direct sunlight.
  - Do not give a strong impact such as piercing a nail, hitting it with a hammer, or stepping on it.
  - Do not immerse or soak in water, condensation or seawater.
  - Do not put in a microwave oven or highly compressed container.
  - Do not disassemble or modify.
  - Do not store in places where there is a possibility of water leakage such as rain or where the humidity is high.
  - Do not place flammable materials around.

⚠ WARNING

- **Do not use wireless LAN in medical facilities.**

  It may cause malfunction of medical equipment and may be life-threatening. Turn off the WIRELESS switch or remove Wireless LAN unit from the CTRS-100A.

- **Do not use wireless LAN in aviation facilities and aircraft**.

  It may cause malfunction of aviation equipment and may be life-threatening. Turn off the WIRELESS switch or remove Wireless LAN unit from the CTRS-100A.

⚠CAUTION

- **Use the product in a temperature range of -10 to 50 ℃.**
  - Using the product at temperatures outside of the specified range may lower product performance or result in malfunctions. If the product must be used under direct sunlight or in a cold place, protect the product with a screen or take proper measures to keep it warm.
- **Use the product in a relative humidity range of 20 to 90 %.**
  - Using the product in environments in which the relative humidity falls outside the specified range may degrade product performance or result in malfunctions.
- **Take care of condensation after an abrupt change in the environment.**
  - Abrupt changes in ambient temperature, such as during transportation, may cause condensation, which can degrade performance or cause malfunctions. Make sure that there is no condensation before using the instrument.
- **Avoid exposing the product to liquid.**
  - The product is not waterproof or drip-proof. Make sure no liquids come into contact the product; otherwise, electrical leakage or malfunctions may result.
- **Take care when operating the product in locations where the product may be subject to severe impact or vibration.**
  - Continuous vibration or severe impact may result in performance degradation or malfunctions. Also, when using in an environment with impact or vibration, Please fix the chassis and connection cable.
- **Avoid using the product in the presence of strong electromagnetic fields.**
  - Use the product only in environments in which magnetic fields will not disrupt computer operations. Performance degradation, erratic operation, or malfunctions may occur if the product is used near radio equipment, microwave ovens, electric furnaces, or other equipment generating strong electromagnetic fields.
- **Pay attention to static electricity.**
  - It may cause damage due to static electricity. Before touching the equipment, touch a metal object to discharge static electricity.
- **Avoid using the product under poor power supply conditions.**
  - Failure to observe this precaution may result in performance degradation, erratic operations, or malfunctions. Be sure to use a power supply that does not emit noise or produce risk of instantaneous power outages.

⚠ CAUTION

- **Avoid installing sensors near a welding machine or performing measurements near a welding machine.**
  - Failure to observe this precaution may result in output abnormalities, erratic operations, or malfunctions.
- **Take care when operating this product in high or low pressure environments.**
  - Failure to observe this precaution may result in malfunction, performance degradation, or failure.
  - This product is designed to be used under pressure of the standard atmosphere.
- **Do not use in an environment exposed to dust or corrosive gas.**
  - Failure to observe this precaution may result in performance degradation or malfunctions.
- **If the product is used or stored in a place near the sea, take appropriate measures to protect the product from exposure to outside air.**
  - Failure to observe this precaution may result in performance degradation or malfunctions.
- **Please use indoors.**
  - For normal and safe use, do not install outdoors.
- **After power is turned OFF, wait at least five seconds before turning ON power once again.**
  - If power is turned on again within five seconds or if the power is repeatedly turned ON and OFF, the product may cause performance degradation or failure due to the inrush current generated by the product being turned on.
- **Allow the product to warm up before use.**
  - When switched on, the product will assume operating status in about five seconds. However, the internal electric parts and semiconductors need more time to reach thermal stability. To ensure stable operations, always let the product warm up for about 30 to 40 minutes.

    When measuring trace strains of about several 100 μm/m, using a thermocouple for measurements, or performing measurements for an extended period of time, let the product warm up for 60 minutes. If the product is insufficiently warmed up before use, measurement accuracy may fail to meet product specifications.

⚠ CAUTION

- **Do not remove SD card while the SD card access LED is lit.**
  - Remove SD card while the SD card access LED is lit, it may cause data corruption or SD card failure.
- **Do not disconnect the communication cable during data collection.**
  - Disconnecting the connected cable during data collection may cause data corruption or product failure.
- **Do not turn off the power during data collection.**
  - It may cause data corruption or SD card failure. It is recommended to use the battery unit CTRS-BATT010A together when using it in a place where the power supply is unstable.
- **Do not pull on or apply excessive tension to the cables.**
  - Lay the cables with a certain safety margin of length to avoid subjecting the connections to excessive force. Applying excessive tension to a cable may result in abnormal output, conductor damage, or connector damage.
- **Clean the product as needed.**
  - When the product becomes dirty, clean with a soft, dry cloth. Do not wipe the product with a wet cloth or with benzine, thinner, alcohol, etc. Doing so may cause discoloration or deformation.
- **When using the AC adapter, replace with a new adapter periodically.**
  - The optional AC adapter (UIA345-12-L-JP, UNI345-1238-L-US) has a limited service life. Replace about once every five years.
- **Replace the battery in the battery unit regularly with new ones.**
  - The battery has a limited life. Since it has a function to check the deterioration status, please check regularly and consider replacement if it has deteriorated. For details on how to check the deterioration status, see "Battery health display" on pages 1-20.
  - Our company handles replacement. Please contact our company's sales staff or your nearest distributor.

PRECAUTIONS REGARDING WIRELESS COMMUNICATION

● General notes

- Depending on your environment, you may not be able to communicate, please be sure to check the communication before use.
- Communication may not be possible near metal objects, in areas with a lot of metal powder, or surrounded by metal walls.
- CTRS-WLAN010A is a model for Japan only. Not available in other countries.
- CTRS-WLAN011A is a model for United States only. Not available in other countries.
- CTRS-WLAN012A is a model for Thailand only. Not available in other countries.
- Do not connect this instrument directly to the network of telecommunications carriers that have jurisdiction over the public network.
- Do not use in places where the use of wireless equipment such as mobile phones is prohibited.

● Precautions when using the 2.4 GHz band

- Make sure that there are no other devices using the 2.4 GHz band such as other wireless LAN equipment, microwave ovens, industrial heating equipment, high frequency medical equipment, etc. in the vicinity. If the device is used near equipment that uses the same frequency band as this unit, radio interference may occur, resulting in a decrease in communication speed or loss of communication. In addition, Bluetooth® in the PC can also be a source of interference. If you have trouble with the connection, stop the Bluetooth® function of your computer.

● Precautions when using the 5 GHz band

- Do not use the 5 GHz band outdoors. By law, outdoor use in the 5 GHz band is prohibited.

● Precautions regarding laws and regulations (CTRS-WLAN010A)

・ This instrument has been certified as a low power radio station in accordance with the Radio Law of Japan. Therefore, you do not need a radio station license to use this instrument.

・ Never disassemble or modify the wireless module installed in this unit. You may be punished for violating the law.

・ Various certification numbers for wireless LAN units.

Certification number (Japan): 201-170874

● FCC Notice (CTRS-WLAN011A)

This device complies with part 15 of FCC rules. Operation is subject to the following two conditions:(1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Contain FCC ID: N6C-SDMAC

● Thailand (NBTC) (CTRS-WLAN012A)

REGULATORY INFORMATION in Thailand

เครื่องโทรคมนาคมและอุปกรณ์นี้ มีความสอดคล้องตามข้อกำหนดของ กสทช.

LIMITED LIFESPAN PARTS AND PREVENTIVE MAINTENANCE

The product incorporates various electronic components, some of which have limited service life. These parts will degrade over the time, depending on the frequency of use, cumulative operating time, operating conditions (temperature and humidity), and other factors, leading eventually to potential performance degradation, erratic operations, or malfunctions. To prevent such problems, perform inspections/maintenance and replace parts as needed.

The limited lifespan parts used in the product and optional accessories are as follows:

- Backup battery (CTRS-100A, built-in)
- Lithium-ion battery (CTRS-BATT010A, built-in)
- AC adapter (optional accessory)
- SD card (standard accessory, optional accessory)

To ensure that the product can be stably used over the long term, regular maintenance including inspections and parts replacement is necessary. For the approximate replacement timing, see "7-1. Maintenance Details" on page 7-1.
For details on maintenance inspections or replacing limited lifespan parts, please contact our company's sales office or your nearest distributor.

EQUIPMENT RENEWAL

Maintaining the product and replacing components will help ensure optimal performance and prolong product service life. However, since only consumables and limited-lifespan parts can be replaced, natural age-related degradation will occur and progress for the entire unit. We recommend replacing units that have served for an extended period or begin to require frequent repairs.

NOTATIONS OF THE INSTRUCTION MANUAL

Notations used in the instruction manual

The compact recorder CTRS-100A and various units are collectively called "this equipment".

Cautionary and reference notes

The notations below are used to attract your attention to important cautionary and reference notes when handling the product.

Examples of cautionary notations

CAUTION

Describes cases where incorrect handling could result in physical damage (product malfunctions, etc.).

NOTE

Describes important information pertaining to product usage.

Example of a reference note

Describes information useful for product usage

Quoted text

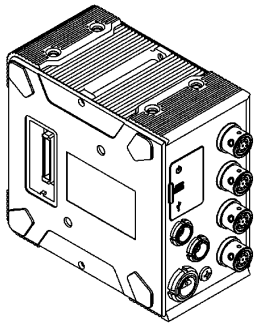
If statements or other parts in the instruction manual are cited in other parts of the manual, they are enclosed in quotation marks (").

Example: For terms and indicators used in the manual, see "NOTATIONS OF THE INSTRUCTION MANUAL" on page 18.

1. PRODUCT OVERVIEW

1-1. Product Overview

CTRS-100 series are data recorder system that can be acquired standalone.
By combining various measurement units and expansion units, you can increase the number of measurement channels and expand the functions, enabling a system configuration that meets your measurement needs.In addition, because it is compact and lightweight and excellent vibration and shock resistance, it can be used in a variety of measurement environments.

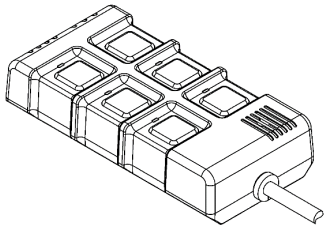


- **Compact Recorder: CTRS-100A**

  CTRS-100A is a data recorder that combines a data acquisition function and analog front end for strain/voltage measurement. It has 4 input channels and can measure and acquire independently.

  This instrument can be expanded to maximum of 32 measurement channels by connecting measurement units (optional accessories). In addition, using a synchronization unit (optional accessories) can be expanded up to 128 channels.

  By using a remote control unit (optional accessories) enables stand-alone operation without using a PC. In addition, operation is possible even if it is installed out of reach.

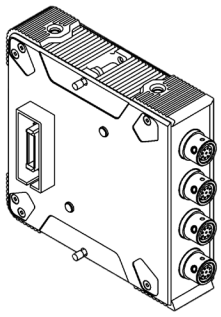


- **Remote Control Unit: CTRS-RCU010A**

  CTRS-RCU010A is a remote control unit for CTRS-100A.

  By connecting to the CTRS-100A, you can operate even if it is installed out of reach. In addition, buzzer function, various display LEDs and the OPTION button can be used to enhance the operability of the CTRS-100A.

Measurement units

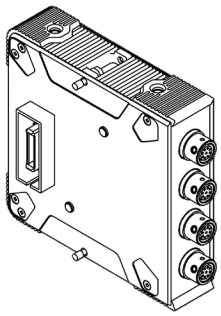


● **Strain / Voltage Unit: CTRS-CDV010A**

CTRS-CDV010A is a measurement unit that equipped with analog front end for strain/voltage measurement.

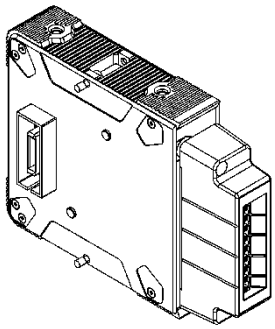
This instrument is equipped with 4 input channels.

By connecting to CTRS-100A, you can be expanded to maximum of 32 measurement channels.



● **Voltage Unit: CTRS-CVPS010A**

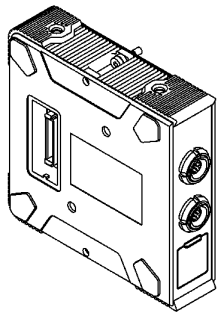
CTRS-CVPS010A is a measurement unit with an analog front-end for voltage measurement. It can output 10 VDC and 5 VDC for each channel as a power supply for sensors, and can be used as a power supply for MEMS sensors. Four input channels are provided and are isolated between the input and GND. (The channels are not isolated from each other).



● **Thermocouple Unit: CTRS-CTA010A**

CTRS-CTA010A is a measurement unit equipped with an analog front end for thermocouple measurement. CTRS-CTA010A uses a scanning sampling method to ensure stable measurement. CTRS-CTA010A is equipped with four input channels and supports four types of thermocouples: K, T, J, and N.

Expansion units

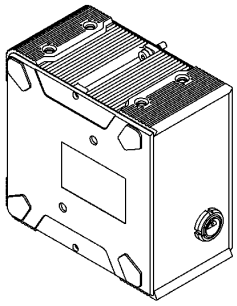


● Synchronization Unit: CTRS-SYNC010A

CTRS-SYNC010A is an expansion unit for connecting multiple CTRS-100A synchronously.

Up to 4 CTRS-100A can be connected using a dedicated synchronization cable (optional accessories). Up to 128 channels can be sampled simultaneously by connecting the CTRS-100A with up to 32 measurement channels synchronously.

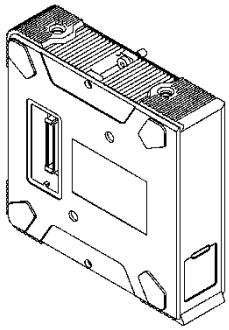
In addition, a LAN communication function is installed, allowing CTRS-100A control via LAN communication.



● Battery Unit: CTRS-BATT010A

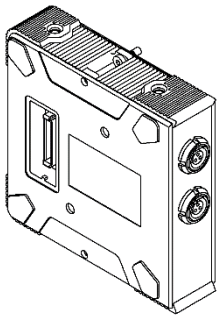
CTRS-BATT010A is an expansion unit for battery operating CTRS-100A.

CTRS-100A can be operated even in an environment without a power supply by connecting this unit. In addition, it can also be used as an uninterruptible power supply in environments where the power supply is unstable.



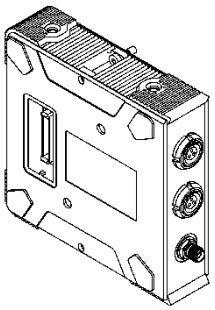
● Wireless LAN Unit: CTRS-WLAN010A/011A/012A

CTRS-WLAN010A/011A/012A is an expansion unit for connecting the CTRS-100A to a PC via wireless LAN. The radio frequency can be selected from 2.4 GHz and 5 GHz. CTRS-WLAN010A/011A/012A is equipped with an easy connection function, and if your PC supports WPS, you can connect with one touch without the need for detailed setting.



● **CAN Unit: CTRS-CAG010A**

CTRS-CAG010A is an expansion unit that can be connected to the CTRS-100A to add CAN ports. In addition to conventional CAN, CAN FD is supported. By using the CTRS-CAG010A together with the CTRS-100A series measurement unit, both analog input signals and CAN data can be measured simultaneously. In addition, it is equipped with a function to automatically check the communication speed, so that the communication speed can be easily set even when the communication speed on the bus is unknown.

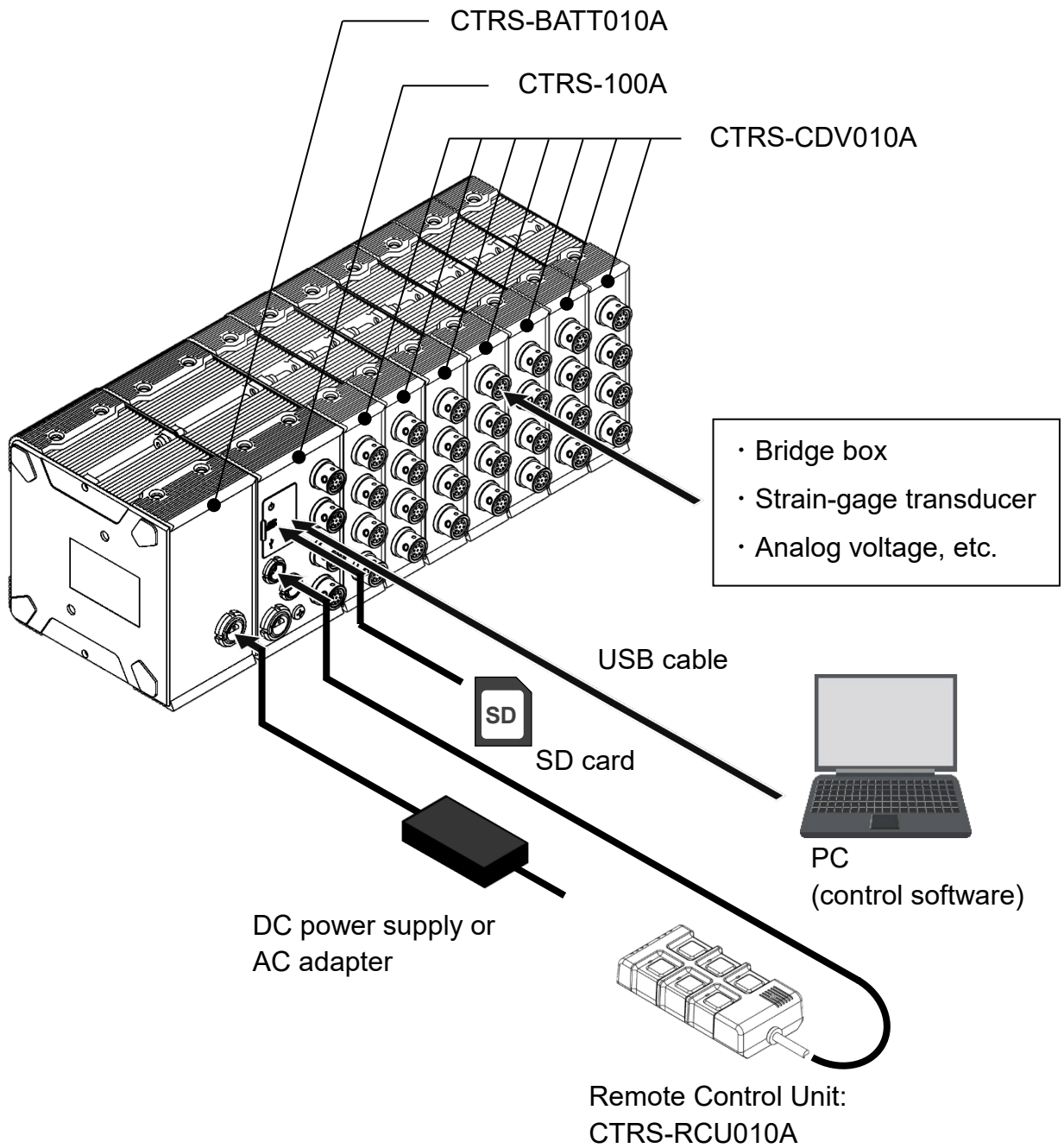


● **CAN/GPS Unit: CTRS-CAG011A**

CTRS-CAG011A is an expansion unit to connect with CTRS-100A to add CAN port and GPS receiving function. The CAN port supports CAN FD in addition to conventional CAN, and when used in conjunction with a CTRS-100 series measurement unit, analog input signals and CAN data can be measured simultaneously. The CAN port is also equipped with an automatic communication speed survey function, making it easy to set the communication speed even when the communication speed on the bus is unknown. The GPS receiving function, when used in combination with a CTRS-100 series measurement unit, allows GPS data to be recorded simultaneously with analog data and CAN data. It is also possible to start recording in synchronization with the time acquired from GPS satellites.

1-2. System Configuration

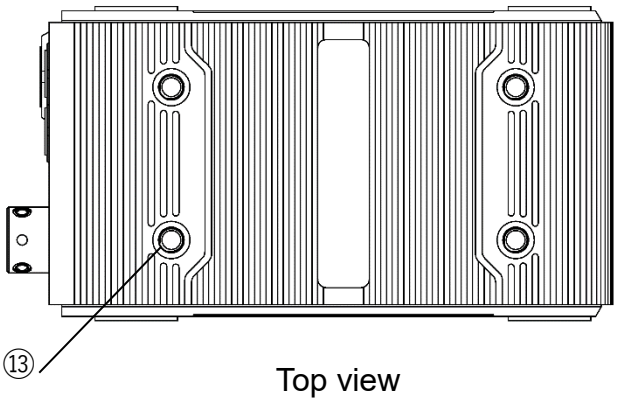
The figure below shows an example of system configuration.



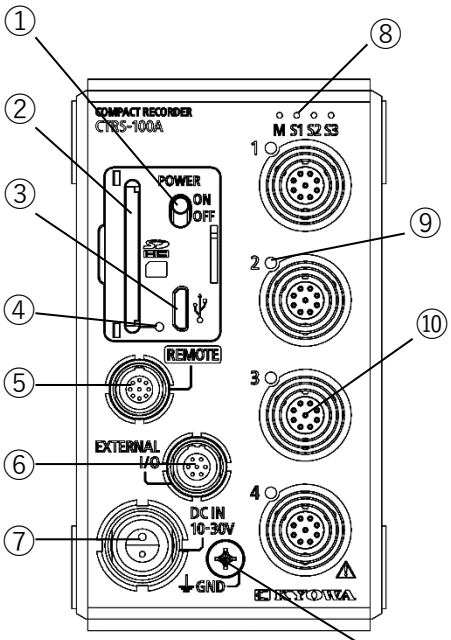
Example of a 32-channel strain/voltage measurement system configuration

1-3. Controls and Indicators

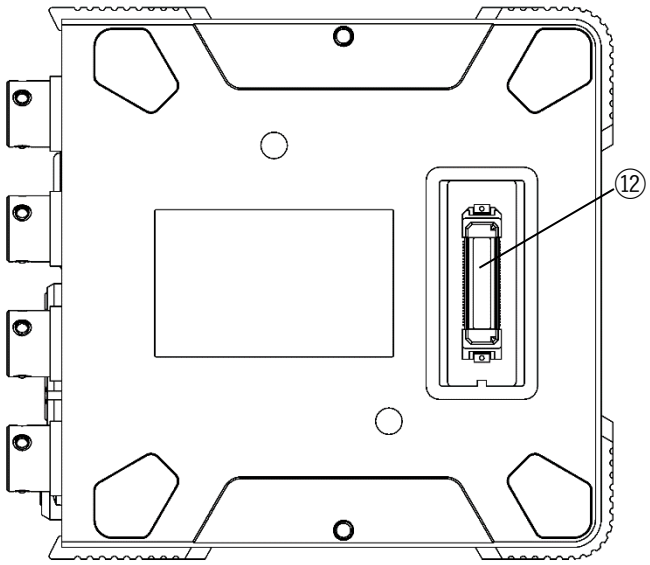
1-3-1. Compact Recorder: CTRS-100A



Top view



Front view



Side view

① Power switch

Switch for turning on/off the power supply of this equipment.

② SD card slot

Slot for inserting an SD card.

③ USB connector

Connector (Micro-B) for connecting a USB cable. Used to connect to a PC via USB.

④ SD card access indicator LED

Lights up in blue during SD card access.

Never pull out the SD card while the LED is lit up.

⑤ Remote control connector

Connector for connecting the remote control unit CTRS-RCU010A.

⑥ External I/O connector

I/O connector for external signals.

For details, see "2-3-4. External I/O connector" on page 2-10.

⑦ Power connector

Connector for connecting a power supply. The power supply voltage range is 10 to 30 VDC.

Connect the included DC power cable or an AC adapter (optional accessory).

⑧ Status LEDs

Display the CTRS-100A status.

For details on the lighting patterns and states, see "Table 1-1. Status LED display" on page 1-8.

⑨ Channel status LEDs

Display the status of each channel.

For details on the lighting patterns and states, see "Table 1-2. Channel status LED display" on page 1-9.

⑩ Input connectors

Connectors for inputting a strain-gage transducer, bridge box, analog voltage, etc.

⑪ GND terminal

Terminal for grounding. Be sure to ground it.

⑫ Connection connector

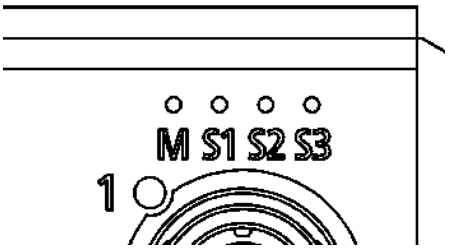
Connector for connecting to other units.

⑬ Utility nuts

Screw holes (M4) that can be freely used by the user. Use them to fasten the equipment, etc. For details, see "5-7. Utility Nuts" on page 5-18.

Status LED display

The LEDs that display the status change depending on the CTRS-100A operating conditions.



1. For non-synchronous operation (standalone operation)

The status is displayed at the M (master) LED.

2. For synchronous operation (master operation)

The status is displayed at the M (master) LED.

The status of the synchronized slave unit is displayed at S1 to S3.

3. For synchronous operation (slave operation)

The status is displayed at the set slave number LED among S1 to S3.

The status is displayed as shown below.

Table 1-1. Status LED display

Color lit	Power supply	Lighting pattern	Status	Status details	Recording
Blue	External power supply	Lit up	Normal	The equipment is operating normally.	Possible
		Flashing	Notice	The free space on the SD card is low. Replace the SD card before it runs out of capacity.	
		Flashing (fast)	Notice	Balance NG or range over have occurred in any of the measurement channels.	
Purple	Battery unit	Lit up	Normal	The equipment is operating normally.	
		Flashing	Notice	The free space on the SD card is low. Replace the SD card before it runs out of capacity. Or the remaining battery charge is low. Charge the battery before its energy runs out.	
		Flashing (fast)	Notice	Balance NG or range over have occurred in any of the measurement channels.	
Red	External power supply or Battery unit	Flashing (fast)	Error	Recording is not possible because an error has occurred. See "6. TROUBLESHOOTING" on page 6-1 and eliminate the cause of the error.	Not possible
		Lit up	Error	Recording is not possible due to an equipment configuration error. See "6. TROUBLESHOOTING" on page 6-1 and review the equipment configuration.	

* If there is an equipment configuration error, all the LEDs light up in red.

Channel status LED display

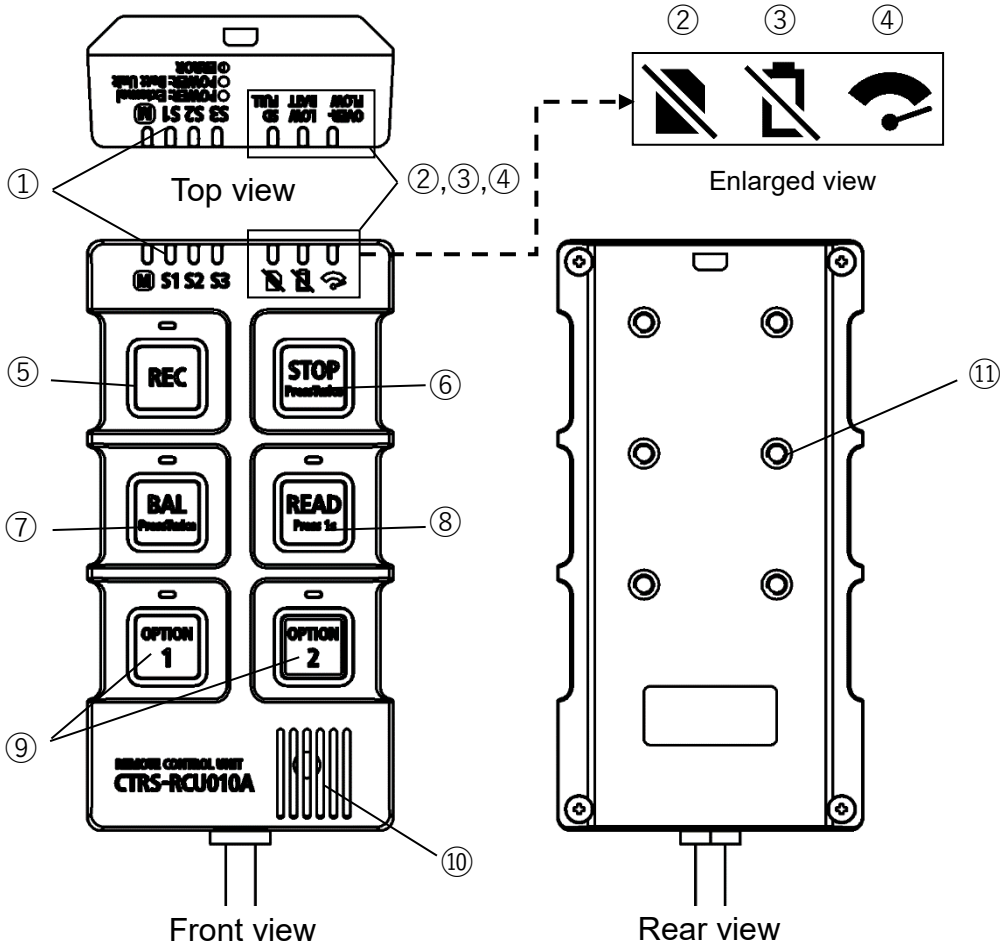
The status is displayed as shown below.

Table 1-2. Channel status LED display

LED display		Status	Status details
Blue	Lit up	On standby	Monitoring or recording can be started.
	Flashing	Recording	Indicates that data is being recorded.
	Flashing (fast)	Executing balance adjustment	Indicates that balance adjustment is being executed.
Purple	Flashing	Monitoring	Indicates that the equipment is monitoring, awaiting a trigger, or awaiting an interval.
		Awaiting trigger	
		Awaiting interval	
Red	Flashing (fast)	Over range	Indicates that the equipment went over range during input or that an error occurred during balance adjustment execution.
		Balance error	
	Flashing	Over range resolved	Indicates that the equipment went over range and that the situation was subsequently resolved.
Off		Measurement OFF	Measurement is set to OFF.

- If the equipment goes over range and then returns to the standby status, the channel status LEDs simultaneously light up in blue (standby status) and flash red (over range).

1-3-2. Remote Control Unit: CTRS-RCU010A



①Status LEDs

Display the CTRS-100A status. The lighting patterns are the same as the CTRS-100A status LEDs. For details, see "Table 1-1. Status LED display" on page 1-8.

② Remaining-SD-card-space indicator LED

Lights up when the remaining SD card space is low. For details, see “Table 1-3. Remaining-SD-card-space indicator LED display" on page 1-11.

③ Remaining-battery-power indicator LED

Lights up when using the battery unit and the remaining battery charge is low. For details, see "Table 1-4. Remaining-battery-power indicator LED display" on page 1-12.

④ Range-over indicator LED

Lights up when any measurement channel is over range. For details, see "Table 1-5. Range-over indicator LED display" on page 1-12.

⑤ REC button

Press this once to start recording. For details on the LED lighting pattern and status, see Table 1-6. REC LED display on page 1-12.

⑥ STOP button

Press this twice to stop recording. The operating method can be changed to pressing this once with the control software setting.

⑦ BAL button

Press this twice to execute balance adjustment. The operating method can be changed to holding this down with the control software setting. See Table 1-7 on page 1-12 for LED lighting patterns and status.

⑧ READ button

Hold this down to read the measurement condition file from the SD card. For details on the LED lighting pattern and status, see Table 1-8 on page 1-13.

⑨ OPTION 1 button, OPTION 2 button

The control software can be used by the user to assign functions to these buttons. For the functions that can be assigned, refer to "4-5. Remote Control Unit Settings" on page 4-36. The LEDs light up in blue during operation.

⑩ Buzzer

The buzzer sounds when the main unit starts up, when the input is over range, or when a button is operated.

⑪ Utility nuts

Screw holes (M3) that can be freely used by the user. Use them to fasten the equipment, etc. For details, see "5-7. Utility Nuts" on page 5-18.

Table 1-3. Remaining-SD-card-space indicator LED display

LED display		Status	Status details
Off		Normal	The SD card is normal.
Red	Flashing	Remaining space caution	The free SD card space is less than 30%. Replace the SD card before it runs out of free space.
	Flashing (fast)	Error	Recording is not possible as no SD card is inserted or there is no free space. Check the SD card.

Table 1-4. Remaining-battery-power indicator LED display

LED display		Status	Status details
Off		Normal	The remaining battery charge is normal.
Red	Flashing	Remaining charge caution	The remaining battery charge is less than 30%. Charge the battery before its energy runs out.
	Flashing (fast)	Error	Recording is not possible because the battery has run out of energy. Charge the battery.

Table 1-5. Range-over indicator LED display

LED display		Status	Status details
Off		Normal	No over range issue has occurred.
Red	Flashing	Over range	Indicates that a measurement channel is over range or went over range.

Table 1-6. REC LED display

LED display		Status	Status details
Off		Stopping	Indicates a stopped status without acquisition or monitoring.
Blue	Flashing	Recording	Indicates that data is being acquired.
Purple	Flashing	Monitoring	Indicates that the status is monitoring, waiting for a trigger, or waiting for an interval.
		Waiting for triger	
		Waiting for interval	

Table 1-7. BAL LED display

LED display		Status	Status details
Off			It is off except when balancing is in progress.
Blue	Lit up	Balancing in progress	Indicates that balancing is in progress.
	Flashing	Balance error	Indicates that an error has occurred in one of the channels during balance execution.

Table 1-8. READ LED display

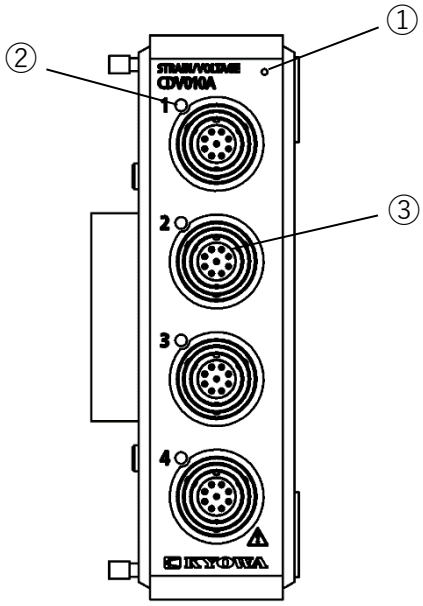
LED display		Status	Status details
Off			It is turned off when the measurement condition file is not read from the SD card.
Blue	Lit up	Read success	Indicates that the measurement condition file has been read correctly from the SD card.
Red	Flashing	Read error	Indicates that the measurement condition file could not be read from the SD card. Refer to "6. Before considering a failure" on page 6-1 and eliminate the cause of the error.

NOTE

- If a remote control unit is connected to a slave unit during synchronous operation, only READ button operation is possible. Start or stop recording, etc. only when connected to a master unit.

- Pressing twice means pressing a button twice within 0.5 seconds.
- Holding down means holding down a button for at least one second.
- With control software, it is possible to select whether to execute the STOP button by pressing it twice or pressing it once. For details, refer to the item related to the remote control in "4 ENVIRONMENT SETTINGS" in the operation manual of the control software DCS-100A [CTRS-100A Operations]. (The initial setting is to press the button twice.)
- With control software, it is possible to select whether to execute the BAL button by pressing it twice or holding it down. For details, refer to the item related to the remote control in "4 ENVIRONMENT SETTINGS" in the operation manual of the control software DCS-100A [CTRS-100A Operations]. (The initial setting is to press the button twice.)
- The following functions can be assigned to the OPTION 1 and OPTION 2 buttons:
  ・Start monitoring ・Delete the latest data file ・Over reset
  ・PAUSE ・Marker input ・Auto range
- The CTRS-RCU010A has special operations, such as initializing to the factory settings. For details, see "11-1. Special CTRS-RCU010A Operations" on page 11-1.

1-3-3. Strain / Voltage Unit: CTRS-CDV010A



① Status LED

Displays the CTRS-CDV010A status. For details on the lighting patterns, see "Table 1-9. Status LED display for Measurement Units" on page 1-16.

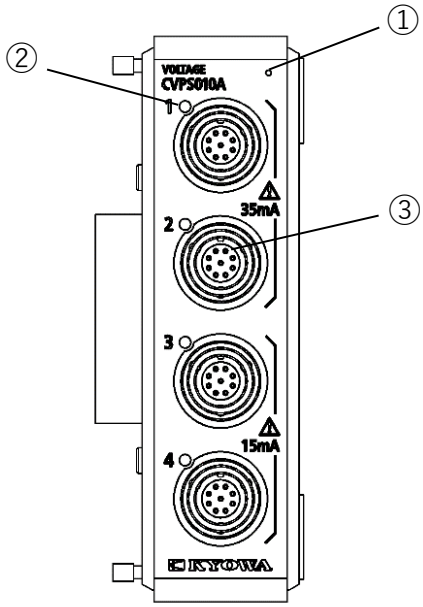
② Channel status LEDs

Display the status of each channel. The lighting patterns are the same as those of the CTRS-100A channel status LEDs. For details, see "Table 1-2. Channel status LED display" on page 1-9.

③ Input connectors

Connectors for inputting a strain-gage transducer, bridge box, analog voltage, etc.

1-3-4.Voltage Unit: CTRS-CVPS010A



① Status LED

Displays the CTRS-CVPS010A status. For details on the lighting patterns, see "Table 1-9. Status LED display for Measurement Units" on page 1-16.

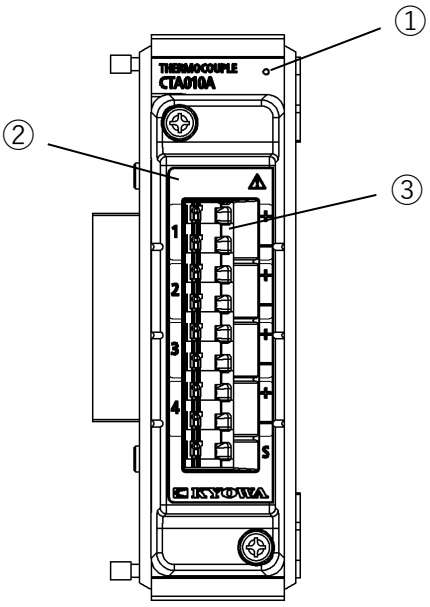
② Channel status LEDs

Display the status of each channel. The lighting patterns are the same as those of the CTRS-100A channel status LEDs. For details, see "Table 1-2. Channel status LED display" on page 1-9.

③ Input connectors

Connectors for inputting an analog voltage. The sensor power supply can output up to 35 mA for channels 1 and 2, and up to 15 mA for channels 3 and 4.

1-3-5. Thermocouple Unit: CTRS-CTA010A



① Status LED

Displays the CTRS-CTA010A status. For details on the lighting patterns, see "Table 1-9. Status LED display for Measurement Units" on page 1-16.

② Temperature measurement adapter

A temperature measurement adapter with an internal reference contact compensation function.

③ Thermocouple connection tarminal block

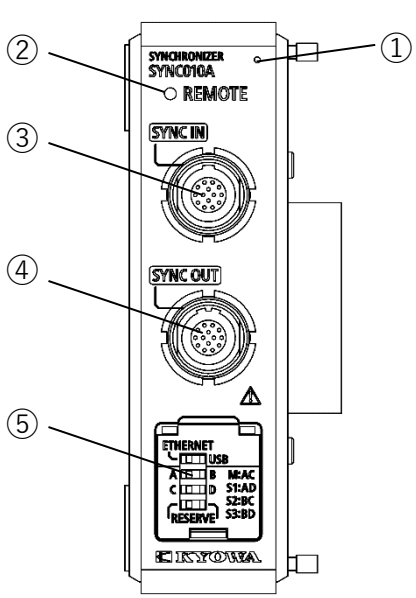
A terminal block for connecting a thermocouple. When using a shielded thermocouple or compensating lead wire, connect the shielded wire to the S terminal.

Table 1-9. Status LED display for Measurement Units

Color lit	Power supply	Lighting pattern	Status	Status details	Recording
Blue	External power supply	Lit up	Normal operation	The equipment is operating normally.	Possible
		Flashing (fast)	Note	Balance NG or range over have occurred in any of the measurement channels.	
Purple	Battry unit	Lit up	Normal operation	The equipment is operating normally.	
		Flashing (fast)	Note	Balance NG or range over have occurred in any of the measurement channels.	
Red	External power supply or battry unit	Lit up	Error	Recording is not possible due to an equipment configuration error. See "6. TROUBLESHOOTING" on page 6-1 and review the equipment configuration.	Not possible

* If there is an equipment configuration violation, all the LEDs light up in red.

1-3-6. Synchronization Unit: CTRS-SYNC010A



① Status LED

Displays the CTRS-SYNC010A status. The lighting patterns are the same as those of the CTRS-CDV010A status LED. For details, see "Table 1-10. Status LED display for expansion unit" on page 1-18.

② REMOTE LED

Displays the status of the PC connection. See "Table 1-11. REMOTE LED display" on pages 1-18 for lighting patterns.

③ SYNC IN connector

Connect the CTRS Communication cable N-131 (optional accessory) if connecting a PC to a LAN. During synchronous operation, use the CTRS Sync cable N-130 (optional accessory) and connect to the SYNC OUT connector of the other synchronization unit.

④ SYNC OUT connector

During synchronous operation, use the CTRS Sync cable N-130 (optional accessory) and connect to the SYNC IN connector of the other synchronization unit.

⑤ DIP switches

Switches for selecting the communication interface and specifying master/slave settings. For switch settings, see “About selection of communication interface” on page 2-45 and “2-12. Connections and Settings During Synchronous Operation” on pages 2-46.

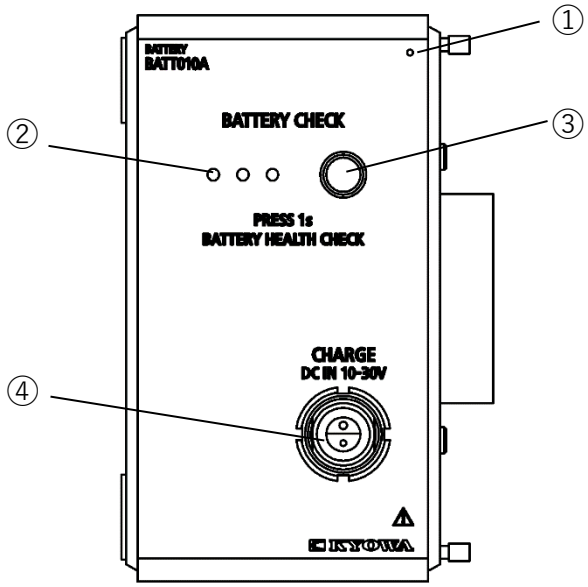
Table 1-10. Status LED display for expansion unit

Color lit	Power supply	Lighting pattern	Status	Stetus detail	Recording
Blue	External power supply	Lit up	Normal operation	The equipment is operating normally.	Possible
Purple	Buttery unit	Lit up	Normal operation	The equipment is operating normally.	
Red	External power supply or Buttery unit	Lit up	Error	Acquisition is not possible due to a device configuration error. Refer to "6. TROUBLESHOOTING" on page 6-1 and check that the device configuration of your system is correct.	Not possible

Table 1-11. REMOTE LED display

LED display		Status	Status detail
Off		Disconnecting	Indicates that the computer is disconnected.
Blue	Lit up	Connecting	Indicates that you are connected to your computer via USB or LAN.

1-3-7. Battery Unit: CTRS-BATT010A



① Status LED

Displays the CTRS-BATT010A status.

Lights / blinks purple when the battery is operated by the battery unit. For details on the lighting pattern and status, see "Table 1-12. Status LED display for battery unit" on page 1-20.

② Battery-check LEDs

The lighting pattern indicates the remaining battery charge and health.

For details, see the next page.

③ Battery-check switch

Switch for checking the remaining battery charge and health.

Perform the operations below to display the status on the battery-check LEDs.

Pressing once : displays the remaining battery charge

Holding down : displays the battery health

④ Power connector

Connector for connecting a power supply while charging.

The power-supply voltage range is 10 to 30 VDC.

Connect a DC power cable (optional accessory) or AC adapter (optional accessory).

Table 1-12. Status LED display for battery unit

Color lit	Power supply	Lighting pattern	Status	Status detail	Recording
Blue	External power supply	Lit up	Normal operation	The equipment is operating normally.	Possible
Purple	Battery unit	Lit up	Normal operation	The equipment is operating normally.	
		Flashing	Caution	The equipment is operating normally, but the remaining battery charge is low. Charge the battery before its energy runs out.	
Red	External power supply or Battery unit	Flashing (Fast)	Error	Recording is not possible because an error has occurred. See "6. TROUBLESHOOTING" on page 6-1 and eliminate the cause of the error.	Not possible
		Lit up	Error	Recording is not possible due to an equipment configuration error. See "6. TROUBLESHOOTING" on page 6-1 and review the equipment configuration.	

Battery-check LED display

●: lit up, ☼: flashing, −: off

1. Remaining charge display

The remaining battery charge is displayed when the battery-check switch is pressed or when operating the CTRS-100A by using battery power.

Color lit	Lighting pattern	Remaining charge
Blue	● / ● / ●	70 to 100%
Blue	● / ● / −	30 to 69%
Blue	● / − / −	6 to 29%
Red	☼ / − / −	5% or less

2. Battery health display

The battery health is displayed when the battery-check switch is held down.

Color lit	Lighting pattern	Health
Purple	● / ● / ●	Good
Purple	● / ● / −	Caution
Purple	● / − / −	Replace

3. Charge-status display

The charge status is displayed during charging.

Color lit	Lighting pattern	Charge status
Blue	● / ● / ●	Charging complete
Blue	● / ● / ☼	70 to 99%
Blue	● / ☼ / –	30 to 69%
Blue	☼ / – / –	0 to 29%

4. Error display

The LEDs flash red if an error occurs. For details on error handling methods, see "6-7. CTRS-BATT010A Details" on page 6-7.

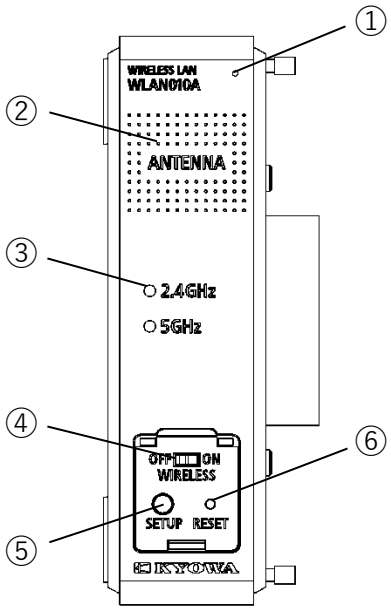
Color lit	Lighting pattern	Status
Red	☼ / ☼ / ☼	Error

NOTE

- Recording and monitoring are not possible if the remaining battery charge is 5% or less. Charge the battery.
- When the battery health becomes "Caution", it may not meet the operating time specifications.
- When the battery health is "Replace", the battery is deteriorating. Consider replacing the built-in battery. Battery replacement will be handled by us. For details, please contact our company's sales staff or your nearest distributor.

- Battery health is determined using a parameter called SOH. SOH is an abbreviation of "State of Health" and is an index showing the degree of health and deterioration.

1-3-8. Wireless LAN Unit: CTRS-WLAN010A/011A/012A



①Status LED

Displays the status of CTRS-WLAN010A / 011A / 012A. The lighting pattern is the same as the status LED of CTRS-SYNC010A. See "Table 1-10. Status LED display for expansion unit" on page 1-18.

②ANTENNA

There is a wireless LAN antenna inside. Be careful not to cover this part with metal.

③Wireless LAN Status LED

Displays the frequency of the radio you are using. The LED flashes while preparing to connect.

④WIRELESS switch

Enables / disables the wireless LAN unit operation. The switch settings are reflected when the power is turned on. See "About selection of communication ingerface" on page 2-45.

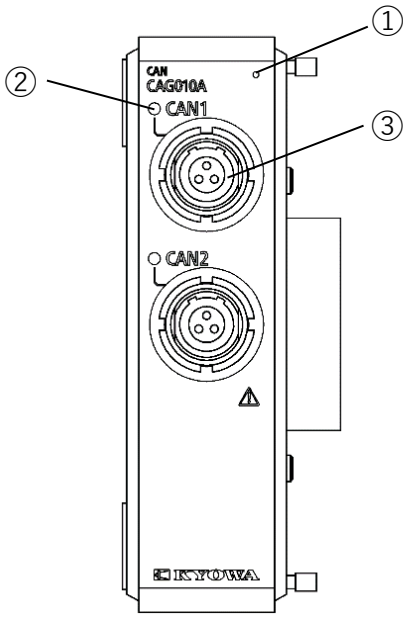
⑤SETUP switch

Use the "Easy connection function".

⑥RESET switch

Restore the SSID and security key to factory defaults.

1-3-9. CAN Unit: CTRS-CAG010A



① **Status LED**

Displays the status of CTRS-CAG010A. See "Table 1-13. Status LED display for CAN unit " on page 1-24.

② **Port status LED**

Displays the status each port. See "Table 1-14. Port status LED display for CAN unit " on page 1-24.

③ **CAN port connector**

This is the input/output connector for CAN data. Connect the CTRS CAN cable 9-pin male D-sub U-135 (optional accessory).

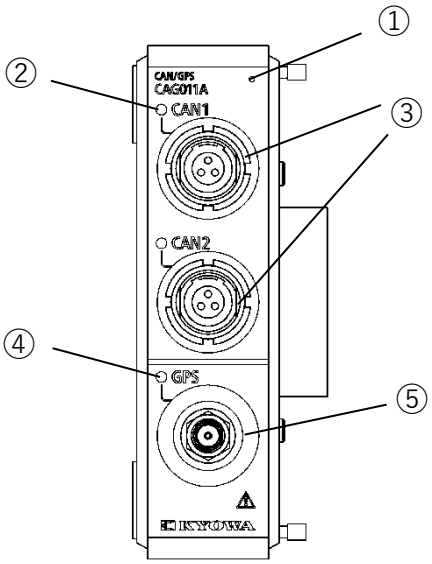
Table 1-13. Status LED display for CAN unit

Color lit	Power supply	Lighting pattern	Status	Stetus detail	Recording
Blue	External power supply	Lit up	Normal operation	The equipment is operating normally.	Possible
		Flashing (fast)	Note	CAN overflow has occurred. Refer to “4-8-3.Number of messages that can be received per second” on page 4-55.	
Purple	Buttery unit	Lit up	Normal operation	The equipment is operating normally.	
		Flashing (fast)	Note	CAN overflow has occurred. Refer to “4-8-3.Number of messages that can be received per second” on page 4-55.	
Red	External power supply or Buttery unit	Lit up	Error	Acquisition is not possible due to a device configuration error. Refer to "6. TROUBLESHOOTING" on page 6-1 and check that the device configuration of your system is correct.	Not possible

Table 1-14. Port status LED display for CAN unit

LED display		Status	Status detail
Off		Stopping	The port is not operating because the CAN receive or output conditions have not been set.
Blue	Lit up	Normal operation	The port is operating normally.
	Flashing	Receiving data	Data is being received.
Purple	Lit up	Surveying for communication speed	Communication speed survey is in progress.
	Flashing (fast)	Testing for output	Output test for CAN Data is in progress.
Red	Lit up	Bus error	Bus error has occurred. Refer to "6. TROUBLESHOOTING" on page 6-1 and remove cause of the error.

1-3-10. CAN/GPS Unit: CTRS-CAG011A



① **Status LED**

Displays the status of CTRS-CAG011A. See "Table 1-13. Status LED display for CAN unit " on page 1-24.

② **Port status LED**

Displays the status each port. See "Table 1-14. Port status LED display for CAN unit " on page 1-24.

③ **CAN port connector**

This is the input/output connector for CAN data. Connect the CTRS CAN cable 9-pin male D-sub U-135 (optional accessory).

④ **GPS status LED**

Displays GPS status. See “Table 1-15. GPS status LED display" on page 1-26.

⑤ **GPS connector**

This connector is used to connect the GPS antenna.

Table 1-15. GPS status LED display

LED display		Status	Status detail
Off		Stopping	GPS function is disabled.
Blue	Lit up	Positioning	Indicates that GPS data is being received and positioning is in progress.
	Flashing	Monitoring/Recording (Positioning)	Indicates that data is being monitored/recorded with GPS data being received and potioning.
Red	Lit up	No positioning	Indicate that GPS data is not being received and no positioning has been achieved.
	Flashing	Monitoring/Recording (No positioning)	Indicates that data is being monitored/recorded with no GPS data being received and no positioning.

2. INSTALLATION METHOD

2-1. Installation Procedure

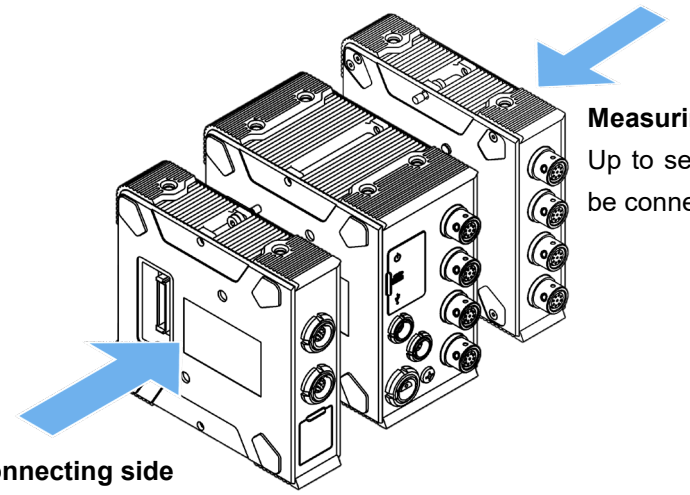
This section explains the preparatory work necessary from installation to measurement. Follow the procedure below.

Section 2-2	Unit Connection	…	Connect a measuring unit or expansion unit to the CTRS-100A as necessary.
↓			
Section 2-3-1	Power connector	…	Connect to a DC power supply, AC adapter, or battery unit.
↓			
Section 2-3-5	Input connector	…	Connect various sensors to the input.
↓			
Section 2-11	Connecting to a PC	…	Specify the initial interface settings for connecting to a PC. If using a USB interface, install the USB driver on the PC. If using a LAN interface, set the network conditions.
↓			
Section 2-12	Connections and Settings During Synchronous Operation	…	If performing synchronous operation, configure the connections and settings.
↓			
Section 4	MEASUREMENT	…	Prepare for and make measurements.

2-2. Unit Connection

To connect each unit, turn off the CTRS-100A power supply and then perform the procedure below.

① Connect the CTRS-100A to the connection connectors of each units. Connect each measuring unit to the right side of the CTRS-100A, and connect each expansion unit to the left side. Up to seven measuring units can be connected. Up to five expansion units can be connected.



Measuring unit connecting side
Up to seven measuring units can be connected.

Expansion unit connecting side
Up to five expansion units can be connected.

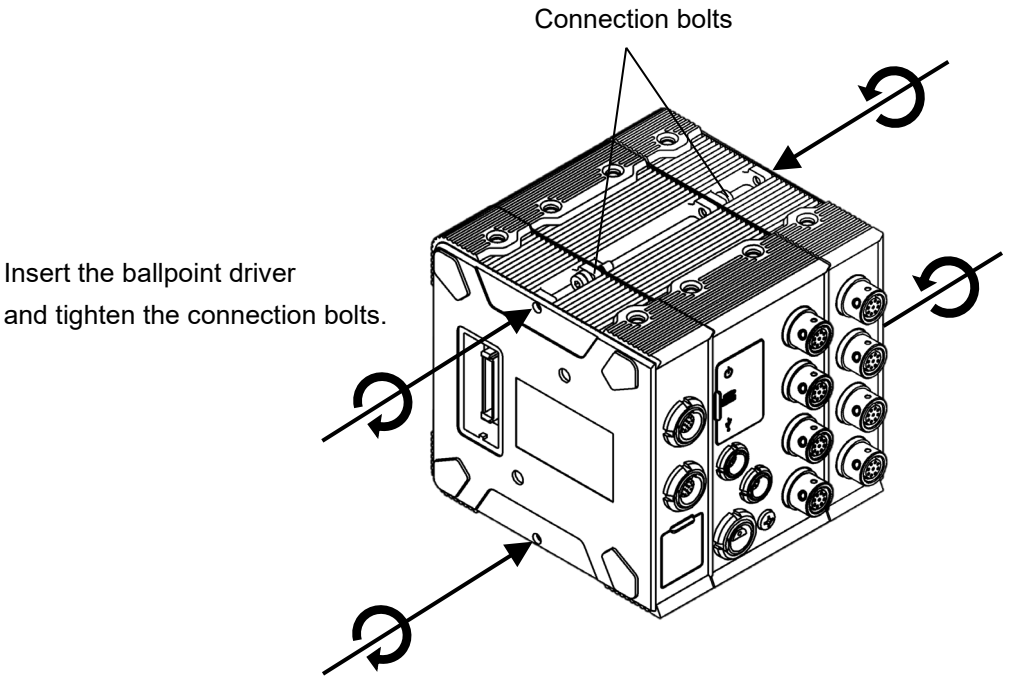
CAUTION

- Be sure the CTRS-100A power is off before inserting or removing various units. If the power is on when this is done, it may cause the units or CTRS-100A to malfunction.

NOTE

- If eight or more measuring units are connected, an equipment configuration error occurs and measurement becomes impossible.
- Only one expansion unit of each type can be liked. If more than one of the same type of unit is connected, an equipment configuration error occurs.

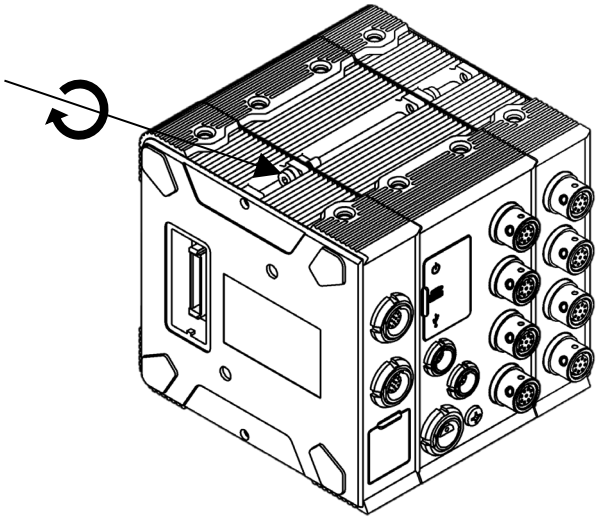
② Use the included ballpoint driver to tighten the connection bolts on the top and bottom and fasten the units to each other.



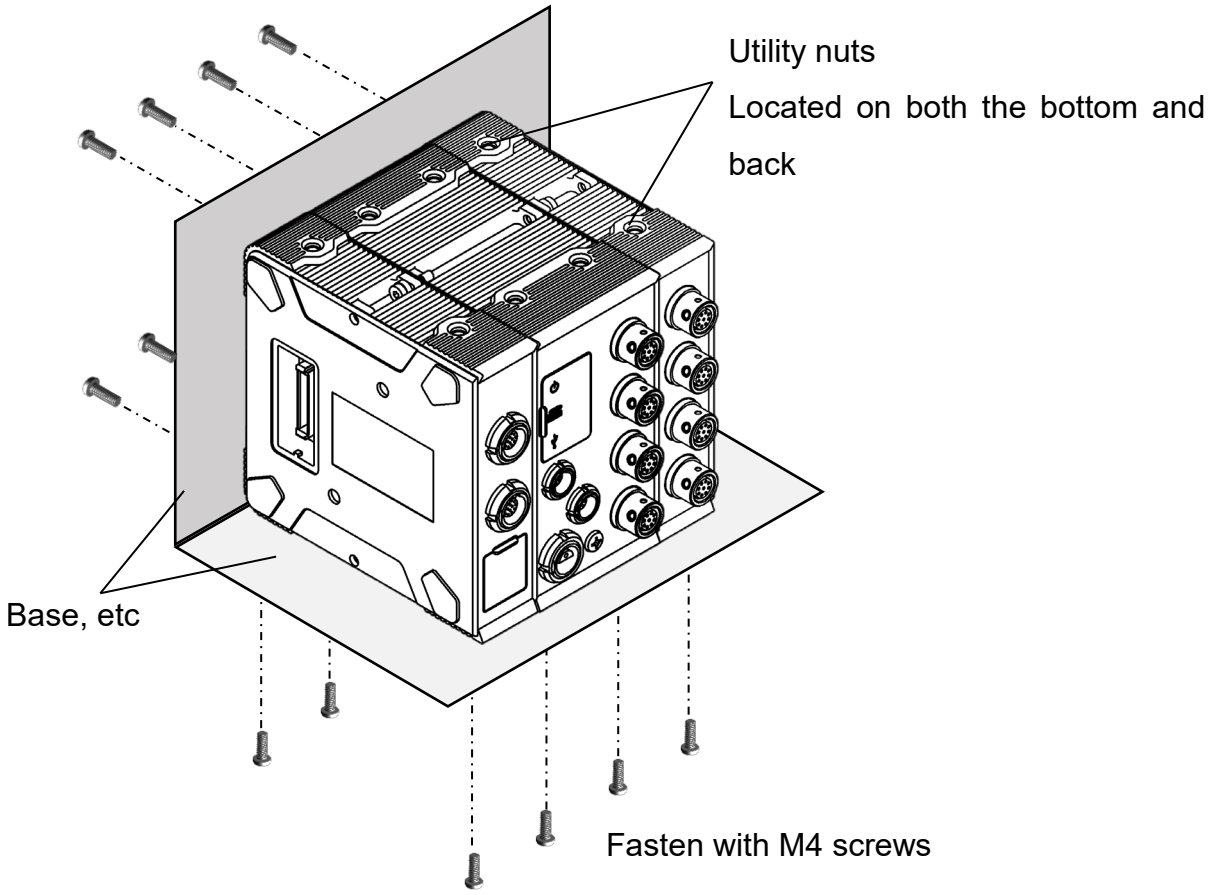
CAUTION

- **Be sure to tighten the top and bottom connection bolts when connecting each unit,** as failure to do so may cause performance degradation, malfunctions, or breakage.

- The ballpoint driver can also be inserted at an angle.



③ If necessary, connected units can be fixed to a base, etc. Each unit has utility nuts, so use M4 screws to fasten them down. The effective depth of the utility nuts is 7 mm. Use screws that have a length equal to (the base thickness) + (5 to 7 mm). For details on the utility nuts, see "5-7. Utility Nuts" on page 5-18.



NOTE

- When used in environments exposed to vibrations or shocks, use utility nuts, etc. to separately fix each unit to a base, etc.

2-3. CTRS-100A Wiring Method

2-3-1. Power connector

If using a DC power supply

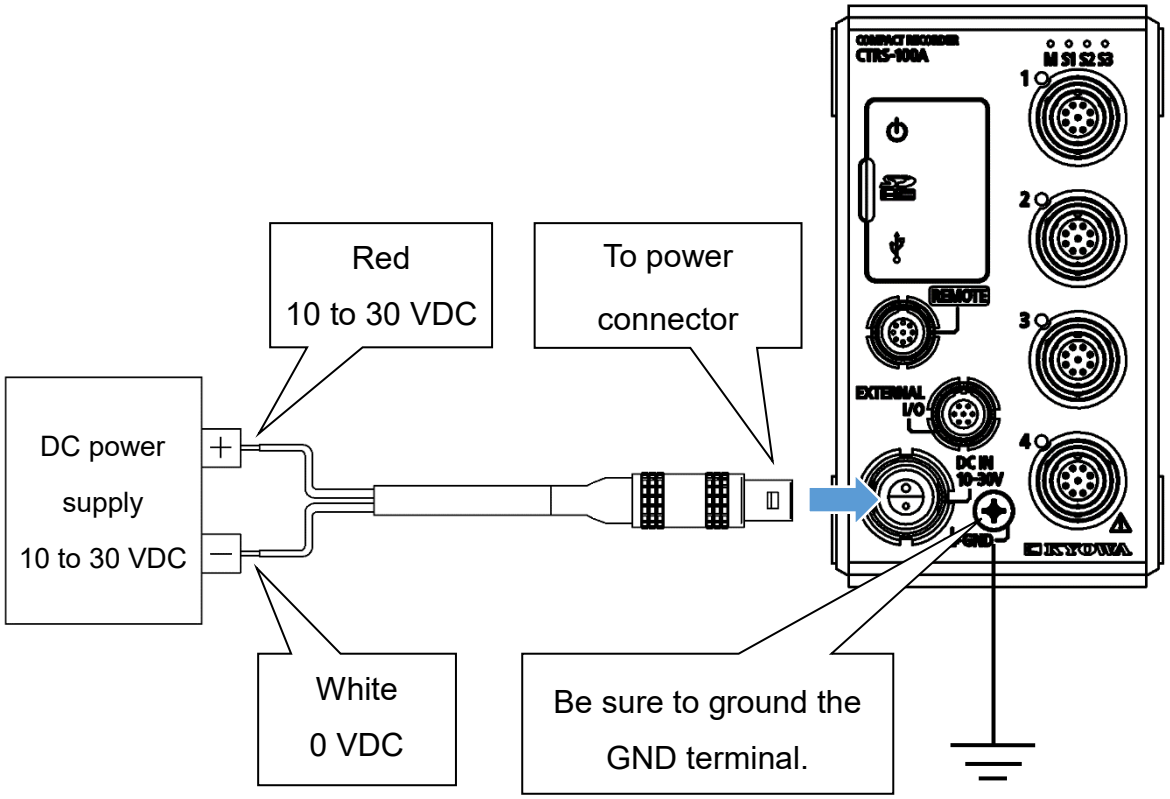
Confirm the power-supply voltage before connecting the DC power cable.

The acceptable range for the power-supply voltage is 10 VDC to 30 VDC. Make sure the DC power-supply voltage is within the allowable range. Use a power supply whose power capacity is at least twice the total power consumption of each unit you are using. The power consumption of each unit is indicated on the side label. Be sure to ground the product.

Next, use the included DC power cable to supply power. Connect the power-supply cable connector to the power connector on the front panel, and connect the loose wires of the cable as follows:

Red ➡ 10 to 30 VDC

White ➡ 0 VDC



CAUTION

- Applying power supply voltage outside the power-supply voltage range or reversing the connection of the power supply polarity could cause malfunctions or accidents. Be sure not to do this.
- Be sure to ground the GND terminal. If it is not grounded, it could cause electric shocks, performance degradation, or malfunctions.

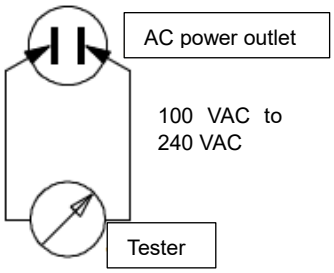
NOTE

- If using a vehicle battery as a DC power supply, confirm that the negative side of the battery is connected to the vehicle.
- If a vehicle battery is used as a DC power supply, there is a risk of unstable operation if the power supply voltage temporarily decreases due to a self-starter, etc., so separately handle this.

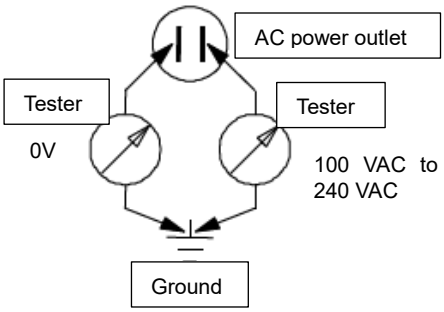
If using an AC adapter (optional accessory: UIA345-12-L-JP or UNI345-1238-L-US)

Confirm the power-supply voltage before connecting the AC plug of the AC adapter to a power outlet. The power-supply voltage can be checked by doing the following:

① Measure the voltage between the terminals of the AC power outlet with a tester to make sure it is within the range of 100 VAC to 240 VAC.

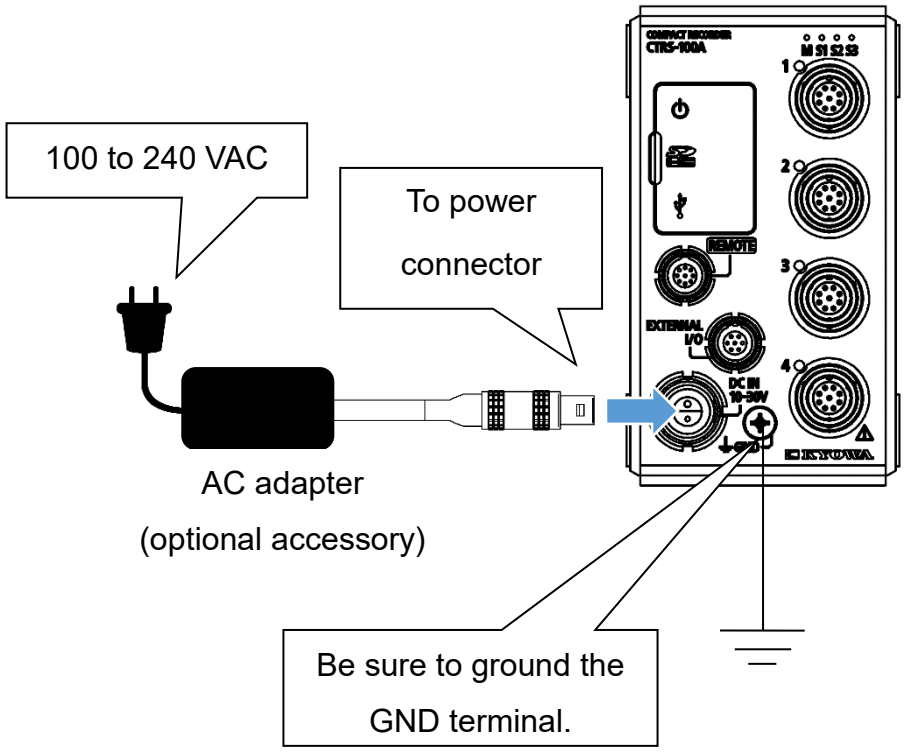


② Measure the voltage between each of the terminals of the AC power outlet and ground to make sure the voltage at one terminal is 0 V and the voltage at the other terminal is within the range of 100 VAC to 240 VAC.



③ If an induction motor, electric welding machine, or other noisy equipment is used in the same environment, use an isolation transformer or a commercial noise cut transformer to minimize noise effects. The presence of significant noise is likely to result in poor power supply conditions.

After checking the power supply voltage, connect the AC adapter to the power connector.

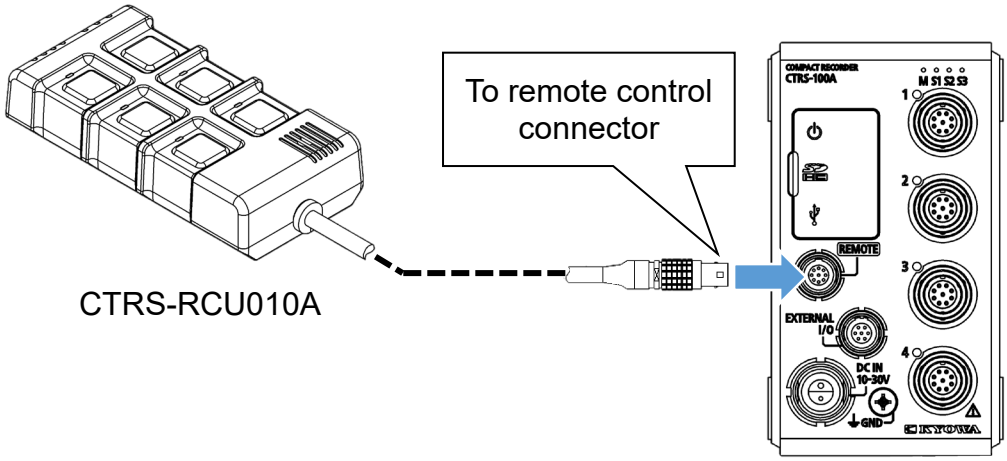


CAUTION

- **The acceptable range for the power supply voltage for the AC adapter is 100 to 240 VAC. Make sure the power supply voltage is within this range.**
- If the power supply voltage is out of the above voltage range, or if each terminal voltage of the power supply has a potential that exceeds the power supply voltage with respect to ground, it may cause a malfunction or accident, so never connect it.
- Be sure to connect the [GND] terminal to ground. Failure to ground the product properly may result in electrical shock, degraded performance, or malfunctions.

2-3-2. Remote control connector

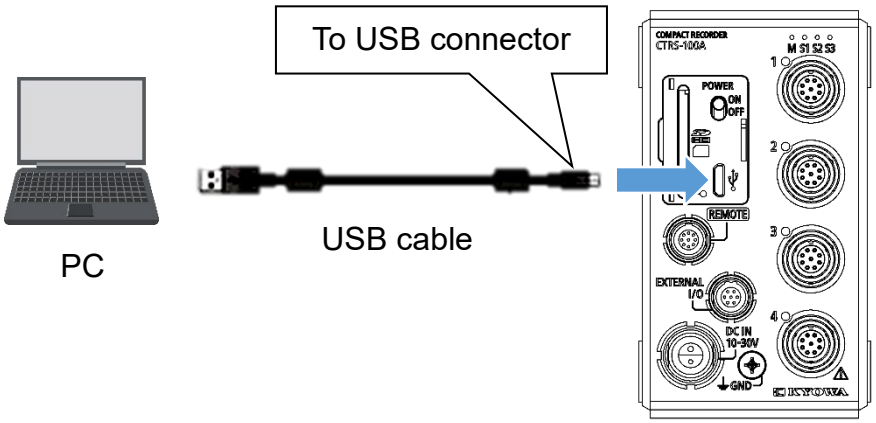
The connector for connecting the remote control unit CTRS-RCU010A.



Connect the CTRS-RCU010A cable to the connector labeled as REMOTE.

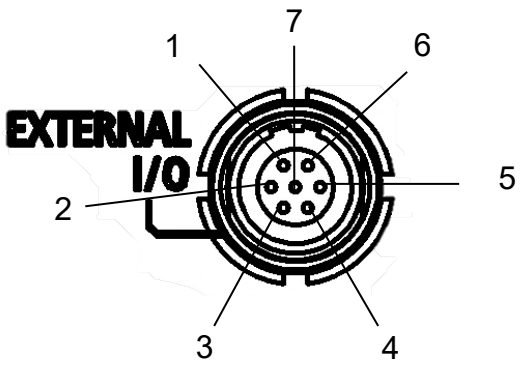
2-3-3. USB connector

When connecting to a PC, use the included USB cable to connect to a USB connector. The USB connector can be found by opening the SD card cover.



2-3-4. External I/O connector

Connect the EXTERNAL I/O cable (optional accessory) to use external I/O functions.
The pin assignments and signals are shown below.
For details on external I/O functions, see "4-4. External I/O" on page 4-21.

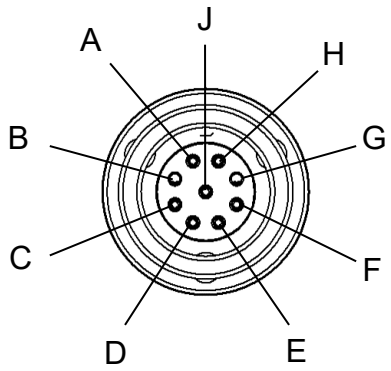


Pin	Signal name	Function outline
1	CLK OUT	Divides and outputs the sampling clock.
2	TRG OUT	Outputs the trigger signal when a trigger occurs.
3	TRG IN	Used during external trigger measurement. Recording is started by inputting a trigger signal.
4	CLK IN	Used if operating this equipment by using an external clock signal.
5	RESERVE	Do not connect anything.
6	RESERVE	Do not connect anything.
7	DCOM	Connected to COM.

2-3-5. Input connector

The input connector pin assignments are shown below.

Note that the CTRS-CDV010A also has the same input connector pin assignments.



Pin	Signal name
A	bridge excitation +
B	input -
C	bridge excitation -
D	input +
E	FG
F	Not connected
G	Not connected
H	TEDS+
J	TEDS-/COM

Strain gage, strain-gage transducer, and voltage measurement are possible.

Each connection method is described below.

NOTE

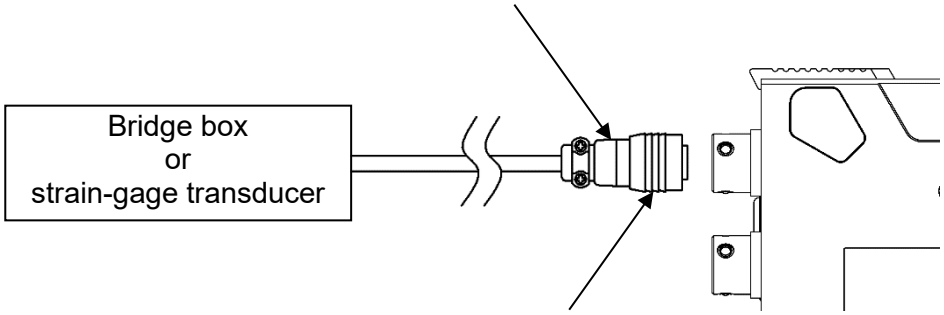
- A separate bridge box is necessary to connect a strain gage.

If using a strain gage or strain-gage transducer

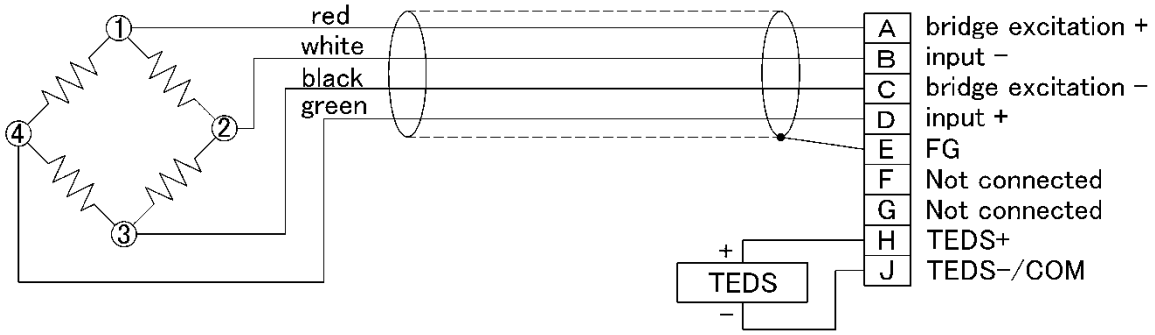
Connect the bridge box or strain-gage transducer output connector as shown in the figure below. If necessary, use the U-136 (optional accessory). Perform monitoring before recording data, and—if there is a lot of noise—try grounding the bridge box grounding terminal or connecting to the CTRS-100A GND terminal and use whichever one has less noise.

If directly connecting a bridge box or strain-gage transducer

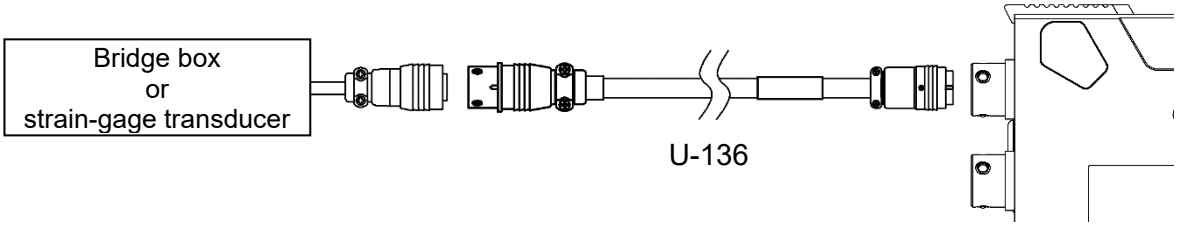
Hold this part and push it in at connection.
It automatically locks.

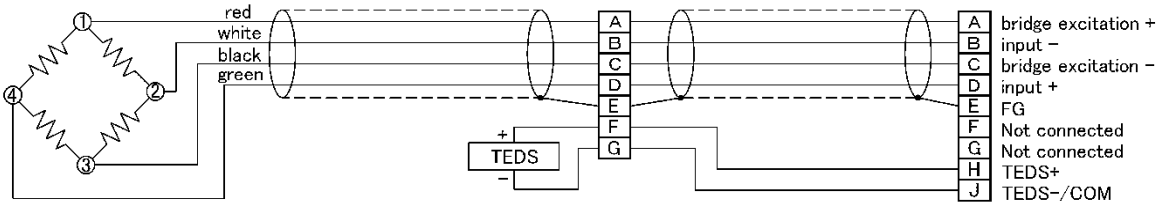


Hold this part and pull it toward you at removal.



If using the U-136 (optional accessory)





CAUTION

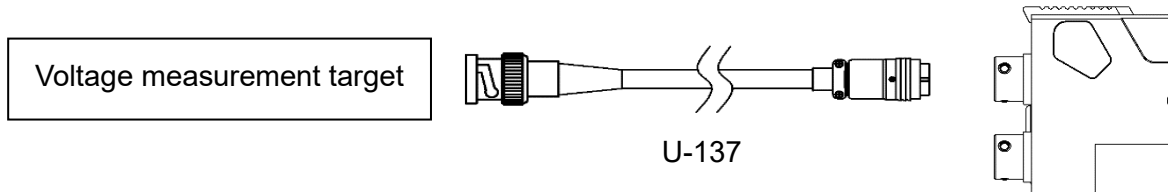
- Never input voltage exceeding the absolute maximum rating. Doing so may cause electric shocks, performance degradation, equipment malfunctions, etc. In the strain measurement mode, the absolute maximum rating of the CTRS-100A and CTRS-CDV010A input is ±5 V.
- When removing the input cable, do not pull on the cable part.
  Applying excessive force to the cable could cause a disconnection, connector breakage, etc.

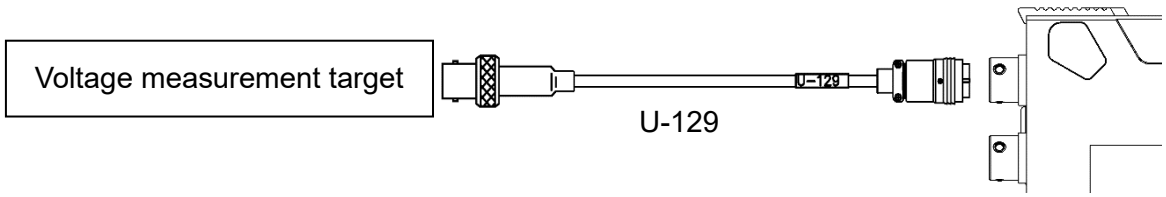
NOTE

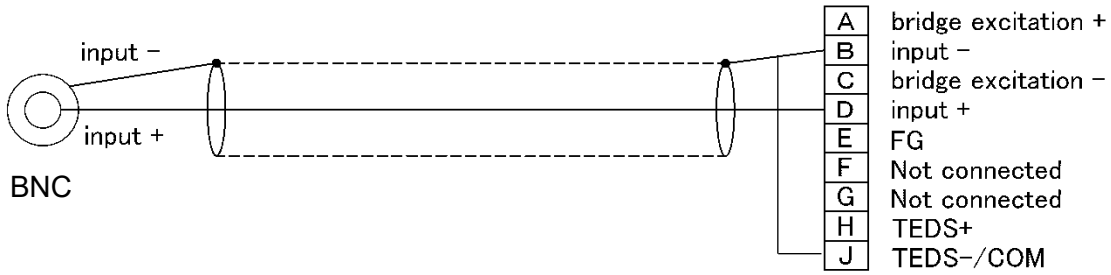
- The H terminal of each CTRS-100A and CTRS-CDV010A channel is the input terminal for TEDS signals. Connecting other signals to this terminal may cause malfunctions.
  - Because the F and A terminals of the simple strain generator CAB-120E and CAB-350E are shorted, they cannot be used in combination with the CTRS-100A and CTRS-CDV010A. In addition, if using the simple strain generator WDS-10, use the connection cable N-03 (optional accessory) to connect it.
  - Transducers with remote sensing cannot be used in combination with this equipment. In the case of such use, insert the extension cable N-81 to N-85 (optional accessory) between the equipment and transducer.

If measuring the voltage

Use the U-137 (optional accessory) or U-129 (optional accessory) as shown in the figure below.







CAUTION

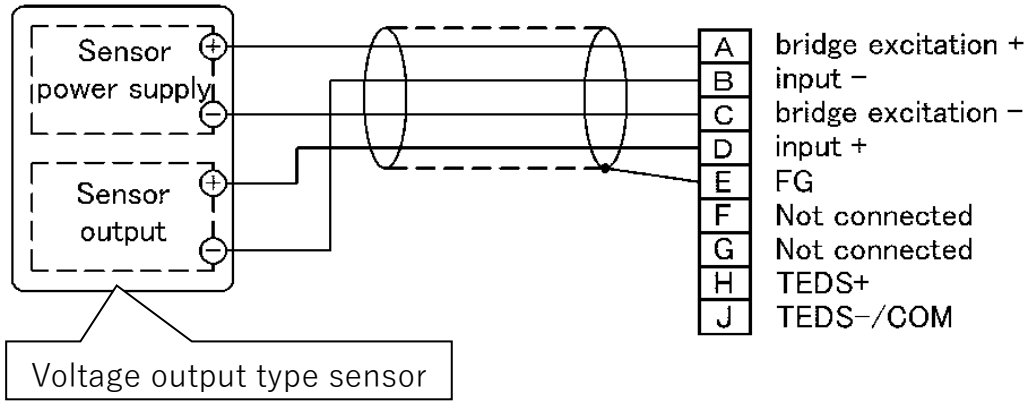
- Never input voltage exceeding the absolute maximum rating. Doing so may cause electric shocks, performance degradation, equipment malfunctions, etc. In the voltage measurement mode, the absolute maximum rating of the CTRS-100A and CTRS-CDV010A input is ±70 V.

When connecting a voltage output type sensor that requires a sensor power supply

Use the bridge excitation as the power supply for the sensor.

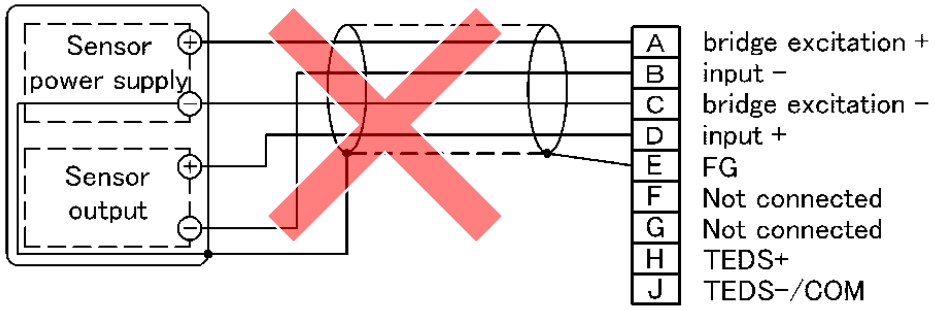
The bridge excitation can be switched between 2 VDC and 5 VDC, and ±1 V / ±2.5 V is output for each GND level.

The maximum output current of the bridge excitation is 20 mA per channel.



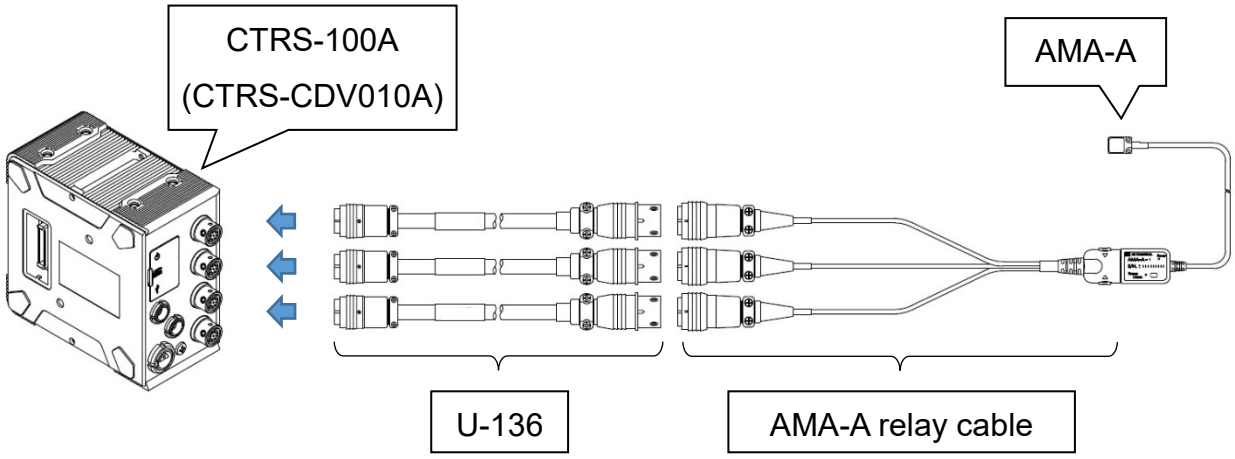
CAUTION

- If the sensor power supply (-) is connected to the case (shield), the sensor may not be able to measure accurately and may cause damage to the instrument. Do not connect.



If connecting the AMA-A series of small-sized triaxial accelerometer

Connect the U-136 (optional accessory) between the AMA-A relay cable and CTRS-100A (or CTRS-CDV010A) as shown in the figure below.



* The figure shows an example of connecting the AMA-A-2 or AMA-A-5.

In addition, in the CTRS-100A analog channel settings, specify measurement mode: voltage (5 V).

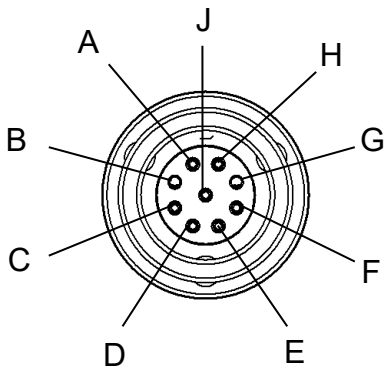
- The AMA-A relay cable differs depending on the capacity.
  For details, see the separate catalog.

2-4. CTRS-CDV010A Wiring Method

The wiring method of CTRS-CDV010A is the same as that of the input connector of CTRS-100A. Refer to "2-3-5. Input connector" on page 2-11.

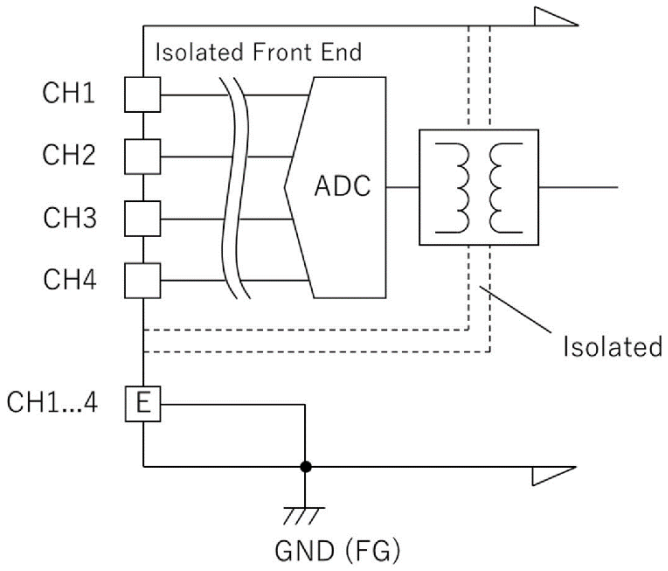
2-5. CTRS-CVPS010A Wiring Method

The input connector pin assignments are shown below.

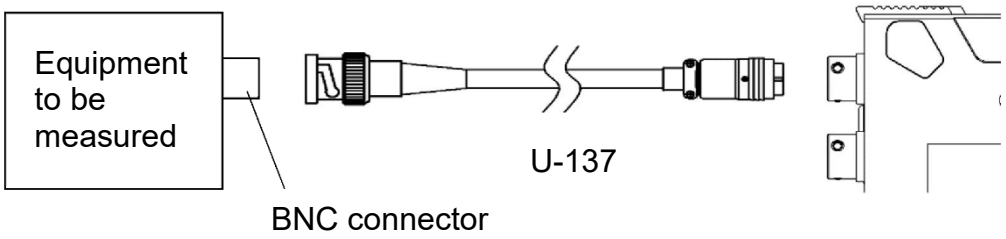


Pin	Signal name
A	sensor power output
B	input -
C	COM
D	input ＋
E	GND(FG)
F	Not connected
G	Not connected
H	TEDS＋
J	TEDS－/COM

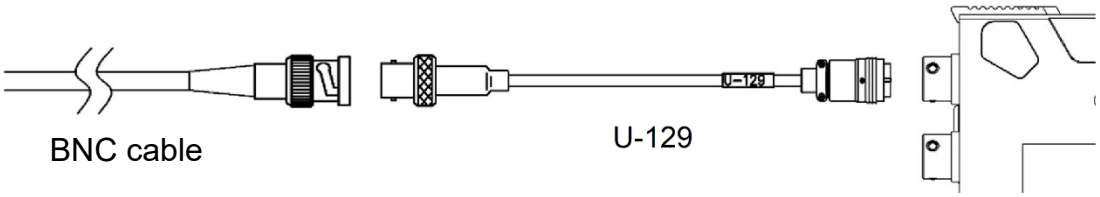
The input circuit of CTRS-CVPS010A is insulated as follows.



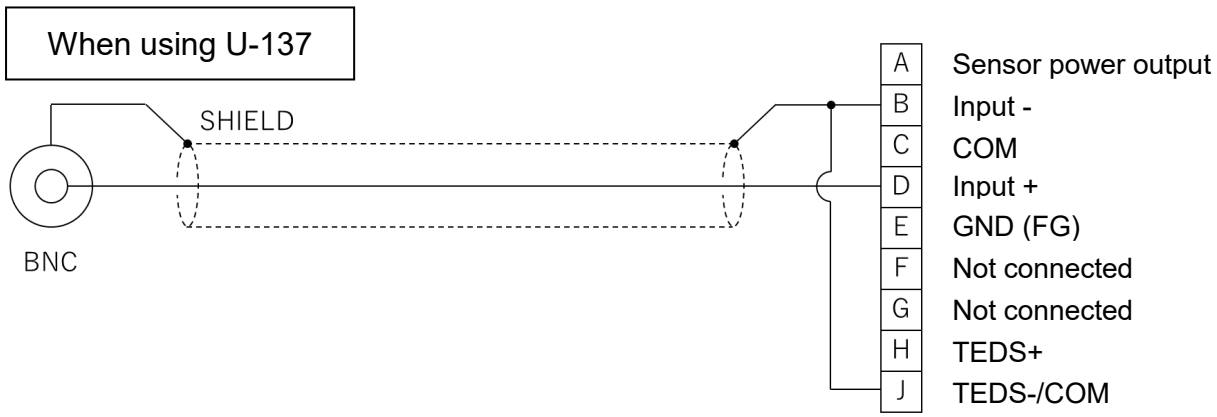
If the output terminal of the device to be measured is a BNC connector, use the 4109P-BNC plug U-137 (optional accessory) to connect to the instrument.

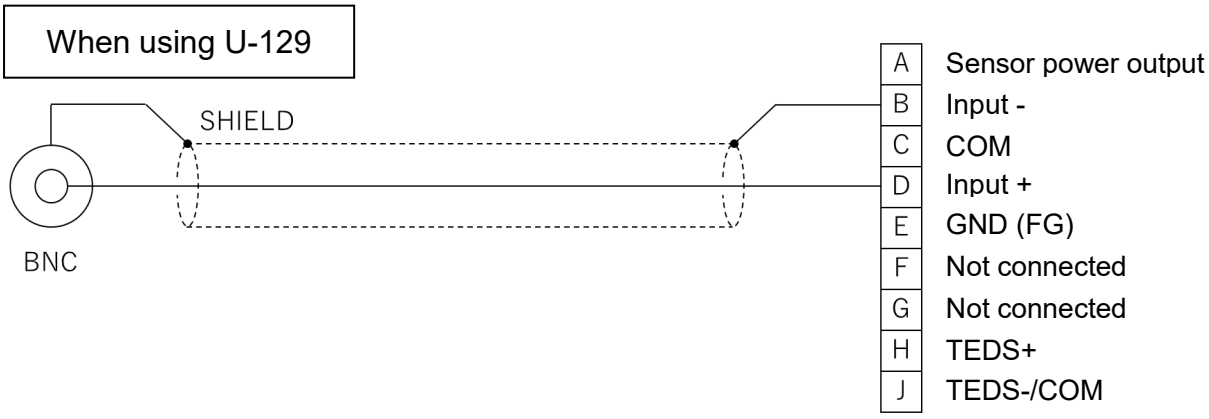


When using a general BNC cable, use the 4109P-BNC jack U-129 (optional accessory) to connect to this unit.

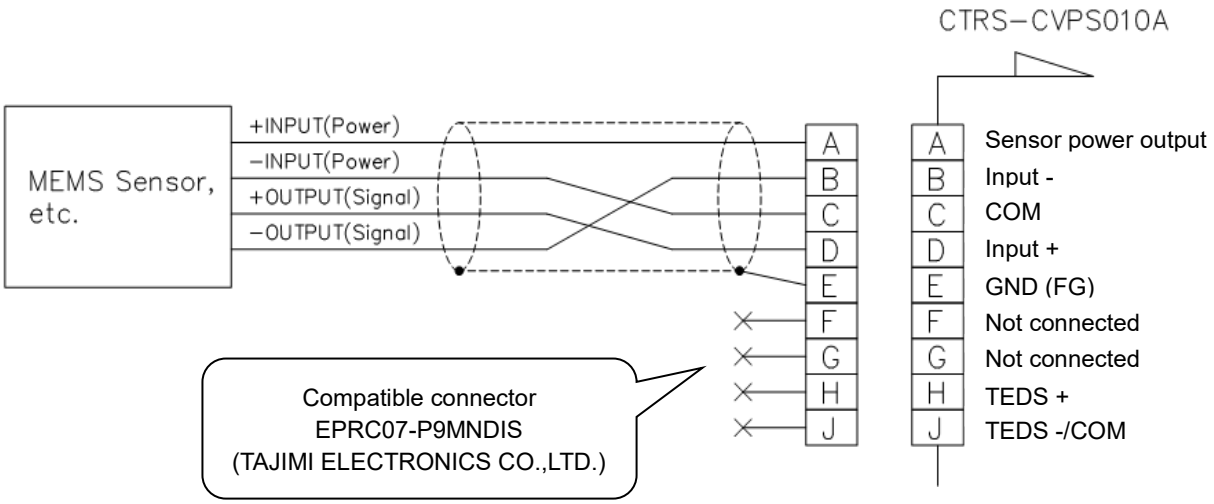


The wiring for BNC connection is as follows.

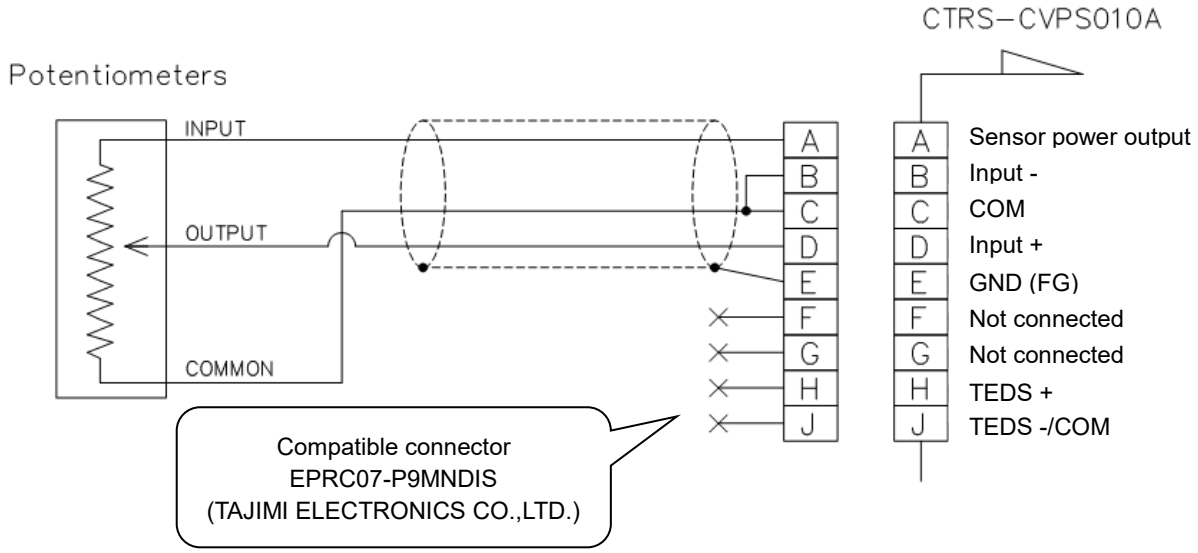




The following is a wiring example for supplying power to a sensor such as a MEMS sensor.
If the connector on the sensor side has 7 pins, use U-136 (optional accessory).



The following is a wiring example when connecting a potentiometer type sensor.
If the connector on the sensor side has 7 pins, use U-136 (optional accessory).



COUTION

- Never input a voltage that exceeds the absolute maximum rating. There is a risk of electric shock, performance degradation, equipment failure, etc. The absolute maximum rating of the + and-inputs of the CTRS-CVPS010A is ± 70 V.

NOTE

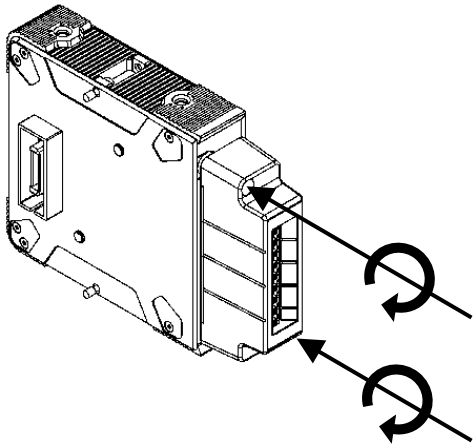
- The maximum output current of the sensor power supply depends on the channel.

  Channels 1 and 2 can output up to 35 mA, and channels 3 and 4 can output up to 15 mA.

2-6. CTRS-CTA010A Wiring Method

2-6-1. Attaching and removing the Temperature measuring adapter

The temperature measuring adapter CT-3A-4 is fixed to CTRS-CTA010A with two hexagon socket head cap screws. Use the ballpoint screwdriver provided with the CTRS-100A or a 2 mm hex wrench to install and remove.

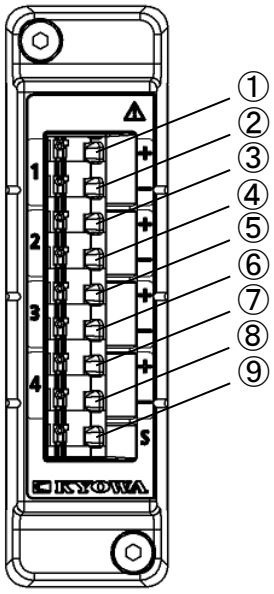


NOTE

- When connecting the thermocouple to the terminal block, remove the temperature measurement adapter from the CTRS-CTA010A.

2-6-2. Connection to terminal block

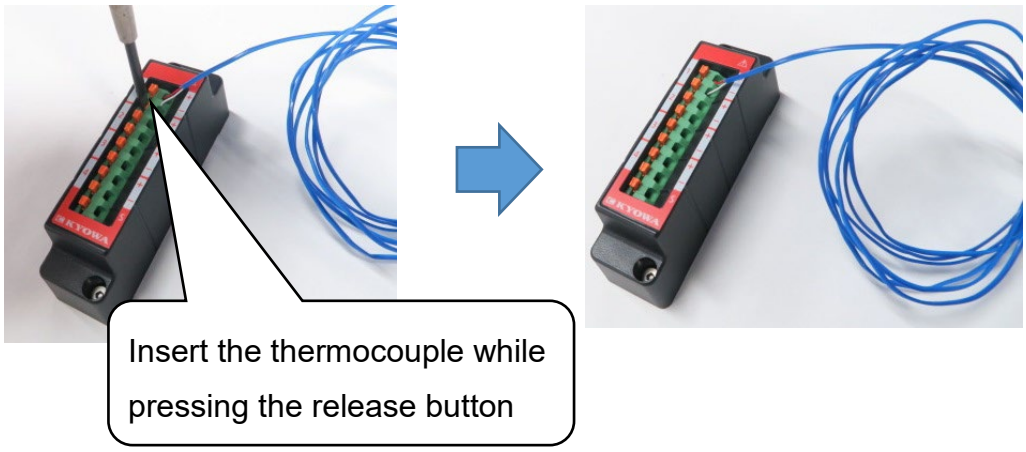
The pin layout of the terminal block is as follows.



Pin	Signal name
①	CH1＋
②	CH1－
③	CH2＋
④	CH2－
⑤	CH3＋
⑥	CH3－
⑦	CH4＋
⑧	CH4－
⑨	SHIELD

If you press the release button on the terminal block with a flat-blade screwdriver, the contacts will open, so insert the thermocouple as it is. Remove the coating on the tip of the thermocouple by about 7 to 8 mm.

When you release the release button, the contacts close and the thermocouple is locked.



NOTE

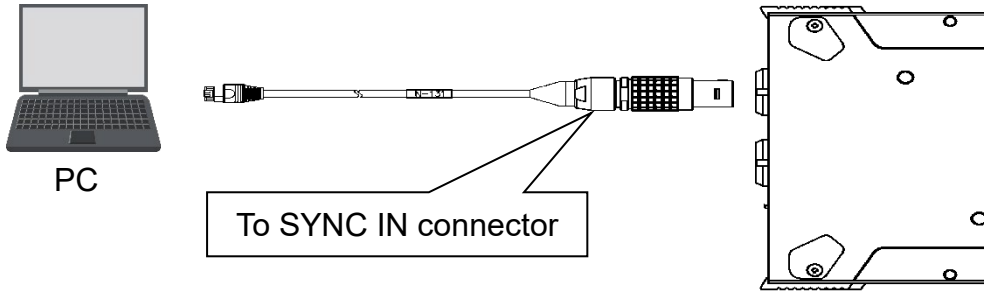
- Make sure that the (+) and (-) of the thermocouple are connected correctly.
- If the core wire protrudes significantly from the terminal block, the internal reference contact accuracy may deteriorate. Remove the coating so that the core wire does not protrude from the terminal block.
- Do not apply excessive force when pressing the release button. The terminal block may be damaged.
- Do not use sharp-edged tools to press the release button. The terminal block may be damaged.
- Do not connect thermocouples other than K, T, J, and N.

- After connecting the thermocouple to the terminal block, it takes about 15 minutes for the contacts with the terminal block to reach temperature equilibrium. After connecting the thermocouple, allow time for the temperature to reach equilibrium before starting measurement.
- The output may not be stable if the thermocouple is moving due to the influence of wind, etc., or if the terminal block is exposed to wind. Securely fix the thermocouple so that it does not move, and take measures such as installing a windshield so that the terminal block is not exposed to wind.
- Since the channel to which the thermocouple is not connected is in the open state, the measured value is indefinite. Turn off channels that are not measured.

2-7. CTRS-SYNC010A Wiring Method

2-7-1. SYNC IN connector

If connecting a LAN, use the CTRS communication cable N-131 (optional accessory) as shown in the figure below.



CAUTION

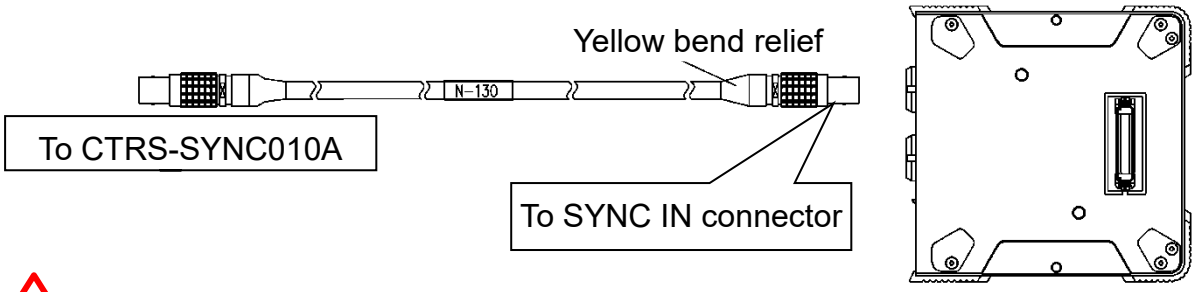
- When removing the CTRS communication cable, do not pull on the cable part. Applying excessive force to the cable could cause a disconnection, connector breakage, etc.

NOTE

- Using a LAN cable other than the recommended product or an RJ-45 extension connector may cause unstable LAN communication.

- The length of the cable between the PC and CTRS-SYNC010A can be extended to approximately 50 m by using the CTRS communication cable N-131, the recommended LAN cable, and an RJ-45 extension connector.

If performing synchronous recording, use the CTRS Sync cable N-130 (optional accessory) as shown in the figure below.

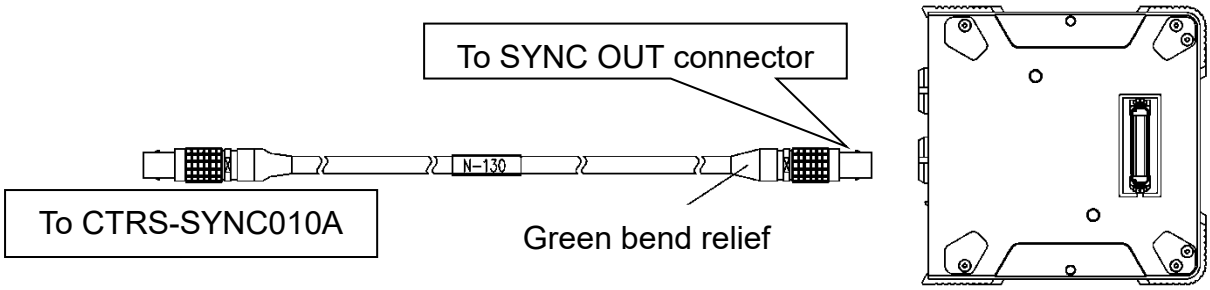


CAUTION

- Be sure the CTRS-100A power is off before inserting or removing the synchronous cable. If the power is on when this is done, it may cause the CTRS-SYNC010A to malfunction.
- When removing the cable, do not pull on the cable part.
  Applying excessive force to the cable could cause a disconnection, connector breakage, etc.

2-7-2. SYNC OUT connector

If performing synchronous operation, use the synchronous cable N-130 (optional accessory) as shown in the figure below.

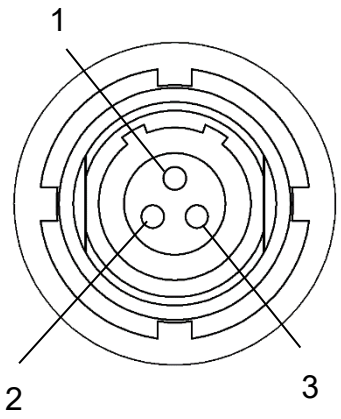


CAUTION

- Be sure the CTRS-100A power is off before inserting or removing the CTRS sync cable. If the power is on when this is done, it may cause the CTRS-SYNC010A to malfunction.
- When removing the cable, do not pull on the cable part.
  Applying excessive force to the cable could cause a disconnection, connector breakage, etc.

2-8. CTRS-CAG010A Wiring Method

The pin layout of the CAN input connector is as follows.

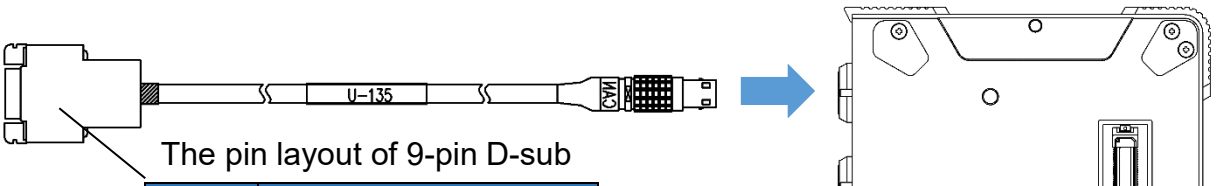


Pin	Signal name
1	CAN_H
2	CAN_L
3	CAN_GND

Model name: ECB 1B 303 CLN

Manufacture: LEMO

It can be converted to 9-pin D-sub by using the CTRS CAN cable 9-pin male D-sub U-135 (optional accessory).



The pin layout of 9-pin D-sub

Pin	Signal name
2	CAN_L
3	CAN_GND
7	CAN_H

* The rest of the pins are all NC.

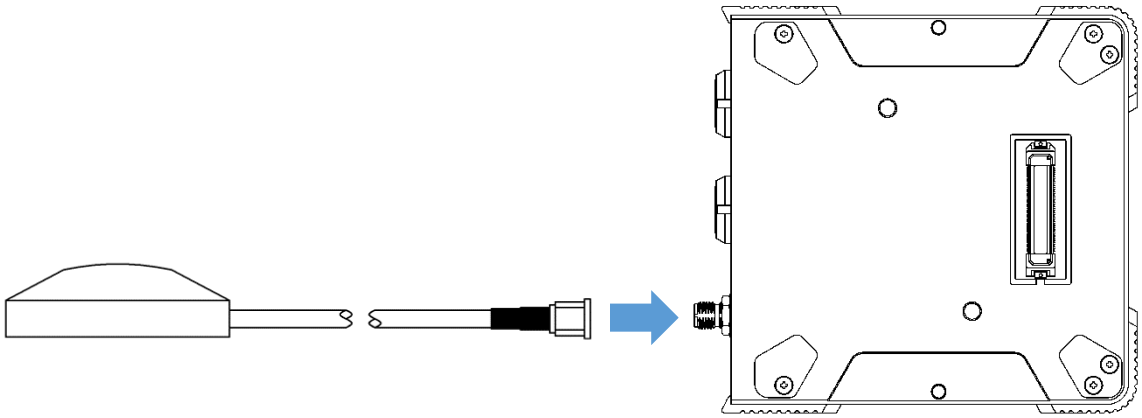
CAUTION

- When disconnecting the CAN cable, do not pull on the cable part. If excessive force is applied to the cable, it may cause disconnection or connector damage.

2-9. CTRS-CAG011A Wiring Method

The wiring method for the CAN input connector of the CTRS-CAG011A is the same as that for the CAN input connector of the CTRS-CAG010A. See "2-8.CTRS-CAG010A Wiring Method" on page 2-26.

Connect a GPS antenna to the GPS connector.



CAUTION

- When removing the GPS antenna, do not pull on the cable part. Applying excessive force to the cable may break the wire or damage the connector.

NOTE

- Do not use a GPS antenna other than the one specified by our company. Do not extend the antenna cable. This may reduce the sensitivity of satellite reception and prevent positioning.

- The GPS antenna should be located away from tall buildings and trees, with a clear view of the sky (no obstructions around the GPS antenna), so that more satellites can be captured. In cloudy or rainy weather, satellite reception sensitivity may be reduced.

2-10. CTRS-BATT010A Wiring Method

2-10-1. Power connector

Charge the battery by connecting an external power supply.
Follow the procedure below to connect the power supply.

If using a DC power cable

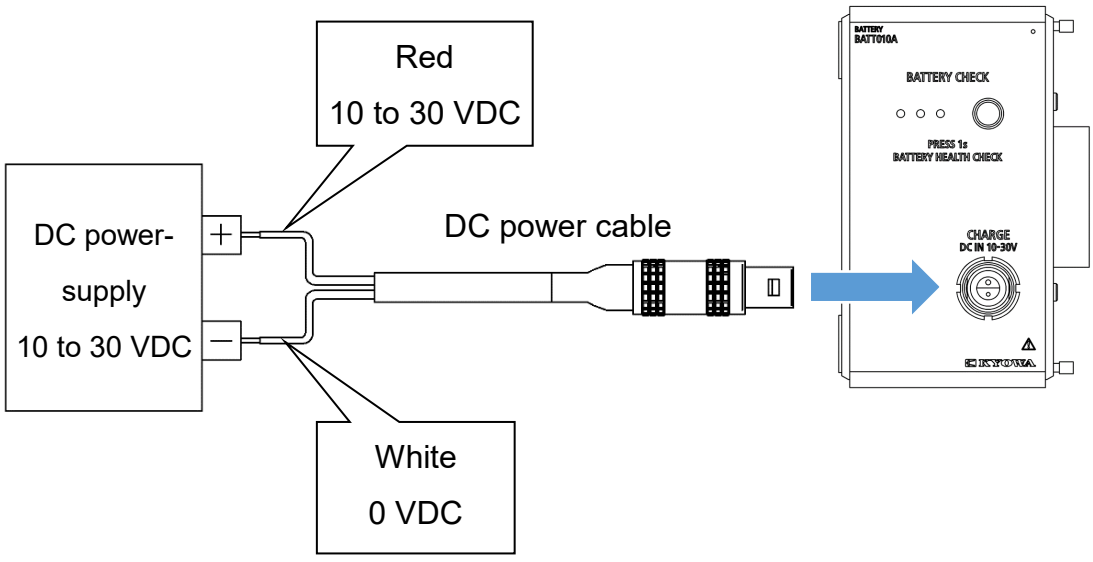
Connect the loose-wire side of the DC power cable to a DC power supply (or external battery).

Before connecting the DC power cable, check the voltage of the DC power supply (or external battery) to be used.

CAUTION

- The input power range of the CTRS-BATT010A is 10 to 30 VDC. Input outside this range can cause failures or malfunctions, so do not do this.

Connect the DC power supply cable connector to the CTRS-BATT010A power connector. Insert the connector all the way in.



If using an AC adapter (optional accessory: UIA345-12-L-JP or UNI345-1238-L-US)

Insert the AC adapter outlet plug into an outlet.

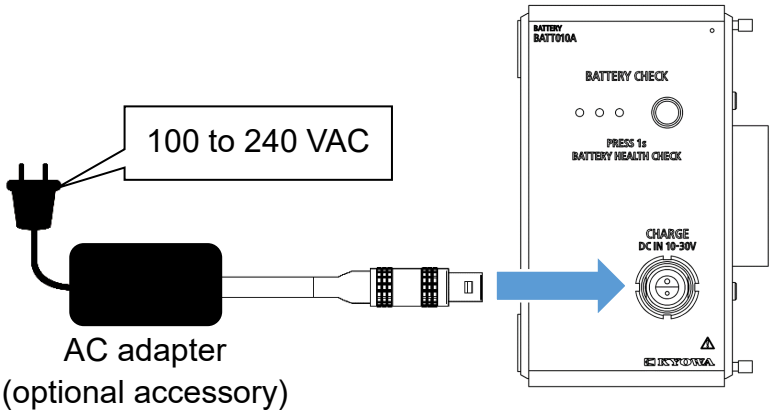
Before connecting the AC adapter outlet plug to an AC outlet, check the power supply voltage.

CAUTION

- The power-supply voltage range of the AC adapter is 100 to 240 VAC. Be sure to stay within this range.
- If the power supply voltage is outside the above range, it could cause malfunctions or accidents, so never connect such voltage.

Connect the AC adapter connector to the CTRS-BATT010A power connector.

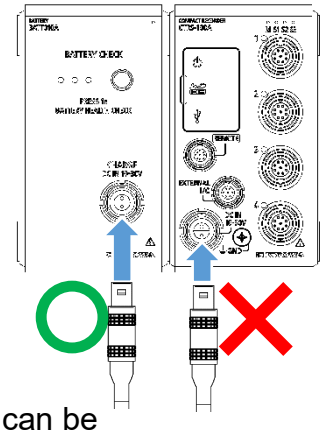
Insert the connector all the way in.



AC adapter
(optional accessory)

NOTE

- If operating a system connected to the CTRS-100A, the CTRS-BATT010A is not charged even if external power is connected to the CTRS-100A power connector. Connect external power to the CTRS-BATT010A power connector during use.
- By connecting external power to the CTRS-BATT010A, the system can be operated while charging the battery, and the CTRS-BATT010A can be used as standby power. For details, see "5-1-2. Data protection function during power interruption" on page 5-2.



2-11. Connecting to a PC

USB is used as the interface to connect to a PC. A LAN interface can also be used by using the CTRS-SYNC010A and the CTRS communication cable N-131 (optional accessory).

2-11-1. USB connection

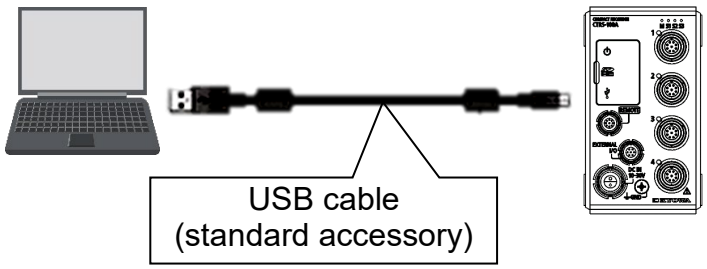
Setting up the USB driver

To achieve control by using a USB interface, it is necessary to set up the USB driver for the CTRS-100A on the PC.

When setting up the control software, set up the USB driver for the CTRS-100A at the same time. For details, see the instruction manual “FOR USB DRIVER SET-UP”.

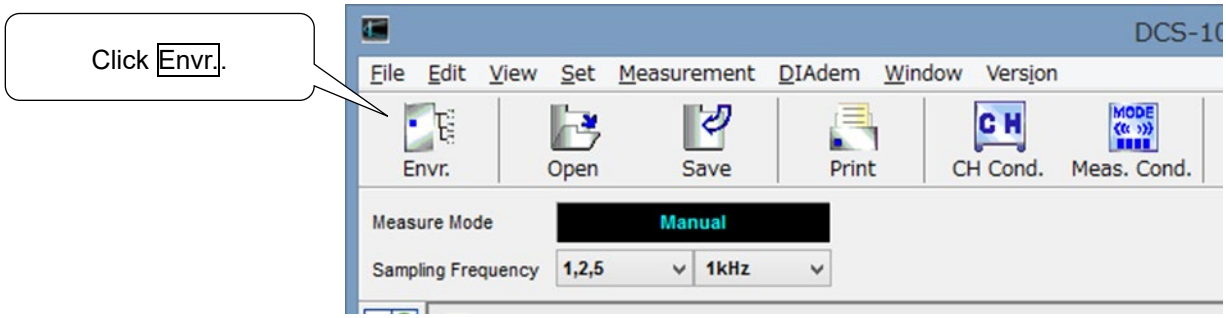
Connecting to a PC

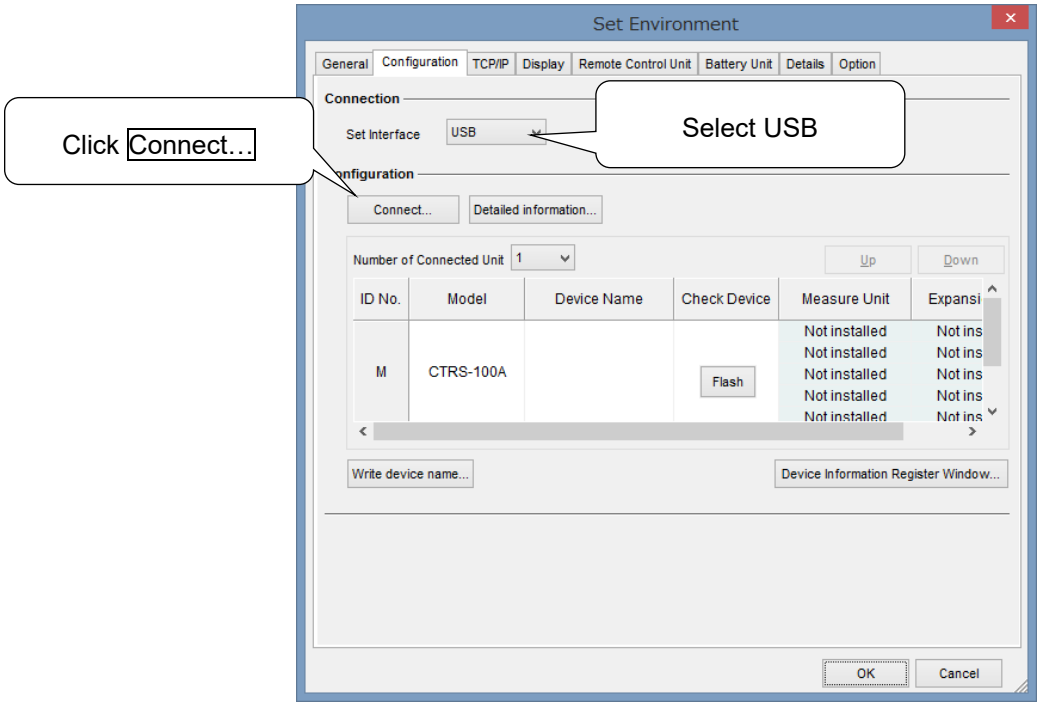
Connect the CTRS-100A to a PC by using the included USB cable.



Start up the control software, select CTRS-100A, and then click Select.

Click the Envr., Select the USB in the control interface of the Configuration tab, and then click the Connect….





2-11-2. Wired LAN connection

Initializing the interface

To control the CTRS-100A by using a LAN interface, it is necessary to first set the network conditions.

- The factory default network conditions for the CTRS-100A are as follows:

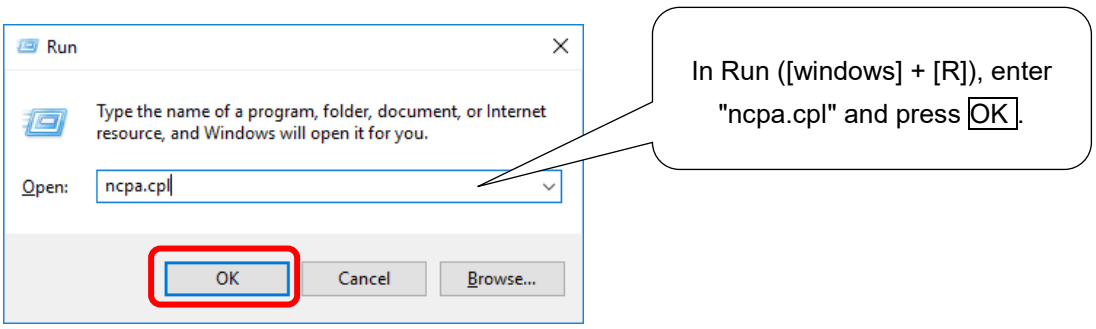
  IP address : 192.168.70.100

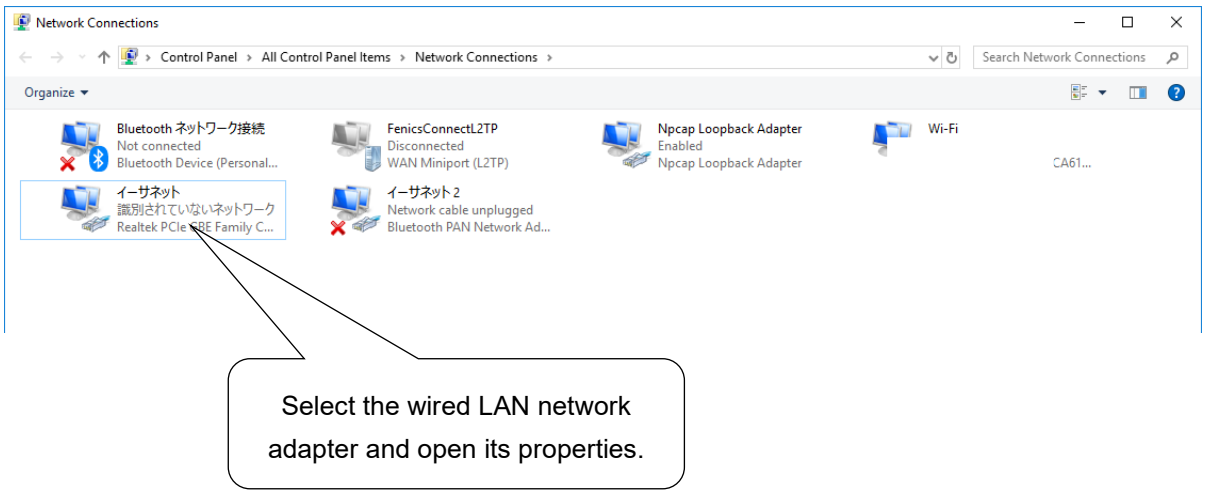
  Subnet mask : 255.255.255.0

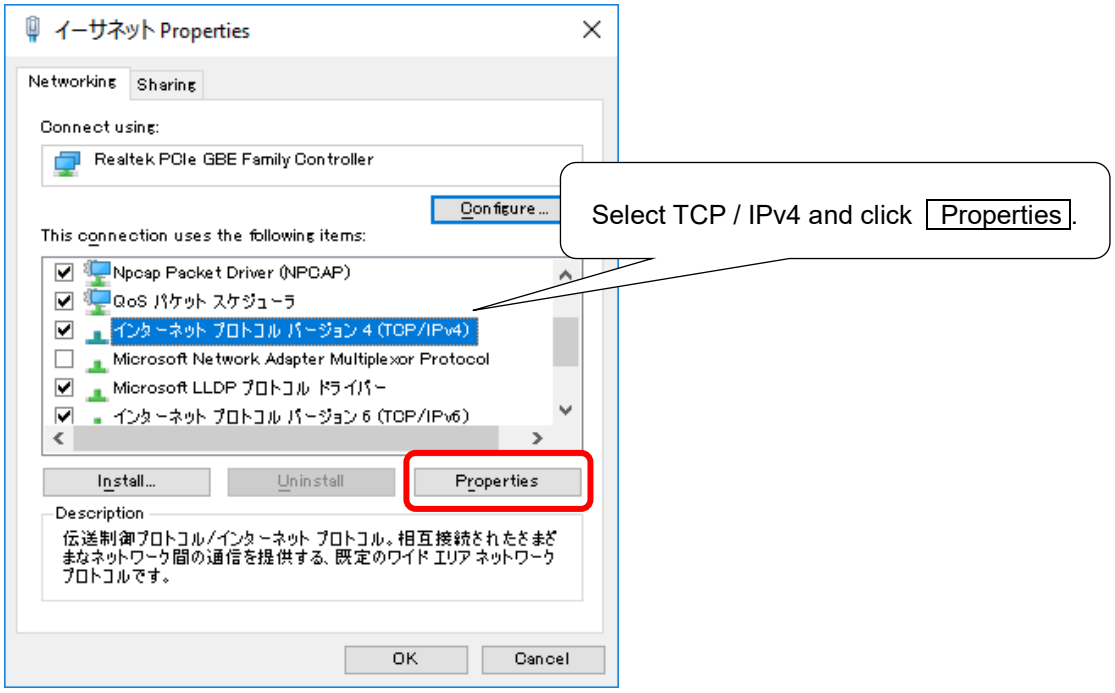
  Default gateway : 0.0.0.0

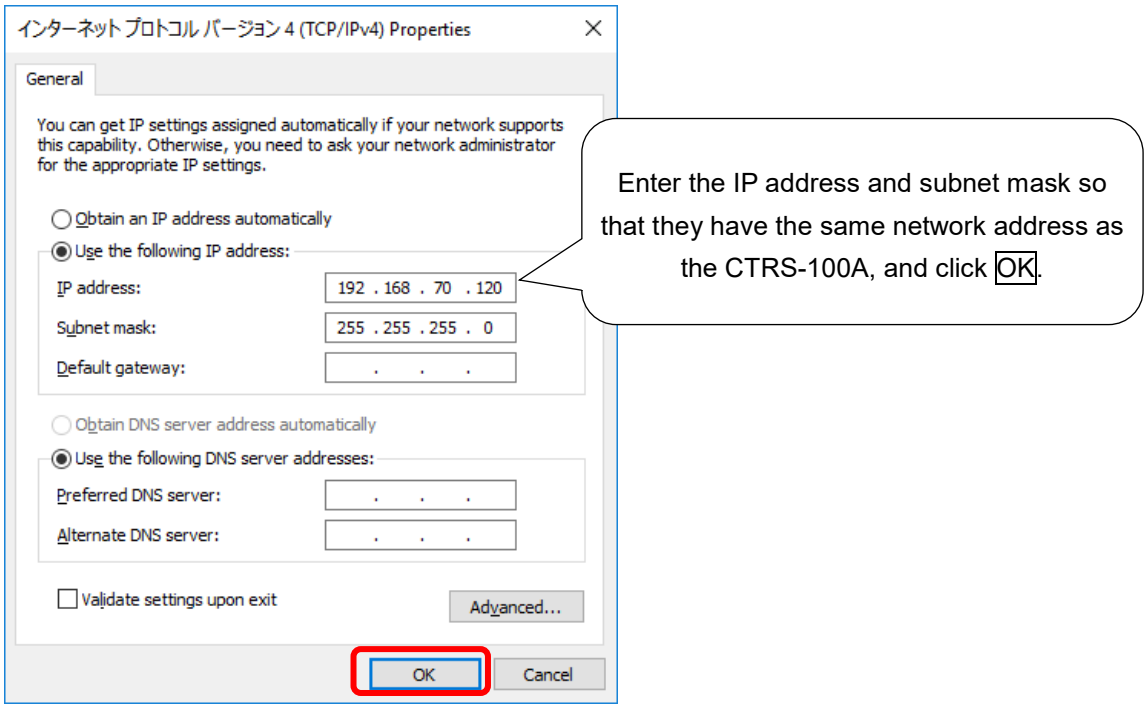
The method for setting network conditions on the PC side is shown below.

In order to connect to the CTRS-100A via LAN, it is necessary to manually set the IP address on the personal computer so that it has the same network address as the CTRS-100A.









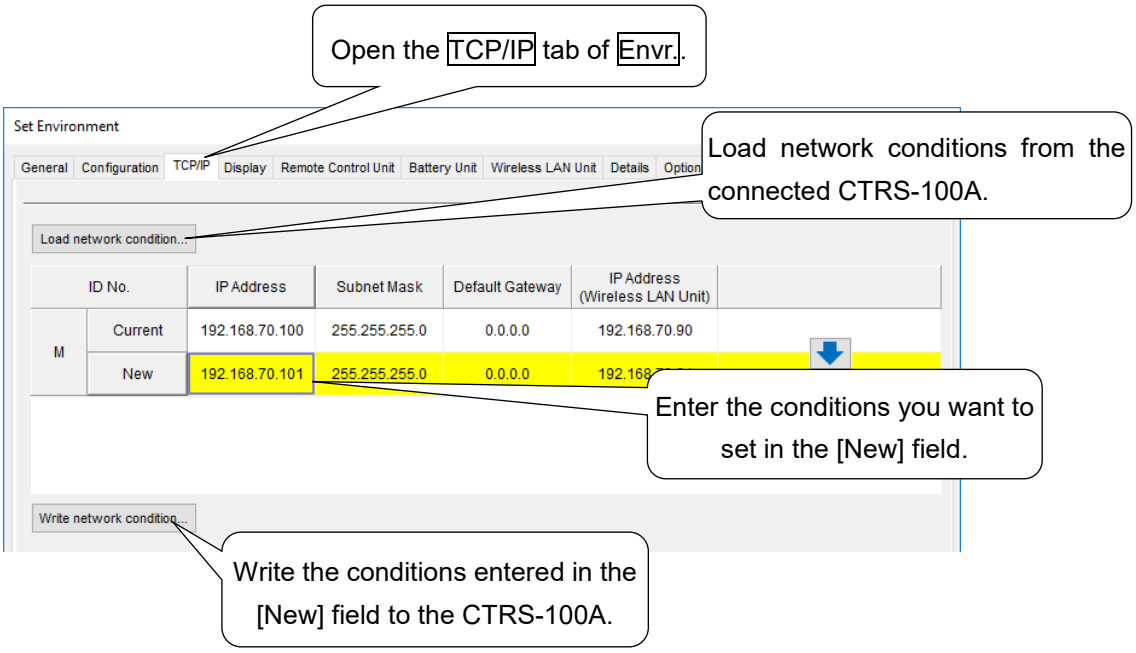
NOTE

- Communication is not possible if the IP address of the connected CTRS-100A and the personal computer are duplicated. Please set so that they do not overlap.

The following three methods can be used to set the CTRS-100A network conditions.

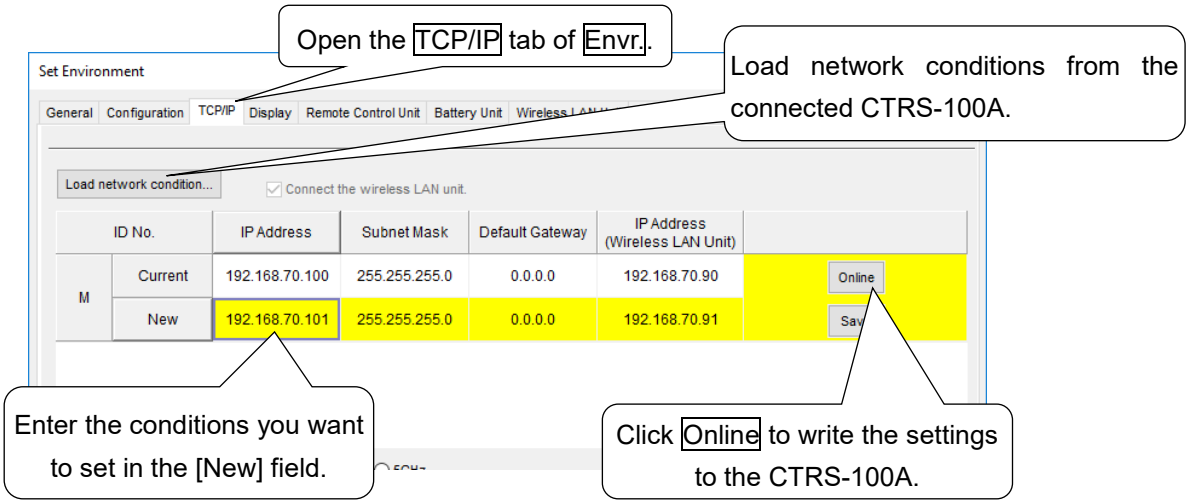
① Setting the conditions via a USB interface

This method involves temporarily setting the interface to USB, connecting the CTRS-100A, and then setting the network conditions. For details, see the Instruction manual for control software DCS-100A [CTRS-100A Operations] Items related to TCP / IP settings in "4 ENVIRONMENT SETTINGS".



② Setting the conditions via a LAN interface

This method involves actually performing LAN communication to set the network conditions. The CTRS-SYNC010A is necessary when setting the conditions. For details, see the control software instruction manual.



③ Setting the conditions offline

This method involves reading a network setting file on an SD card to set the network conditions. The CTRS-RCU010A is necessary when setting the conditions. The method for creating a network configuration file is shown below. See page 2-37 “Setting network conditions” for the procedure for setting network conditions.

Creating a network setting file

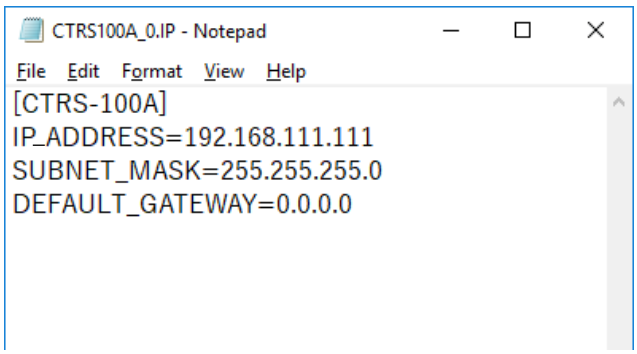
The following describes the method for creating a network setting file without using the control software.

(Step 1) Use Notepad or other text editor software to create a file that has the details below. Input suitable values for the IP address, subnet mask, and default gateway according to the network being used.

Detail

```
[CTRS-100A] ↲
IP_ADDRESS=192.168.111.111 ↲
SUBNET_MASK=255.255.255.0 ↲
DEFAULT_GATEWAY=0.0.0.0 ↲
```

Example

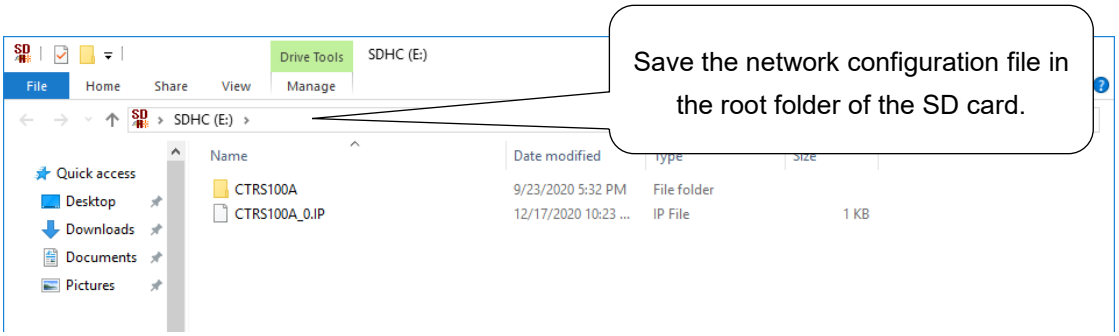


(Step 2) Assign a file name to the created text. Set the file name according to the equipment ID. See the table below when assigning the file name.

File name

Equipment ID	File name
Master	CTRS100A_0.IP
Slave 1	CTRS100A_1.IP
Slave 2	CTRS100A_2.IP
Slave 3	CTRS100A_3.IP

(Step 3) Save the created network setting file to the CTRS-100A SD card used to set up the network. Save the file in the SD card root folder.



NOTE

- Use CR(0x0D) + LF(0x0A) as the newline character. In addition, input only capitalized, single-byte alphanumeric characters, and do not input spaces or tabs.
- If connected CTRS-100A and the PC have duplicate IP addresses, communication will not be possible. Do not specify duplicate settings.

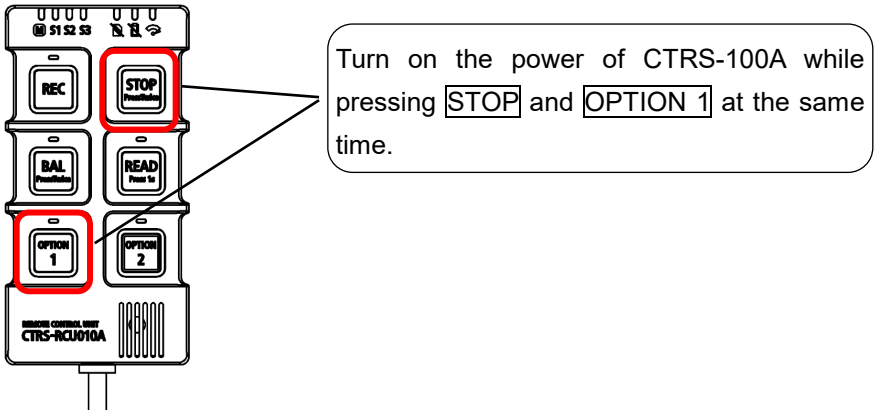
- Set the equipment ID for the synchronization unit.
  If no synchronization unit is connected, the equipment ID is master.
- The network setting file can be written from the control software. For details, see the Instruction manual for control software DCS-100A [CTRS-100A Operations] Items related to TCP / IP settings in "4 ENVIRONMENT SETTINGS".

Setting network conditions

The following describes the method for setting network conditions without using the control software.

(Step 1) Insert the SD card on which the network setting file is saved into the CTRS-100A SD card slot. At this time, connect the remote control unit CTRS-RCU010A to the CTRS-100A.

(Step 2) Hold down the CTRS-RCU010A STOP button and OPTION 1 button simultaneously as you turn on the CTRS-100A power switch.



(Step 3) If you simultaneously press the STOP button and the OPTION 1 button for a while, the CTRS-RCU010A buzzer sounds, all the LEDs light up in blue, and reading the network setting file finishes. After confirming this, release the STOP button and the OPTION 1 button.

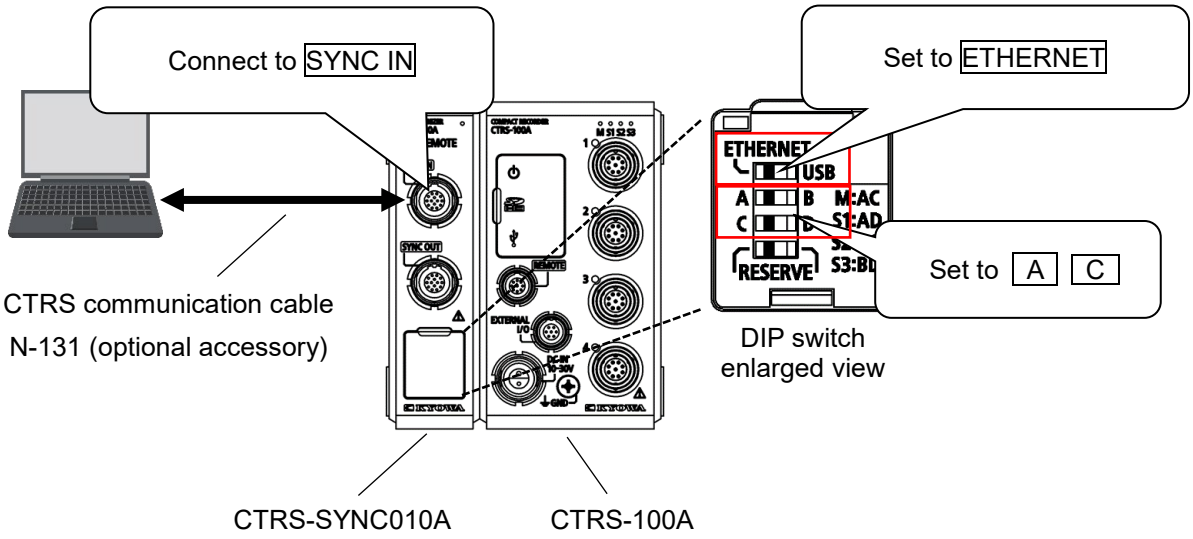
(Step 4) After the above operation, turn off the power supply and then turn it back on.

NOTE

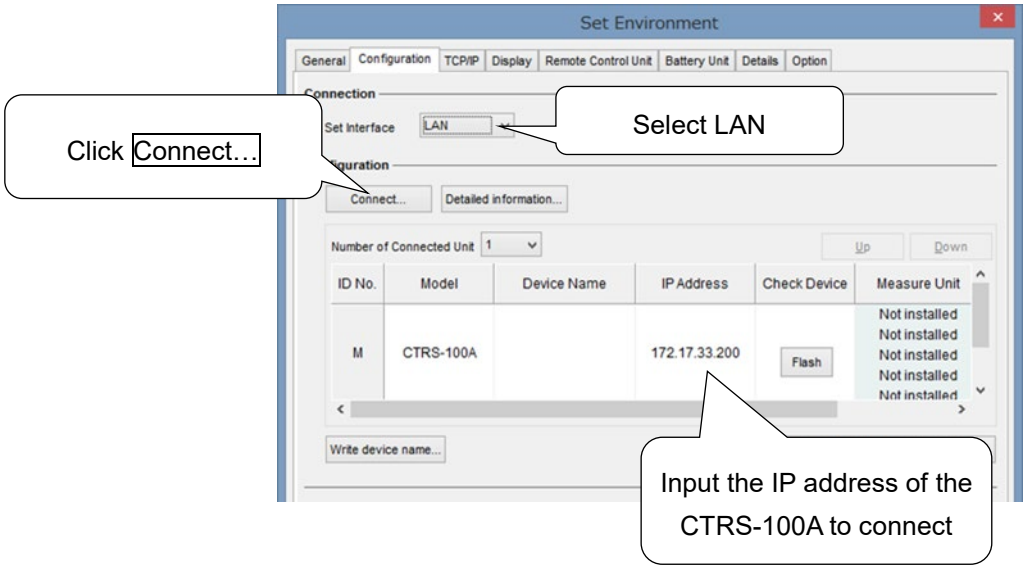
- After reading the network setting file, the settings will not be applied unless the power is turned off and back on, so be careful.
- If reading the network setting file fails, the CTRS-RCU010A buzzer will continuously sound, and all the LEDs will flash red. If a failure occurs, check the details of the network setting file, revise them, and try again (from step 1).
- Individually set up the network offline for each unit. If using multiple CTRS-100As, such as during synchronous operation, prepare a separate network setting file for each CTRS-100A, and then specify the settings for each unit by performing the above steps.

Connecting to a PC

Connect the CTRS-100A and CTRS-SYNC010A. For details on the connection method, see "2-2. Unit Connection" on page 2-2. After achieving connection, connect the CTRS-SYNC010A and PC by using the CTRS communication cable N-131.



Start up the control software, click the Envr., select the LAN in the interface of the Configuration tab. And then input the CTRS-100A IP address in the IP address field. Next, click Connect…



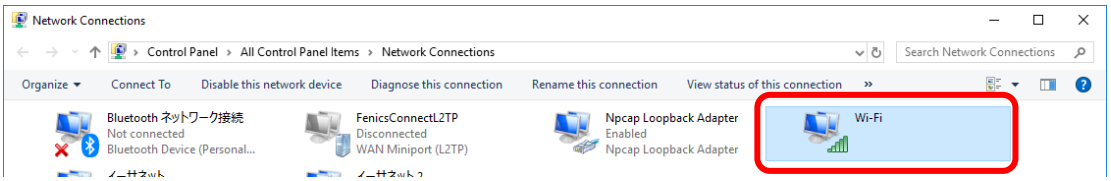
2-11-3. Wireless LAN connection

Initializing the interface

In order to control the CTRS-100A with the LAN interface, it is necessary to set the network conditions of the CTRS-100A and the connected personal computer in advance. The setting method is the same as for wired LAN. Refer to "2-11-2. Wired LAN connection" on page 2-32.

- With the default settings, the IP address of the wireless LAN unit is automatically assigned based on the CTRS-100A address. The value obtained by subtracting 10 from the address of CTRS-100A is the IP address of the wireless LAN unit.

  Ex. IP address of CTRS-100A : 192.168.70.100
  IP address of the wireless LAN unit : 192.168.70.90
- You can set any IP address to the wireless LAN unit by using the CTRS-100A network utility software. The CTRS-100A network utility software is distributed on our website.
- For the IP address setting on the personal computer side, select the wireless LAN network adapter.

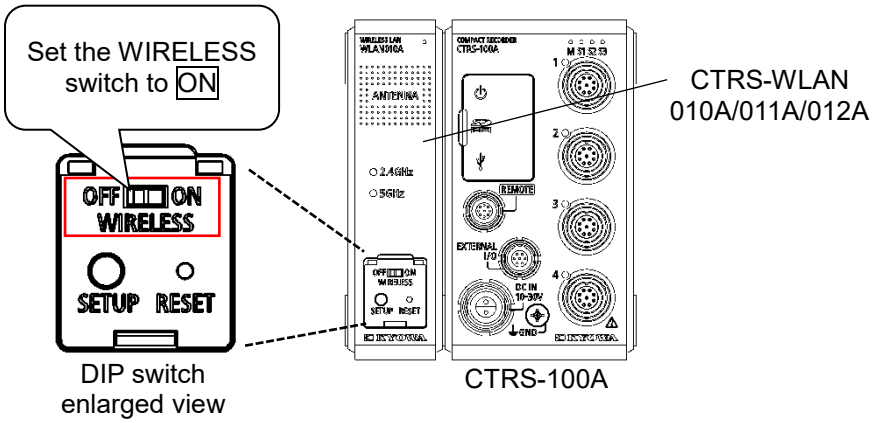


Connecting to a PC

This section describes how to connect your computer and CTRS-100A via wireless LAN.

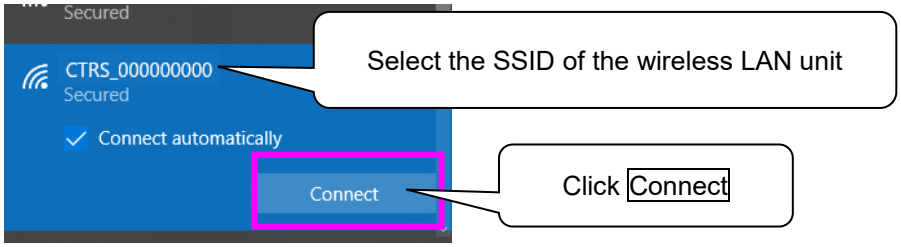
(Step 1) Connect CTRS-100A and CTRS-WLAN010A / 011A / 012A. For the connection method, refer to "2-2 Unit Connection" on page 2-2.

(Step 2) After connecting, check that the WIRELESS switch of CTRS-WLAN010A / 011A / 012A is ON, and then turn on the power of CTRS-100A.

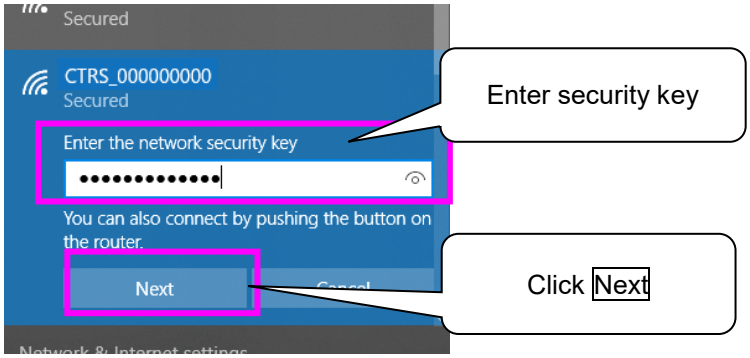


(Step 3) Operate your computer and click the network icon in the task tray to display the connection destination list.

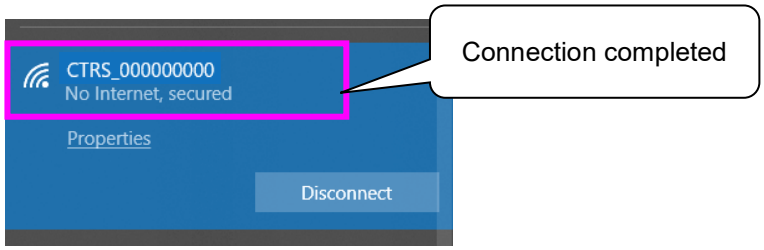
(Step 4) Select the network name (SSID) of CTRS-WLAN010A / 011A / 012A in the connection destination list, and click the connect button.



(Step 5) The security key input screen is displayed. Enter the security key and click the Next button.



(Step 6) When you enter the security key, the connection process will be performed. The connection will be completed after a while.



NOTE

- USB connection is not possible when the WIRELESS switch of the wireless LAN unit is ON. When making a USB connection, turn off the WIRELESS switch and restart.
- A reboot is required for the WIRELESS switch operation to take effect. After changing the switch, turn the power of CTRS-100A off and then on again.

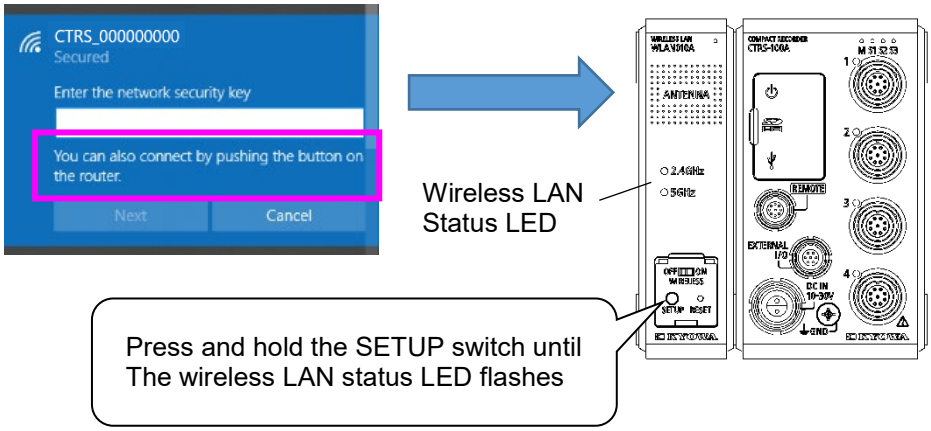
- The default settings for the SSID and security key are printed on the name sticker affixed to the side of CTRS-WLAN010A / 011A / 012A.
- If your computer supports WPS (Wi-Fi Protected Setup), you can use the easy connection function to omit entering the security key. See page 2-43 for how to use the easy connection function.
- After connecting, the network display will show "No Internet" or "Unidentified network", but this is because there is no function to connect to the Internet. There is no problem with the operation of CTRS-100A, so you can use it as it is.

About "Easy connection function"

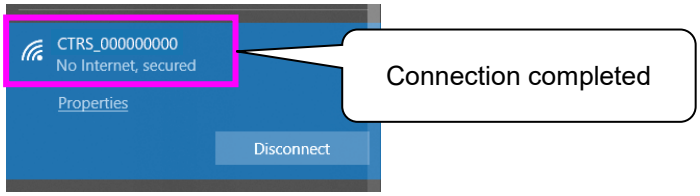
Easy connection function is a method of connecting using WPS (Wi-Fi Protected Setup).

- Easy connection function is equivalent to WPS 2.0.

(Step 1) On the security key input screen, when the message "You can also connect by pushing the button on the router." is displayed, press and hold the SETUP switch on CTRS-WLAN010A / 011A / 012A. Release the switch when the wireless LAN status LED changes to blinking.



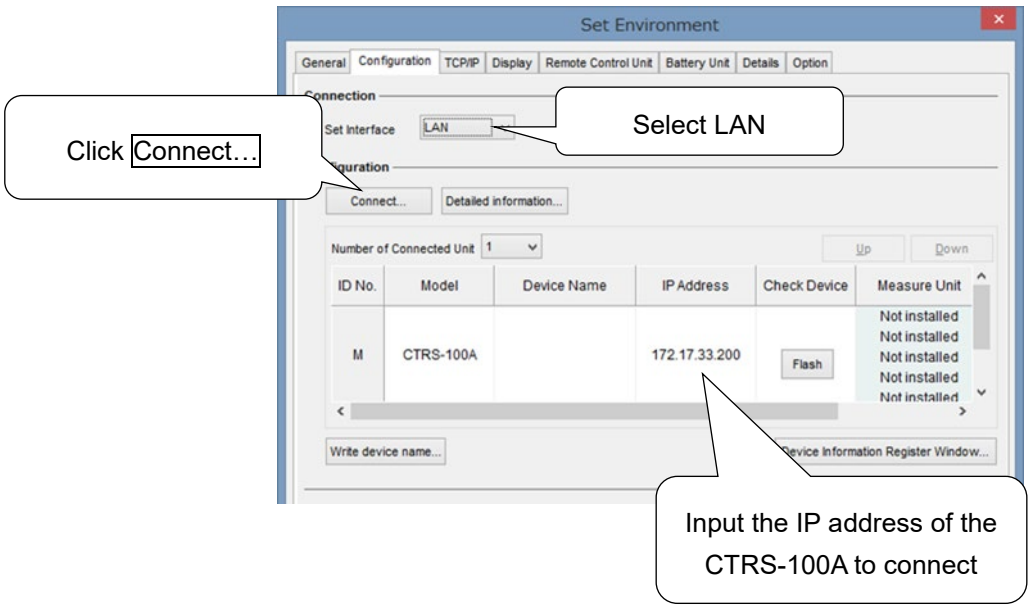
(Step 2) After the security key replacement process is complete, the wireless LAN status LED will stop blinking and turn on. After a while, the connection will be completed.



NOTE

- If the security method of the wireless LAN unit is set to WPA-PSK (AUTO / TKIP), the "Easy connection function" cannot be used.
- If your computer does not support WPS, you cannot use the "Easy connection function".

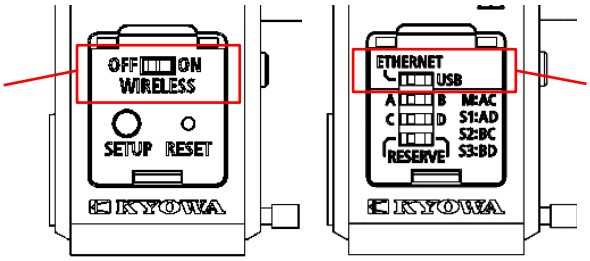
Start the control software when the wireless LAN connection is completed.
Click Environment Settings, select Control Interface: LAN on the Device Configuration tab, and select.Enter the IP address of CTRS-100A in the IP address field.
Then click Connect.



About selection of communication interface

When using the wireless LAN unit and the synchronization unit at the same time, select the interface to connect to the personal computer by setting the DIP switches installed in each unit.

[Wireless LAN unit]
WIRELESS Switch



[Synchronization unit]
ETHERNET／USB switch

・When connecting with a USB

Set the ETHERNET / USB switch to [USB] before turning on the power. Communicates via USB regardless of the WIRELESS switch setting.

・When connecting with a wired LAN

Set the WIRELESS switch to [OFF] and the ETHERNET / USB switch to [ETHERNET] before turning on the power.

・When connecting with a wireless LAN

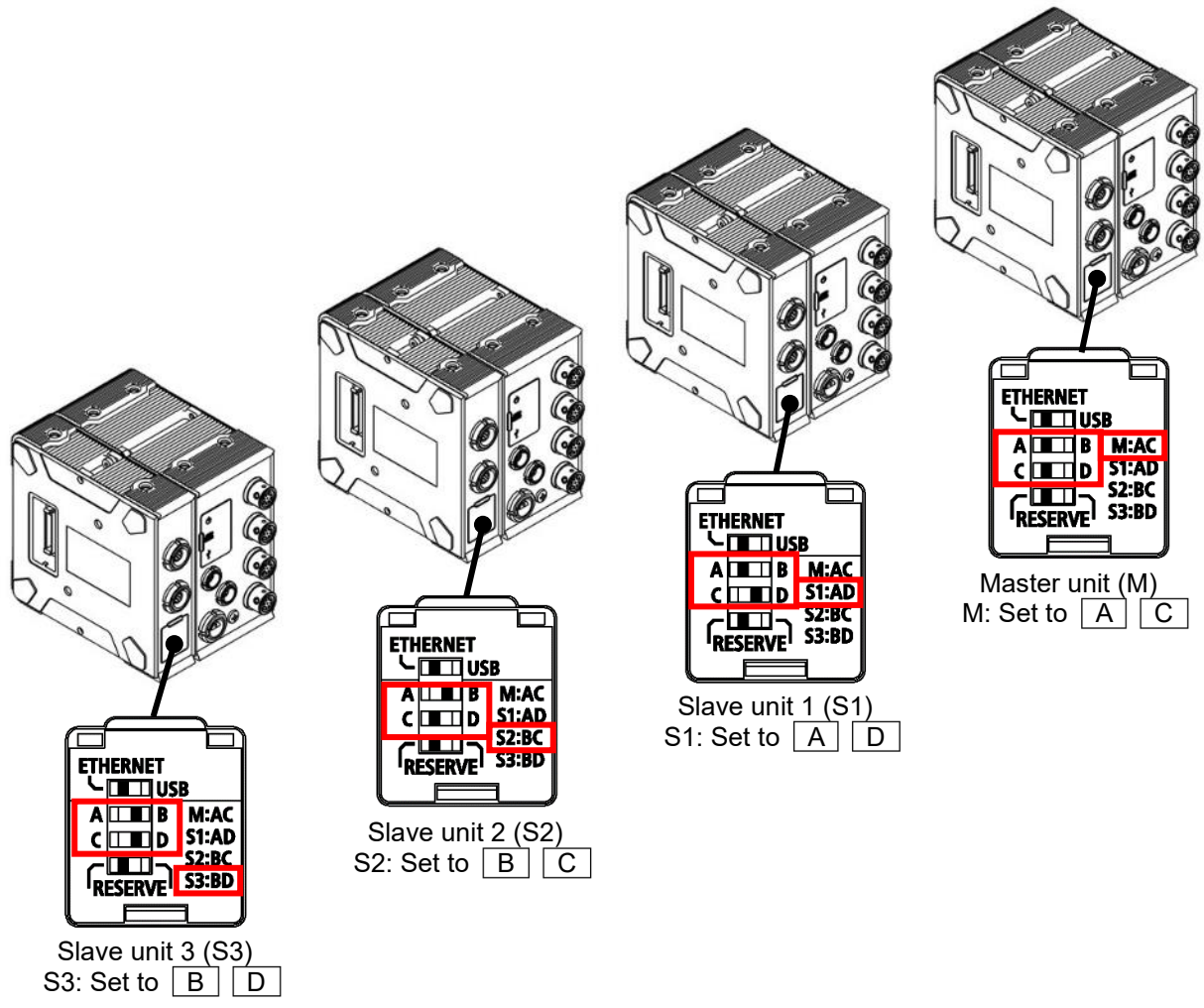
Set the WIRELESS switch to [ON] and the ETHERNET / USB switch to [ETHERNET] before turning on the power.

2-12. Connections and Settings During Synchronous Operation

Synchronous operation is a function that makes it possible to measure multiple CTRS-100As at the same timing (sampling clock). Using this function enables to record up to 128 channels (32 channels x 4) of measurement data at the same timing. It is therefore effective for recording more than 32 channels of data. To perform synchronous operation, the synchronization unit CTRS-SYNC010A and CTRS sync cable N-130 (optional accessories) are necessary.
The connection procedure for synchronous operation is shown below. Note that it is necessary to turn off the main unit power supply before establishing these connections.

(Step 1) Connect the CTRS-100A and synchronization unit. For details on the connection method, see "2-2. Unit Connection" on page 2-2.

(Step 2) Operate the DIP switches of each synchronization unit and assign them as either the master unit (M) or slave units (S1 to S3).



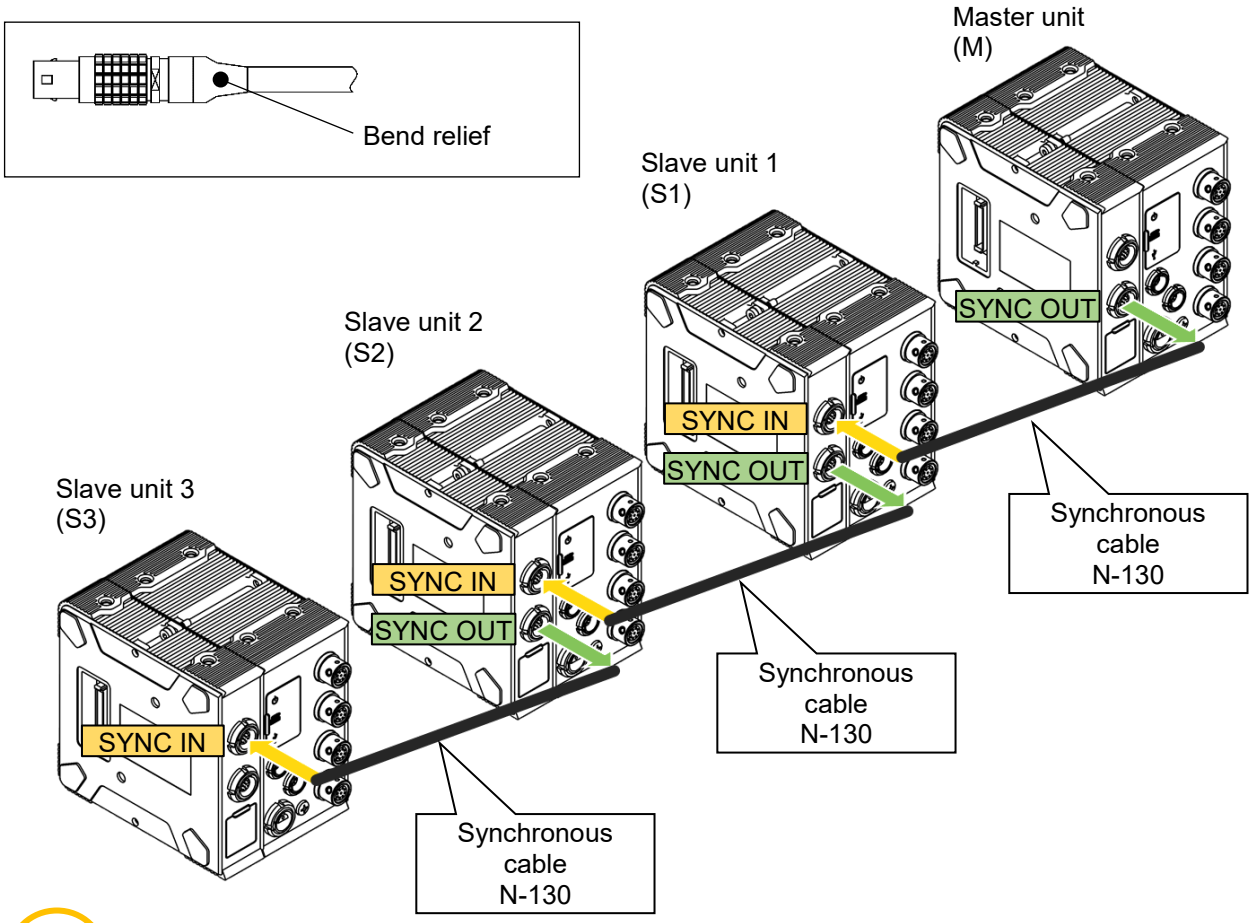
Slave unit 3 (S3)
S3: Set to [B] [D]

Slave unit 2 (S2)
S2: Set to [B] [C]

Slave unit 1 (S1)
S1: Set to [A] [D]

Master unit (M)
M: Set to [A] [C]

(Step 3) Use the CTRS sync cable N-130 to connect M to S1, S1 to S2, and S2 to S3 as shown in the figure below. Connect the yellow bend relief side of the CTRS sync cable to SYNC IN, and connect its green bend relief side to SYNC OUT.

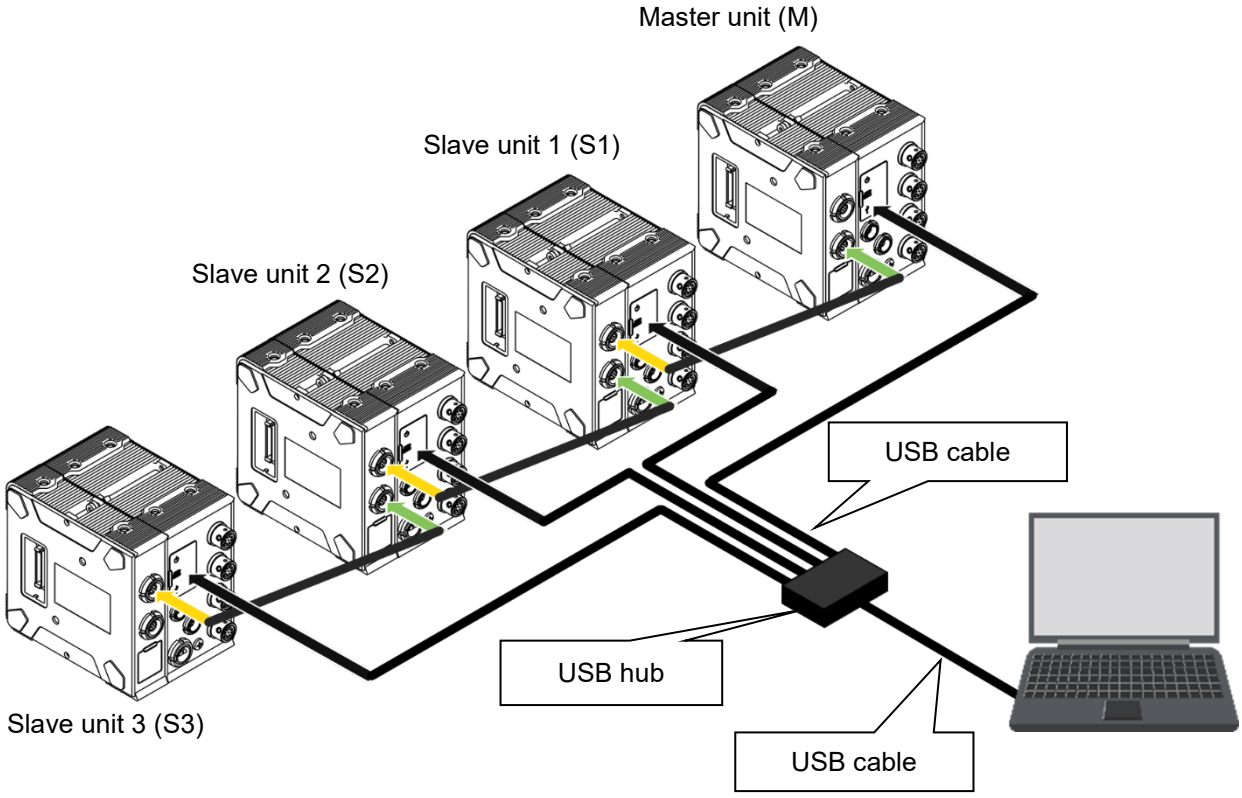


NOTE

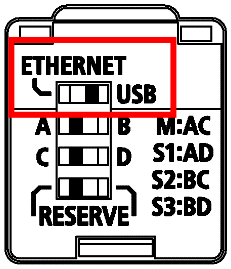
- Set the equipment IDs (M, S1, S2, and S3) so that there are no duplications or jumps. If there are duplications or jumps, communication errors will occur, and measurement will not be possible.
- The limit on synchronous units is up to four units. Do not connect five or more CTRS-100As. If this is done, communication errors will occur, and the system may not operate normally.
- If the power of the slave unit is turned off during synchronous acquisition, the unit on the master side continues to acquire data, but the unit on the slave side stops recording. To resume acquisition, power cycle all units once.

2-12-1. USB connection

If using USB to connect a synchronously connected unit group to a PC, connect the included USB cable to each CTRS-100A through a USB hub to connect them to the PC as shown in the figure below.



If using a USB connection, set the interface selection switch of every synchronization unit included in the synchronously connected system to the USB side.
(The figure shows a master unit, but set the switches of the slave units S1 to S3 to the USB side as well.)



NOTE

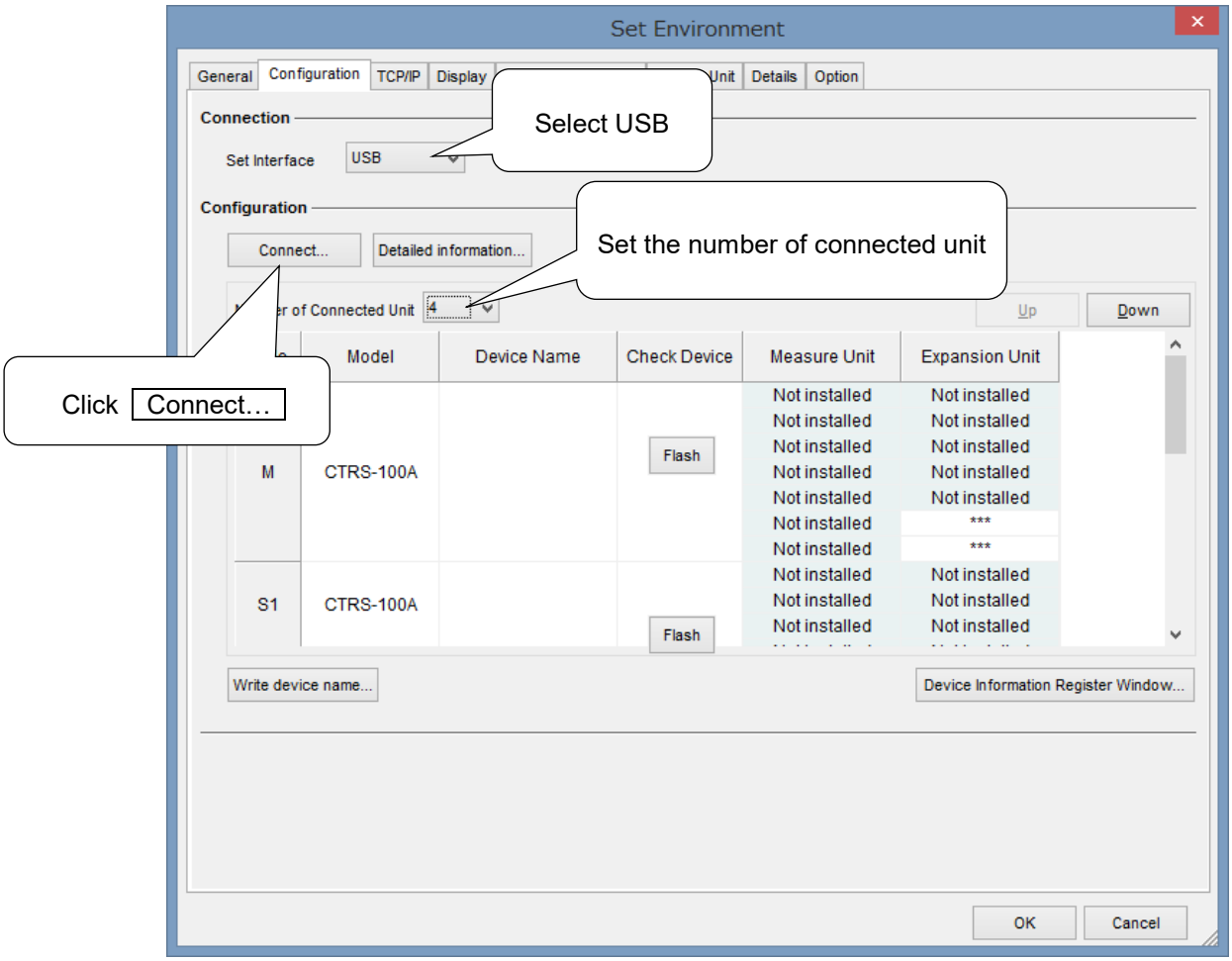
- If removing the USB hub from the PC, first remove the CTRS-100As connected to the USB hub.
- The operation-confirmed USB hubs are as follows.

  Model: BSH4U310U3, Manufacturer: BUFFALO

  Model: BSH4U25BKZ, Manufacturer: BUFFALO

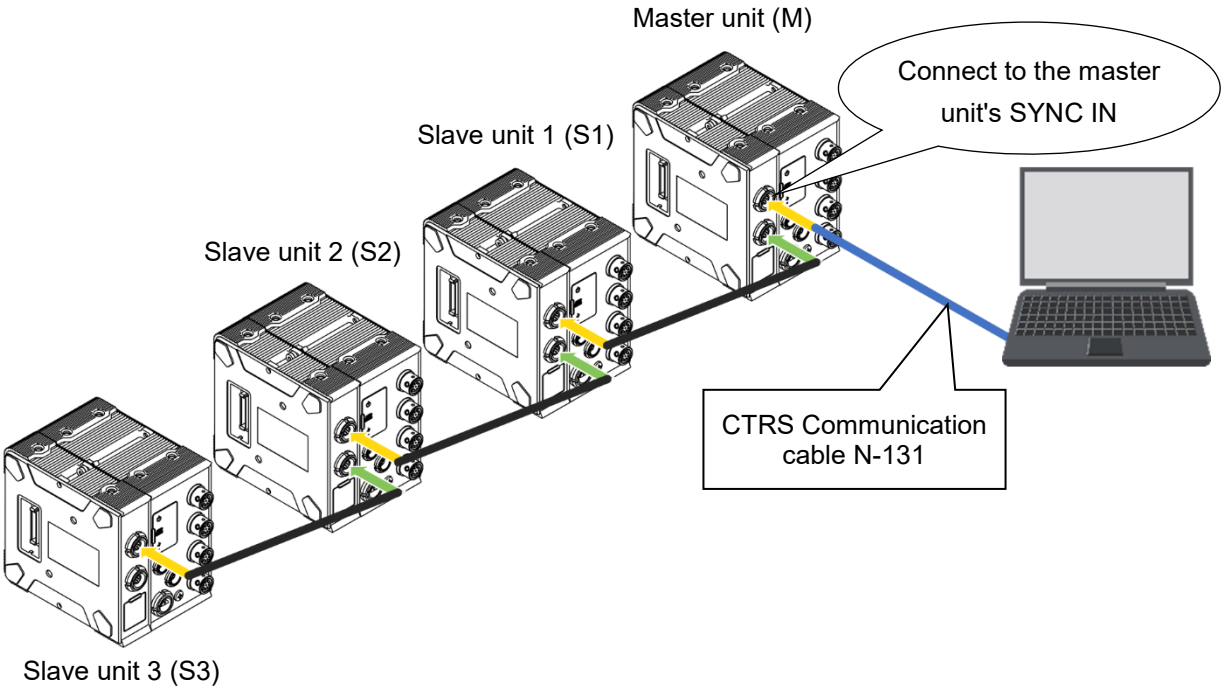
Start up the control software, click the Envr., select the USB in the interface of the Configuration tab. And then set the number of connected unit.

Next, click Connect…

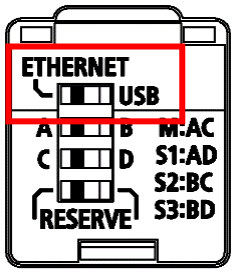


2-12-2. Wired LAN connection

If using a LAN to connect a synchronously connected unit group to a PC, use the CTRS communication cable N-131 as shown in the figure below.



If using a LAN connection, set the interface selection switch of every synchronization unit included in the synchronously connected system to the ETHERNET side.
(The figure shows a master unit, but set the switches of the slave units S1 to S3 to the ETHERNET side as well.)

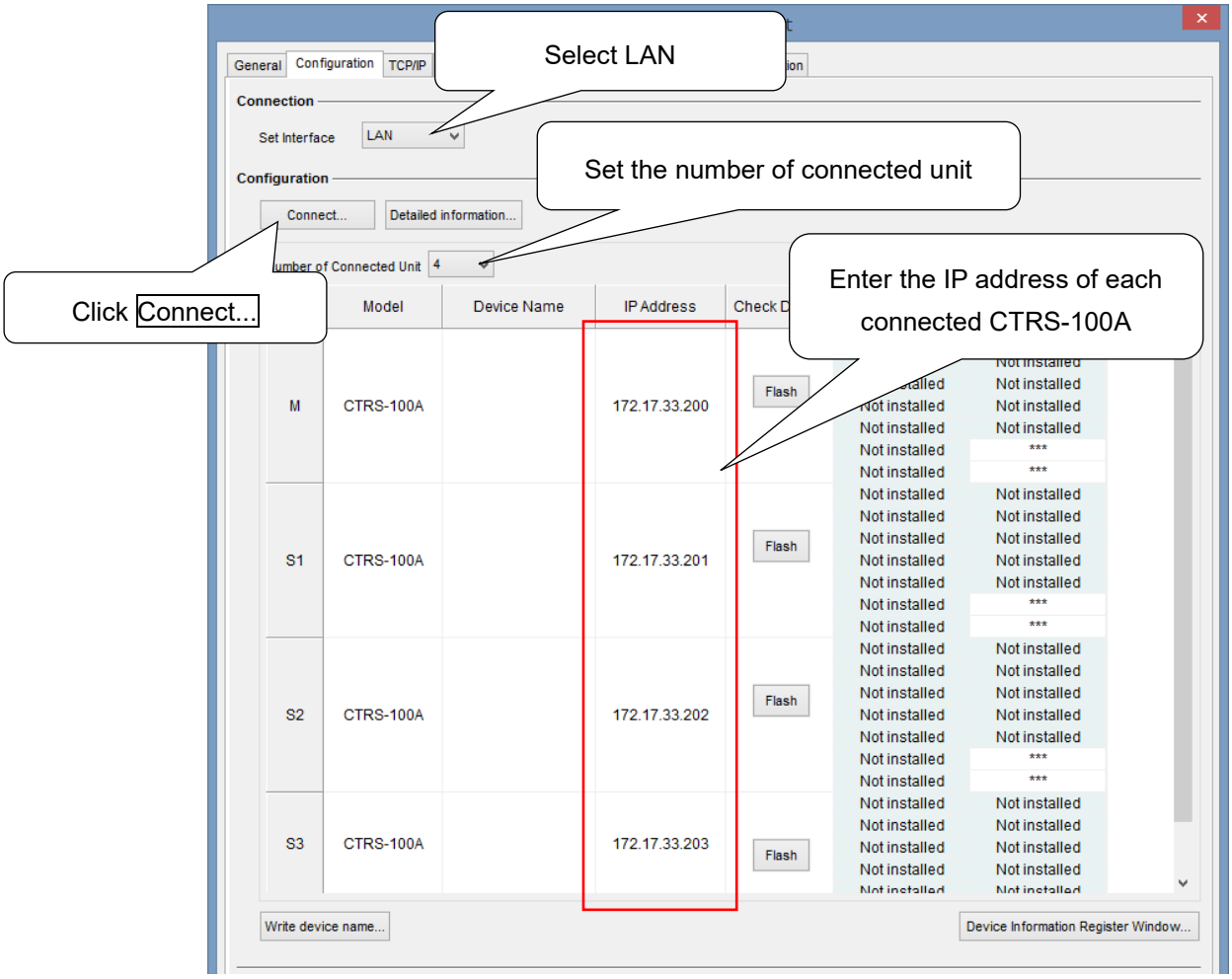


NOTE

- Do not specify duplicate IP addresses for each CTRS-100A.
  If the IP addresses are duplicated, synchronous connection will not be possible.

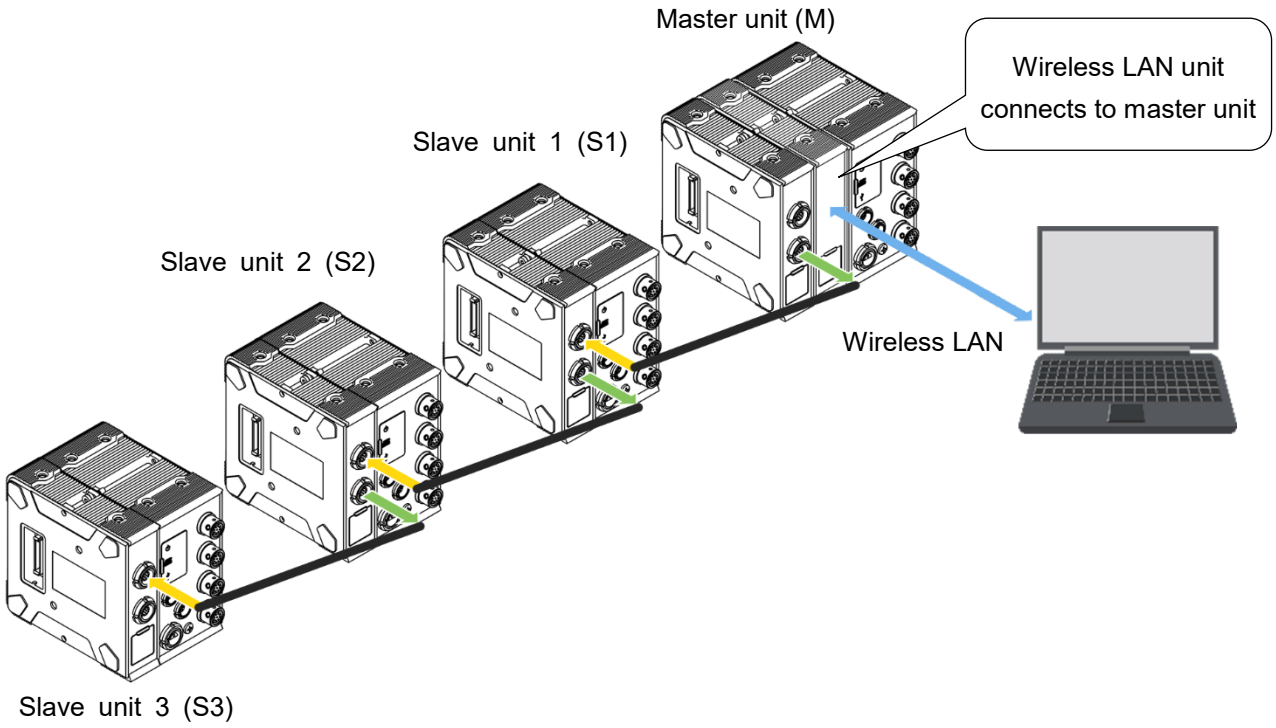
Start up the control software, click the Envr., select the LAN in the interface of the Configuration tab. Next, set the number of connected unit and input the CTRS-100A IP address in the IP address field.

Then, turn on every CTRS-100A power supply, confirm that they have started up, and then click Connect…

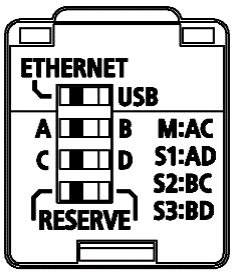


2-12-3. Wireless LAN connection

To communicate between a synchronously connected unit group and a personal computer via wireless LAN, connect the wireless LAN unit to the master unit as shown in the figure below. For details on how to connect to a computer via wireless LAN, see "2-11-3. Wireless LAN connection" on page 2-40.



Set the interface selection switch of all synchronization units in the system connected synchronously to the ETHERNET side.
(The figure is for the master unit. Set the slave units S1 to S3 on the ETHERNET side as well.)

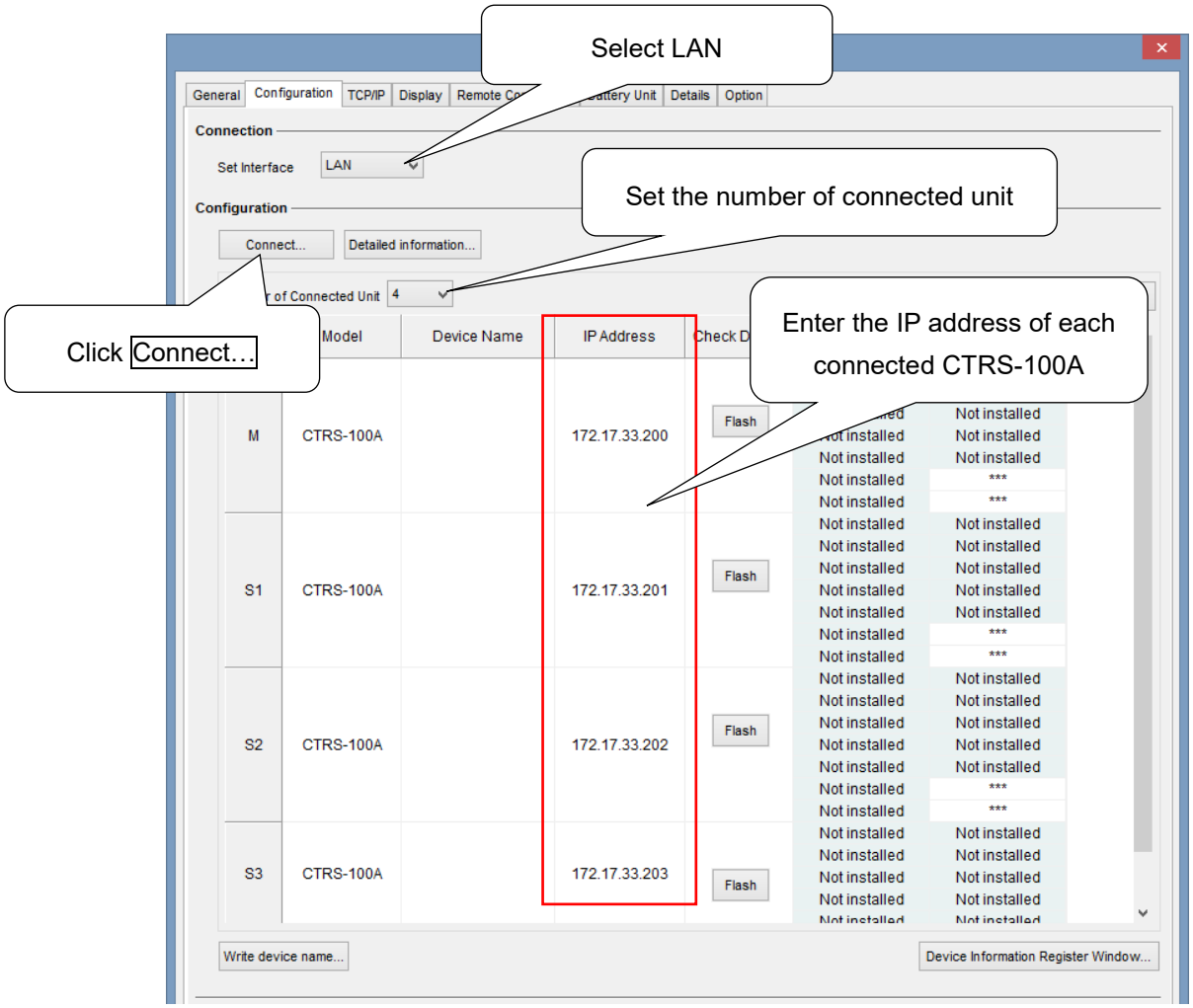


NOTE

- Set the IP addresses of each CTRS-100A and the wireless LAN unit so that they do not overlap. If the IP address is duplicated, synchronous connection will not be possible.
- Even if you connect the wireless LAN unit to the slave unit, you cannot connect to the wireless LAN. Connect the wireless LAN unit to the master unit.

Start up the control software, click the Envr., select the LAN in the interface of the Configuration tab. Next, set the number of connected unit and input the CTRS-100A IP address in the IP address field.

Then, turn on every CTRS-100A power supply, confirm that they have started up, and then click Connect…



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3. TURNING THE POWER ON OR OFF

To turn on the CTRS-100A, slide the power switch on the front up.
Start up the equipment, and all the LEDs will light up in the following order:
red → purple → blue. If the remote control unit CTRS-RCU010A is connected, the buzzer will sound to notify you that the equipment has started up.
To turn off the power, slide the power switch down.

Power switch

Power off

Power on

NOTE

- When the power is turned on, the equipment starts operating in around five seconds. However, the parts used internally do not achieve thermal stability immediately after power is supplied. To ensure stable operation, allow the equipment to preheat for about 30 to 40 minutes.
  If measuring a small amount of strain (a factor of 100 x 10^{-6} strain) or making measurements for a long time, preheat the equipment for around one hour.
  If the preheating is not sufficient, the accuracy may not satisfy the specifications due to the temperature characteristics of each unit.
- After turning off the power, wait at least five seconds before turning it back on. If the power is turned back on within five seconds or the power is repeatedly turned on and off, the inrush current that occurs when the power is turned on makes it impossible to guarantee operation.

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4. MEASUREMENT

4-1. Types of Measurement

This equipment can make both online measurements, which are made by using a PC, and offline measurements, which are made on a standalone basis without using a PC.

4-1-1. Online measurement

This measurement method involves connecting a PC and this equipment and then measuring data by using the control software. The procedure is shown below.

Install software
(only upon first use)

Install the control software on the PC to be used. For details on the installation method, see the instruction manual “For Setup” of the control software DCS-100A.

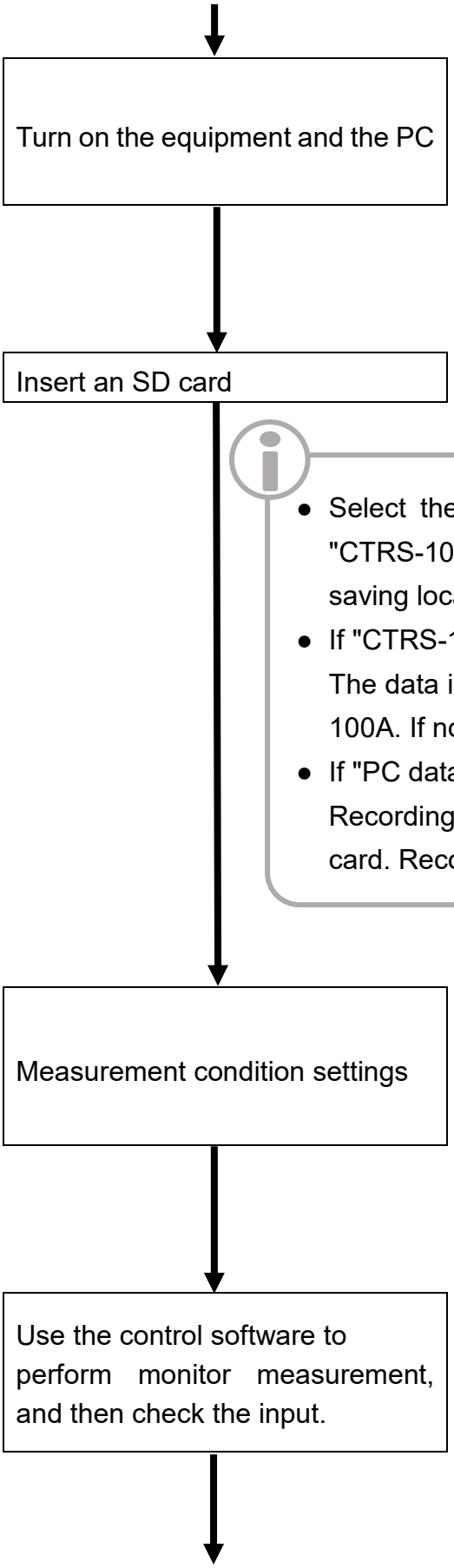
Control software

Installation
・Unit connection
・Power supply connection
・Sensor connection
・Interface initialization
・Interface connection

Install the equipment.
For details, see "2. INSTALLATION METHOD" on page 2-1.

NOTE

- A USB connection is not possible with a PC that does not have a USB driver installed. For details, see "2-11-1. USB connection" on page 2-30.



Turn on the equipment and the PC

Turn on the equipment and the PC. For details, see "3. TURNING THE POWER ON OR OFF" on page 3-1.

Insert an SD card

Insert an SD card into the SD card slot.

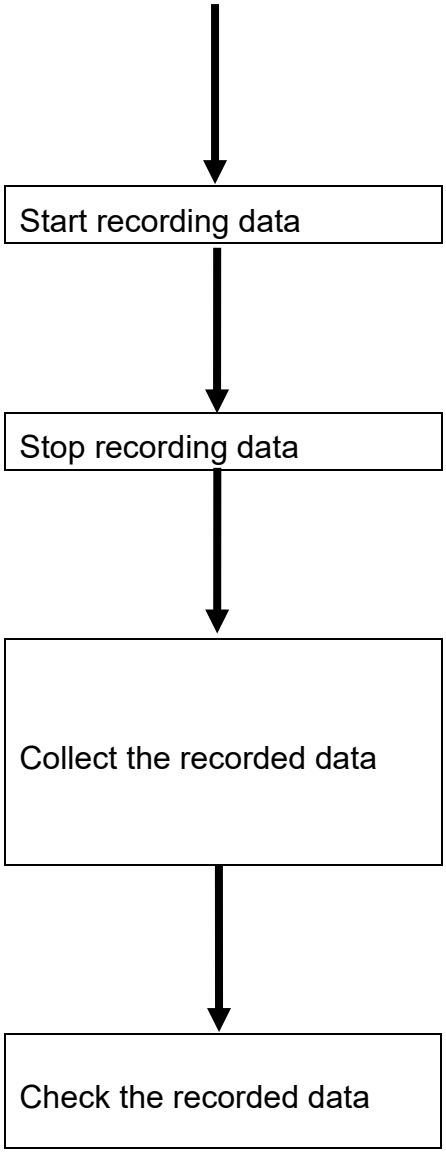
- Select the recorded data file saving location from among "CTRS-100A SD Card" and "PC data file folder". The data file saving location is selected from the control software.
- If "CTRS-100A SD Card" is selected
  The data is recorded to the SD card inserted into the CTRS-100A. If no SD card is inserted, recording is not possible.
- If "PC data file folder" is selected
  Recording is possible regardless of whether there is an SD card. Recorded data is saved to the PC.

Measurement condition settings

Set the recording conditions, channel conditions, etc. from the control software.
For details, see "4-3. Measurement Condition Settings" on page 4-8.

Use the control software to perform monitor measurement, and then check the input.

Use the control software to monitor measured values.
If necessary, execute balance adjustment and specify filter settings.



Use the control software to start recording data.

Use the control software to stop recording data.

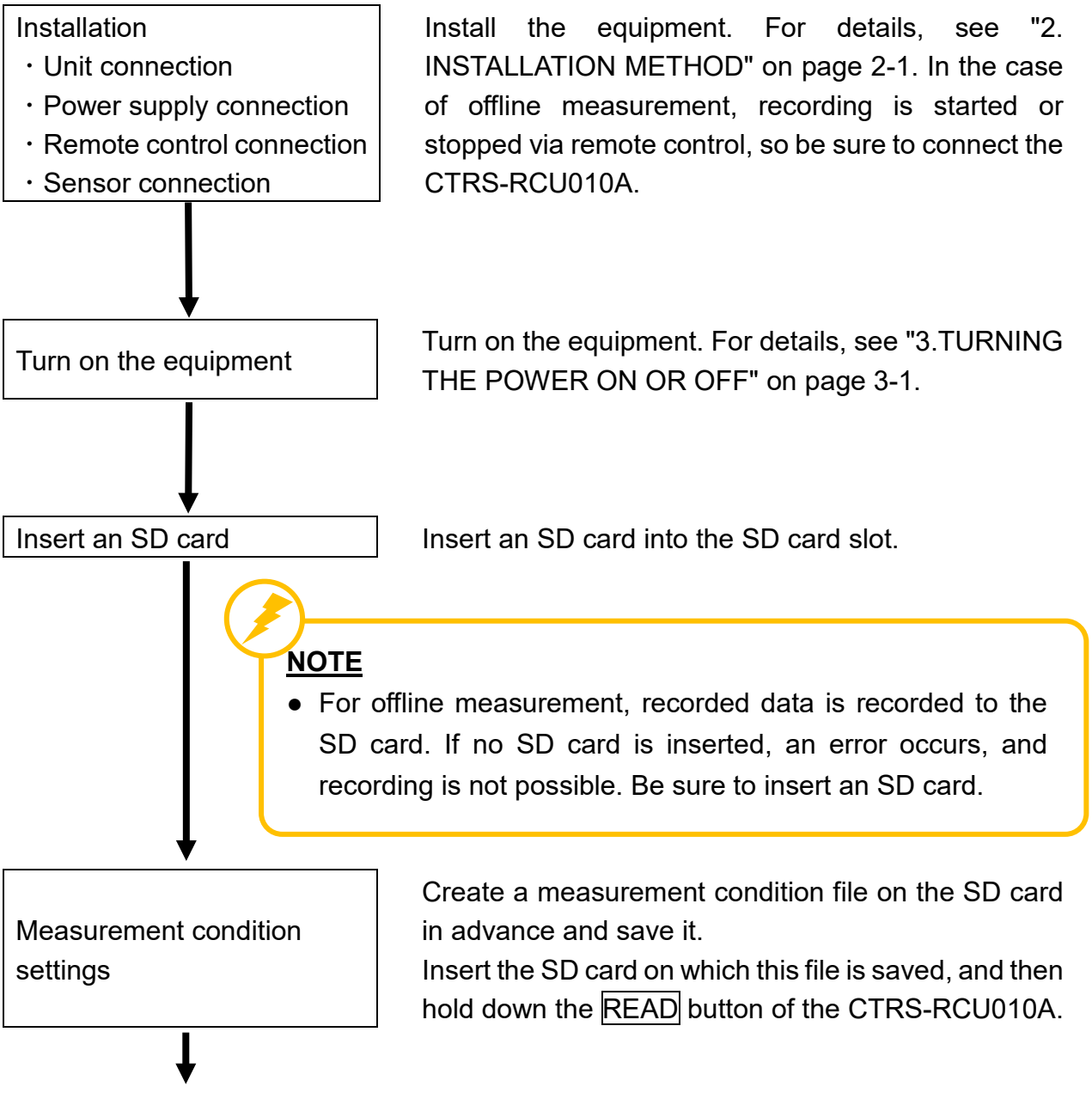
Use the control software to collect the recorded data. The acquisition data format to the SD card is KS3. When collecting data, the file format can be converted to KS2 or CSV.

Use the control software to check the recorded waveform.

- After collecting data, the analysis software DAS-200A (optional accessory) can be used to check and analyze the recorded data.

4-1-2. Offline measurement

This measurement method involves setting measurement conditions from the control software or by reading a measurement condition setting file saved to an SD card and then performing remote control operations to perform recording.
The procedure is shown below.



- The measurement condition settings are recorded even if the power is turned off. If the measurement conditions have not changed since the last time measurement was performed, the above measurement-condition setting operation is not necessary, and measurement is possible immediately after turning on the power.

Start recording data

Press the REC button of remote control unit. Data recording starts, or the equipment starts awaiting a trigger or interval.

Stop recording data

Press the STOP button of remote control unit twice to stop recording.

Collect the recorded data

Remove the SD card and then insert it into the PC to collect the data. The data can also be collected by connecting to the PC with USB and then using the control software.
The acquisition data format to the SD card is KS3. When collecting data, the file format can be converted to KS2 or CSV.

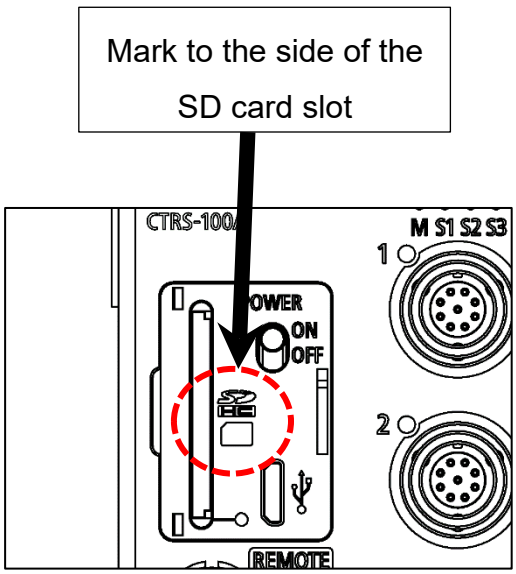
Check the recorded data

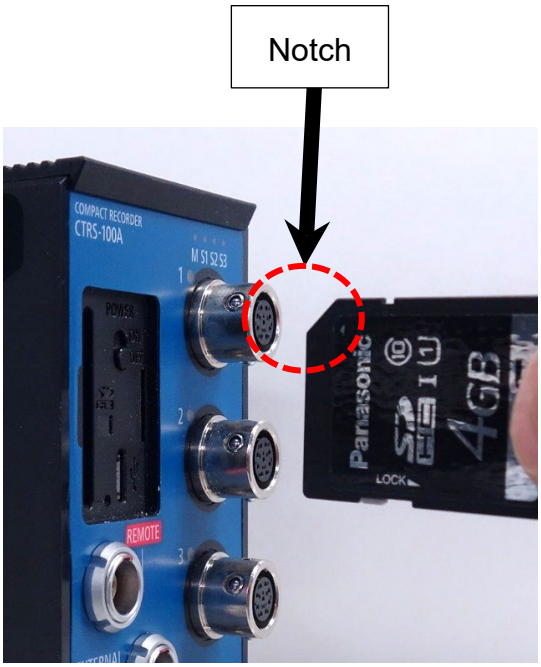
Use the control software to check the recorded data waveform.

- After collecting data, the analysis software DAS-200A (optional accessory) can be used to check and analyze the recorded data.

4-2. Inserting or Removing an SD Card

This equipment uses SD cards as its data recording media.
Insert an SD card by lining it up with the mark to the side of the SD card slot as shown in the photo.





CAUTION

- When inserting an SD card, be careful about its orientation. Trying to insert it the wrong way may break the product or the SD card.

NOTE

- Note that this equipment will write data to an SD card regardless of the state of its LOCK switch.
- This equipment supports the SDHC standards. Note that the SDXC standards are not supported.
- If formatting an SD card on a PC, use the FAT32 format.
- When using the CTRS-WLAN010A/011A/012A to connect to a PC via wireless LAN, data cannot be saved only to the PC. Use a setting that includes the SD card as the destination.

- The destination setting for saving data files can be made in "Set Environment" - "General" of the DCS-100A control software. For details, refer to the DCS-100A operation manual.

4-3. Measurement Condition Settings

4-3-1. Common settings

This section explains settings common to the system as a whole.
For details on analog channel condition settings, see "4-3-2. Analog channel" on page 4-15. This section describes how to set using the control software DCS-100A.

- The displayed details may differ depending on the used control software.
  For details, see the control software instruction manual.

① Measure mode

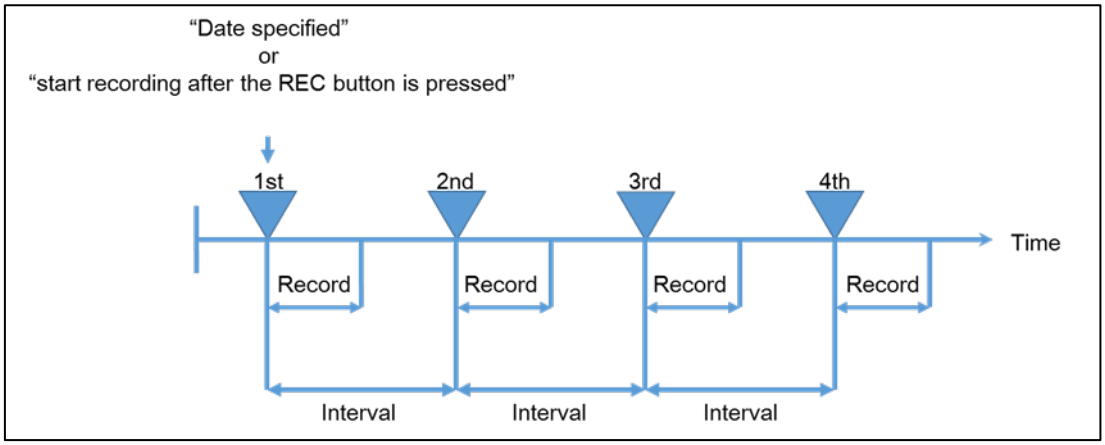
・Manual
Recording starts when the REC button is pressed or at the start of the set recording and then stops either when the STOP button is pressed.

・Manual(Set Record Data)
Recording starts when the REC button is pressed or at the start of the set recording and then stops either when the set number of data items/channels are recorded.

- The recording start time can be set when the PAUSE function is off.
  For details, see the control software instruction manual.
- Manual(Set Record Data) can be use when the PAUSE function is off.

・Interval

Recording automatically starts at the set time interval and then stops when the set number of data items/channels are recorded. For the recording start condition, either of the following can be selected: "date specified" or "start recording after the REC button is pressed".



・Analog Trigger

Use the analog channel signal as the trigger source. Recording automatically starts with the start trigger condition is satisfied and then stops either when the set number of data items/channels are recorded or the end trigger condition is satisfied.

・External Trigger

Use an external signal as the trigger source.Recording automatically starts with the start trigger condition is satisfied and then stops either when the set number of data items/channels are recorded or the end trigger condition is satisfied.

For detail, see "4-4-1. External trigger input" on page 4-21.

・Manual Trigger

Use the REC button on the remote control or the Record button on the control software as a trigger. Recording automatically starts with the start trigger condition is satisfied and then stops either when the set number of data items/channels are recorded or the end trigger condition is satisfied.

・Complex trigger

Recording automatically starts when the analog trigger 4CH, external trigger, or manual trigger AND/OR trigger condition is satisfied and then stops either when the set number of data items/channels are recorded or the end trigger condition is satisfied.

・CAN Trigger

Use CAN signal as the trigger source. Recording automatically starts when the start trigger condition is satisfied and then stops either when the set recording time past or the end trigger condition is satisfied.

There are four types of CAN triggers as follows.

(1)Manual

Use the REC button on the remote control or the recording button on the control software. After the button is pressed, the recording starts from the point where the CAN data is first received.

(2)Digital

Use one bit in the signal.

(3)Analog

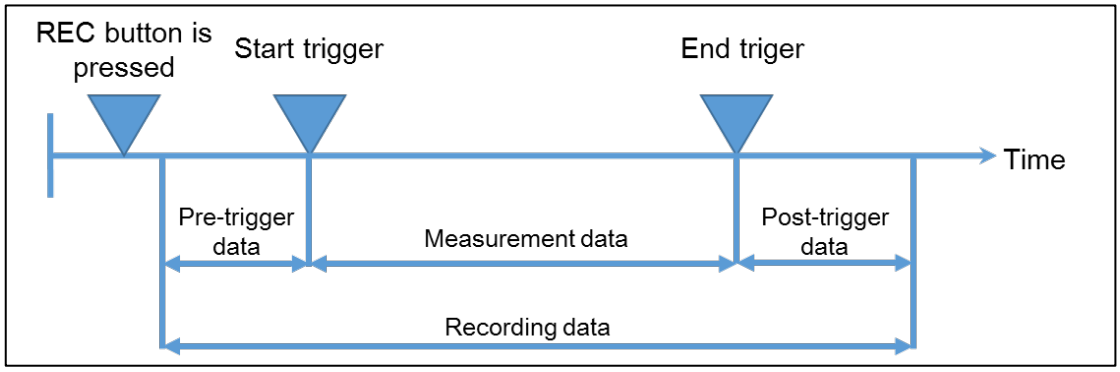
Treats the signal as an analog value and use it.

(4)Complex

Recording automatically starts when the trigger conditions are satisfied by AND/OR of CAN trigger (analog) and CAN trigger (digital). 8 conditions can be combined.

NOTE

- In the case of recording only CAN messages without setting analog channels, the measurement mode is CAN trigger.
- CAN trigger cannot be used together with other triggers.



- During trigger measurement or multi trigger measurement, the number of pre-trigger data items and post-trigger data items can be set. However, at the time of CAN trigger, only post-trigger data items can be set, and pre-trigger data items are set about 1 second. The maximum number of data items that can be set is 524,288 data items / the number of measurement channels when CAN data is not recorded, and 524,288 data items / (number of measurement channels + 2) when CAN data is recorded. For example, if the number of measurement channels is 16 and CAN data is not recorded, the maximum number of pre-trigger (or post-trigger) data items that can be set = 32,768.

② Sampling frequency

The following can be selected: 1-2-5 series, 2^n series, or external clock.

1-2-5 series (Hz) 100k, 50k, 20k, 10k, 5k, 2k, 1k, 500, 200, 100, 50, 20, 10, 5, 2, 1

2^n series (Hz) 65536, 32768, 16384, 8192, 4096, 2048, 1024, 512, 256, 128, 64, 32, 16, 8, 4

For the external clock, any clock can be input to the external I/O connector [CLK IN] - [DCOM] and used as the sampling clock.

- The maximum sampling frequency that can be set is "100 kHz / the number of measurement channels".

Sampling frequency(Hz) 1-2-5 series	Maximum number of measurement channels
100k	1
50k	2
20k	5
10k	10
5k	20
2k or less	32

Sampling frequency(Hz) 2^n series	Maximum number of measurement channels
65,356	1
32,768	3
16,384	5
8,192	10
4,096	24
2,048 or less	32

- If the analog channel low-pass filter is set to AUTO, the sampling frequency can not be set below 100Hz.

・Clockout frequency dividing

The external output clock can be divided by using the sampling frequency and then output. Any division ratio in the range from 1 to 65,534 can be set.

・Clockout Mode

Set the output mode of the external output clock.

always	Always outputs a square wave at the frequency set for the sampling frequency.
during recording	Only outputs a square wave at the frequency set for the sampling frequency while recording.
Do not output	Does not output a clock signal.

As an option for outputting the external output clock, it is possible to invert the output signal. For details on the external output clock, see "4-4-4.External clock output" on page 4-33.

③ Record Data

Number of Data/CH : Set the number of recording data.

Record Time : Set the record time.

Since the Number of Data/CH and Record Time are coupled with each other, you can set the either of the two.

④ Repeat Times

Set the Repeat times. Setting range is change by number of digits in file number.

The setting range of the repeat times is the same as the range of the file number.

Number of digits in the file number	Setteing range
3 digits	0 ～ 999
4 digits	0 ～ 9999
5 digits	0 ～ 99999

- Measurement stops when the number of repetition or the file number reachs the maximum value.
- The number of digits of the file number assigned to the data file name can be set in the "Measurement conditions" - "Data file".

⑤ Measurment using time synchronization function

The measurement starts using the time data received from the GPS satellites. (Time Synchronization Function) Measurements using the time synchronization function include the following.

・Point zero measurements (Manual / Manual n. of data)

Manual measurement starts from zero millisecond time (hh:mm:ss.000 ms) using time data received from GPS satellites. In the case of point zero (manual), recording is stopped by manual operation. In case of point zero (manual n. of data), recording is performed for the set number of record data/CH. When the recording start time is not set, recording starts from zero millisecond time, which is approximately 2 seconds (5 seconds for synchronous operation) after the start of recording by pressing the recording button or other means.

・Interval (GPS sync)

Interval measurement starts from zero millisecond time (hh:mm:ss.000 ms) using time data received from GPS satellites.

- Measurements using the time synchronization function use precise time information from GPS satellites and synchronizing pulse signals to start measurements that are hardware synchronized to the GPS time. Therefore, the measurement start time can be matched between each CTRS.
- When the time synchronization function is used, the sampling clock is corrected when the time to start recording arrives. The sampling clock starts to fall within about 3μS after receiving the synchronization pulse signal received from the GPS satellites, and then the AD conversion operation starts.
- In measurement using the time synchronization function, if the GPS status becomes "Error" at least once during the period from 2 seconds before the start time of recording to the start time of recording, recording will start approximately 2 seconds after the start time of recording set using the built-in clock of the CTRS-100A.

4-3-2. Analog channel

This section explains the analog channel condition settings.

For details on items not indicated in this table, see the instruction manual for the control software DCS-100A [CTRS-100A Operations] "5 SETTING CHANNEL CONDITION".

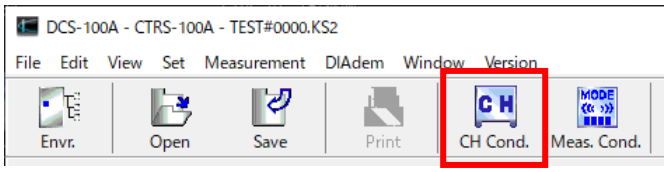


Table 4-1. Analog-channel condition settings*1 (representative items)

Item	① Measurement	② Mode	③ Measurement range*2	④ LPF	⑤ HPF	⑥ Balance
Options	☑ (ON) ☐ (OFF)	Strain (2 V) Strain (5 V)	1,000 µm/m 2,000 µm/m 5,000 µm/m 10,000 µm/m 20,000 µm/m 50,000 µm/m OFF	FLAT 10 kHz 5 kHz 2 kHz 1 kHz 500 Hz 200 Hz 100 Hz 50 Hz 20 Hz 10 Hz AUTO	OFF 0.2 Hz 1 Hz	ON OFF NONE
		Voltage Voltage (2 V) Voltage (5 V)	1 V 2 V 5 V 10 V 20 V 50 V OFF			

*1 The above table is the setting items for CTRS-100A and CTRS-CDV010A.

*2 Any measurement range can be set. For details, see "③ Measurement range".

① Measurement

Select on/off as the measuring target channel setting.

Check box on	☑	Measure
Check box off	☐	Do not measure

② Mode

Select the mode according to the measuring target. The choice depends on the measument units used.

CTRS-100A CTRS-CDV010A	Strain (2 V)	Strain measurement Bridge voltage: 2 V
	Strain (5 V)	Strain measurement Bridge voltage: 5 V
	Voltage	Voltage measurement Sensor power supply: off
	Voltage (2 V)	Voltage measurement Sensor power supply: 2 V *3
	Voltage (5 V)	Voltage measurement Sensor power supply: 5 V *4
CTRS-CVPS010A	Voltage	Voltage measurement Sensor power supply: off
	Voltage(5V)	Voltage measurement Sensor power supply: 5 V *5
	Voltage(10V)	Voltage measurement Sensor power supply: 10 V *6
CTRS-CTA010A	TC/K	K-type thermocouple measurement
	TC/T	T-type thermocouple measurement
	TC/J	J-type thermocouple measurement
	TC/N	N-type thermocouple measurement

*3 The positive side of the sensor excitation is + 1 V and the negative side is -1 V.

*4 The positive side of the sensor excitation is + 2.5 V and the negative side is -2.5 V.

*5 The positive side of the sensor excitation is + 5 V and the negative side is 0 V.

*6 The positive side of the sensor excitation is + 10 V and the negative side is 0 V.

CAUTION

- The applicable bridge resistance ranges for CTRS-100A and CTRS-CDV010A are as follows:

  When the bridge voltage is 2 V: 120 to 1000 Ω

  When the bridge voltage is 5 V: 350 to 1000 Ω

  If a sensor that has a resistance lower than the applicable range is connected, the equipment or sensor may malfunction.

Cable correction value

To correct sensitivity reductions due to the reciprocating resistance of various conversion and extension cables, input a correction value for the cable correction value item as necessary. For details, see "10-1.Cable calibration value" on page 10-1.

③ Measurement range

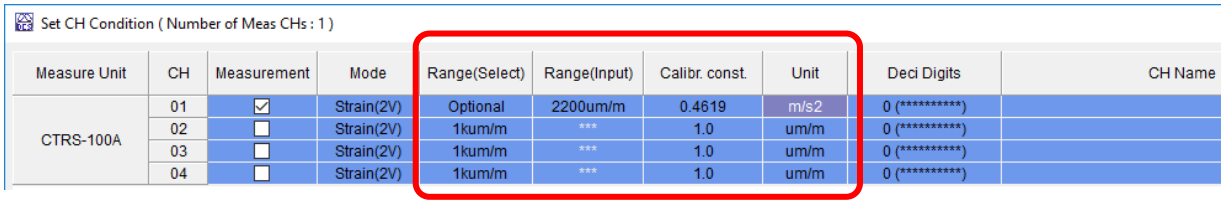
Select a suitable measurement range based on the rated sensor output, expected maximum output value, etc.
In addition, any measurement range can be set. To set this, set "Range(select) " to "Optional", and then directly enter a numerical value for the analog channel setting "Range(Input)".

・When setting the strain (2 V) or strain (5 V) mode
If a measurement range 1,000 to 10,000 μm/m, the range can be set in 100μm/m steps, and, if a measurement range 10,000 to 50,000 μm/m, the range can be set in 1,000 μm/m steps.
・When setting the voltage, voltage (2 V), or voltage (5 V) mode
If a measurement range 1 to 10 V, the range can be set in 0.1 V steps, and, if a measurement range 10 to 50 V, the range can be set in 1 V steps.

By setting any measurement range, the rated output of the transducer and the full scale of the measurement range can be matched.

Setting example

If using an acceleration transducer that has a rated capacity of 980.7 m/s^2, a rated output of 2,123 μm/m, and a calibration constant of 0.4619 / 1 μm/m.


Set CH Condition (Number of Meas CHs : 1)

Measure Unit	CH	Measurement	Mode	Range(Select)	Range(Input)	Calibr. const.	Unit	Deci Digits	CH Name
CTRS-100A	01	☑	Strain(2V)	Optional	2200um/m	0.4619	m/s2	0 (**********)	
	02	☐	Strain(2V)	1kum/m	***	1.0	um/m	0 (**********)	
	03	☐	Strain(2V)	1kum/m	***	1.0	um/m	0 (**********)	
	04	☐	Strain(2V)	1kum/m	***	1.0	um/m	0 (**********)	

(1) Set the calibration constant and unit.
(2) Set the measurement range. The rated output is 2,123 μm/m, so the setting is rounded up to 2,200 μm/m.

You can add setting items and change the display order from the "Set CH Condition" window- "Change setting items".

NOTE

- The displayed details and setting steps may differ depending on the used control software. For details, see the control software instruction manual.
- It is necessary to select suitable values for the measurement range according to the size of the input signal.
  Also consider the following when setting the range:
  - ・If the input signal is significantly smaller than the set measurement range, the measurement accuracy will decrease.
  - ・If the input signal is larger than the measurement range, the recorded data will result in saturation.
  - ・If the measurement range is set to "OFF", the bridge and sensor power will be OFF (0 V), and the measured value will be zero.

④ LPF

Select the cutoff frequency of low-pass filter.

AUTO	Low-pass filter on The cutoff frequency is set to approximately 1/4 of the sampling frequency. Use this as an anti-aliasing filter.
FLAT	Low-pass filter off
10 kHz	Low-pass filter on, cutoff frequency: 10 kHz
5 kHz	Low-pass filter on, cutoff frequency: 5 kHz
2 kHz	Low-pass filter on, cutoff frequency: 2 kHz
1 kHz	Low-pass filter on, cutoff frequency: 1 kHz
500 Hz	Low-pass filter on, cutoff frequency: 500 Hz
200 Hz	Low-pass filter on, cutoff frequency: 200 Hz
100 Hz	Low-pass filter on, cutoff frequency: 100 Hz
50 Hz	Low-pass filter on, cutoff frequency: 50 Hz
20 Hz	Low-pass filter on, cutoff frequency: 20 Hz
10 Hz	Low-pass filter on, cutoff frequency: 10 Hz

NOTE

- If the sampling frequency is less than 100 Hz, the low-pass filter cannot be set to "AUTO".

- If using a low-pass filter, the high frequency component included in the sensor output can be removed, which is especially effective when there is a lot of noise in the output.
- If the input signal changes to a sine wave (similar to a sin function), set the cutoff frequency so that it is around two to five times the input signal frequency. If the input signal changes suddenly, set the cutoff frequency so that it is around ten times the input signal frequency.

⑤ HPF

Select whether the high-pass filter is on or off.

OFF	High-pass filter off
0.2 Hz	High-pass filter on, cutoff frequency: 0.2 Hz
1 Hz	High-pass filter on, cutoff frequency: 1 Hz

⑥ Balance

Select whether to enable or disable the auto balance (zero suppress) function.

OFF	When balance is executed, it becomes the untargeted channel. Balance Applies the balance value from the last balance performed when [ON] was set. (Balance function enabled)
ON	When balance is executed, it becomes the target channel. When you execute balance, the balance value is updated and the measured value becomes zero. (Balance function enabled)
NONE	When balance is executed, it becomes the untargeted channel. Since the bridge imbalance is not canceled, the initial imbalance value of the converter and gauge bridge can be checked. In the voltage measurement mode, the input voltage is used as the measured value without canceling the input voltage. (Balance function disabled)

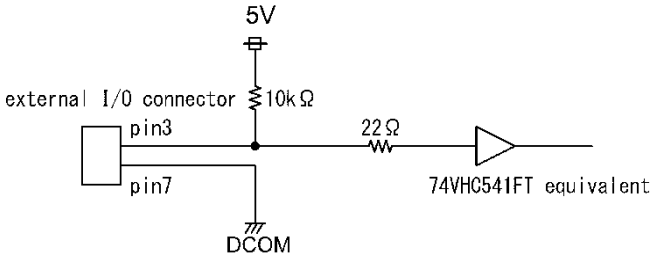
4-4. External I/O

4-4-1. External trigger input

By inputting a trigger signal from an external source, you can start or stop recording. Input an external trigger signal to pin 3 (TRG IN) and pin 7 (DCOM) of the external I/O connector.

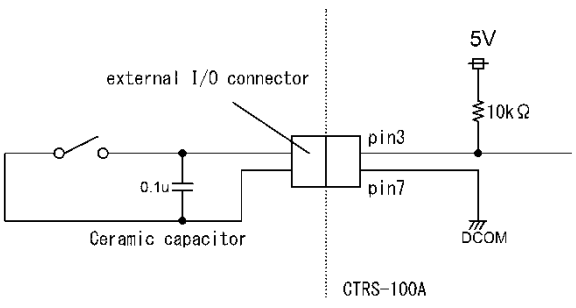
Input circuit

An outline of the input circuit is shown below.

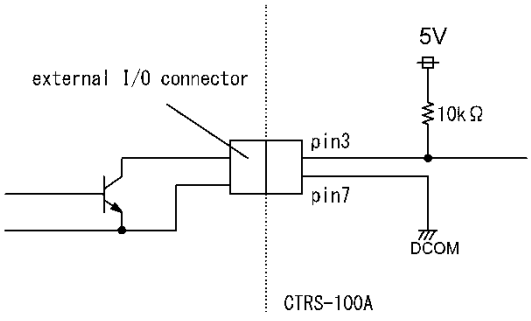


Input signal

Input a no-voltage contact signal or open collector signal as the external trigger input signal. If inputting a voltage signal, use a signal that is within the input threshold and maximum input voltage range. Set the start trigger and end trigger slope (rising/falling) by using the control software. When inputting a non-voltage contact signal, insert a ceramic capacitor of about 0.1uF as shown in the figure below to prevent chattering.

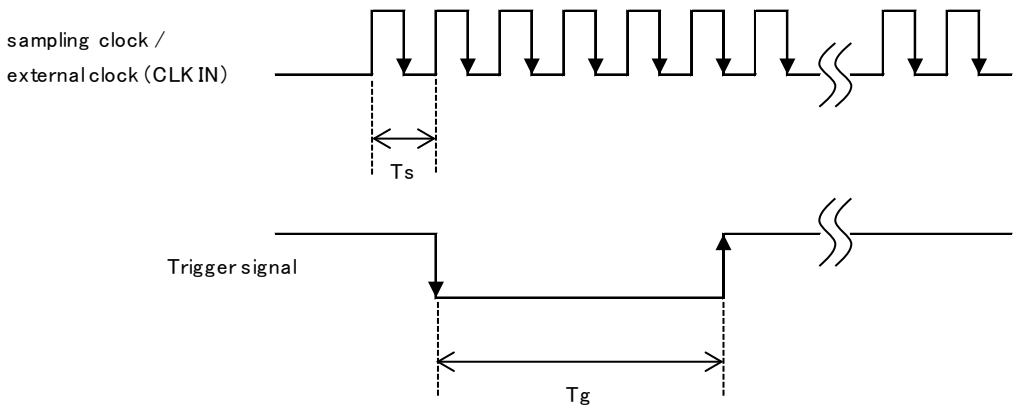


No-voltage contact signal



Open collector signal

In addition, the effective input signal pulse width Tg depends on the sampling frequency. With a sampling clock cycle of Ts, if the sampling frequency is set to 100 Hz or more, a trigger signal is recognized when Tg > 4Ts. If the sampling frequency is set to less than 100 Hz, a trigger signal is recognized when Tg > Ts.



Tg＞4Ts (if the sampling frequency is set to 100 Hz or more)
Tg＞Ts (If the sampling frequency is set to less than 100 Hz)

CAUTION

- The input threshold value levels are as follows: high level: 2.4 to 5.0 V, low level: 0 to 0.4 V. In addition, the maximum input voltage range is 0 to 5.5 V. If voltage outside this range is applied, malfunctions may occur.
- Do not input an external trigger signal to any external I/O connector pins other than 3 and 7. Doing so could cause malfunctions or failures.

NOTE

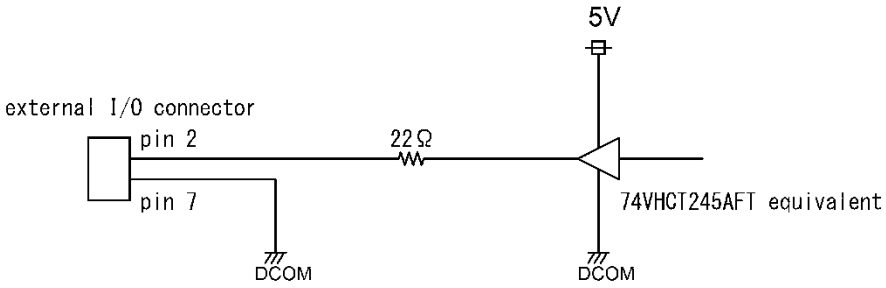
- Ensure that there is no trigger input signal chattering.
- To prevent noise from external sources, it is recommended to use an open collector signal for trigger input together with using insulation elements such as a photo-coupler.
- Before the main test, conduct a pretest and be sure to confirm whether a trigger occurs.

4-4-2. External trigger output

If making measurements in the trigger (analog, external, manual, complex, CAN), it is possible to output trigger signals to external equipment. Trigger signals are output from pins 2 (TRG OUT) and 7 (DCOM) of the external I/O connector.

Output circuit

An outline of the output circuit is shown below.



Output signal

The output signal voltage levels are as follows: high level: 5 V, low level: 0 V. In addition, a fall in the trigger output signal acts as a start trigger, and a rise acts as an end trigger.

Output timing(analog / external / manual / complex trigger)

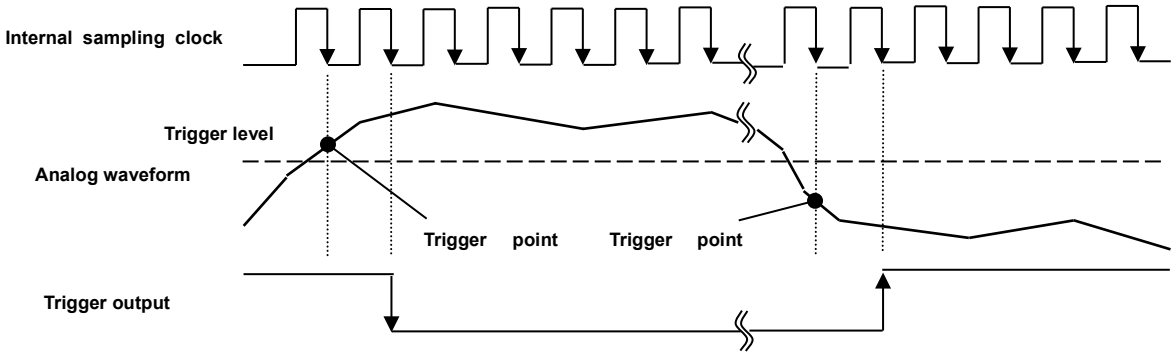
The trigger output timing differs depending on the sampling frequency. If the frequency is less than 100 Hz, the trigger signal is output the next time the sampling clock falls. If the frequency is 100 Hz or more, a check is performed to see if the trigger condition has been satisfied four times in a row, and the trigger signal is then output the next time the sampling clock falls. For details, see the figure starting on the next page.

Type of start trigger	Sampling frequency	Output timing of the trigger output signal from the trigger point (Note 2)	Reference
Analog trigger (Note 1)	Less than 100 Hz	1 clock worth of sampling clock	Ex. 1
	100 Hz or more	4 clock worth of sampling clock	Ex. 2
Extenal trigger (Note 1)	Less than 100 Hz	1 clock worth of sampling clock	Ex. 3
	100 Hz or more	4 clock worth of sampling clock	Ex. 4

Note 1: Including start trigger of the complex trigger.
Note 2: The trigger output signal is output after the trigger condition is satisfied (after the trigger point).

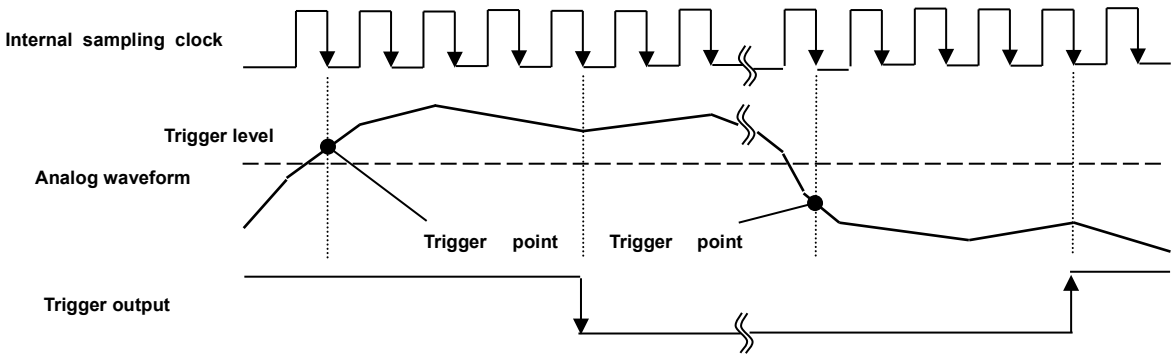
Ex. 1

Trigger type	Analog (start slope: rise, end slope: fall)
Sampling frequency	Less than 100 Hz
Trigger output	Output one clock cycle after the trigger point



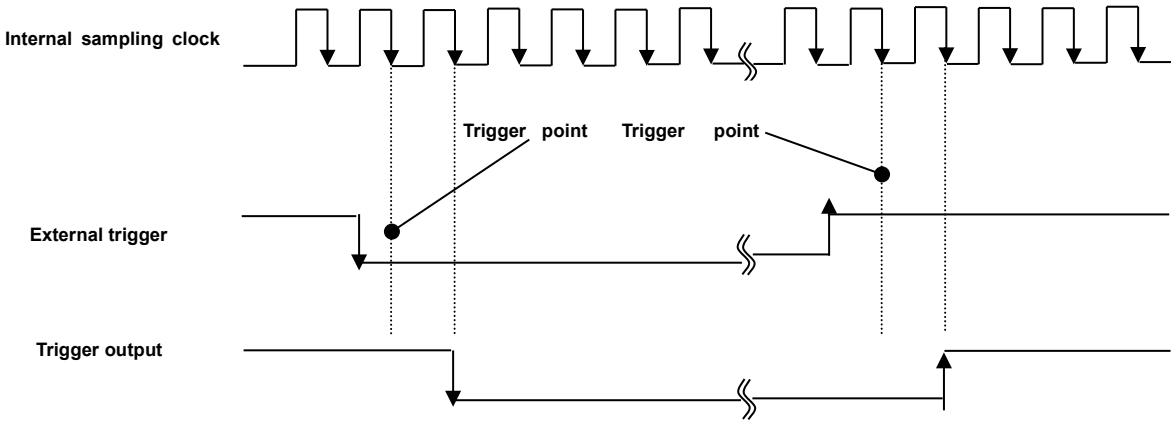
Ex. 2

Trigger type	Analog (start slope: rise, end slope: fall)
Sampling frequency	100 Hz or more
Trigger output	Output four clock cycles after the trigger point



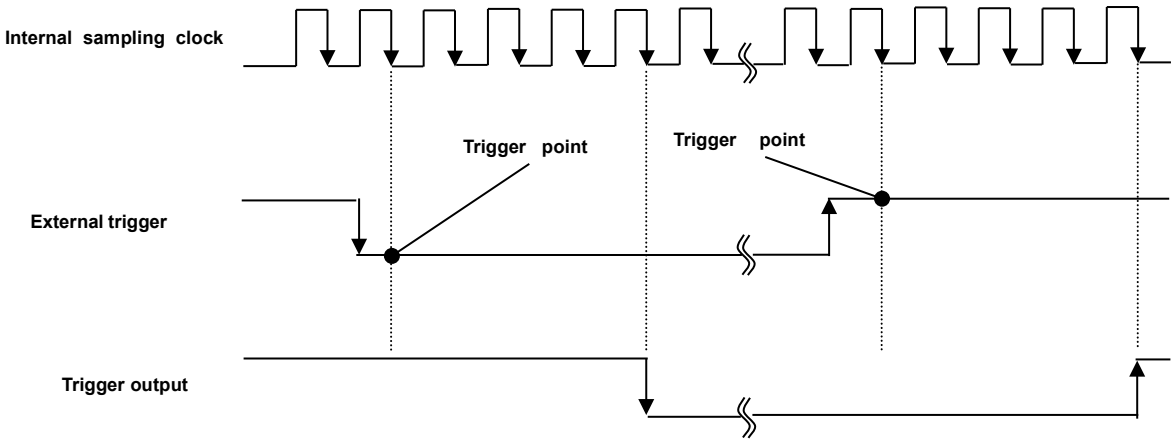
Ex. 3

Trigger type	External (start slope: fall, end slope: rise)
Sampling frequency	Less than 100 Hz
Trigger output	Output one clock cycle after the trigger point



Ex. 4

Trigger type	External (start slope: fall, end slope: rise)
Sampling frequency	100 Hz or more
Trigger output	Output four clock cycles after the trigger point



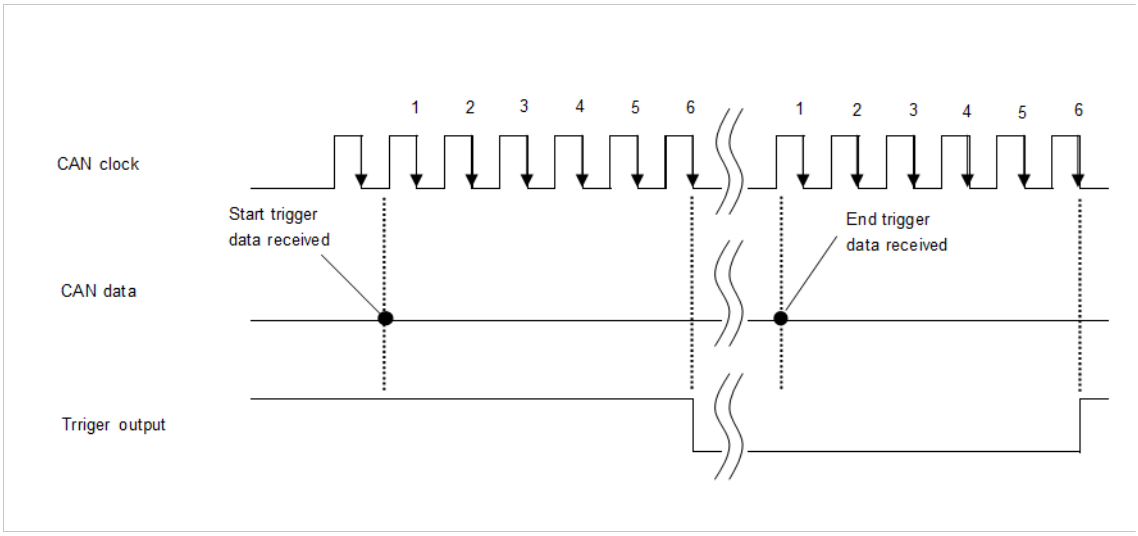
Output timing(CAN trigger)

When using the CAN trigger, the output timing of the trigger signal is different from that of other triggers. the CAN clock, which is a clock for CAN measurement, is used for CAN measurement in addition to the sampling clock. The frequency of the CAN clock is as follows.

Sampling frequency	Frequency	CAN clock frequency
1-2-5 series	All frequency	100kHz
2^n series	All frequency	65.536kHz
External clock	2^n series	65.536kHz
	Non 2^n series	100kHz

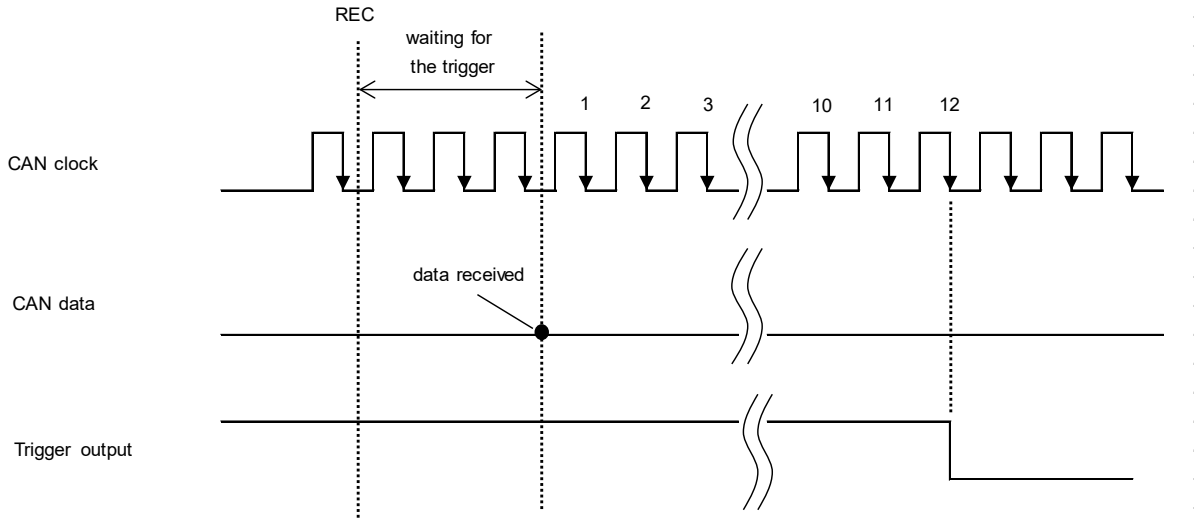
(1) CAN analog trigger or CAN digital trigger

When the CAN analog trigger and CAN digital trigger are selected, the trigger signal is output at the falling edge of the sixth CAN clock after the trigger data is received. An example of the output timing is shown below.



(2) CAN manual trigger

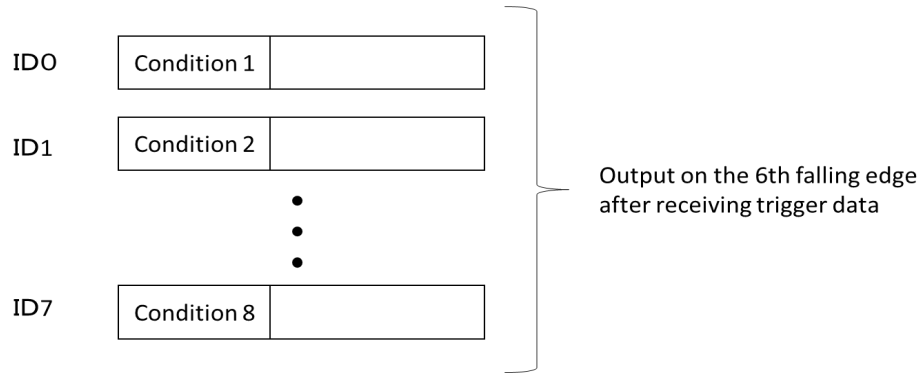
When the CAN manual trigger is selected, the trigger signal is output on the 12th falling edge of the CAN clock after the trigger data is received.



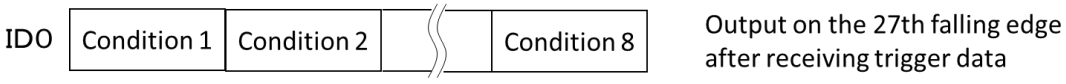
(3) CAN complex trigger

When the CAN complex trigger is selected, the output timing of the trigger signal varies depending on the trigger condition. The output timing of the trigger signal is shown in the table below.

Number of trigger data signals in one message	Trigger signal output timing (CAN clock reference)
1	6th falling edge from reception
2	9th falling edge from reception
3	12th falling edge from reception
4	15th falling edge from reception
5	18th falling edge from reception
6	21th falling edge from reception
7	24th falling edge from reception
8	27th falling edge from reception



Example 1: When eight conditions are distributed across multiple messages



Example 2: When eight conditions are contained in one message

Output timing(time synchronization function)

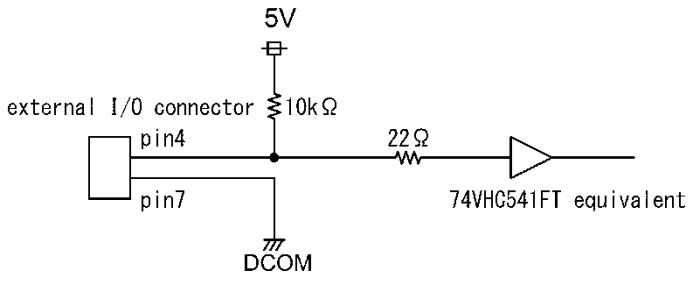
When time is synchronized by GPS at point zero (manual), point zero (manual n. of data), or interval (GPS sync), the trigger signal is output at the same time as the falling edge of the sampling clock at the start of recording.

4-4-3. External clock input

A pulse signal supplied from an oscillator or other external equipment can be used as a sampling clock. This makes it possible to record data for which clock synchronization has been achieved with another data logger or other external equipment. Input an external clock signal to pin 4 (CLK IN) and pin 7 (DCOM) of the external I/O connector.

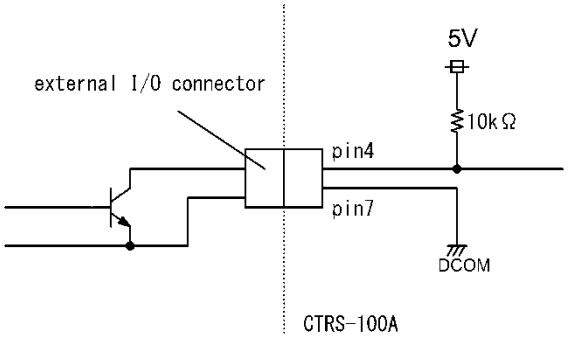
Input circuit

An outline of the input circuit is shown below.



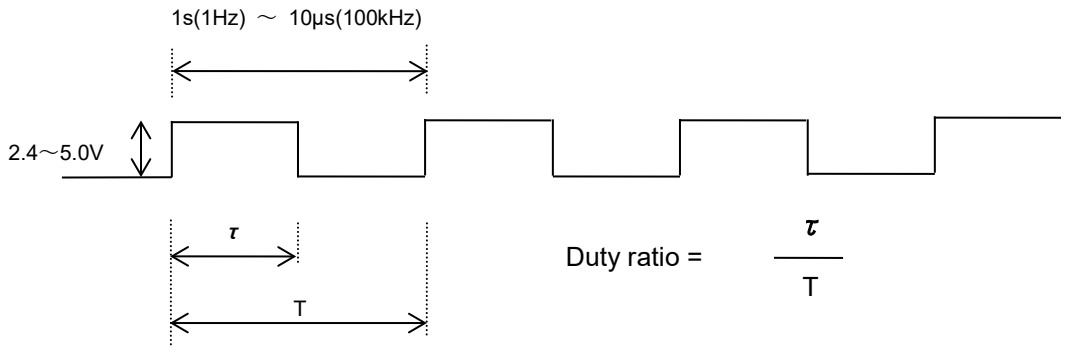
Input signal

Input a pulse signal (high level: 2.4 to 5.0 V, low level: 0 to 0.4 V) or open collector signal as the external clock input signal.



Open collector signal

For the input clock signal, use a square wave that has a duty ratio of 0.5 ±0.2 (50 ±20%).



The usable external clock frequency range is 1 to 100,000 Hz. In addition, the range can be set in 1-Hz increments. However, restrictions apply to the settable external clock frequency depending on the number of measuring channels and low-pass filter settings. For details on these restrictions, see, "4-3-1. Common settings - ③ Sampling frequency" on page 4-8.

NOTE

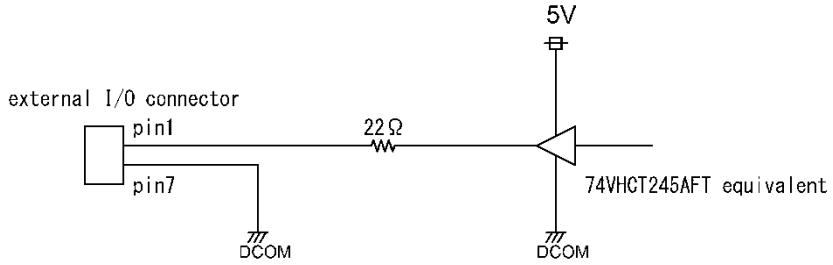
- Input a fixed clock signal for which the frequency does not fluctuate.
  If the frequency of the supplied clock fluctuates more than ±5% of the software-set value or the supply is cut off during processing, an external clock error will occur and measurement operations will stop.
- Constantly supply a clock during measurement operations. If no external clock is supplied at the start of measurement, measurement operations cannot be started.
- If an external clock error occurs during recording, the measurement operations stop, and the data recorded from the start of recording until the error was recognized is automatically saved.
- If the external clock frequency is within approximately ±5% of the set reference frequency value, a certain frequency is regarded as being input. For example, if the reference frequency is 8,000 Hz, it is necessary to supply a clock in the range of 7,600 to 8,400 Hz. However, to prevent trouble during the analysis processing after data recording, supply a clock with a frequency that is as similar to the set reference frequency as possible.

4-4-4. External clock output

Output a clock signal synchronized with the set sampling frequency to external equipment. By supplying this clock to other data loggers, high-speed cameras, etc., the data for which clock synchronization has been achieved with the equipment can be recorded. In addition, the sampling frequency can be divided for output. The clock signal is output from pins 1 (CLK OUT) and 7 (DCOM) of the external I/O connector.

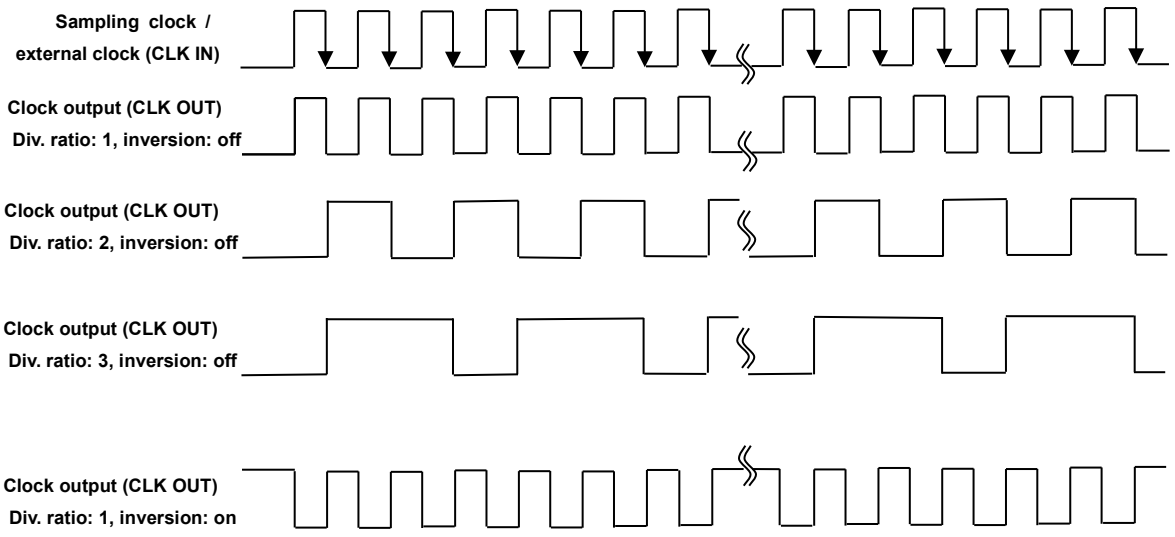
Output circuit

An outline of the output circuit is shown below.



Output signal

The output signal voltage levels are as follows: high level: 5 V, low level: 0 V. The frequency is equal to the sampling frequency divided by the set division ratio (1 to 65,534). The waveform is a square wave. In addition, by specifying the "Invert signal" setting in the control software, the output signal can be inverted. However, if no clock is output, the low level will be used regardless of the setting.

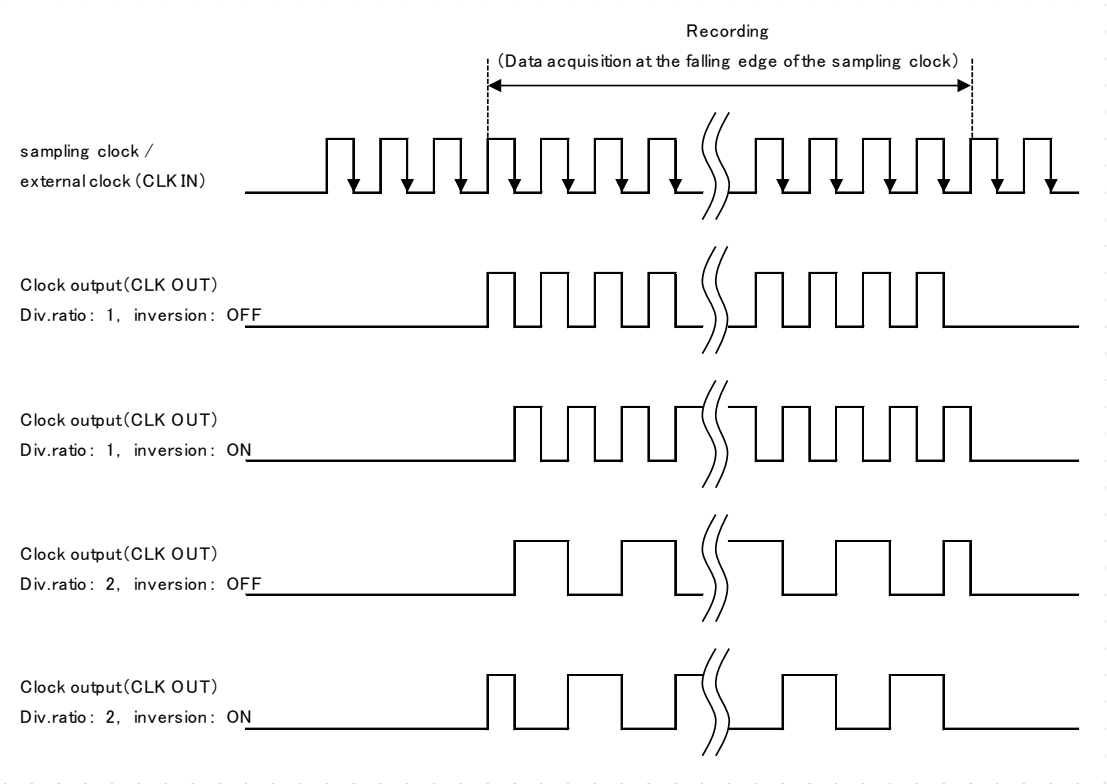


NOTE

If the division ratio is an odd number greater than or equal to 3, the duty ratio of the output CLK OUT signal will not be 0.5 (50%). The duty ratio differs depending on the division ratio. When the division ratio is 3, the duty ratio is the maximum value of 0.66(66%).

Output timing

If "only output while recording" is selected as the output mode setting, the clock signal output timing is as shown below.



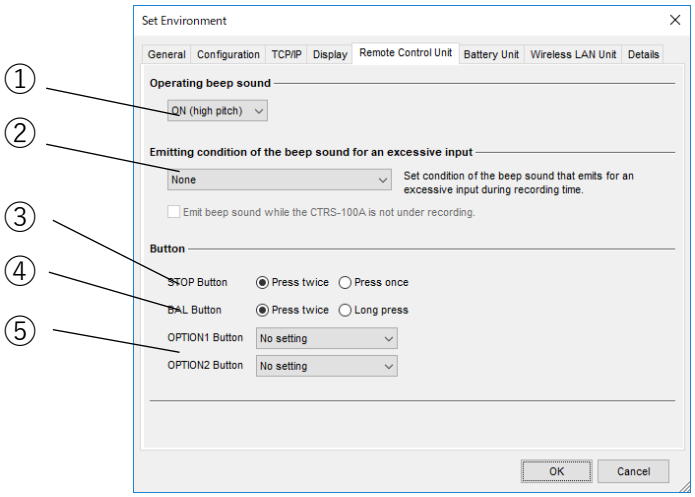
Example of the output timing when the output mode is set to "only output while recording"

NOTE

- Depending on the division ratio and inversion settings, there may be a clock output rising edge before the sampling clock signal falls for the first time.
- If the clock output mode is set to "Output during recording" and trigger recording is being used to perform recording, the clock is output while the external trigger output is at the low level. Note that the clock output start and end timing will be delayed compared to the trigger point. The delay time differs depending on the sampling frequency setting. For details on external trigger output, see "4-4-2.External trigger output" on page 4-23.

4-5. Remote Control Unit Settings

Remote control unit CTRS-RCU010A operations can be set from the control software.



① Operating sound

Select the buzzer sound from the following:

"ON(High pitch)", "ON(Low pitch)", or "OFF" (default: ON(High pitch)).

② Channel over sound

Select when to sound the buzzer if a channel goes over in terms of input from among the following: "Beep is generated until STOP/PAUSE", " Beep is generated only when input over", or "None" (default: None).

③ STOP switch execution method

Select from the following: press twice or press once (default: press twice).

④ BAL switch execution method

Select from the following: press twice or hold down (default: press twice).

⑤ Option switch

Select the functions to assign to the OPTION 1 and 2 buttons from the following:

No setting (default)	No function assigned. The button does nothing when pressed.
Start monitoring	Starts monitoring.
Delete the recorded data	After the acquisition is complete, delete of the latest data file. Press and hold the button.
Over reset	Clears the input-over status (the status when the set measuring range value is exceeded), and restores to the status before the input went over.
PAUSE	Pause recording. Acquisition is resumed by operating the REC switch.
Marker input	Marker data is added to the acquired data when the switch is pressed.
Auto range	Performs the auto range function. For the auto range, refer to the item related to the auto range in "7 MEASUREMENT" in the operation manual of the control software DCS-100A [CTRS-100A Operation].
CAN manual output	Start the CAN manual output.

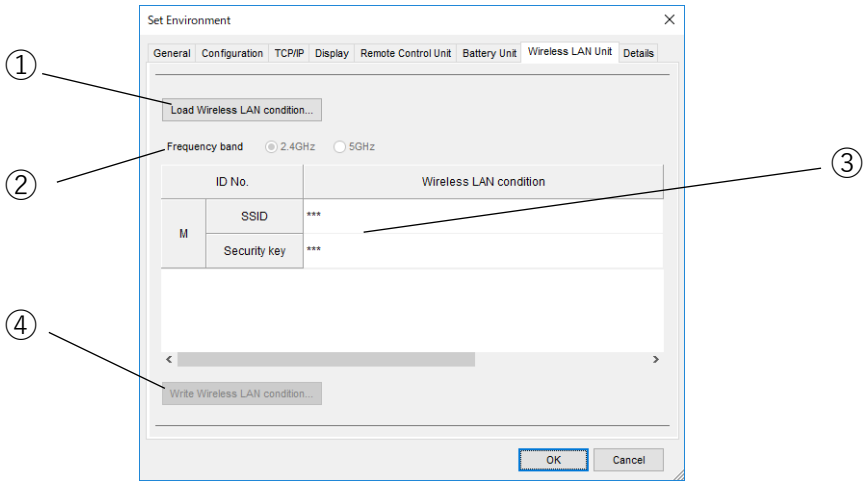
NOTE

- To use the PAUSE function, click Preferences and uncheck "Do not use PAUSE function during acquisition" in the "Preferences" window- "Details".
- The PAUSE function can be used only when the measurement mode is "Manual".
- The operation of the option switch is basically pressed once, but the operation is long-pressed only when the acquisition data deletion is set.

4-6. Wireless LAN unit setting

4-6-1. Wireless LAN condition setting

You can change the frequency band, SSID, and security key used for wireless LAN from "Preferences"-"Wireless LAN unit" of the control software.



① Load Wireless LAN condition

Click to read the wireless LAN conditions currently set for the connected wireless LAN unit. If you want to change the wireless LAN conditions, execute reading.

② Frequency band

Select the frequency band used for wireless LAN communication from 2.4GHz and 5GHz.

③ SSID and Security key

Double-click on the item you want to change or press the "SPACE" key on the keyboard to change the SSID and security key. The current security key is required for the change.

④ Write Wireless LAN condition

Click to write the changes to the connected wireless LAN unit.

NOTE

- The frequency band 5 GHz is prohibited by law for outdoor use.
  Select 2.4 GHz for outdoor use.

The following wireless LAN conditions can be changed by using the CTRS-100A network utility software.

Frequency band, Wireless channel, SSID, Security key, Encryption mode, IP address, DHCP server function ON / OFF

Please download and use the CTRS-100A network utility software from our website.

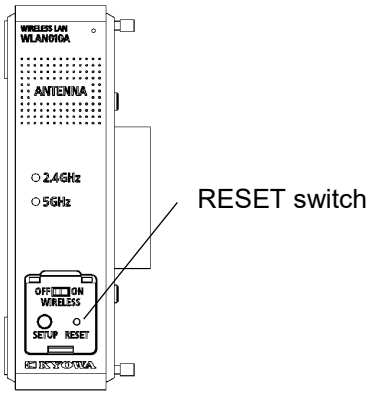
4-6-2. Initialization of SSID and security key

Follow the procedure below to initialize the SSID and security key of the wireless LAN unit to the factory default settings.

(Step 1) Connect the CTRS-100A to the wireless LAN unit and turn on the power.

(Step 2) Press and hold the RESET switch on the wireless LAN unit for 10 seconds or longer with something thin.

(Step 3) The CTRS-100A will restart when the initialization is complete.



4-6-3. About DHCP server function

The DHCP (Dynamic Host Configuration Protocol) server function is a function in which the wireless LAN unit automatically sets the setting information required for wireless connection such as the IP address for the wireless connection device (i.e. personal computer). This allows wireless connection without making detailed network settings on the wireless connection device side.

The DHCP server function of the wireless LAN unit is turned off at the factory. To enable the DHCP server function, make the settings on the CTRS-100A network utility software. Please download and use the CTRS-100A network utility software from our website.

- The IP address automatically assigned by the DHCP server function is set by the CTRS-100A network utility software. With the default settings, it is automatically assigned based on the IP address of CTRS-100A. The value obtained by adding 20 to the IP address of CTRS-100A is the start value of the IP address assigned by the DHCP server function.

  Ex. IP address of CTRS-100A : 192.168.100.100

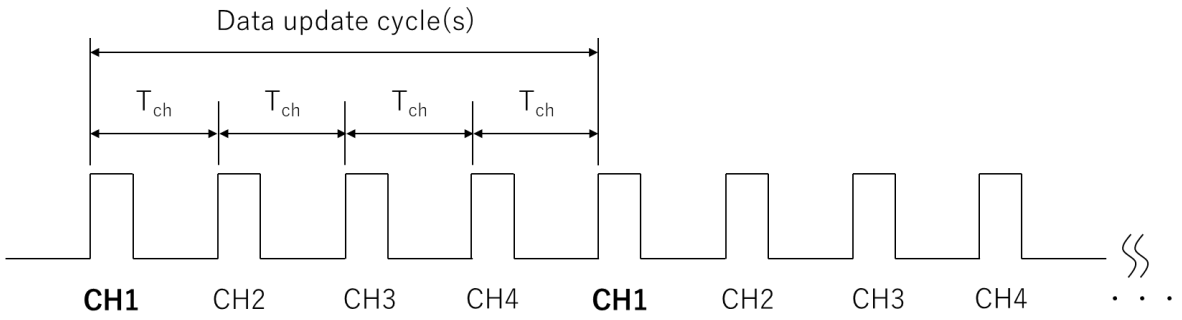
  IP address that is automatically assigned to the PC : 192.168.100.120～

- The settings of the DHCP server function are stored in the memory of the CTRS-100A. If the CTRS-100A is changed, the IP address and DHCP server function must be reconfigured.

4-7. Thermocouple Unit setting

4-7-1. Internal sampling frequency setting

The thermocouple measurement unit CTRS-CTA010A performs AD conversion while switching for each channel. The channel switching interval and data update cycle (internal sampling frequency) are as follows.



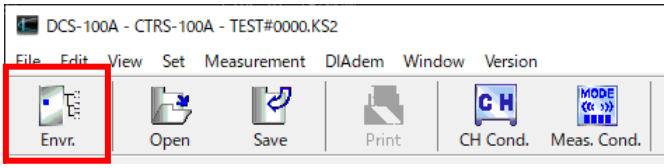
Data update cycle(s) = 1／Internal sampling frequency(Hz)

T_{ch} : Channel switching interval(s) = Internal sampling period ／4

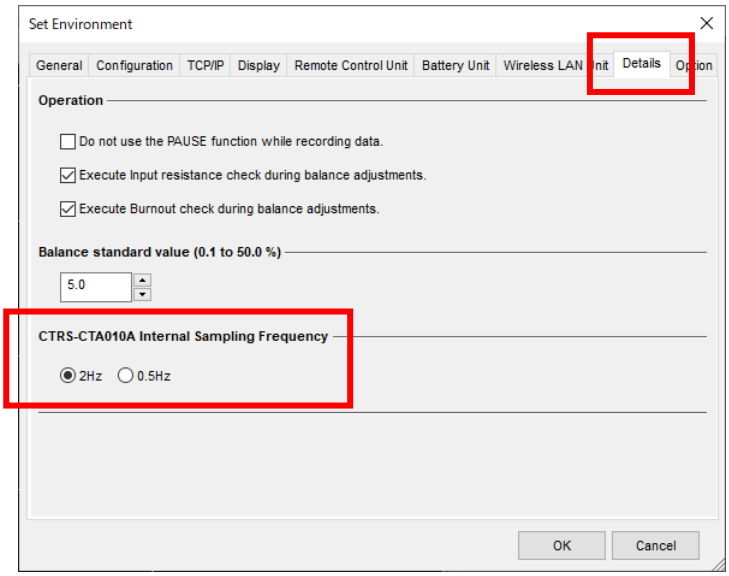
The internal sampling frequency can be selected from 2 Hz and 0.5 Hz. The default is set to 2 Hz. When measuring in an environment with large variations in measured values, setting 0.5 Hz can reduce variations in measured values.

This section describes the setting method when using the control software DCS-100A.

Open the “Set Environment” window.



Select the “Details” tab and select 2 Hz or 0.5 Hz from the “CTRS-CTA010A Internal Sampling Frequency”.

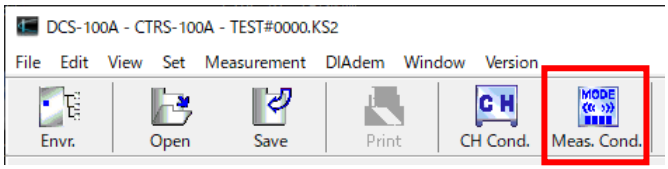


- For acquired data, the same data is treated as an acquired value until the data is updated.

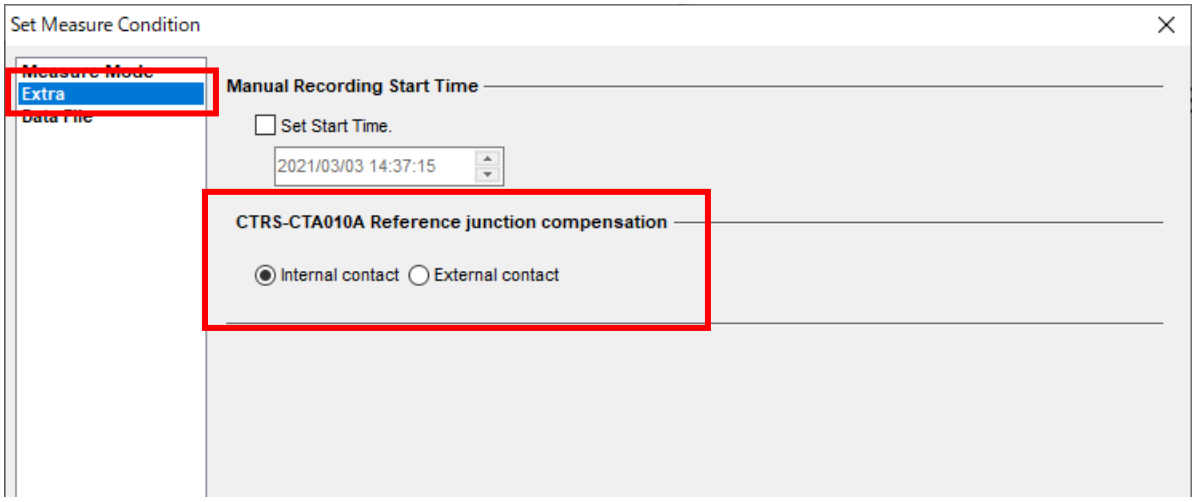
4-7-2. Reference junction compensation setting

The thermocouple unit CTRS-CTA010A can switch the reference junction compensation Internal / External. This section describes how to set using the control software DCS-100A.

Opens the measurement condition setting window.



Select "Extra" in the list on the left, and then select Internal / External in the "CTRS-CTA010A Reference Contact Compensation" item. The default is "Internal".

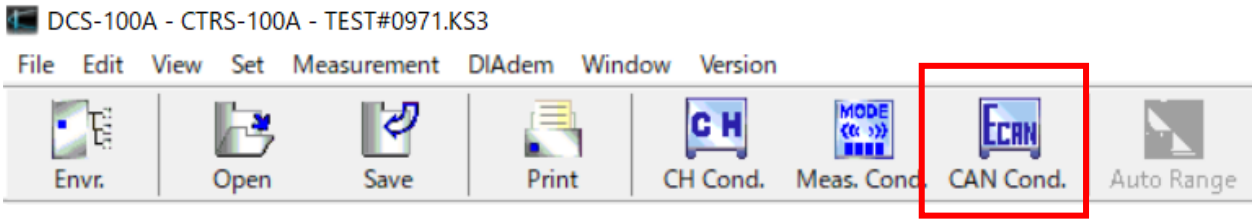


4-8. CAN Unit setting

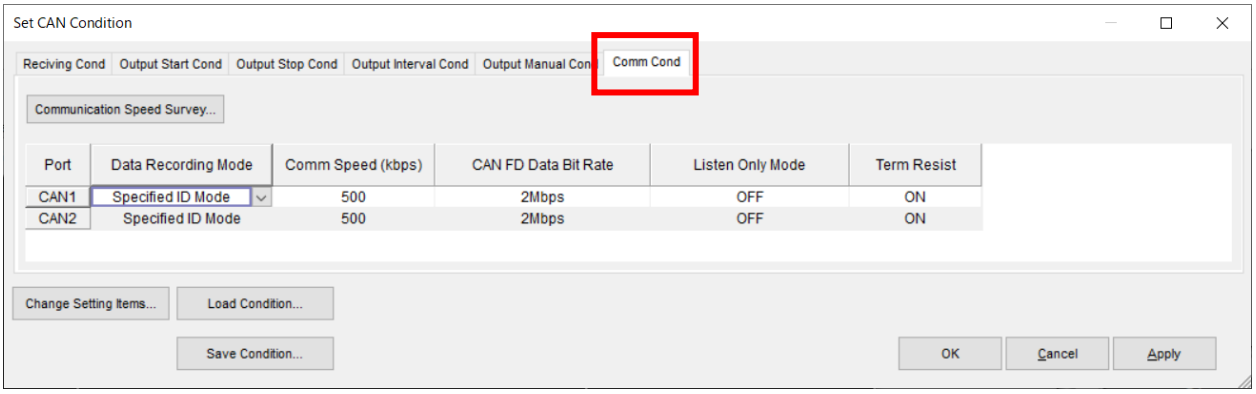
This section describes how to set up the CAN input unit when using the DCS-100A.

4-8-1. Comunication condition setting

Open “Set CAN condition” window.



Select “Comm Cond” tab.



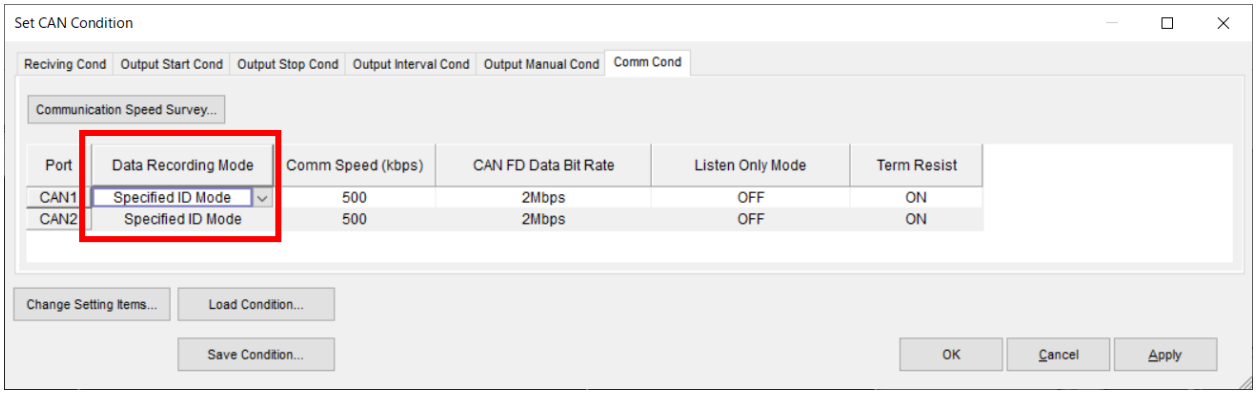
The following items are available for setting the communication conditions.

(1)Data recording mode

Data recording mode can be selected from “Specified ID Mode” and “All ID Mode”.

Specified ID Mode: Only the messages with the ID set in the “receiving cond” will be recorded.

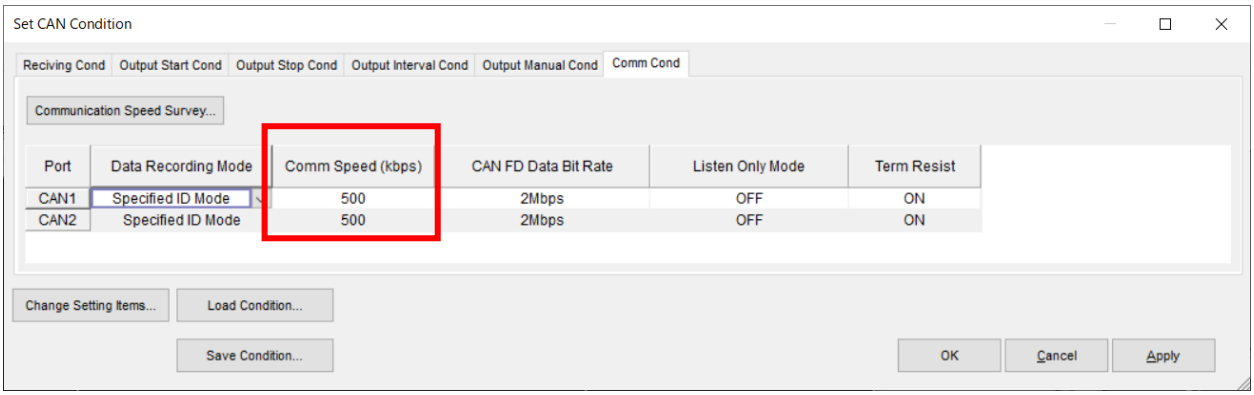
All ID Mode: All received messages will be recorded.



(2)Comm Speed

The communication speed can be choose from the following options.

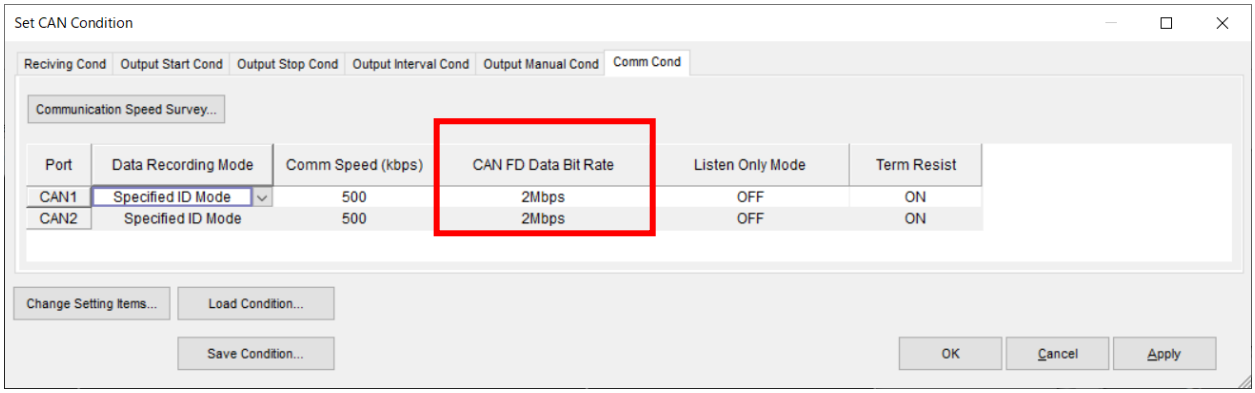
1000, 800, 500, 250, 125, 100, 83.3, 62.5, 50, 33.3, 25, 20, 10 (kbps)



- Communication speed can be set by "Communication Speed Survey" in addition to manual setting. For details, refer to “5-4.Communication Speed Survey (CTRS-CAG010A)” on page 5-11.

(3)CAN FD Data Bit Rate

CAN FD has a function called the bit rate switch, which enables high-speed communication by switching the speed of the data area. The communication speed to be switched can be selected in the "CAN FD Data Bit Rate". When only CAN is used, the CAN FD data bit rate is not used, so select "OFF".



NOTE

- There are limited combinations of CAN FD data bit rate and communication speed that can be set. Please refer to the table below.

The configurable CAN FD Data Bit Rate Table

Communication speed [kbps]	CAN FD data bit rate [Mbps]
1000, 800	2, 1, OFF
500, 250	5, 4, 2, 1, 0.5, OFF
125	2, 1, 0.5, OFF
100, 83.3, 62.5	1, 0.5, OFF
50, 33.3	0.5, OFF
25, 20, 10	OFF

- Communication speed can be set by "Communication Speed Survey" in addition to manual setting. For details, refer to “5-4.Communication Speed Survey (CTRS-CAG010A)” on page 5-11.

- The sample point and resynchronization jump width for each communication speed are set as follows. These values are fixed and cannot be changed.

1000kbps - 100kbps

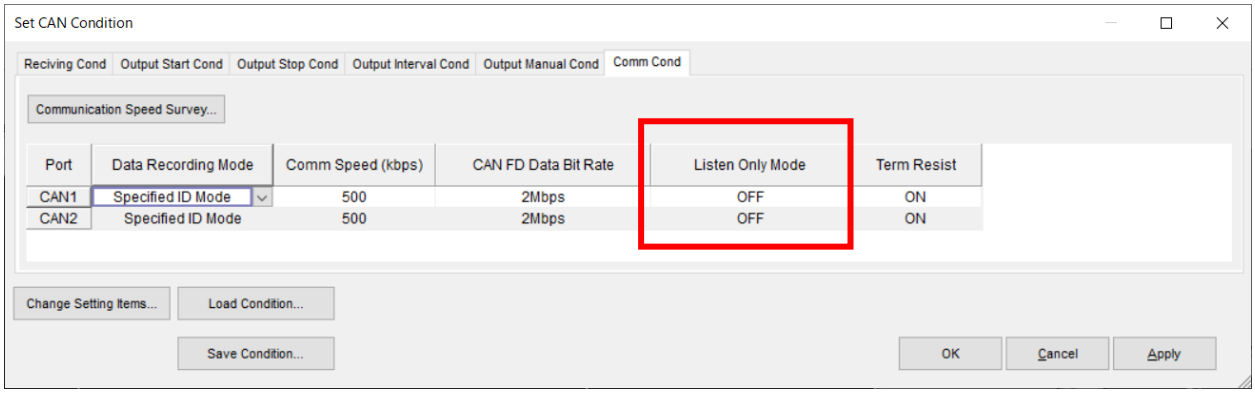
Communication speed			CAN FD data bit rate		
Bit rate [kbps]	Sample point	resynchronization jump width	Bit rate [Mbps]	Sample point	resynchronization jump width
1000	80%	8	2	75%	5
1000	80%	4	1	80%	4
1000	80%	4	OFF	80%	4
800	80%	10	2	75%	5
800	80%	5	1	80%	4
800	80%	2	OFF	80%	2
500	80%	16	5	62.5%	3
500	80%	16	4	70%	3
500	80%	16	2	75%	5
500	80%	8	1	80%	4
500	80%	4	0.5	80%	4
500	80%	4	OFF	80%	4
250	80%	32	5	62.5%	3
250	80%	32	4	70%	3
250	80%	32	2	75%	5
250	80%	16	1	80%	4
250	80%	8	0.5	80%	4
250	80%	4	OFF	80%	4
125	80%	32	2	80%	2
125	80%	32	1	80%	4
125	80%	16	0.5	80%	4
125	80%	4	OFF	80%	4
100	80%	20	1	80%	2
100	80%	20	0.5	80%	4
100	80%	4	OFF	80%	4

83.3kbps - 10kbps

Communication speed			CAN FD data bit rate		
Bit rate [kbps]	Sample point	resynchronization jump width	Bit rate [Mbps]	Sample point	resynchronization jump width
83.3	80%	24	1	80%	2
83.3	80%	24	0.5	80%	4
83.3	80%	4	OFF	80%	4
62.5	80%	32	1	80%	2
62.5	80%	32	0.5	80%	4
62.5	80%	4	OFF	80%	4
50	80%	20	0.5	80%	2
50	80%	4	OFF	80%	4
33.3	80%	30	0.5	80%	2
33.3	80%	4	OFF	80%	4
25	80%	4	OFF	80%	4
20	80%	4	OFF	80%	4
10	80%	4	OFF	80%	4

(4)Liston Only Mode

The listen only mode can be selected from ON or OFF. When ON is selected, no ACK or error frame is returned when a CAN message is received, and no effect is caused to the bus.

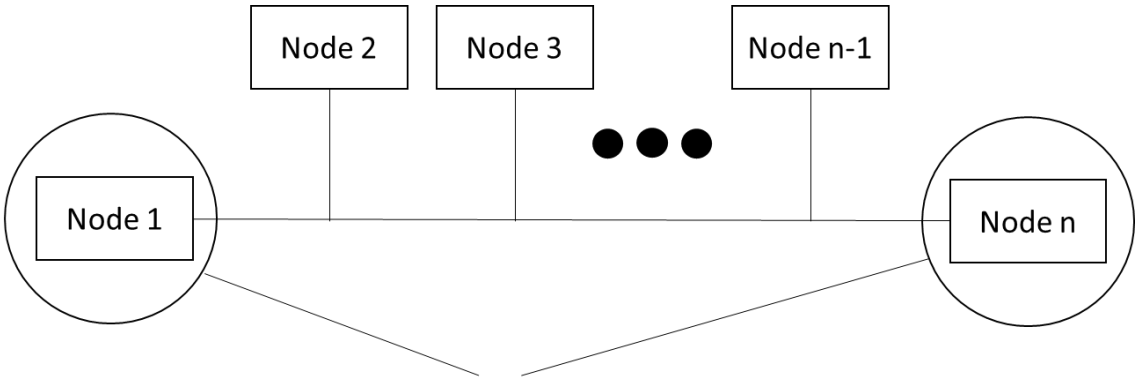


NOTE

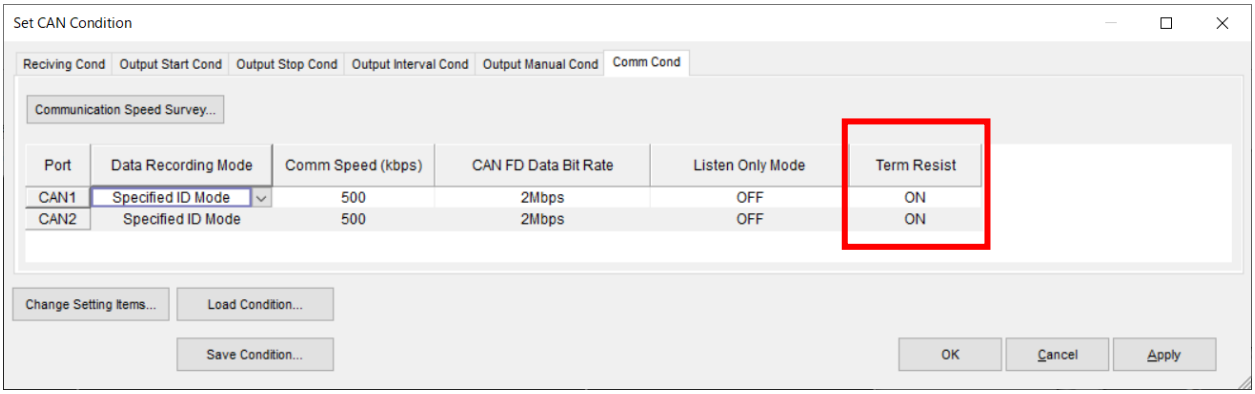
- When the listen only mode is turned on, CAN messages cannot be output.

(5)Term Resist

The termination resistor can be selected from ON or OFF. When ON is selected, a 120Ω termination resistor is inserted.When this unit is placed at the end of the CAN bus, insert a terminating resistor.

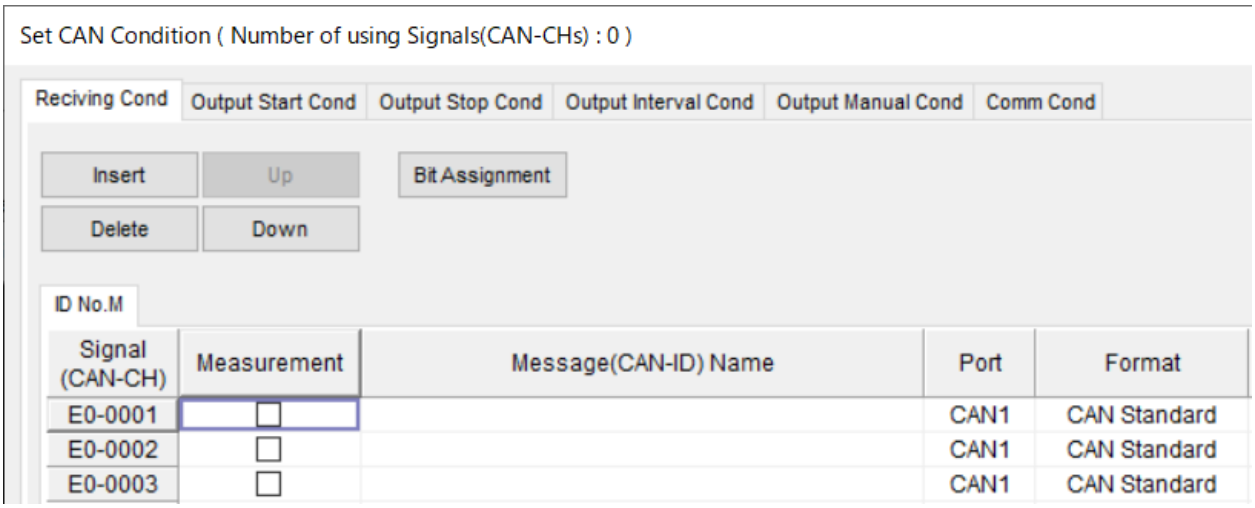


When this unit is installed at the end of the CAN bus, a terminator is required.



4-8-2. Receiving condition setting

Select the “Receiving Cond” tab in the “Set CAN Condition” window.



- When the data recording mode is set to "All ID mode", setting the receiving condition is not necessary.

The following items are available for setting the reception conditions.

(1)Measurement
For the signal to be measured, check the Measurement.

(2)Message(CAN-ID) Name
Set the name of the message to be received.

(3)Port
Select the port to receive the message.

(4)Format
Select the format of the message to be received. The format can be selected from "CAN Standard", "CAN Extended", "CAN FD Standard", and "CAN FD Extended". Note that messages with different formats are treated as different messages, even if they have the same ID.

(5)Frame ID
Enter the frame ID of the message to be received. The value can be set in the range of 0x000 to 0x7FF for the standard format, and 0x00000000 to 0x1FFFFFFF for the extended format.

(6)Data Length
Select the data length of the message to be received, which can be selected from 1 to 8 bytes in the case of CAN format, or 1 to 8, 12, 16, 20, 24, 32, 48, or 64 bytes in the case of CAN FD format.

(7)Signal (CAN-CH) Name
Set the name of the signal.

(8)Start Bit

Set the position of the first bit when cutting out a signal from a message.

(9)Bit Length

Set the number of bits to be cut out from the start bit when cutting out a signal from a message. The maximum is 64 bits. If the data type is "Float", the setting is 32 bits; if the data type is "Double", the setting is fixed at 64 bits.

(10)Data Type

Set the data type of the signal. The data type can be selected from "Signed", "Unsigned", "Float", and "Double".

(11)Endian

Select the endian of the signal. The endian can be chosen between "Little" and "Big".

(12)Calibr. Const.

Set the calibration constant as required.

(13)Offset

Set the offset as required.

(14)Node Name

Enter the node name.

(15)Unit

Set the signal unit.

(16)Deci Digits

Set the number of digits used to display the signal as a numerical value.

NOTE

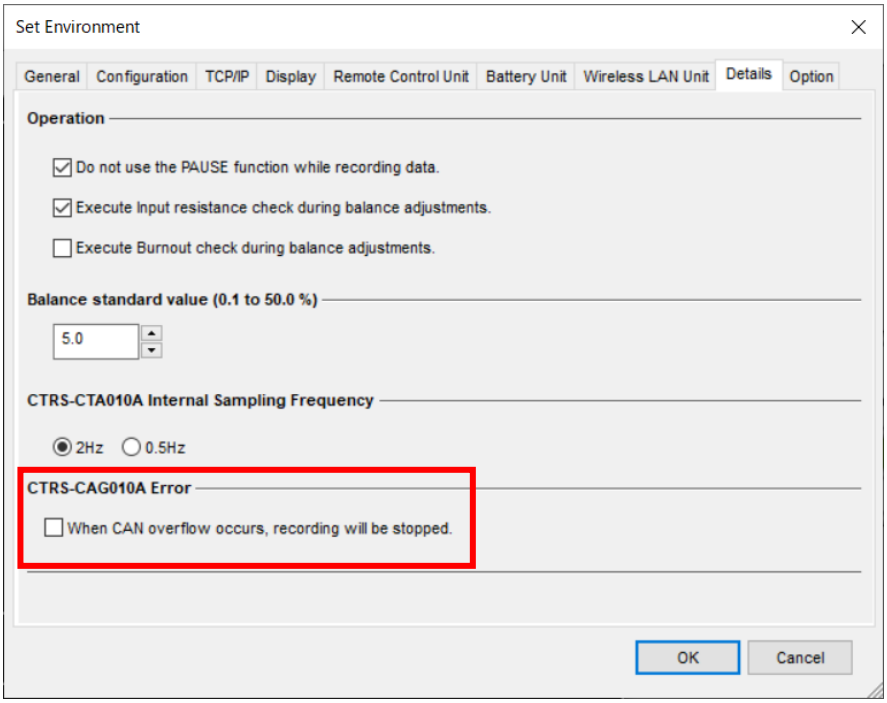
- Even when CAN messages are received at the same time on ports 1 and 2, there is a difference in the reception time of both messages due to internal processing. The time difference varies depending on the measurement conditions and internal processing status, but it is usually several tens of microseconds.

4-8-3. Number of messages that can be received per second

The maximum number of messages that the CAN unit can receive per second is 1000 per port, regardless of the number of analog measurement channels. If CAN messages that exceed this number are received, this product may temporarily stop recording CAN messages. This phenomenon is called "CAN overflow." When CAN overflow occurs, you can select whether to continue recording or to stop recording. If recording continues while CAN overflow occurs, thinned data will be recorded, so some data will be lost, but analog data will be recorded without loss. If the CAN overflow occurs frequently, the following method may reduce the frequency of CAN overflow.

(1) Reduce the bus load by reducing the number of messages flowing on the CAN bus.
(2) Reduce the number of messages to be recorded.
(3) Reduce the number of ports used.
(4) Do not use CAN trigger.
(5) Reduce the number of conditions for complex CAN trigger.

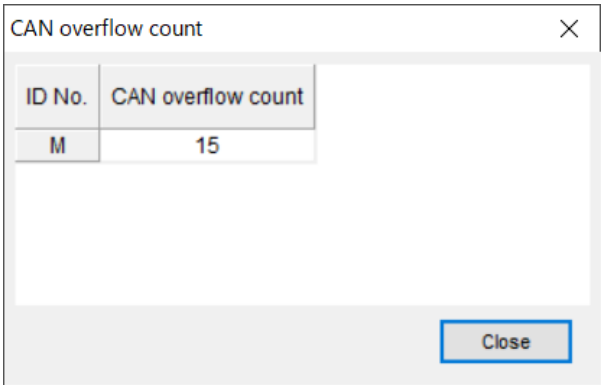
The operation at CAN overflow can be selected in the “Details” tab of the “Set Environment” window.



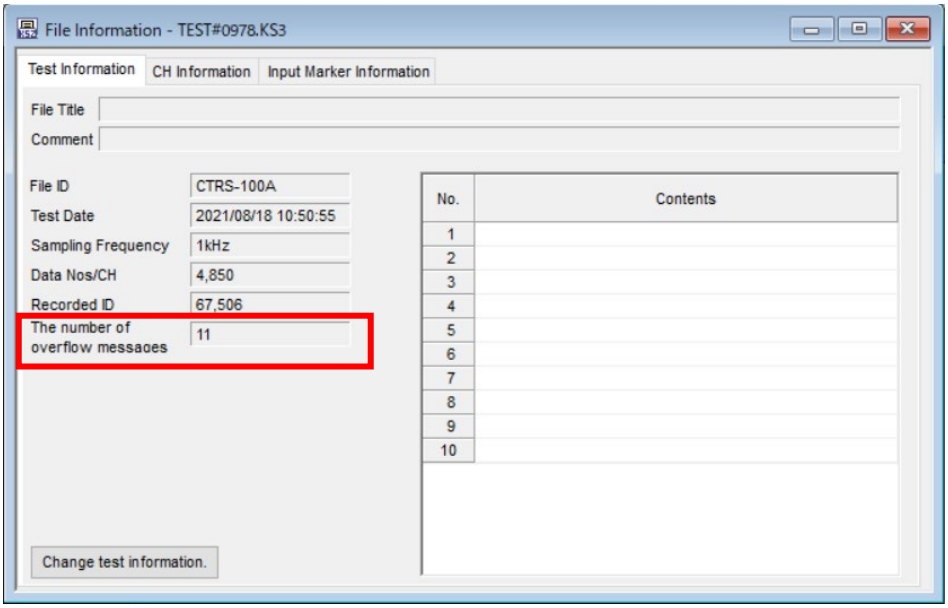
- The occurrence of CAN overflow can be confirmed by the following method.

(1) If a CAN overflow occurs even once during monitoring/recording, the status LED of the CAN unit will blink rapidly. This LED status will be maintained until a new monitoring/recording is started.

(2) When the DCS-100A is being used for monitoring/recording, the number of times CAN overflow has occurred will be displayed on the screen.



(3) If a CAN overflow occurs during recording, the history is recorded in the recording file and can be checked in the file information of the DAS-200A.



4-8-4. CAN output setting

There are four types of output conditions for the CAN Unit. The setting method is the same for all output conditions.

Start output: Outputs at the start of monitoring.
Stop output: Outputs at the start of monitoring.
Interval output: Outputs at regular intervals set during monitoring.
Manual output: Outputs at any timing during monitoring.
For details on each output timing, refer to page 4-59.

The settings for each output include the following items.

(1)Output
Place a check mark in the box for the output.

(2)Tx Port
Select the port for the output.

(3)Tx Format
Select the format of the output message. The format can be selected from "CAN Standard", "CAN Extended", "CAN FD Standard", and "CAN FD Extended".

(4)Tx Frame ID
Set the frame ID of the message to be output. In the case of the standard format, the value can be set in the range of 0x000 to 0x7FF, and in the case of the extended format, the value can be set in the range of 0x00000000 to 0x1FFFFFFF.

(5)Tx Data Length
Select the data length of the message to be output, which can be selected from 1 to 8 bytes for CAN format, or 1 to 8, 12, 16, 20, 24, 32, 48, or 64 bytes for CAN FD format.

(6)Data

Enter the data for the message to be output.

(7)Interval Until Next Output

When the next output is available, you can set the time to wait until the next output. After the output is completed, the next message is output after the set time has elapsed. The time can be set in the range of 10 ms to 1000 ms.

(8)Confirmation

Set the response confirmation for the CAN output test. If checked, response confirmation will be performed after output is completed. To perform response confirmation, set items (9) to (12) below. Response confirmation will be performed until a response message is received or the receive timeout period elapses.

(9)Rx Port

Select the port to receive the message at the response confirmation.

(10)Rx Format

Select the format of the message to be received during response confirmation. The format can be selected from "CAN Standard", "CAN Extended", "CAN FD Standard", and "CAN FD Extended".

(11)Rx Frame ID

Enter the frame ID of the message to be received during response confirmation.

(12)Rx Timeout

If no response message is received after the transmission is completed and the time set for the receive timeout elapses, the next output will be sent. The receive timeout can be set in the range of 10 ms to 1000 ms.

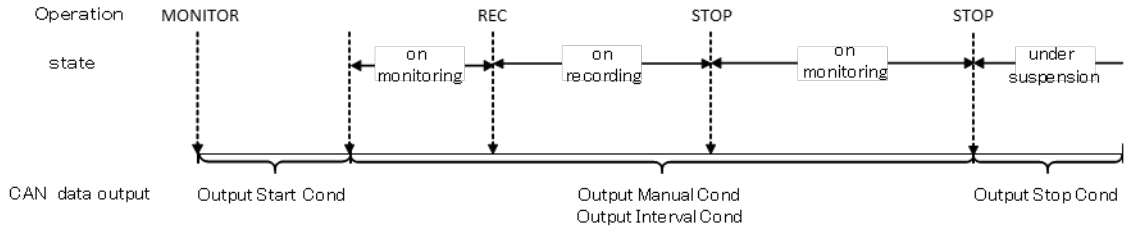
(13)Cycle (only Output Interval Cond)

Sets the output interval, which can be set between 0.1s and 100s.

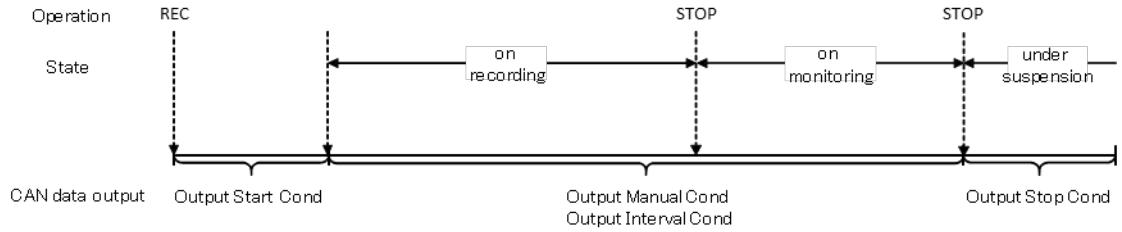
The output timing for each output (start/stop/interval/manual) is shown below.

[Manual mode]

●Monitor button → REC button → STOP button

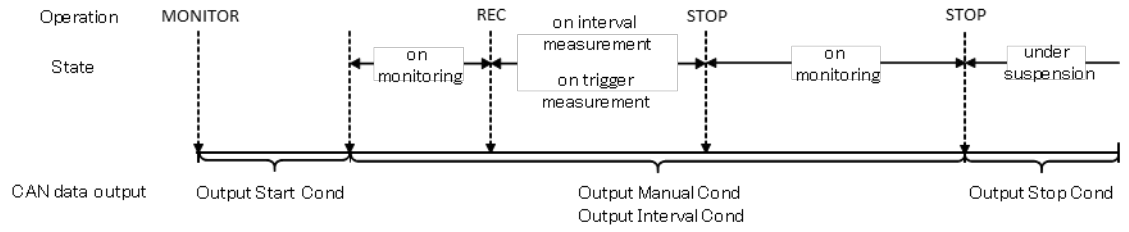


●REC button → STOP button

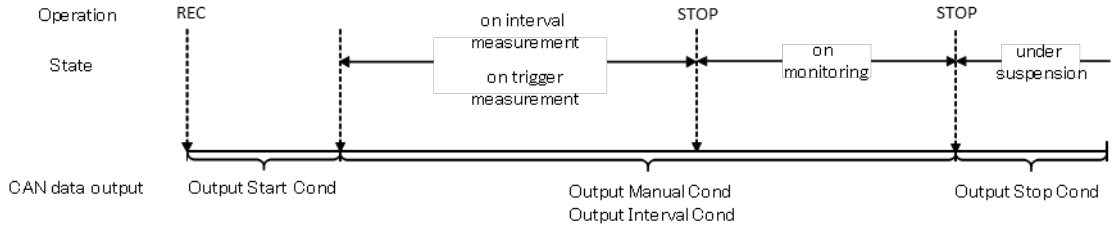


[Interval mode or Trigger mode]

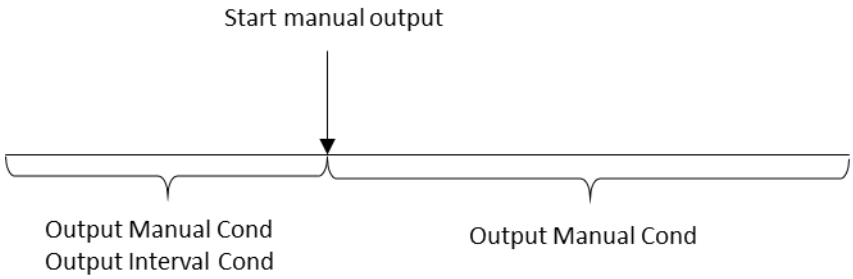
●Monitor button → REC button → STOP button



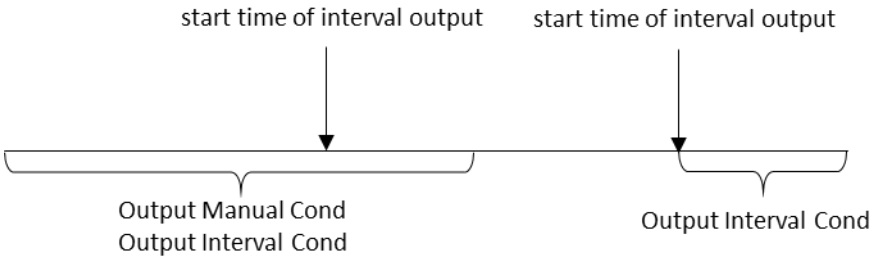
●REC button → STOP button



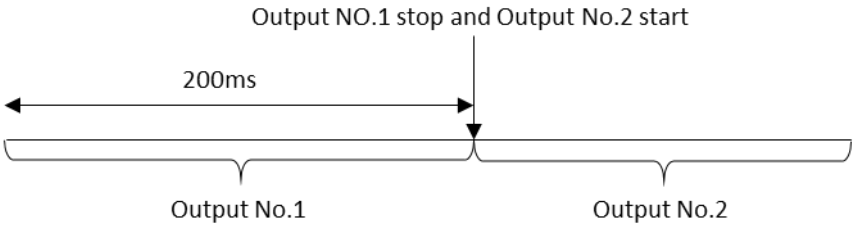
- If a new manual output is started during interval output or manual output, the current output is stopped and a new manual output is started.



- If the start time of the next interval output is reached during interval output or manual output, the current output is continued without starting a new interval output. In this case, when the next interval output start time comes, the interval output starts again.



- If transmission is not completed within 200 ms after the start of transmission, the output stops and moves to the next output. To ensure that data can be transmitted normally, perform an output test beforehand.

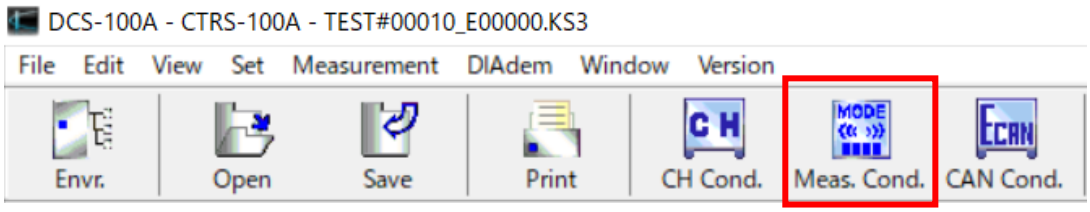


4-9. CAN/GPS Unit setting

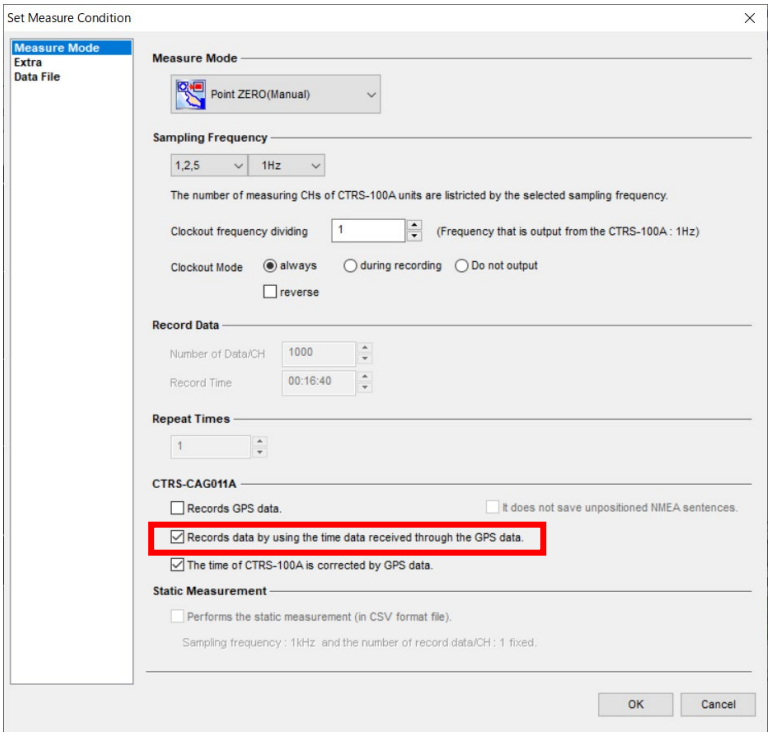
This section describes how to set up the CAN/GPS input unit for functions that use GPS. The settings for CAN-related functions are the same as those for the CAN unit; refer to "4-8.CAN Unit setting" on page 4-44.

4-9-1. Point zero (manual) setting

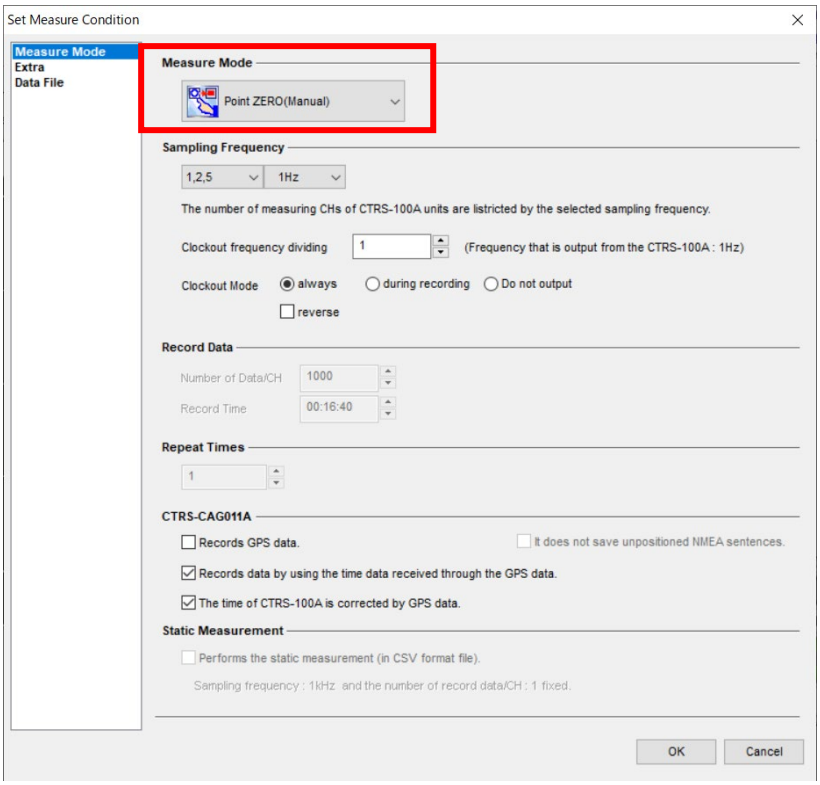
Open the set measure condition window with the CTRS-CAG011A included in the device configuration.



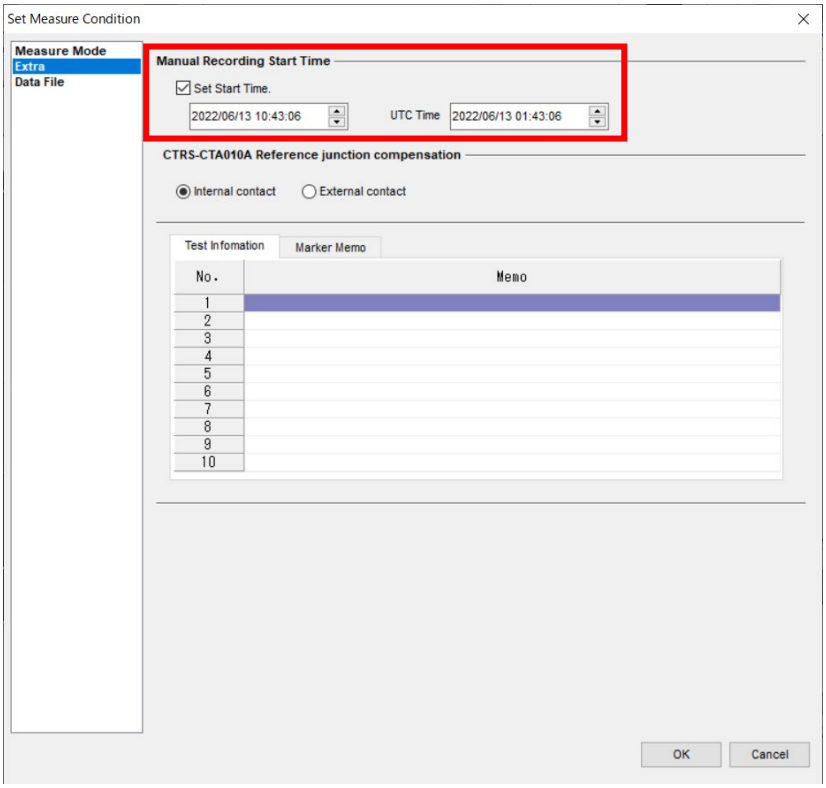
Check the “Records data by using th time data received through the GPS data”.



Set the measure mode to point zero (manual).

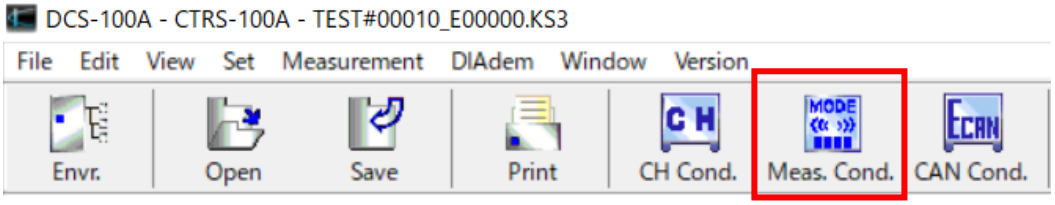


To set the time to start recording, select "Extra" from the list on the left, then check “Set Start Time” under “Manual Recording Start Time”, and then set the date and time.

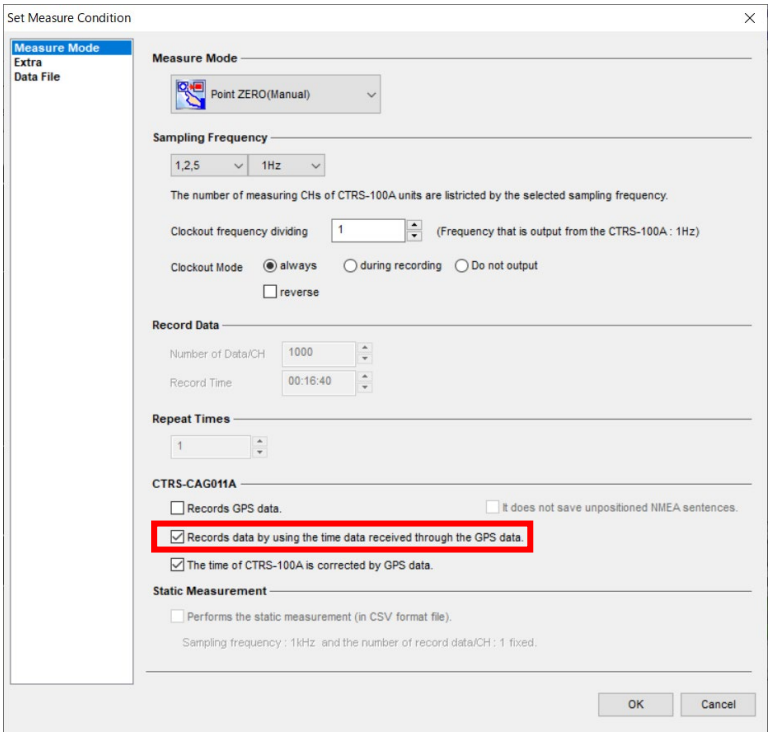


4-9-2. Point zero (manual n. of data) setting

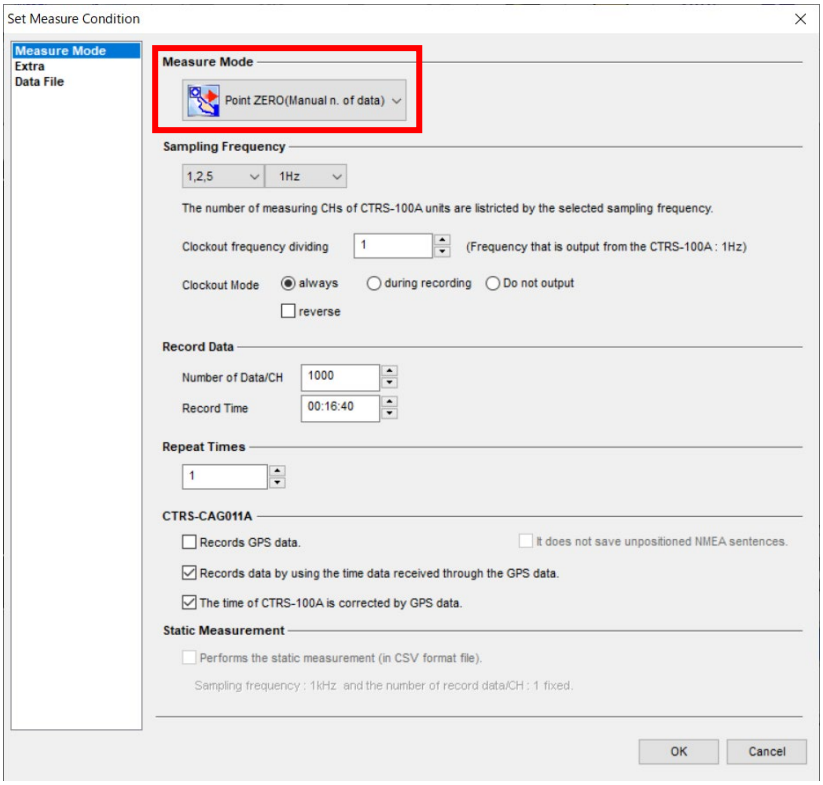
Open the set measure condition window with the CTRS-CAG011A included in the device configuration.



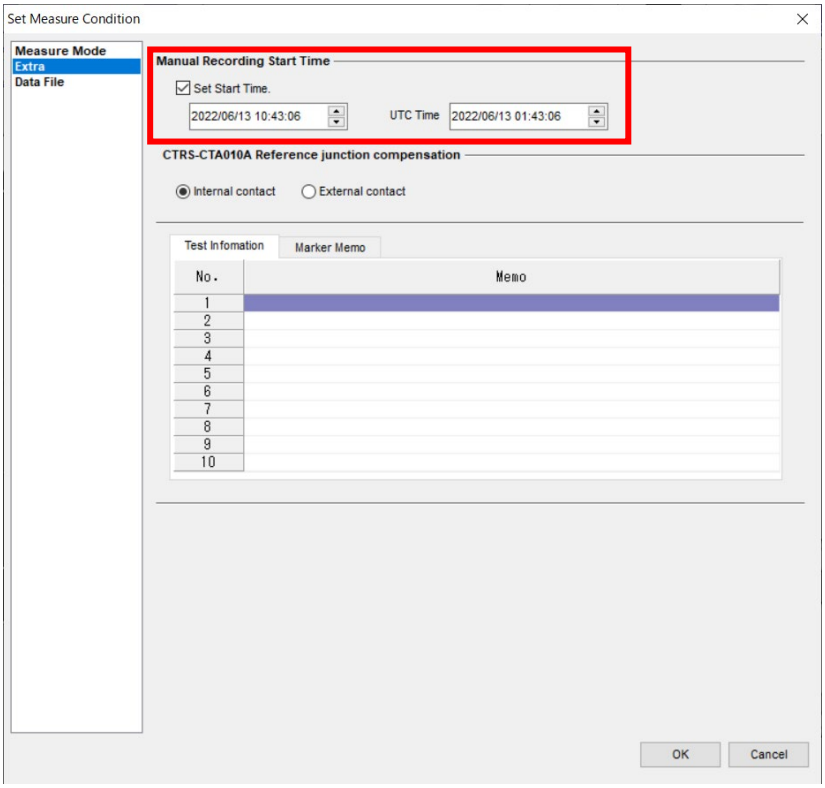
Check the “Records data by using the time data received through the GPS data”.



Set the measure mode to point zero (manual n. of data).

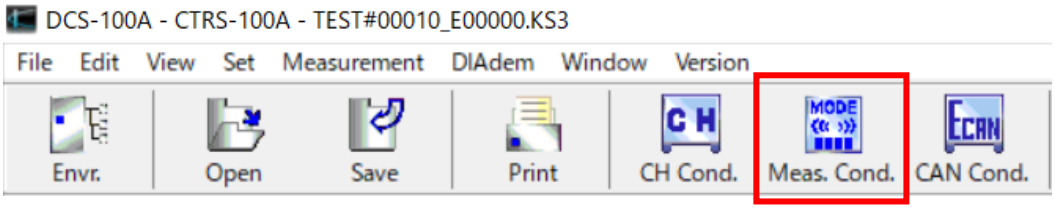


To set the time to start recording, select "Extra" from the list on the left, then check “Set Start Time” under “Manual Recording Start Time”, and then set the date and time.

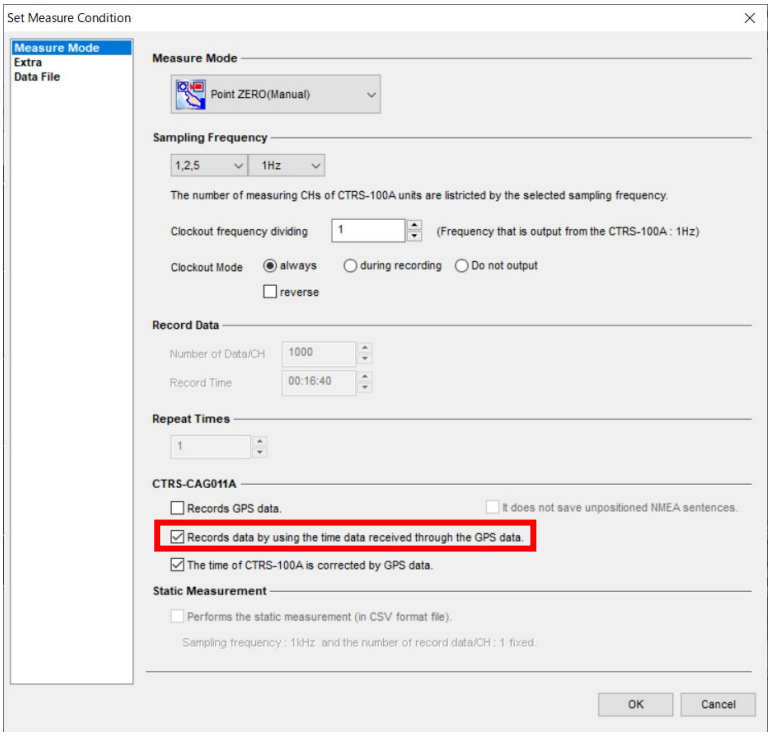


4-9-3. Interval (GPS sync) setting

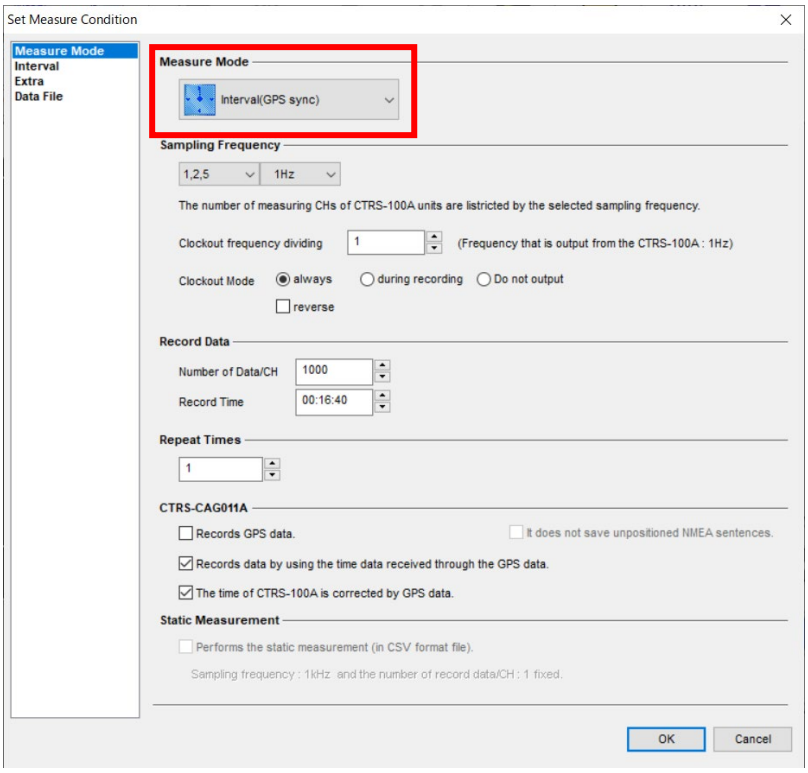
Open the set measure condition window with the CTRS-CAG011A included in the device configuration.



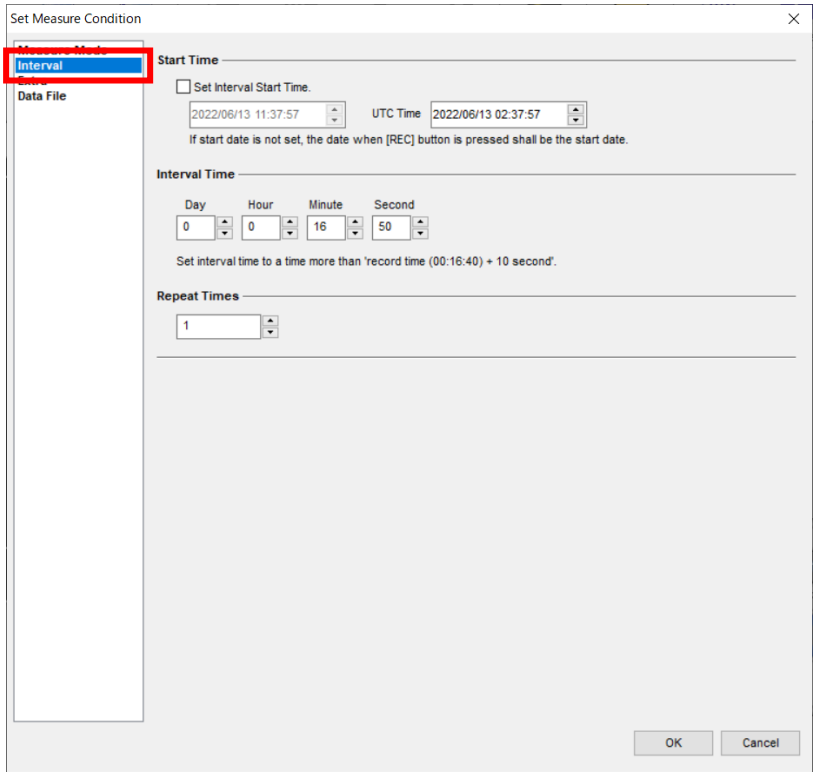
Check the “Records data by using the time data received through the GPS data”.



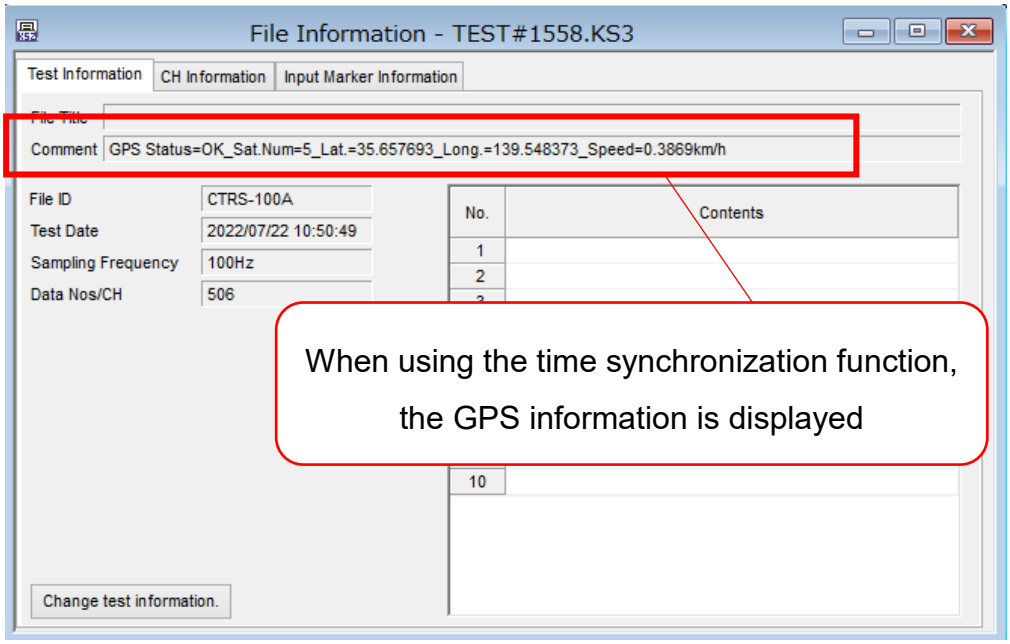
Set the measure mode to interval (GPS sync).



Select "Interval" from the list on the left, to set detailed conditions for interval measurement.

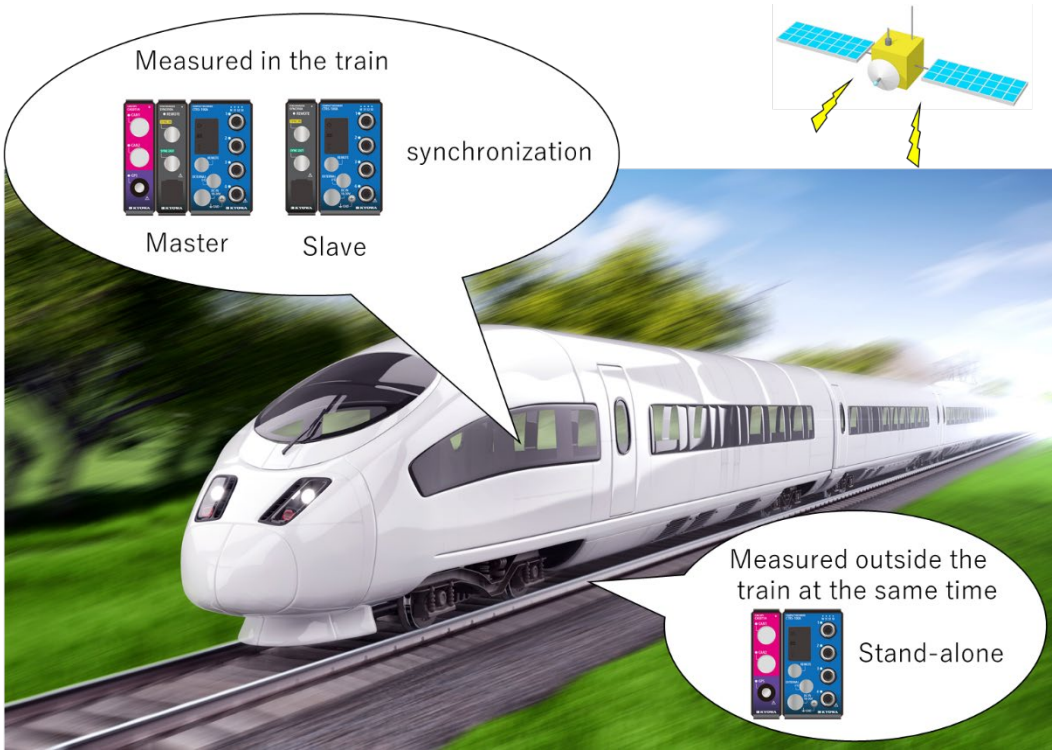


- Data files recorded by point zero measurement using the time synchronization function and data files recorded by manual measurement without the time synchronization function cannot be distinguished from each other by their file names. Similarly, data files recorded in interval (GPS sync) measurements using the time synchronization function and data files recorded in interval measurements not using the time synchronization function cannot be distinguished from each other by their file names.
  To distinguish, open a data file (KS2 file) with DAS-200 (optional accessary). For data files collected from measurements using the time synchronization function, GPS information is displayed in the test information comments (as follow).
  ※For information on how to operate DAS-200A, refer to the DAS-200A INSTRUCTION MANUAL.



4-9-4. Installation of CTRS-100A

The following is an example of an installation for measurement using the time synchronization function of the CTRS-CAG011A. The figure below shows a case where sensor information attached to a train is recorded in a running train, and sensor information attached to the surrounding environment is recorded outside the train at the same time.



Each CTRS-100A can operate in either stand-alone or synchronization.

NOTE

- For synchronous operation, the CTRS-CAG011A must be connected to the master. If it is connected to a slave, the time synchronization function cannot be used.

4-9-5. GPS data recording

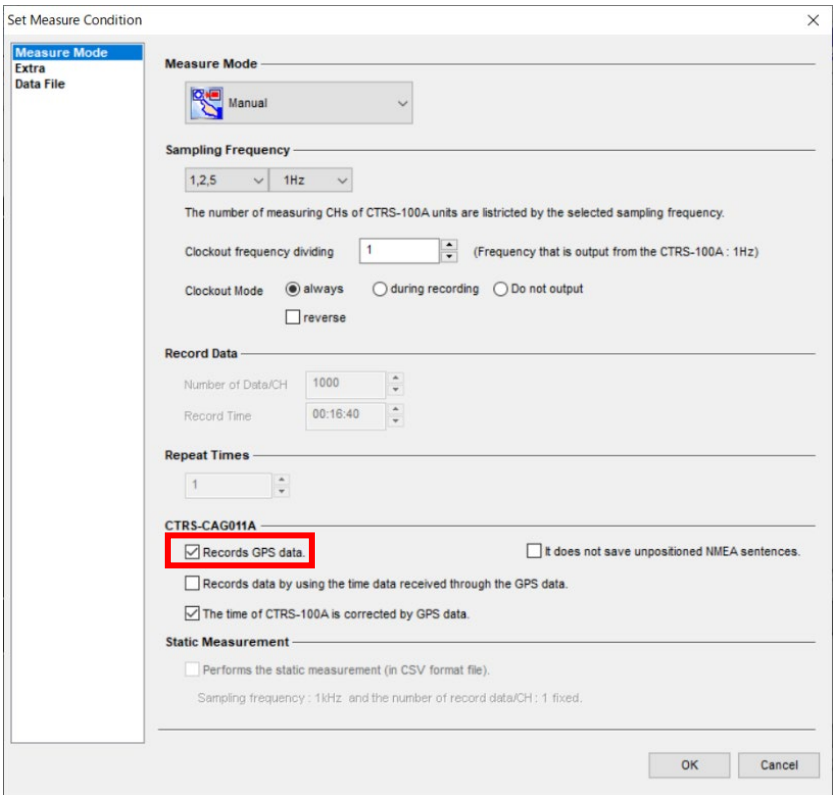
This section describes the settings for GPS data recording.

The recorded GPS data file is saved in NMEA format.

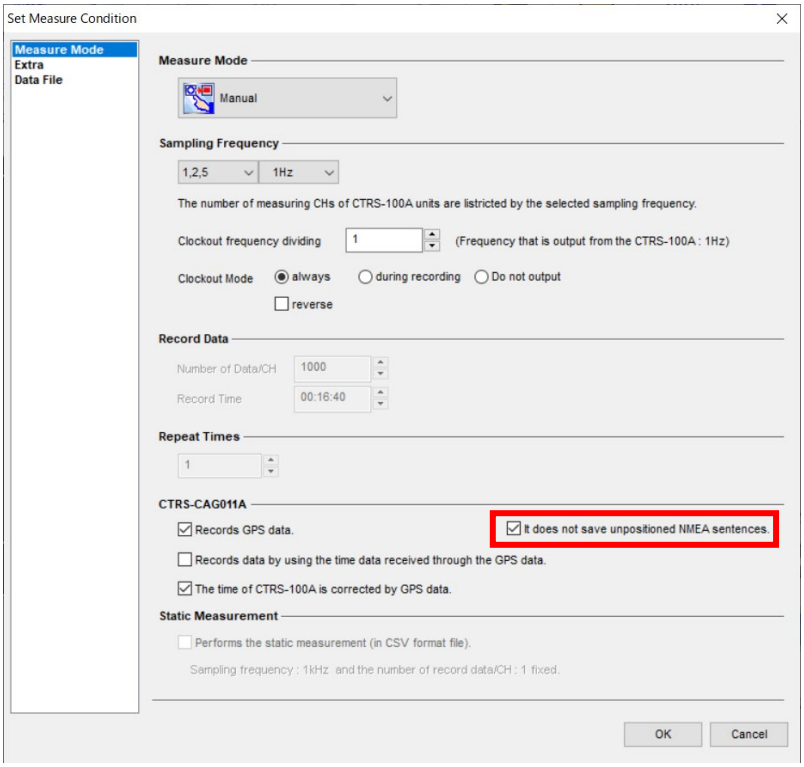
NOTE

- GPS data is recorded at the timing when GPS data is received, regardless of the set sampling frequency.

To record GPS data, check "Records GPS data" in the set measure condition window with CTRS-CAG011A connected.



- When recording GPS data, you can create an NMEA file which is not included unpositioned data by checking "It does not save unpositoned NMEA sentence".

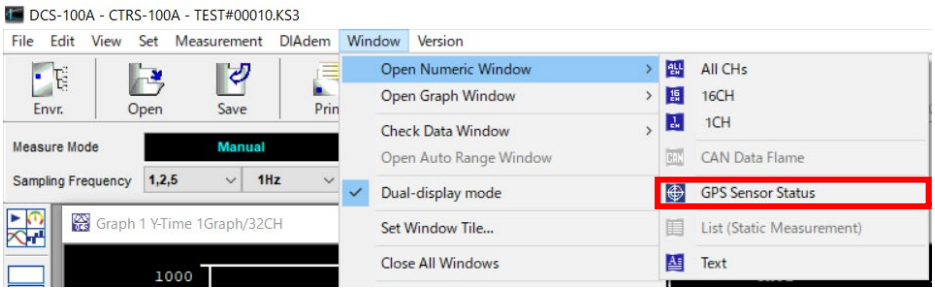


4-9-6. About GPS sensor status

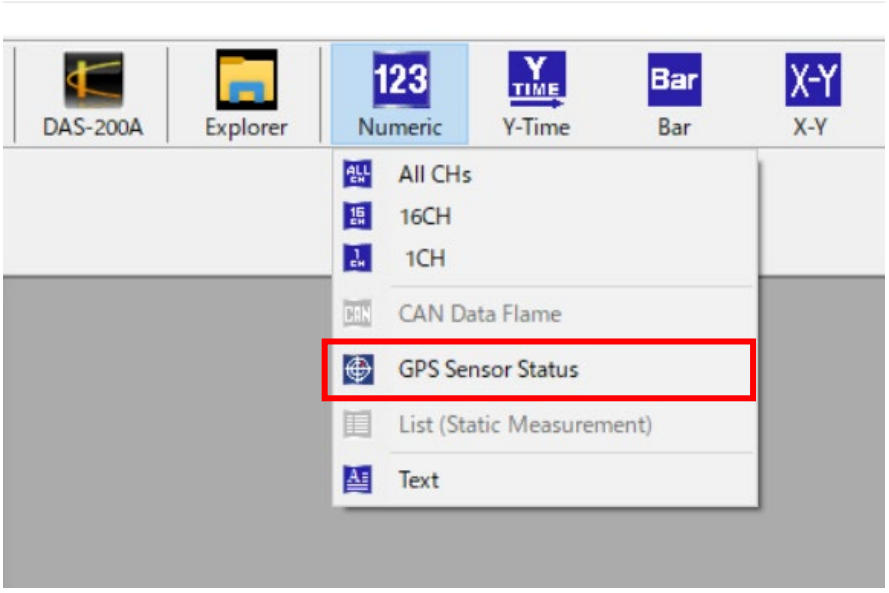
When measuring using the time synchronization function or recording GPS data, the GPS sensor status can be checked. The GPS sensor status consists of the following information obtained from the GPS sensor.

Latitude:	Latitude (N: North latitude, S:South latitude)
Longitude	Longitude (E:East longitude, W:West longitude)
Speed	Speed (km/h)
GPS time	The time received from the GPS sensors.
Num. of satellites	The number of GPS satellites in use. Use this status as a guide when checking the receving condition.
GPS status	OK: GPS is in positioning status. The time synchronization function is available. The built-in clock can be corrected. Error: GPS is in no positioning status. The time synchronization function is not available. The built-in clock can’t be corrected.
Travelling direction	Course over ground (degree TN:0°) In the stationary state, it is 0.00°.
Altitude above sea level:	Below mean sea level (m)
Geoidal height	Geoidal height (m)
HDOP	Horizontal dilution of precision.
PDOP	Position dilution of precision.
VDOP	Vertical dilution of precision.

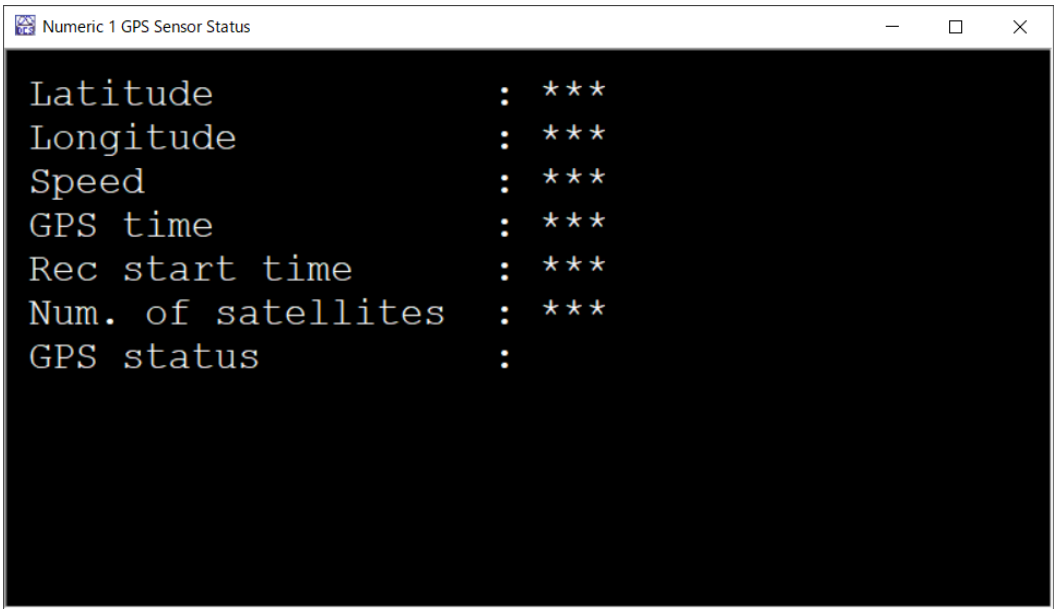
To check GPS sensor status, select “Window” – “Open Numeric Window” – “GPS Sensor Status” from the menu bar.



Alternatively, click on the "Numeric" icon from the toolbar and select "GPS Sensor Status".



The GPS sensor status window opens.



- The time it takes for the GPS status to go from "Error" to "OK" varies depending on the environment. It is greatly affected by the number of satellites received, the installation condition of the GPS antenna, and weather conditions.

NOTE

- The magnetic declination is not included in the GPS sensor status that can be acquired by this unit; even if magnetic declination is selected as a display item in the GPS sensor status window of the DCS-100A, the value is not displayed.

4-9-7. Recording operation when GPS status is not “OK”

In measurement using the time synchronization function, if the GPS status becomes "Error" at least once during the period from 2 seconds before the start time of recording to the start time of recording, the CTRS-100A starts recording approximately 2 seconds after the set start time of recording (approximately 5 seconds after in synchronous operation) using the built-in clock of the CTRS-100A. Files created by this action are prefixed with "$_". For GPS status, refer to "4-9-6.About GPS sensor status" on page 4-71.

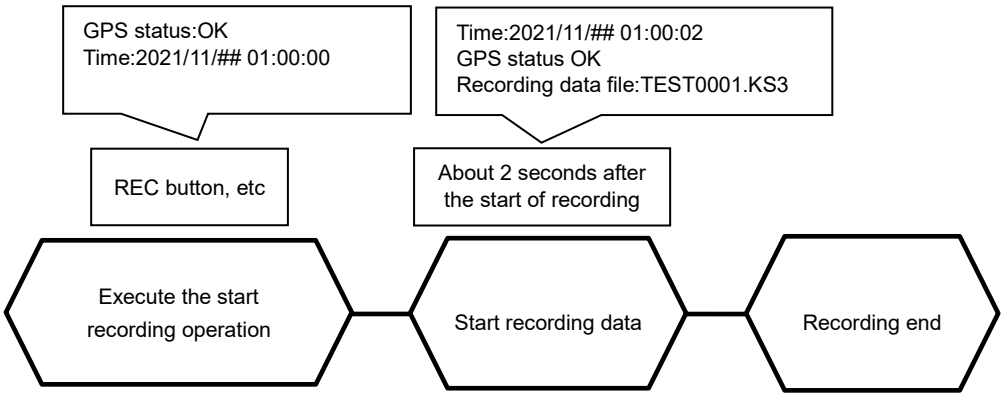
<Example>

Measuring mode: point zero (manual)

File name: TEST

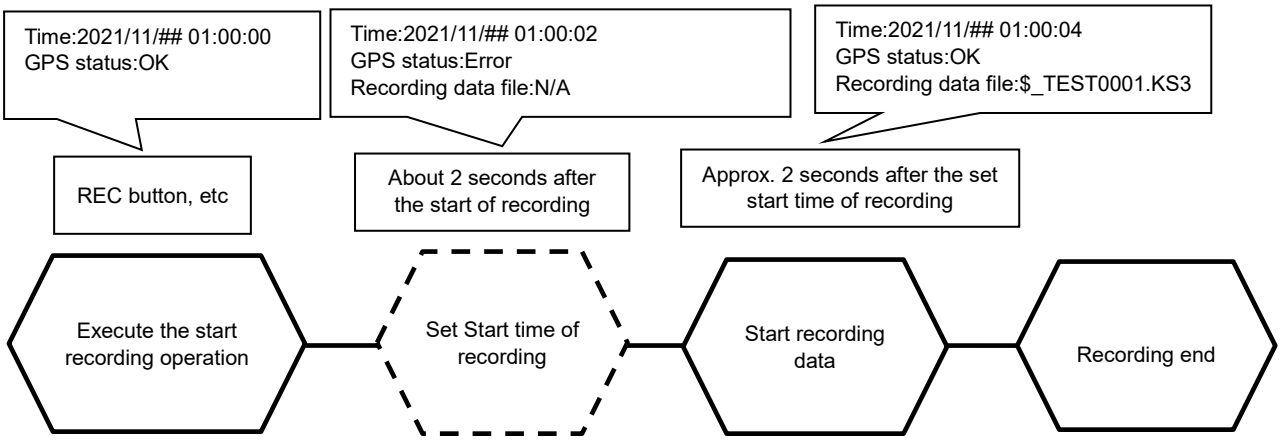
File No: 1

・When GPS status is “OK”



If the GPS status is "OK", recording starts at the time when the msec value becomes "00", about 2 seconds after the recording start operation is executed.

・When GPS status is “error”



If GPS satellite reception is poor and the GPS status becomes "Error" from 2 seconds before the start time of recording to the start time of recording, recording is performed by the internal clock approximately 2 seconds after the set recording start time.

<Example>

Measurering mode: Interval (GPS sync)

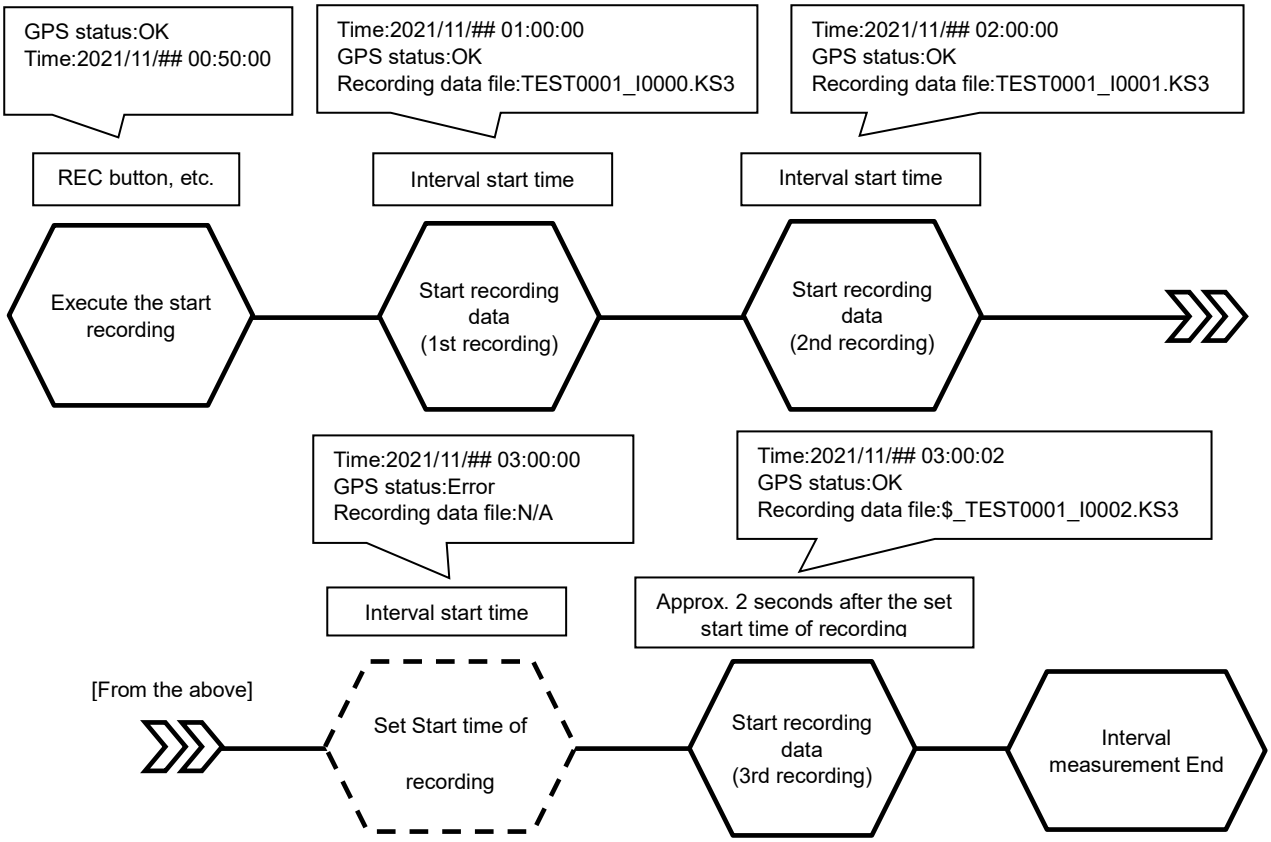
Repeat times: 2

Start time: 2021/11/## 01:00:00

Interval time: 0 day 1 hour 0 minute 0 second

File name TEST

File No. 1



1st recording and 2nd recording: GPS status is “OK”.

Recording starts at the set interval start time.

3rd recoding: GPS satellite reception was poor, and the GPS status became "Error" between 2 seconds before the interval start time and the interval recording start time.

Recording is performed by the built-in clock approximately 2 seconds after the set recording start time (interval start time).

5. OTHER FUNCTIONS

5-1. Data Protection Functions

5-1-1. File closing function

The file closing function is used to close the recording file and then safely stop recording, such as when the power switch is accidentally operated during recording.
The function works in the cases below.

1. When the power switch is turned off

If the power switch is turned off during recording, the file is closed, and then recording is safely stopped. Next, the power supply is turned off.

2. When the CTRS-BATT010A is being used and the remaining battery charge drops to 5% or less

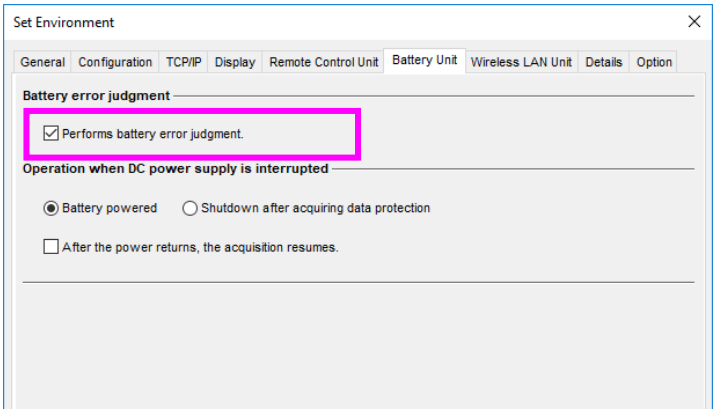
If the remaining battery charge drops to 5% or less during recording, the file is closed, and then recording is safely stopped.

NOTE

- If the external power supply is interrupted while not using the CTRS-BATT010A, the file closing function does not work.
- If the file is closed due to the remaining battery charge decreasing, the power is not turned off after the recording is stopped. To judge whether recording has stopped, confirm that the CTRS-100A status LED as well as the CTRS-BATT010A status LED and battery-check LEDs are flashing red and that the SD card access indicator LED is not flashing.

5-1-2. Data protection function during power interruption

By using an external power supply with the CTRS-BATT010A, the battery can be used as standby power. The operation to perform if there is an unforeseen power interruption during recording, such as a power outage, can be selected from the two options below.



1. Switch to battery power

If the external power supply is interrupted, automatically switch to battery power and continue recording.

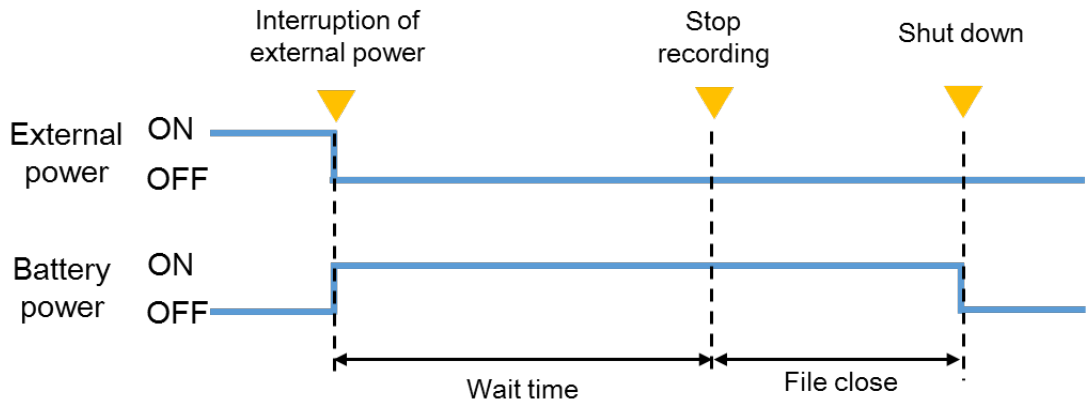
When the external power supply is restored, automatically switch back to it and continue recording.

2. Close the file and then turn off the power supply

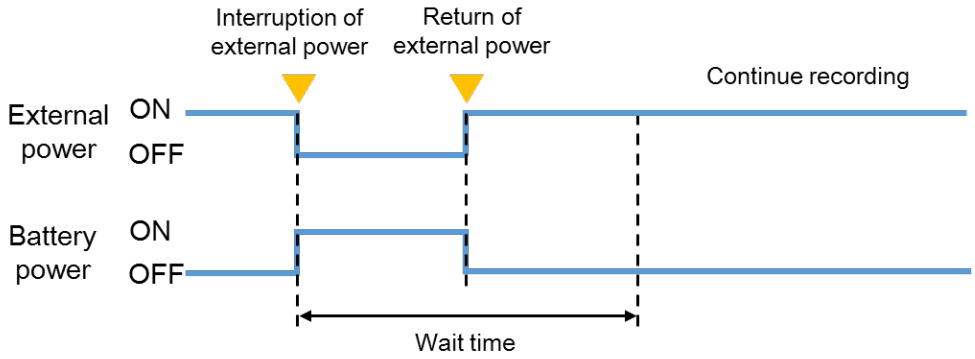
If the external power supply is cut off, the system waits for about 10 seconds.

Then performs file close processing and safely stop recording.

After recording stops, shut down.

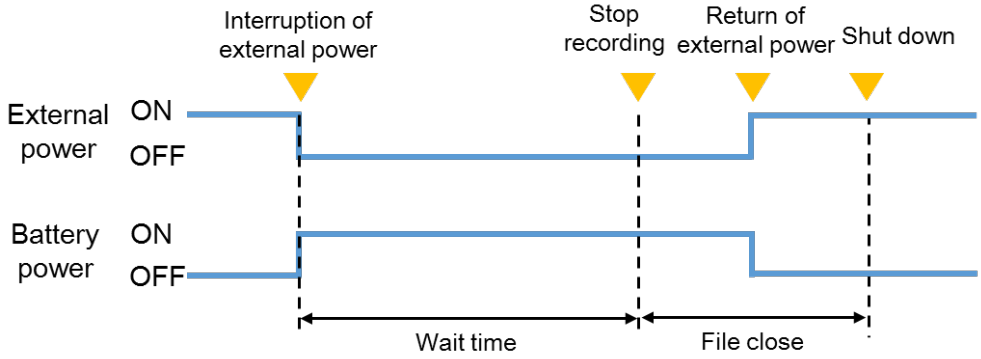


If the external power returns during the wait time, the recording will continue without performing the file close processing.



If the external power supply is returned during file close processing, file close processing is performed without returning to the recording state. After file close processing, turn off the power.

When restarting, turn the power switch off and on again. Or restart the external power supply when it is turned off once and then turned on again.

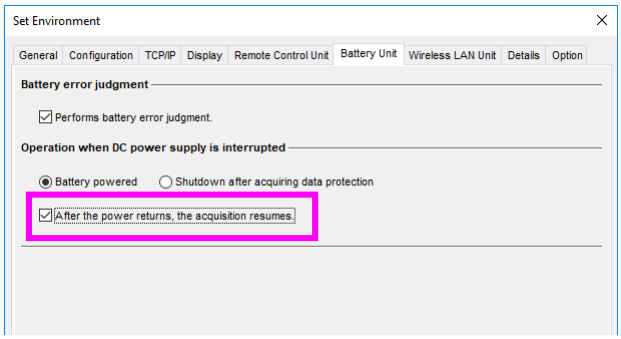


NOTE

- If the CTRS-BATT010A is not connected, the data protection function does not work when there is a power interruption.
- When the CTRS-RCU010A is connected, a buzzer souds until after the power is shut down after the external power is cut off.
- If the recording is stopped during the wait time, the shut down will not be performed.
- If the external power supply is interrupted during the recording pause, CTRS-100A will be turn off the power.

5-1-3. Recording resumption function

The recording resumption function is used to resume recording when the recordable status is restored, such as by restoring the external power supply after closing the file. Whether to enable or disable the function can be set by using the control software.



The operation when the recording resumption function is enabled is described below.

1. If the power switch is turned off during recording and the file is closed

Resume recording when the power switch is turned on.

2. If the CTRS-BATT010A is being used and the file is closed due to a power interruption

Restart when the power supply is restored and then resume recording.

However, if the power switch is off, the equipment does not restart, and recording is not resumed.

Recording is resumed when the power switch is turned on.

NOTE

- When the recording is resumed, a buzzer sounds.
- If the measurement mode is set to interval, trigger, or compound trigger and the recording count is specified, recording is not resumed after recording is completed the specified number of times.
- If the external power supply is interrupted during the recording pause (PAUSE) and a shutdown is performed, when the external power supply is restored, the PAUSE is released and the recording resumes.

NOTE

- Upon resuming recording (restoring power), the control software is disconnected. To connect it, use the control software to perform the connection processing. It is also possible to connect to the control software during recording.

About the recording file upon the resumption of recording

When recording is resumed, a file different from the one that was closed is saved. Upon the resumption of recording, a file is created as described below.

1. Measurement mode: manual

If the file name setting is a file number

The file number is incremented, and a new file is created.

If the file name setting is a date

A new file is created with the date on which recording was resumed.

Examples

File name setting	Name of the closed file	File name upon recording resumption
File number	[TEST #0000.ks3]	[TEST #0001.ks3]
Date	[TEST #20190101_123000_000.ks3]	[TEST #20190101_130000_000.ks3]

2. Measurement mode: manual (recording count specified)

If the file name setting is a file number

The file number is incremented, and recording is redone starting at a recording count of 0.

If the file name setting is a date

A new file is created with the date on which recording was resumed.

Examples

File name setting	Name of the closed file	File name upon recording resumption
File number	[TEST #0000_M0015.ks3]	[TEST #0001_M0000.ks3]
Date	[TEST #20190101_123000_000.ks3]	[TEST #20190101_130000_000.ks3]

3. Measurement mode: interval

If the file name setting is a file number

The repeat number is incremented, and interval recording is resumed. If the recording start time before resumption is exceeded, the repeat number is based on that time.

If the file name setting is a date

A new file is created with the date on which recording was resumed (the first recording start time after recovery).

Examples

File name setting	Name of the closed file	File name upon recording resumption
File number	[TEST#000_I0015.ks3]	[TEST #000_I0018.ks3]
Date	[TEST #20190101_123000_000.ks3]	[TEST #20190101_130000_000.ks3]

4. Measurement mode: trigger (analog/digital/external/compound)

If the file name setting is a file number

The repeat number is incremented, and trigger recording is resumed.

If the file name setting is a date

A new file is created with the date on which recording was resumed (the first trigger judgment after recovery).

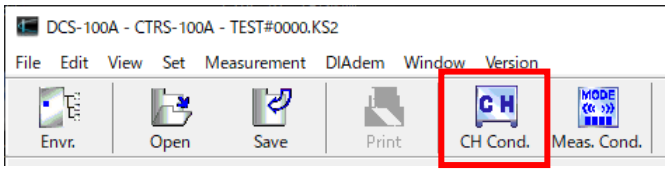
Examples

File name setting	Name of the closed file	File name upon recording resumption
File number	[TEST#000_A0015.ks3]	[TEST #000_A0016.ks3]
Date	[TEST #20190101_123000_000.ks3]	[TEST #20190101_130000_000.ks3]

5-2. Input Resistance check function (CTRS-100A, CTRS-CDV010A)

The CTRS-100A and CTRS-CDV010A have the function of checking the bridge input resistance of the strain gauge transducer. This section describes how to check the input resistance when using the control software DCS-100A.

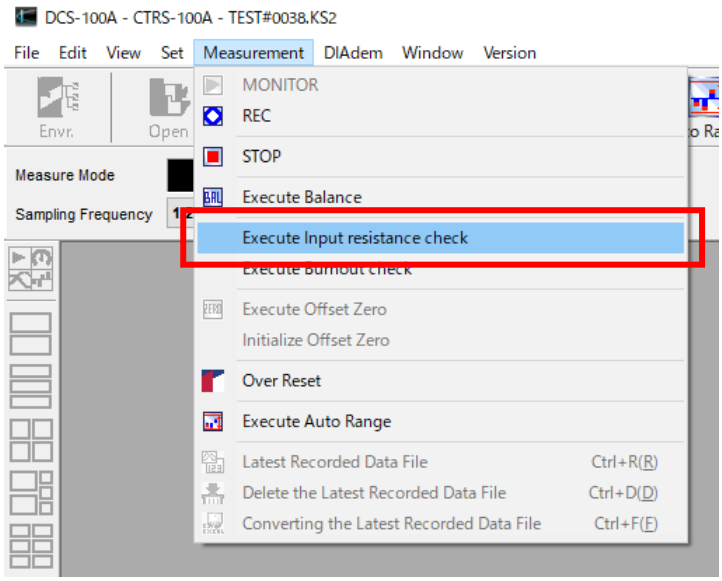
Open the "Set CH Condition" window and check the [Input Resistance Check] item.



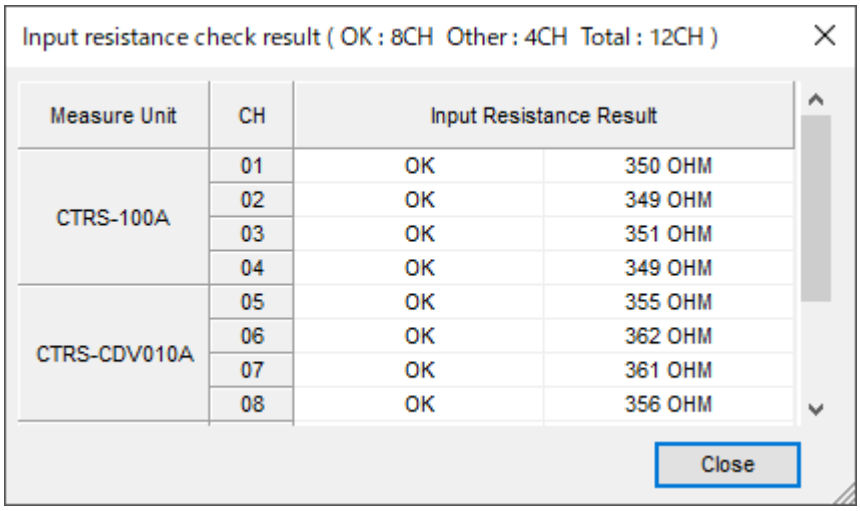
Set CH Condition (Number of Meas CHs : 12)

Measure Unit	CH	HPF	LPF	Balance	Input Resistance Check	Burnout Check	Cable correction value	Calibr. const.	Unit	Deci Digits
CTRS-100A	01	OFF	1kHz	ON	☑	***	1.0	1.0	um/m	0 (**********)
	02	OFF	1kHz	ON	☑	***	1.0	1.0	um/m	0 (**********)
	03	OFF	1kHz	ON	☑	***	1.0	1.0	um/m	0 (**********)
	04	OFF	1kHz	ON	☑	***	1.0	1.0	um/m	0 (**********)
CTRS-CDV010A	05	OFF	1kHz	ON	☑	***	1.0	1.0	um/m	0 (**********)
	06	OFF	1kHz	ON	☑	***	1.0	1.0	um/m	0 (**********)
	07	OFF	1kHz	ON	☑	***	1.0	1.0	um/m	0 (**********)
	08	OFF	1kHz	ON	☑	***	1.0	1.0	um/m	0 (**********)
CTRS-CTA010A	09	***	***	***	***	☑	1.0	1.0	degC	Auto
	10	***	***	***	***	☑	1.0	1.0	degC	Auto
	11	***	***	***	***	☑	1.0	1.0	degC	Auto
	12	***	***	***	***	☑	1.0	1.0	degC	Auto

Start monitoring. After that, execute the input resistance check from "Measurement (M)" on the menu bar.



Check the result. The check result and the measured bridge input resistance value are displayed.



The contents of the check result are shown below.

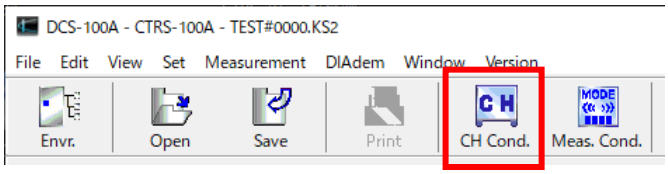
Result	Contents
OK	It is normal. The BV voltage is set appropriately within the applicable bridge resistance (120 to 1000 Ω).
BV NG	The BV voltage is too high for the bridge input resistance value. Review in the direction of lowering the BV voltage setting. Or it is out of the applicable bridge resistance (120 to 1000 Ω) range.
RESISTANCE NG	The upper limit of measurable resistance (9999 Ω) has been exceeded.
OFF	The input resistance check setting is invalid and the check is not executed.
***	This unit has [Measurement] turned off in the channel condition settings or does not support input resistance check.

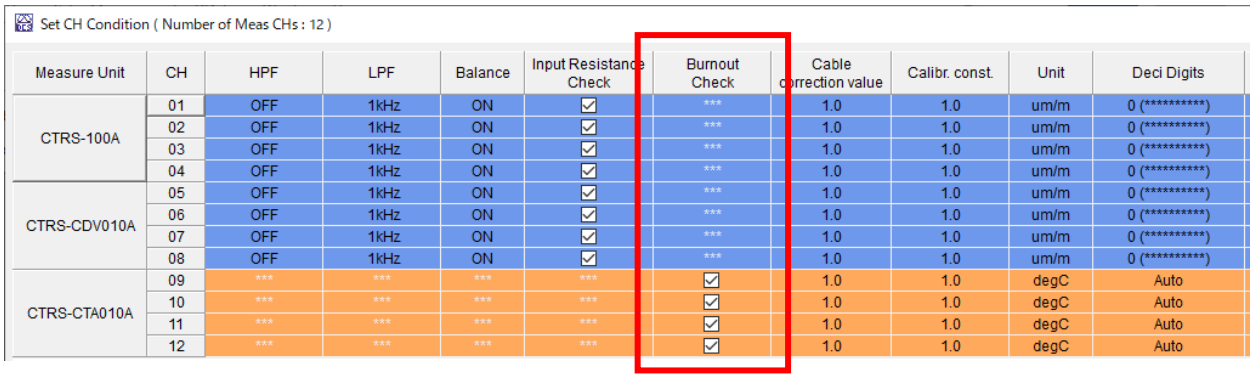
- The input resistance check can be checked at the same time when the balance is executed. To set it, check "Execute Input resistance check during balance adjustments" on the "Details" tab of the "Set Environment " window.

5-3. Burnout check function (CTRS-CTA010A)

CTRS-CTA010A has a burnout check function. This section describes how to execute the burnout check when the control software DCS-100A is used.

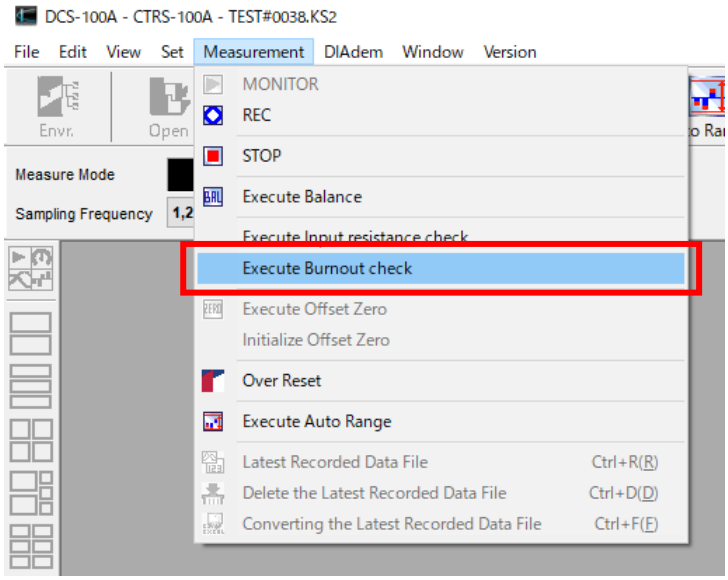
Open the "Set CH Condition" window and check the [Burnout Check] item.



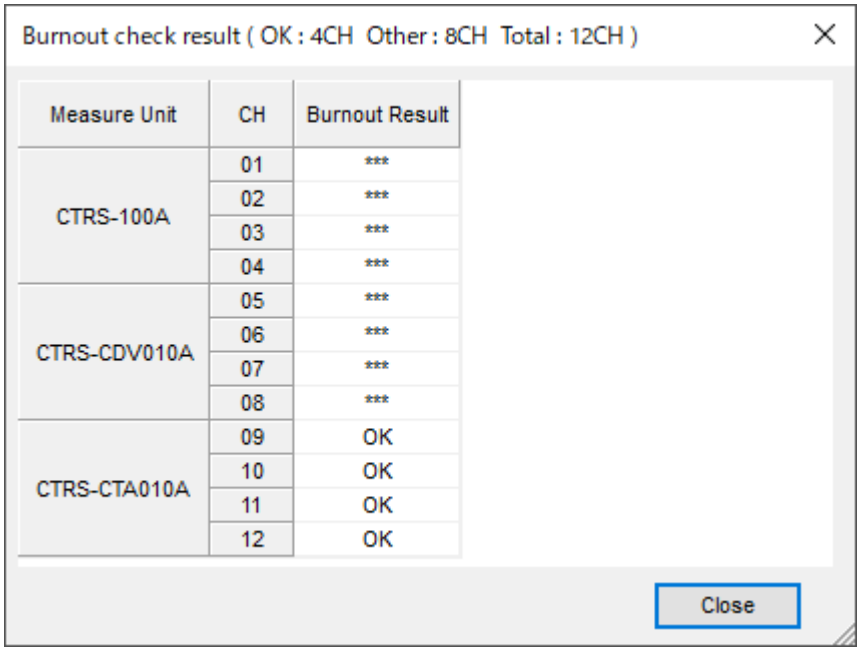


Measure Unit	CH	HPF	LPF	Balance	Input Resistance Check	Burnout Check	Cable correction value	Calibr. const.	Unit	Deci Digits
CTRS-100A	01	OFF	1kHz	ON	☑	***	1.0	1.0	um/m	0 (**********)
	02	OFF	1kHz	ON	☑	***	1.0	1.0	um/m	0 (**********)
	03	OFF	1kHz	ON	☑	***	1.0	1.0	um/m	0 (**********)
	04	OFF	1kHz	ON	☑	***	1.0	1.0	um/m	0 (**********)
CTRS-CDV010A	05	OFF	1kHz	ON	☑	***	1.0	1.0	um/m	0 (**********)
	06	OFF	1kHz	ON	☑	***	1.0	1.0	um/m	0 (**********)
	07	OFF	1kHz	ON	☑	***	1.0	1.0	um/m	0 (**********)
	08	OFF	1kHz	ON	☑	***	1.0	1.0	um/m	0 (**********)
CTRS-CTA010A	09	***	***	***	***	☑	1.0	1.0	degC	Auto
	10	***	***	***	***	☑	1.0	1.0	degC	Auto
	11	***	***	***	***	☑	1.0	1.0	degC	Auto
	12	***	***	***	***	☑	1.0	1.0	degC	Auto

Start monitoring. After that, execute the burnout check from "Measurement (M)" on the menu bar.



The check result is displayed, so check the contents.



The contents of the check result are shown below.

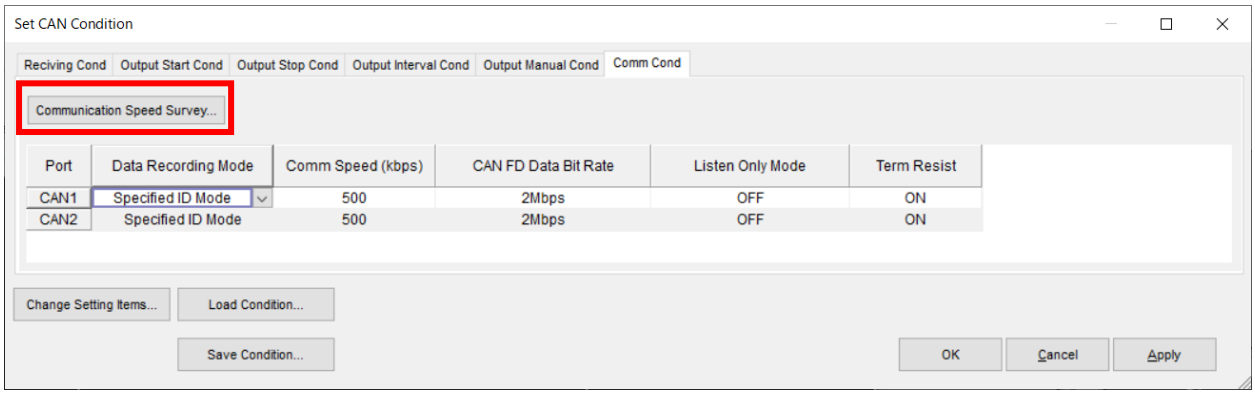
Result	Contents
OK	It is normal.
NG	The thermocouple is broken. Replace the thermocouple. Or it exceeds the range of available resistance values (1 kohm or less). Use a thermocouple with a resistance value of 1 kohm or less.
OFF	The burnout check setting is invalid and the check is not executed.
***	[Measurement] is OFF in the channel condition settings. Or it is a unit that does not support burnout check.

- The burnout check can be checked at the same time when the balance is executed. To set it, check "Execute Burnout check during balance adjustments" on the "Details" tab of the "Set Environment" window.

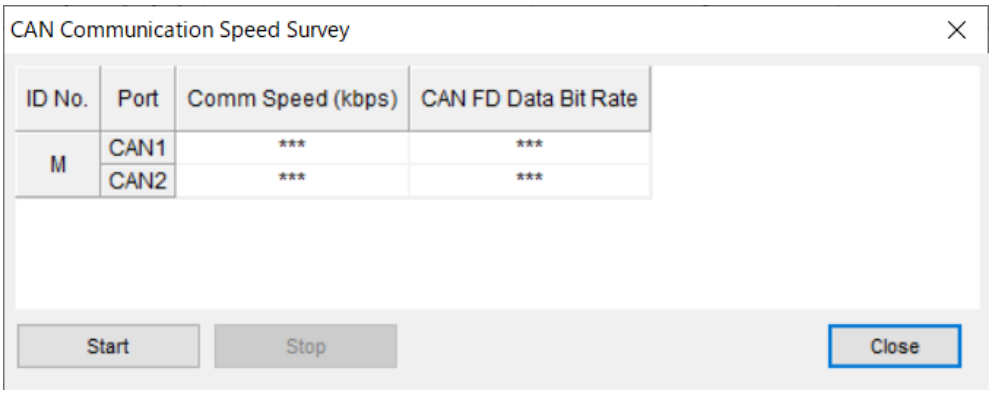
5-4. Communication Speed Survey (CTRS-CAG010A)

The CTRS-CAG010A has a function of communication speed survey. This function analyzes the CAN/CAN FD messages that are currently flowing on the bus and sets the communication speed to the CTRS-CAG010A. The following explains the procedure of the communication speed survey.

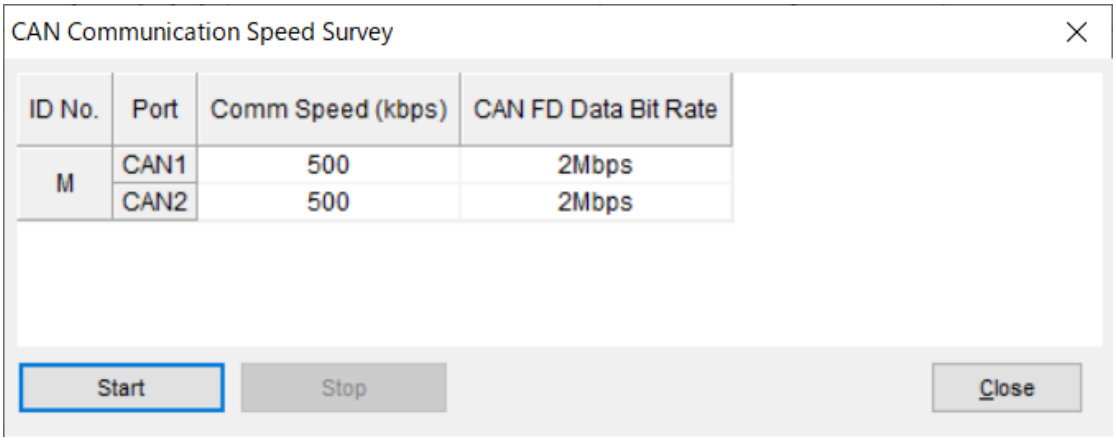
(1)Select the “Comm Cond” tab in the “Set CAN Condition” window.
(2)Click on the "Communication Speed Survey" button.



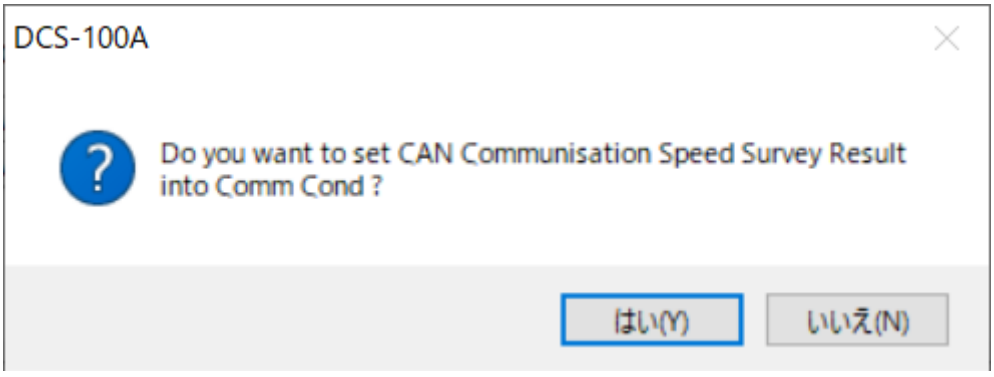
(3)Connect the CTRS-CAG010A to the CAN bus to be measured.
(4) With the message flowing on the CAN bus, click the "Start" button.



(5)When the survey is completed, the communication speed and the CAN FD data bit rate for the message currently flowing on the CAN bus will be displayed. If the message could not be detected successfully, "Not detected" will be displayed. It takes up to 10 seconds to complete the survey. You can stop the communication speed survey by clicking the "Stop" button.



(6)When you click the "Close" button, a message will be displayed asking you whether you want to apply the settings or not, if the survey was successful. If you want to apply the settings, click the "Yes" button.



NOTE

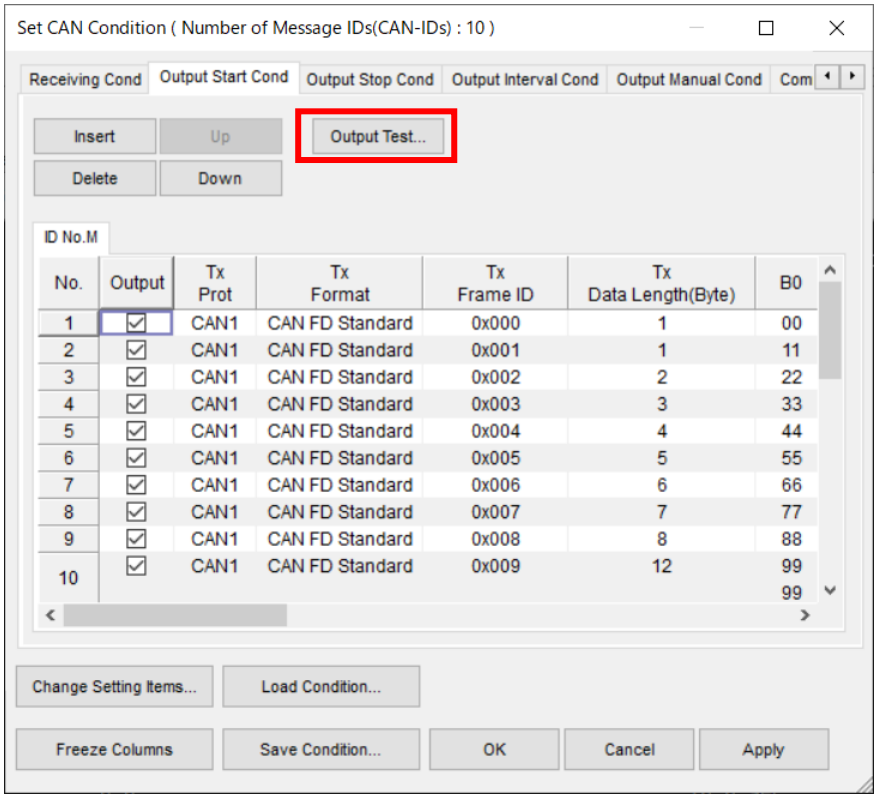
- If the communication speed survey is executed when no message is flowing on the CAN bus, the survey result will be undetected. Make sure that messages are flowing on the CAN bus.

5-5. Can Output Test (CTRS-CAG010A)

The CTRS-CAG010A has a function to test the output of CAN messages. The following section describes the procedure for the CAN output test.

(1)In the "CAN Cond" window, set the output messages in the "Output Start Cond", "Output Stop Cond", "Output Interval Cond", and "Output Manual Cond" tabs.

(2)Click on the "Output Test" button.



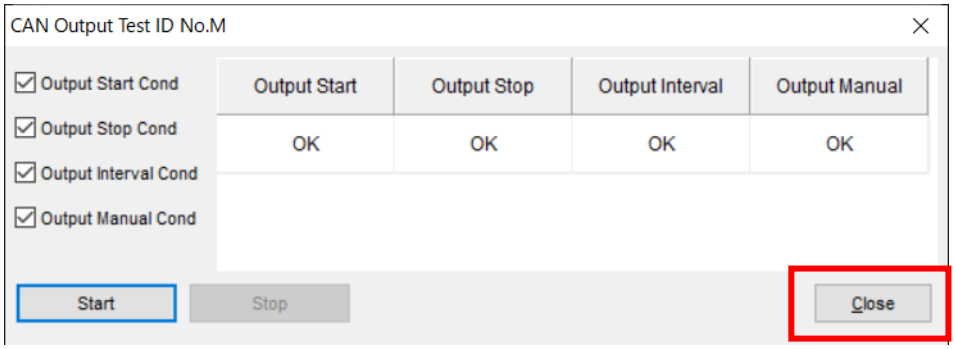
(3)Select the check box for the output to be tested. If multiple outputs are checked, the test will be executed at once in the order of "Output at start", "Output at stop", "Interval", and "Manual".

(4) Click the "Start" button to start the test.

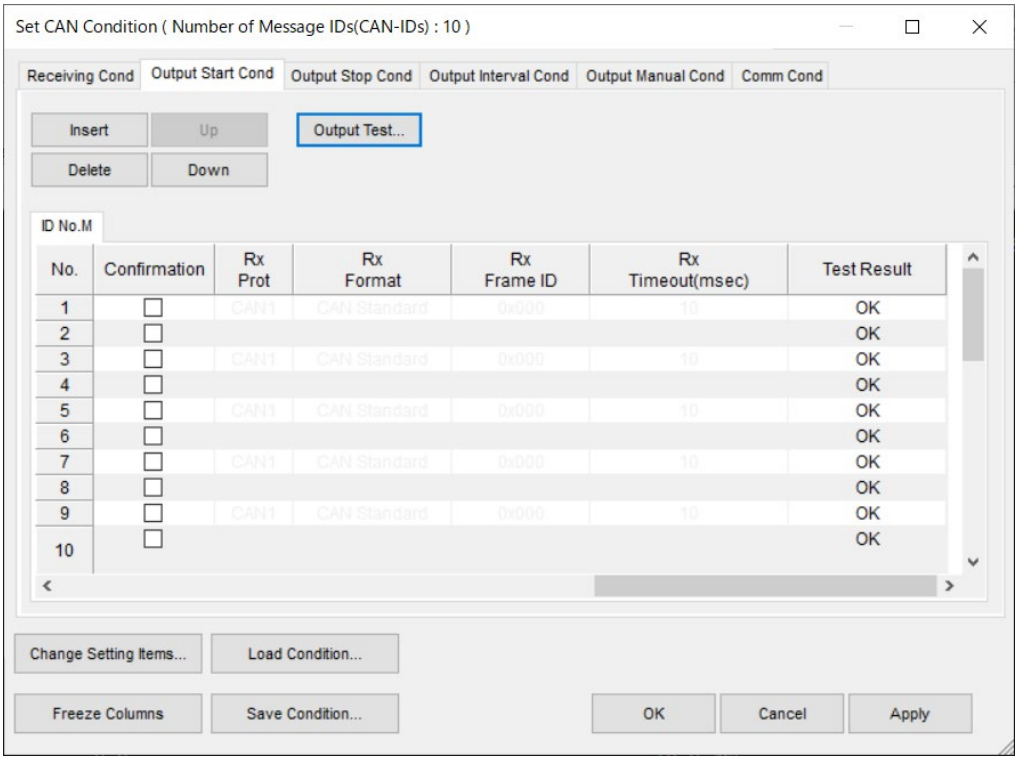
(5) While the test is running, the message "Testing" will be displayed. If you want to stop the test midway, click the "Stop" button.

(6) When the test is completed, the result will be displayed as "OK" or "NG". If the result is "NG", check the cause in the "Test Result" field.

(7)Click the "Close" button to close the CAN Output Test window.



(8) The test results for each output will be displayed in the "Test Results" column.



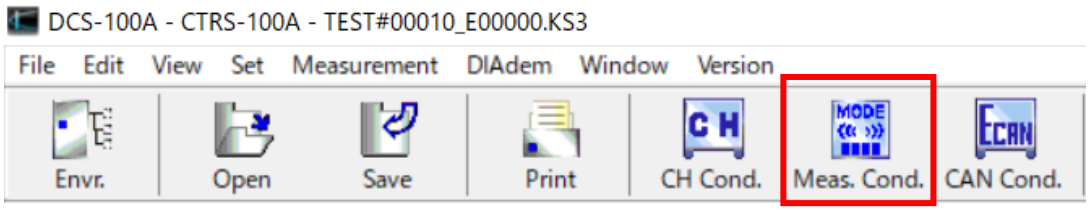
The test results displayed include the following.

Result	Contents
OK	The test was completed successfully.
Error Output	CAN message transmission did not complete successfully.
Error Timeout	A timeout occurred in the reception confirmation. Could not confirm receipt of the response message in time.
Not applicable	The output test is not applicable or has not been performed.

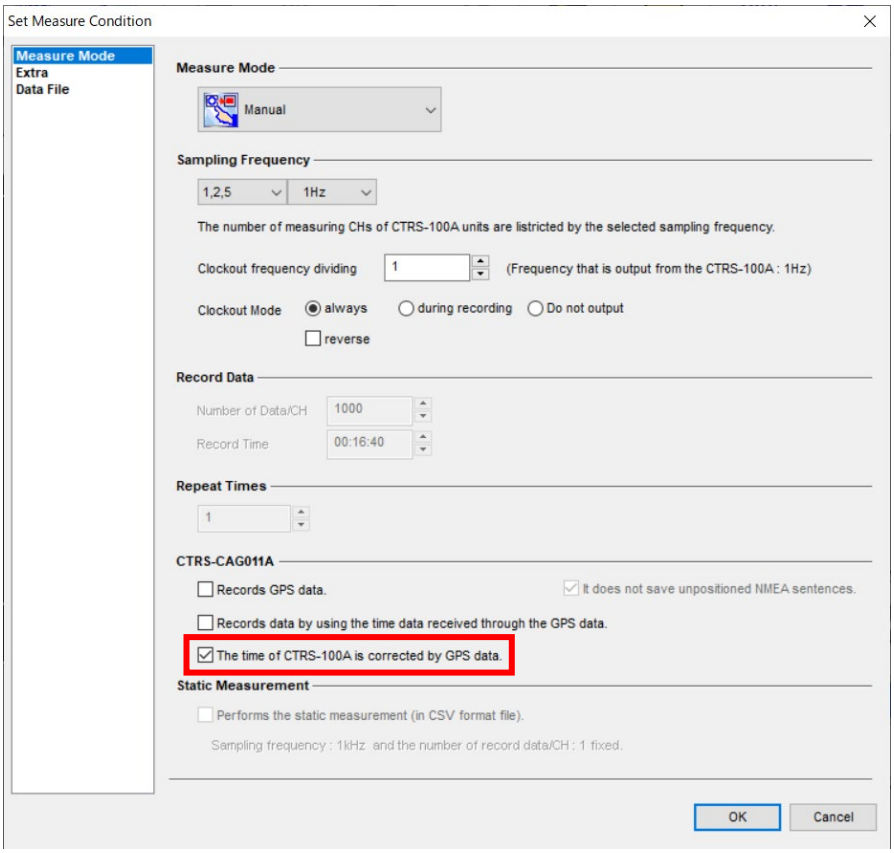
5-6. Time correction function (CTRS-CAG011A)

The CTRS-CAG011A has a function to correct the built-in clock of the CTRS-100A with time information from a satellite. To use this function, perform the following procedure on the DCS-100A.

Open the set measure condition window with the CTRS-CAG011A included in the device configuration.



Check the “The time of CTRS-100A is corrected by GPS data.”.



NOTE

- Time correction is performed once an hour, one second after exactly xx o'clock.
- If time correction has never been performed after power-on, correction is performed at the start of monitoring/recording.
- Time correction is performed only during positioning. No correction is performed when positioning is not yet completed. If the time correction cannot be performed while positioning is not yet completed, the time will be corrected when positioning is restored.
- When measuring with the time synchronization function, the built-in clock is always corrected. This function cannot be turned off.

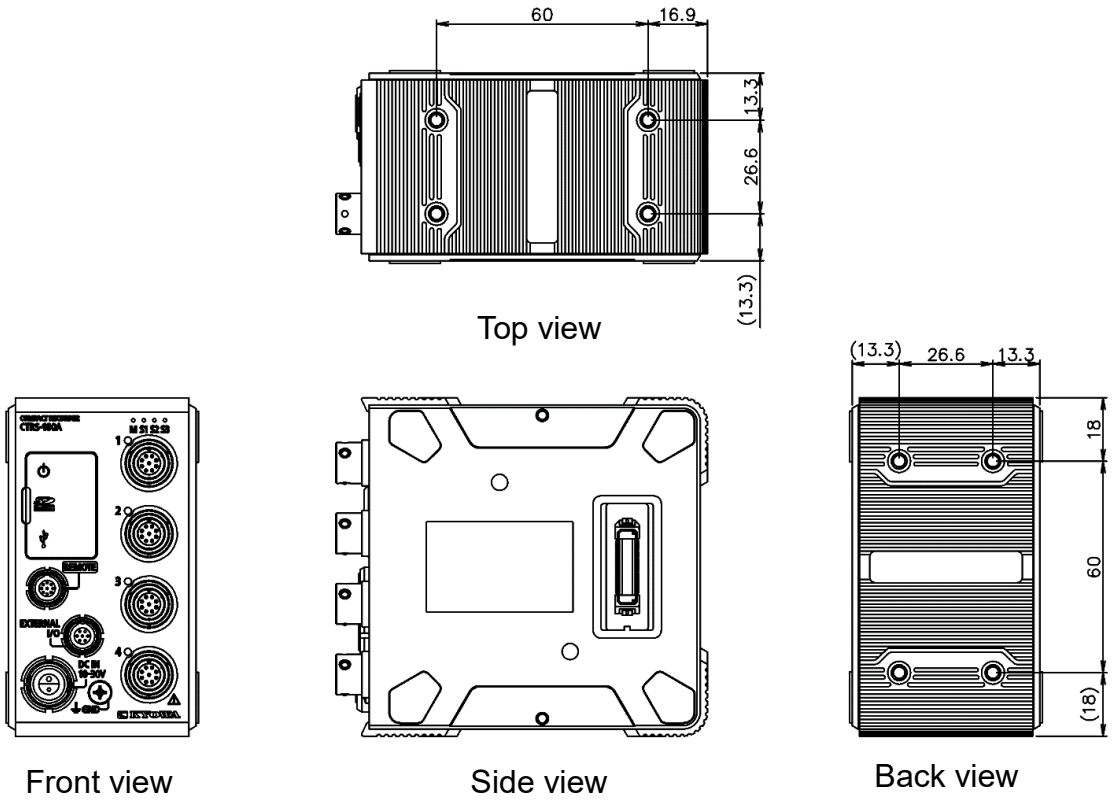
5-7. Utility Nuts

The CTRS-100A, measuring unit, and expansion unit have utility nuts (screw holes) that can be freely used by customers.

5-7-1. Utility nut positions

There are utility nuts on the top, bottom, and back of each unit (only on the back for the CTRS-RCU010A). For details on the number and position of utility nuts, see the figures below.

Compact Recorder, Battery Unit



Top view

Front view

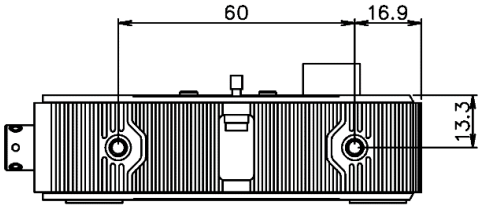
Side view

Back view

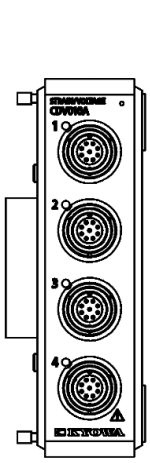
*The above figure shows the Compact Recorder CTRS-100A. The location of the utility nut is the same for other units.

- The utility nuts on the bottom are in the same positions as those in the top view.

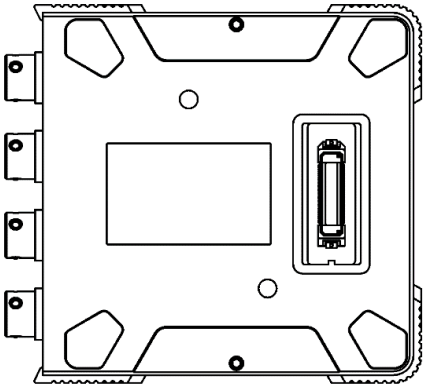
Strain/Voltage Unit, Thermocouple Unit, Synchronization Unit, Wireless LAN Unit, CAN Unit, CAN/GPS Unit



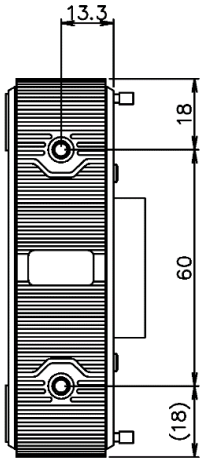
Top view



Front view



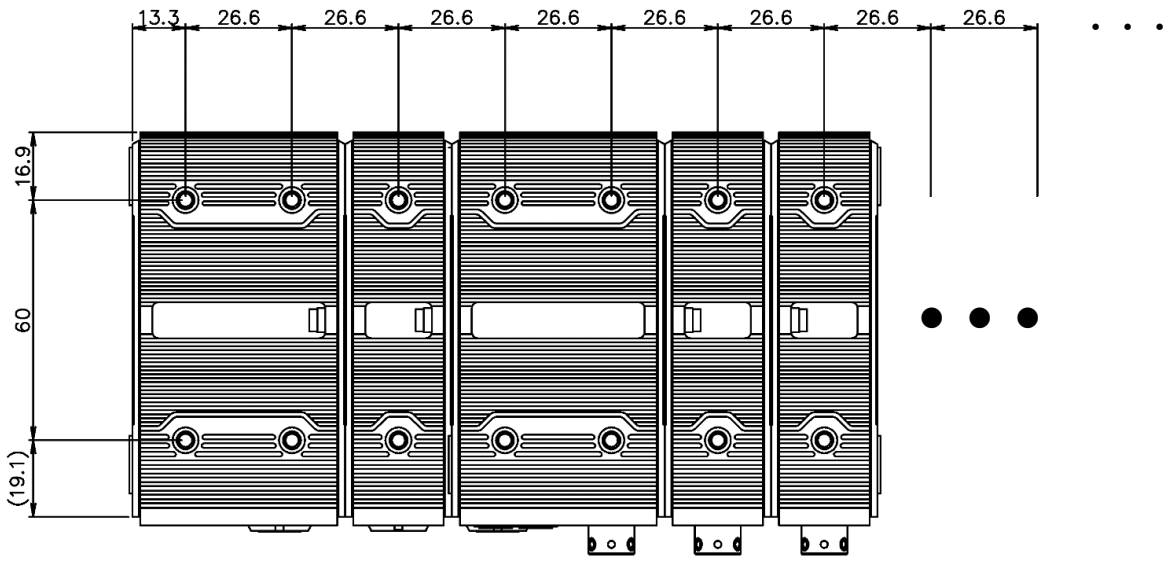
Side view



Back view

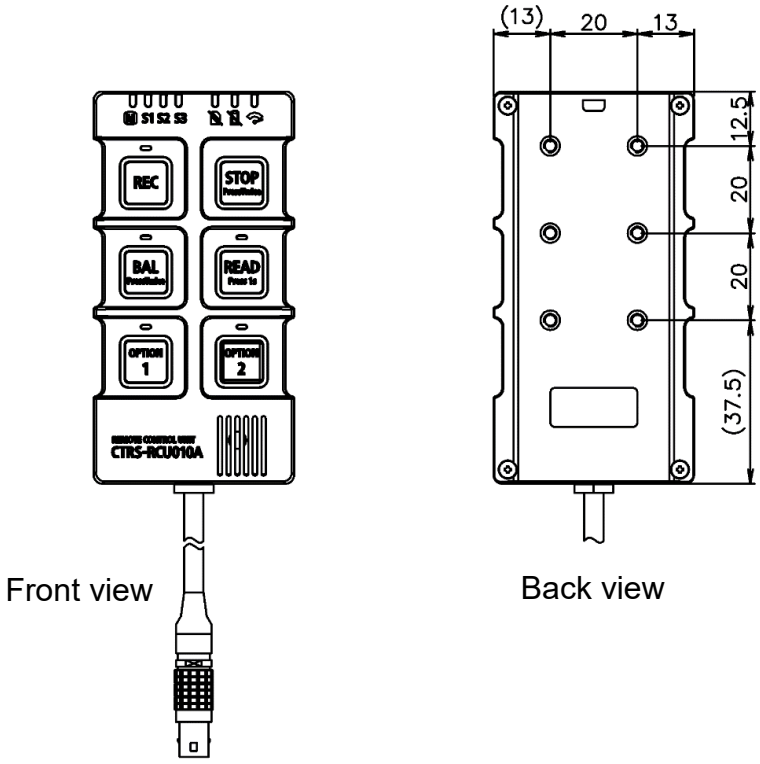
*The above figure shows the Strain/Vpltage Unit CTRS-CDV010A. The location of the utility nut is the same for other units.

View when each unit is connected to the CTRS-100A



Top view

Remote Control Unit: CTRS-RCU010A



5-7-2. Size of attachment screws

The CTRS-100A and each unit utility nuts support M4 screws. In addition, the CTRS-RCU010A utility nuts support M3 screws.

The screw length differs depending on the thickness of the attached object, but select screws based on the depth from the attachment surface in accordance with the values in Table 5-1. In addition, if using utility nuts, pay close attention to the figure below and the warnings on the next page.

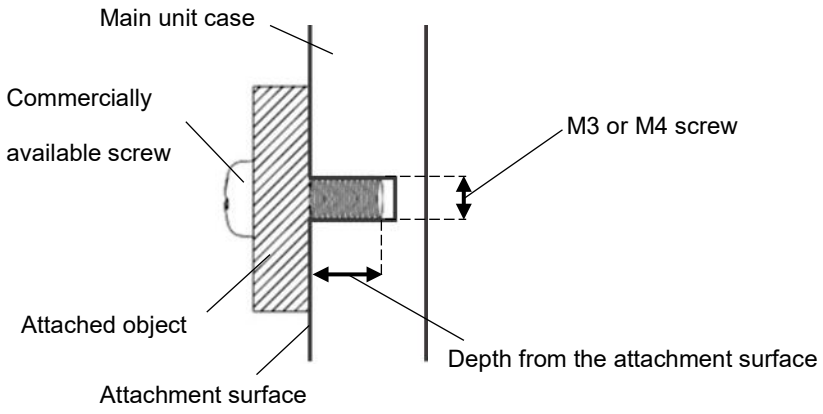


Table 5-1.Screws that can be used with each unit and the recommended tightening torque

Model	Screw diameter	Depth from the attachment surface	Recommended tightening torque*
CTRS-100A	M4	5 to 7 mm	1.5 N・m
CTRS-CDV010A			
CTRS-CTA010A			
CTRS-SYNC010A			
CTRS-BATT010A			
CTRS-WLAN010A /011A/012A			
CTRS-CAG010A/011A			
CTRS-RCU010A	M3	2 to 4 mm	0.55 N・m

* If using mild or stainless-steel screws

CAUTION

- If the used screws are too short, they cannot be tightened. In addition, if the screws are too long, the tips of the screws could contact the bottom of the utility nuts, which may cause a gap between the attached object and the case or may even break the case or screws. See Table 5-1 and select a suitable length of screws.
- If using utility nuts, carefully confirm the size and weight of the object to be attached as well as any safety information before attaching it.
- For the recommended tightening torque, see Table 5-1. If the screws are not tightened strongly enough, they may come out, resulting in unexpected injuries or accidents. In addition, if the screws are tightened too strongly, they may break.
- Our company shall not be held liable for any damage resulting from the use of any tightening torque other than the recommended tightening torque.

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6. TROUBLESHOOTING

If the product does not operate as expected or operates unstably, check to see if the problem is caused by other factors before concluding that the product is defective.
Possible causes and check methods for each symptom are described below.
If the product still fails to operate properly after it is inspected and corrective measures are taken, contact your KYOWA representative.
Note that if the product has been damaged due to use of the product in ways or for purposes other than described in this manual or if the product has been disassembled or modified by the user, KYOWA may reject requests for repairs.

6-1. CTRS-100A Details

Symptom	Details to check	Action
When using an AC adapter, there is no power to the main unit.	Is the outlet voltage in the range from 100 to 240 VAC? Use a tester, etc. to check this.	Use an outlet that can be used for the AC adapter.
	Is the output voltage of the AC adapter in the range from 10 to 30 VDC? Use a tester, etc. to check this.	Replace the AC adapter.
	Is the AC adapter securely connected?	Reconnect the AC adapter.
When using a DC power supply, there is no power to the main unit.	Is the output voltage of the power supply in the range from 10 to 30 VDC?	Review the power supply settings.
	Does the power supply have enough capacity?	Replace the power supply with one that has a lot of capacity.
	Is the power supply polarity (+/-) incorrect? In addition, is the power supply cord securely connected?	Review the power supply connection.
When using the CTRS-BATT010A, there is no power to the main unit.	Is the remaining battery charge 0%?	Charge the battery.
	Is the CTRS-BATT010A securely connected?	Tighten the fastening screws to achieve secure connection.
The status LED flashes red, and measurement is not possible.	Is an SD card inserted? Is there enough free space on the card?	Insert an SD card that has free space.
	If using the CTRS-BATT010A, is the remaining battery charge sufficient?	Charge the battery.

The status LED and channel status LED are all lit in red, and measurement is not possible. (Equipment configuration error)	Are eight or more measuring units connected?	Up to seven measuring units can be connected. Do not connect any more than this.
	Are two or more expansion units of the same type connected?	Unable to use the equipment with more than one expansion unit of the same type connected. Connect only one of each type of expansion unit.
No USB connection is possible.	Is the USB driver installed?	Install the USB driver.
	Is the USB cable securely connected?	Reconnect the USB cable.
	If using the CTRS-SYNC010A, is the interface selection switch set to ETHERNET?	Set the interface selection switch to USB.

* For details on measuring units, see "6-3. CTRS-CDV010A Details" on page 6-3.

6-2. CTRS-RCU010A Details

Symptom	Details to check	Action
After starting up, the buzzer keeps going off, and measurement is not possible.	Are eight or more measuring units connected? Alternatively, are two or more of the same type of expansion unit connected?	This is an equipment configuration violation. Review the number of units connected to the CTRS-100A.
The buzzer does not go off even if the remote control button is pressed.	Is the operating noise set to "none"?	Use the control software to set the operating noise.
Operation is not possible even if the remote control switch is pressed.	Is the remote control connector securely connected?	Reconnect the connector.
	Is the remote control connected to the slave unit?	Connect the remote control to the master unit.
	Are you correctly operating a switch for which it is necessary to hold down the switch or press it twice?	Perform the correct operation. Note that the control software can be used to set whether to press the switch twice or hold it down.
	When operating DCS-100A, is the Data Save Folder set to "PC data file folder" or "Both CTRS-100A of the SD Card and PC data file folder" in the Envr. window? If Data Save Folder is set to "PC data file folder" or "Both CTRS-100A of the SD Card and PC data file folder", some remote control operation cannot be used.	If you want to enable remote control operation while monitoring with a PC, set the Data Save Folder to "CTRS-100A SD Card ".

6-3. CTRS-CDV010A Details

Symptom	Details to check	Action
The channel status LEDs do not light up even if there is power to the main unit.	Are all the measurement channel condition settings set to OFF?	Set the measurement setting to ON.
The status LED and channel status LED are all lit in red, and measurement is not possible. (Equipment configuration error)	Are eight or more CTRS-CDV010As connected?	Up to seven measuring units can be connected to one CTRS-100A. If eight or more are connected, it causes an equipment configuration violation, and measurement is not possible.
Unable to achieve balance.	In the channel condition settings, is the balance item set to OFF or NONE?	Set the balance setting to ON.
	Does the input exceed the balancing range?	If the input exceeds the balancing range, balance cannot be achieved.
	Has a sensor for which the bridge resistance exceeds the applicable bridge resistance range been connected?	Connect a sensor that is within the applicable bridge resistance range.
	Is excessive noise being input?	Take action to reduce the noise.
There is a lot of noise.	Is the GND terminal grounded?	If using a strain gage, the noise can sometimes be reduced by connecting the GND terminal to the test piece attached to the gage.
	Is there noise-generating equipment such as an inverter motor near the input cable?	Separate the input cable from sources of noise.
	Has a low-pass filter been set?	The noise can be reduced by setting a suitable low-pass filter.

6-4. CTRS-CVPS010A Details

Symptom	Details to check	Action
The channel status LEDs do not light up even if there is power to the main unit.	Are all the measurement channel condition settings set to OFF?	Set the measurement setting to ON.
Unable to achieve balance.	In the channel condition settings, is the balance item set to OFF or NONE?	Set the balance setting to ON.
	Does the input exceed the balancing range?	If the input exceeds the balancing range, balance cannot be achieved.
	Has a sensor for which the bridge resistance exceeds the applicable bridge resistance range been connected?	Connect a sensor that is within the applicable bridge resistance range.
	Is excessive noise being input?	Take action to reduce the noise.
There is a lot of noise.	Is the GND terminal grounded?	If using a strain gage, the noise can sometimes be reduced by connecting the GND terminal to the test piece attached to the gage.
	Is there noise-generating equipment such as an inverter motor near the input cable?	Separate the input cable from sources of noise.
	Has a low-pass filter been set?	The noise can be reduced by setting a suitable low-pass filter.
The output of the connected sensor is incorrect, or there is no output. (When power is supplied from the instrument to the sensor)	Is the sensor power supplied correctly with the sensor connected? (DC5V, DC10V)	If the output current exceeds the upper limit, the limiting circuit will operate and the output voltage will drop. Use channels 1 and 2 at 35 mA or less, and channels 3 and 4 at 15 mA or less.

6-5. CTRS-CTA010A Details

Symptom	Details to check	Action
The channel status LEDs do not light up even if there is power to the main unit.	Are all the measurement channel condition settings set to OFF?	Set the measurement setting to ON.
The status LED lights red and measurement is not possible. (Equipment configuration error)	Are eight or more measuring units connected?	Up to seven measuring units can be connected to one CTRS-100A. If eight or more are connected, it causes an equipment configuration violation, and measurement is not possible.
The measured value is unstable.	Did you start measurement immediately after connecting the thermocouple to the terminal block?	After connecting the thermocouple, wait for the contact part of the terminal block to reach the temperature equilibrium state before performing the measurement. After connecting the thermocouple to the terminal block, it takes about 15 minutes for the contacts to reach temperature equilibrium.
	Is the warmup time sufficient?	If not warmup adequately, the readings will drift. Allow about 30 to 60 minutes of residual heat.
	Is the thermocouple installation method appropriate?	If the thermocouple is moving under the influence of wind, or if the terminal block is exposed to wind, the output of the thermocouple may not be stable. Securely fix the thermocouple so that it does not move, and take measures such as installing a windshield to prevent the terminal block from being exposed to wind.
	Is the thermocouple broken?	If the thermocouple is broken, the correct output will not be obtained. Perform a burnout check to see if the thermocouple is broken, and if so, replace the thermocouple.

Symptom	Details to check	Action
The measured value is unstable.	Are you using it in an environment where there is a heat source near this unit?	Please install it in a place away from the heat source.
Large variation in measured values	Are you using the unit in an environment where there is an inverter motor, machine tool, welding machine, or AC power supply for the power system near this unit?	Please use it by installing it in a place away from the power source.
	Check the internal sampling frequency setting.	Setting the internal sampling frequency to 0.5 Hz reduces variations in measured values. The settings can change on the "Details" tab in "Preferences".

6-6. CTRS-SYNC010A Details

Symptom	Details to check	Action
LAN communication is not possible.	Have the CTRS-100A IP address setting and used PC IP address setting been specified?	See the instruction manual "Network Setting Software" and specify the IP address settings.
	Is the interface selection switch set to ETHERNET?	If the switch is set to USB, set it to ETHERNET, and then turn the power supply back on.
Synchronous operation is not possible.	Is the master/slave setting switch set incorrectly?	See "2-12. Connections and Settings During Synchronous Operation" on page 2-46 and correctly specify the master/slave setting.

6-7. CTRS-BATT010A Details

Symptom	Details to check	Action
The battery immediately runs out.	Has the battery health decreased? Hold down the battery-check switch to check the health.	If the health has decreased, it is necessary to replace the battery. Please contact our company's sales staff.
Charging won't start.	Are the external power supply and power supply cable securely connected?	Reconnect the cable.
	Is the output voltage of the external power supply being used for charging in the range from 10 to 30 VDC? Use a tester, etc. to check this.	Review the power supply settings. If voltage outside the range from 10 to 30 VDC is applied, charging stops to ensure safety.
	Has the battery been left alone for a long time with a remaining charge of 0%?	If the battery voltage has decreased, pre-charging occurs. Because the LED does not light up during pre-charging, continue charging the battery for about 30 minutes and monitor the situation.
The remaining battery power decreases despite be charging.	Is the battery level near 100%?	When the battery is fully charged, to ensure safety, charging stops. Charging will resume when the battery level drops to some extent. So at around 100% remaining, battely may decrease while charging, but this is not a malfunction.

If an error has occurred (the status LED is flashing red)

Symptom	Details to check	Action
Unable to start recording.	Is the remaining battery charge 5% or more?	Charge the battery.
	There may be excess current flowing from the battery unit. ● Are the number of other connected units, input, etc. within the range of the specifications? ● Are there any abnormalities related to other connected units?	Use other connected units only within the range of the specifications. If there is an abnormality related to another connected unit, replace it.
	Is the battery deteriorated?	Check the battery health. If an error occurs, the battery needs to be replaced.

If an error has occurred (all three battery-check LEDs are flashing red)

Symptom	Details to check	Action
Charging won't start.	Is the ambient temperature within the operating temperature range (0 to 40°C)?	Charge the battery within the operating temperature range. To ensure safety, charging stops while operating at high or low temperatures. In addition, charging sometimes stops if the main unit gets hot, such as immediately after discharging. Charge the battery after the main unit has cooled off.
Unable to start recording.	If the status LED is also flashing red, there may be excess current flowing from the battery unit.	See "If an error has occurred (the status LED is flashing red)" above.
Charging stops before the remaining battery charge reaches 100%.	Is the battery being charged while supplying power to the system in a low-temperature environment? If the ambient temperature is 0 to 10°C, there are restrictions on the charging current, so the charging time is longer compared to when operating in a room-temperature environment.	If charging does not finish even after around eight or more hours, charging temporarily stops to ensure safety. Temporarily cut off the external power supply, and then restart the power to resume charging.

6-8. CTRS-WLAN010A/011A/012A Details

Symptom	Details to check	Action
The SSID of the wireless LAN unit is not displayed on the computer.	Is the WIRELESS switch turned off?	Turn on the WIRELESS switch and reboot.
	Is the wireless LAN unit and the computer too far apart?	The communication distance is about 10 m in an environment with no obstacles around it. Please shorten the communication distance.
	Is there a shield around the wireless LAN unit?	If there is a shield between the wireless LAN unit and the personal computer, communication may not be possible depending on the material of the shield. Take measures such as avoiding obstacles.

Symptom	Details to check	Action
The security key is not authenticated.	Did you enter the security key incorrectly?	The initial key settings are printed on the nameplate of the wireless LAN unit. Please check the key provided and enter it again.
	Have you changed the security key?	Please enter the changed key. If you do not know the changed security key, initialize the key.
Easy connection function cannot be used.	Does your device support WPS?	Use a device that supports WPS 2.0.
	Is the security method set to WPA-PSK (TKIP)?	For WPA-PSK (TKIP), Easy connection function cannot be used. Change the security method or enter the security key.
Cannot connect to control software.	Is the IP address assigned correctly?	Make sure that the IP addresses of the devices you use do not overlap. For the setting method, refer to "2-11-2. Wired LAN connection" on page 2-32.
	Did you enter the IP address correctly?	Check the IP address of the device to be used, and then enter it again.
	Is the DHCP server function setting incorrect?	Check the DHCP server function settings.
USB connection is not possible.	Is the WIRELESS switch turned on?	USB connection is not possible when the WIRELESS switch is on. Turn off the WIRELESS switch and reboot.

6-9. CTRS-CAG010A Details

Symptom	Details to check	Action
CAN messages cannot be sent or received (a bus error occurs and the port status LED turns red)	Are the settings for the communication speed and CAN FD data bit rate correct?	Set the correct communication speed and CAN FD data bit rate. The communication speed and the CAN FD data bit rate can be checked by using the communication speed survey.
	Is the terminating resistor setting correct?	If the terminating resistor is set incorrectly, communication may not work properly. Check the setting of the terminating resistor. For details on how to set the terminating resistor, see page 4-50.
	Is the communication speed set appropriately for the cable length?	If the cable length is long, communication may become possible by slowing down the communication speed.
	Are there CAN FD-supported nodes and CAN FD-uncompliant nodes mixed on the same network?	If a CAN FD frame is received by a node that does not support CAN FD, a receive error will occur. Remove the node that does not support CAN FD or use only CAN frames.
CAN messages cannot be sent or received (port status LED turns blue)	Are the format settings correct?	Even if the frame ID is the same, if the format (CAN standard, CAN extended, CAN FD standard, CAN FD extended) is different, it is treated as a different message. Check the format setting. Also, set the recording mode to All ID Mode, and confirm that messages can be received.

Symptom	Details to check	Action
Communication speed survey cannot detect any messages.	Is there a message running on the CAN bus?	Start the communication speed survey while messages are flowing on the CAN bus.
CAN data is missing.	Is the number of messages flowing on the CAN bus exceeding 1000 per second?	Reduce the bus load by reducing the number of messages flowing on the CAN bus. For details, refer to “4-8-3.Number of messages that can be received per second” on page 4-55.

6-10. CTRS-CAG011A Details

Symptom	Details to check	Action
GPS status remains Error and does not become OK.	Is the GPS antenna properly connected?	Connect the GPS antenna properly.
	Are there any obstructions around the location of the GPS antenna?	Locate the GPS antenna in an unobstructed location with a clear view of the sky.
GPS status LED remains off.	Is either "Records GPS data.", "Records data by using the time data received through the GPS data.", or "The time of CTRS-100A is corrected by GPS data." in DCS-100A Set Measure Condition windows checked?	If the conditions for using GPS are not set, the GPS status LED will be off. Refer to the following to check if the conditions are set correctly. ●To record GPS data, see “4-9-5.GPS data recording" on page 4-69. ●To record data using the time synchronization function, see “4-9-1.Point zero (manual) setting” on page 4-61, “4-9-2.Point zero (manual n. of data) setting” on page 4-63 or “4-9-3.Interval (GPS sync) setting” on page 4-65. ● To correct built-in clock of CTRS-100A, see “5-6.Time correction function (CTRS-CAG011A)” on page 5-16.
GPS trajectory display is abnormal on DAS-200A.	Are there any obstructions around the location of the GPS antenna?	If GPS data contains unplaced data, the DAS-200A may display a distorted trajectory; review the location of the GPS antenna to ensure stable positioning, or use the function to omit unplaced data. For the function to omit unplaced data, see "4-9-5.GPS data recording" on page 4-69.

- About inductive interference

  Inductive noise may occur if there is a device with a large magnetic flux leakage nearby. Examples include large motors, transformers, and ferro-resonant constant voltage transformer. Inductive noise may also occur when the measurement points are far away. The following measures can be taken in such cases.

  ・Separately locate this unit from the power source.

  ・Use shielded input cables and thermocouples.

- About potential interference

  Potential interference occurs when the target to be measured has a certain potential of DC or AC. In this case, grounding the measuring instrument is not necessarily a good thing. It may be appropriate to connect the target to be measured and measuring instrument.

  If there is induction noise or if the target to be measured has potential, it is rare to be solved by a simple method. Especially nowadays, the number of electrical devices that are used together in the measuring environment are increasing resulting to affect with each other as the noise cause.

The above mentioned countermeasures are mere examples. Fully consider the operational environment and take appropriate measured to obtain the most preferable results.

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7. MAINTENANCE

7-1. Maintenance Details

The maintenance items are shown below, including equipment calibration and the replacement of limited lifespan parts.
It is recommended to perform maintenance at the frequencies indicated in the tables.

Table 7-1. Equipment calibration

Item	Details	Frequency
Checking the operation of the CTRS-100A	Regular inspections are recommended to guarantee the operation of the CTRS-100A. These inspections are handled by our company.	Once per year
Checking the measuring unit accuracy	Regular inspections are recommended to guarantee the measuring unit accuracy. These inspections are handled by our company.	Once per year

Table 7-2. Replacement of limited lifespan parts

Item	Details	Replacement frequency
Backup battery (built into the CTRS-100A)	The lifespan of the backup battery differs depending on the usage frequency and usage environment, but it is approximately five years. After around five or more years, the battery capacity decreases, so replace it. Our company handles this replacement.	Once every five years
Lithium-ion battery (built into the CTRS-BATT010A)	The lifespan of the lithium-ion battery depends on the usage frequency, operating temperature, and other factors, but it is approximately one year if a 0 to 100% charge/discharge cycle is completed once per day. After around one or more years, the battery capacity decreases, so replace it. Our company handles this replacement. Note that the CTRS-BATT010A has a function for checking the replacement timing based on the health of the built-in lithium-ion battery. For details, see "1-3-7. Battery Unit: CTRS-BATT010A" on page 1-19.	Once per year under the conditions at the left
AC adapter (optional accessory)	The AC adapter is a limited lifespan part. The lifespan depends on the usage frequency, operating temperature, and other factors, but it is approximately five years. Please replace the AC adapter around once every five years.	Once every five years

Item	Details	Replacement frequency
SD card (standard accessory, optional accessory)	An SD card can be rewritten approximately 60,000 times, and its durability enables it to be inserted or removed 10,000 or more times.	Depends on the usage method and usage environment

The above estimates assume use for eight hours per day, 365 days per year. Note that the above periods are only intended as estimates and do not guarantee that there will be no malfunctions during the above periods, nor are they a promise of free repairs.
Regular maintenance and the replacement of parts are necessary to use the equipment without worry.
In particular, to ensure safety, etc., it is necessary to replace parts early if continuously using the equipment for a long time.

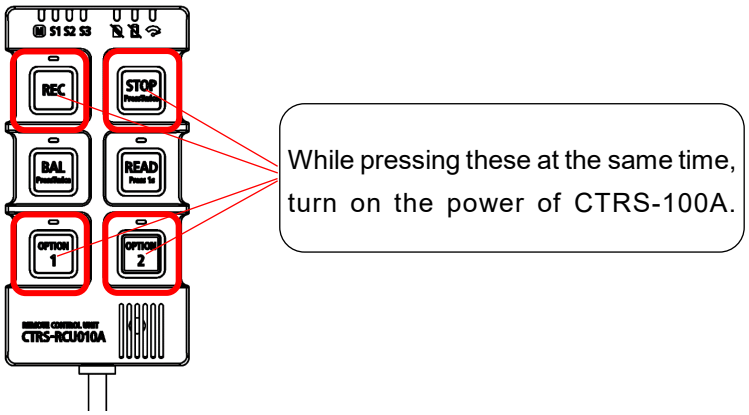
7-2. Initializing the CTRS-100A

The equipment can be initialized to the factory settings by performing the operations below.

(Step 1) Turn off the power supply.

(Step 2) Connect the CTRS-RCU010A.

(Step 3) Turn on the power while simultaneously pressing
REC + STOP + OPTION 1 + OPTION 2.



(Step 4) If initialization is successful, the buzzer will sound, and all the LEDs will light up in blue.

(Step 5) Turn off power supply of the CTRS-100A, wait at least five seconds, and then turn the power supply back on to finish initializing to the factory settings.

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8. PRODUCT SPECIFICATIONS

8-1. CTRS-100A Product Specifications

Control unit specifications (1/2)

Item		Details
Connector	**USB connector**	Micro USB Type-B
	Remote control connector	Used to connect the remote control unit
	External I/O connector	Model: ECA.0B.307.CLN Compatible connector: FGA.0B.307.CLAD52
Operating switch		POWER
Main unit display		Status LED, SD card access indicator LED
Data recording media		Kyowa recommended industrial-use SD card SD standards: SDHC Capacity: 4 GB, 16 GB Format: FAT32 (Operation is not guaranteed if an SD card other than the recommended product is used.)
Communication interface		USB2.0 (USB2.0 High Speed) Ethernet*1 (10/100BASE-T)
Number of units that can be Connected	**Measuring unit**	Up to seven units can be connected per CTRS-100A (total of 32 channels).
	Expansion unit	Up to five units can be connected per CTRS-100A. However, two or more same units cannot be connected and used.
Synchronization between devices	**Synchronization method**	Use a synchronization unit and synchronous cable to connect CTRS-100As.
	Maximum number of units that can be synchronized	The maximum is four CTRS-100As, and a maximum of 128 measurement channels can be synchronized.
	Recorded data	Data is recorded to each unit's SD card or a PC. (Only when online control is performed by a PC)
Recorded data	**File saving location**	SD card, PC (Only when online control is performed by a PC)
	Data format	Kyowa standard format KS3
	Maximum data file size	4 GB/1 data file (1 GB = 1,000,000,000 bytes) *2
	Data collection	Online collection : Collect by control software (PC) Offline collection : Collect by directly reading data from an SD card to the PC
Measurement-condition setting method	**Online setting**	Set by control software (PC)
	Offline setting	Set by reading the measurement-condition settings on the SD card
Recording modes	**Manual**	The user performs operations to start or stop recording.
	Trigger (compound trigger)	Automatic recording is performed based on the trigger condition setting.
	Interval	Automatic recording is performed based on the recording start time and recording interval settings.

*1) A separate synchronous unit and special CTRS communication cable are necessary.
*2) Maximum recording time depends on number of measurement channels and sampling frequency.
Maximum recording time: 1,000,000,000 ÷ number of measurement channels ÷ sampling frequency

Control unit specifications (2/2)

Item		Details
Sampling	**Method**	Synchronous sampling of all channels
	Frequency	1, 2, and 5 series 1, 2, 5, 10, 20, 50, 100, 200, 500, 1k, 2k, 5k, 10k, 20k, 50k, 100k Hz 2n series 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048, 4096, 8192, 16384, 32768, 65536 Hz Maximum sampling frequency that can be set : 100 kHz / number of measurement channels
	External clock	Clock input from an external device is used as the sampling clock. A frequency from 1 to 100 kHz can be set in 1-Hz increments. Input a clock within the range of the specified frequency ±5 %. Voltage level: high-level voltage 2.4 to 5 V, Low-level voltage 0 to 0.8 V DUTY: 30 to 70 %
Trigger functions	**Trigger type**	・Analog input signal (analog trigger) ・External trigger input signal (no-voltage contact, open collector, signal with high-level voltage 2.4 to 5 V and Low-level voltage 0 to 0.8 V) ・Manual (If the REC button is pressed in the trigger awaiting state, recording starts.)
	Trigger level	Any level within the range of ±FS can be set. (Analog input signal only.)
	Trigger slope	Slope (positive), slope (negative)
	Pre-trigger	Specify the amount of data to save from before the start trigger point. Any amount up to 524,288 data items/the number of measurement channels can be set.
	Post-trigger	Specify the amount of data to save from after the end trigger point. Any amount up to 524,288 data items/the number of measurement channels can be set.
Backup function	**Backup target**	Setting conditions, balance-adjustment value (zero suppress value)
	Saving location	Internal nonvolatile memory
External clock output	**Signal level**	5 VDC The inverted or non-inverted signal can be set.
	Division	A clock signal that is synchronized with the sampling clock is divided and output. Any division ratio in the range from 1 to 65,534 can be set.
	Output modes	Select from always output the clock, only output it while recording, or no output it.
Other functions	**Specification of the number of data items to record**	When the specified number of data items is recorded, recording automatically finishes.
	Automatic recovery function in power interruption	Only when the battery unit is connected. While recording, if the power supply is interrupted due to a power outage, etc., you can select whether to switch to battery power and continue recording or close the file being recorded and then shut down. If the option to shut down is selected, you can select whether to resume recording after the power is restored or enter the standby state.
	Recording recovery function	You can select whether to resume recording or enter the standby state when the POWER switch is turned off while recording and then turned back on.
	File name assignment	Automatically assign a file number or recording date to the recorded-data file name.
	Trigger signal output	Output a trigger signal when in the trigger (compound trigger) recording modes. While on standby:5 VDC, while recording: 0 VDC

Measuring unit specifications (1/2)

The measuring unit specifications apply to the state in which the temperature has stabilized after a preheating time of 30 minutes.

Item		Strain measurement	Voltage measurement
Number of input channels		4	
Input connector	**Connector shape**	NDIS4109 receptacle model: EPRC07-RX9FNDIS	
	Compatible plug	NDIS4109 plug model: EPRC07-P9MNDIS	
Measuring targets		Strain gages (A separate bridge box is necessary.) Strain-gage transducers	Voltage
Compatible bridge resistance		When bridge excitation is set to 2 V 120 to 1000 Ω When bridge excitation is set to 5 V 350 to 1000 Ω	–
Gage factor		2.00 fixed	–
Bridge excitation/sensor excitation		2 VDC, 5 DCV	2 VDC, 5 VDC[*1] OFF(0 V)
		A maximum of 20 mA per channel can be output.	
Input impedance		–	3.6 MΩ±10 %
Input modes		Balanced differential input	
Measuring range	**Setting method**	Any range method or OFF	
	Settable range	Minimum: 1000 × 10^{-6} strain Maximum: 50000 × 10^{-6} strain	Minimum: 1 V Maximum: 50 V
	Setting steps	・1000 to 10000 × 10^{-6} strain 100 × 10^{-6} strain steps ・10000 to 50000 × 10^{-6} strain 1000 × 10^{-6} strain steps	・1 to 10 V 0.1 V steps ・10 to 50 V 1 V steps
Range accuracy		Within ±0.2% FS	
Nonlinearity		Within ±0.1% FS	
Temperature stability	**Zero point**	Within ±(0.009% FS + 0.9 × 10^{-6} strain)/°C	Within ±(0.009% FS + 0.21 mV)/°C
	Sensitivity	Within ±0.03%/°C	
Time stability	**Zero point**	Within ±(0.09% FS + 9 × 10^{-6} strain)/8H	Within ±(0.09% FS + 0.1 mV)/8H
	Sensitivity	Within ±0.3%/8H	
Balance adjustment	**Setting**	For each channel, ON, OFF, or NONE can be selected. ON: Execute balance adjustment and set the measured value to zero. OFF: Do not execute balance adjustment again. NONE: Balance adjustment can be disabled to check the initial unbalanced value (input voltage).	
	Operating method	Execute the balance operation by using the control software (Only when online control is performed by a PC) or operate the special-remote-control BAL switch.	
	Adjustment method	Auto balance (saved in nonvolatile memory)	
	Adjustment range	Within ±10000 × 10^{-6} strain	Within ±10 V
	Accuracy	Within ± (0.1% FS + 2 × 10^{-6} strain)	Within ±0.1% FS
	NONE accuracy	Within ±1% FS (When the bridge resistance is 350 Ω.)	Within ±0.2% FS
Input range		Within ±60000 × 10^{-6} strain	Within ±60 V
Common-mode input voltage range		–	Within ±20 V
Absolute maximum rating	**Input**	±5 V	±70 V
Frequency response		DC to 20 kHz, -3 ± 1 dB (at 20 kHz)	

*1) When the sensor excitation is 2 VDC, the positive side of the sensor excitation is + 1 V and the negative side is -1 V.
When the sensor excitation is 5 VDC, the positive side of the sensor excitation is + 2.5 V and the negative side is -2.5 V.

Measuring unit specifications (2/2)

The measuring unit specifications apply to the state in which the temperature has stabilized after a preheating time of 30 minutes.

Item		Strain measurement	Voltage measurement
Low-pass filter	**Transfer characteristics**	Fifth-order Butterworth	
	Cutoff frequency	10, 20, 50, 100, 200, 500, 1k, 2k, 5k, 10k Hz and FLAT, AUTO FLAT： The cutoff frequency is set to approximately 25 kHz. AUTO： The cutoff frequency is set to approximately 1/4 the specified sampling frequency.	
	Amplitude ratio at cutoff point	-3 ± 1 dB	
	Attenuation characteristics	-30 ± 3 dB/oct. (Excluding cutoff frequencies over 5 kHz.)	
High-pass filter	**Cutoff frequency**	0.2, 1 Hz and OFF	
A/D conversion	**Resolution**	24 bits	
	Method	Delta-sigma method, synchronous sampling of all channels	
Indicator	**Channel-status LED**		
Other functions	**Input resistance check functions**	Bridge resistance check function Accuracy within ± 2 % Used for sensor connection checks	
	TEDS	Read the TEDS information and apply it to the measurement conditions. *8	

General specifications

Item	Details
Power connector	Model: ECP.1S.302.CLL
Power-supply voltage range	10 to 30 VDC
Power consumption	Approx. 3.5 W (when supplying 12 VDC)
Operating temperature and humidity range	-10 to 50 °C, 20 to 90 % (non-condensing)
Storage temperature range	-20 to 60 °C
Vibration resistance	49.0 m/s^2 (5G), 5～200 Hz
Shock resistance	490 m/s^2 (50 G), 11 msec or less, Harf sine wave
External dimensions	53.2 (W)×92 (H)×94 (D)mm, not including protrusions or protectors
Weight	Approx. 420 g
Terminal	GND terminal: M3 bind
Utility nuts	Size: M4, 12 places

8-2. CTRS-RCU010A Product Specifications

Item		Details
Operating button switches	**REC**	Start recording. Operating method: Press the button once.
	STOP	Stop recording. Operating method: Press the button once or twice. (This can be switched by using the control software.)
	BAL	Execute a balance operation. Operating method: Press the button twice or hold it down. (This can be switched by using the control software.)
	READ	Read the condition settings from the SD card. Operating method: Hold down the button.
	OPTION1, OPTION2	Use the control software to assign any function to these buttons for use. Operating method: Press the button once. ・Monitor ・Delete the latest data file ・Over reset ・PAUSE ・Marker input ・Auto range
Indicator		Status LED
		Remaining-battery-power indicator LED
		Remaining-SD-card-space indicator LED
		Range-over indicator LED
		REC LED
		BAL LED
		READ LED
		OPTION 1 LED
		OPTION 2 LED
Other functions		Built-in buzzer
		Strap hole
Operating temperature and humidity range		-10 to 50 °C, 20 to 90 % (non-condensing)
Storage temperature range		-20 to 60 °C
Vibration resistance		49.0 m/s^2 (5 G), 5 to 200 Hz
Shock resistance		490 m/s^2 (50 G), 11 msec or less, Harf sine wave
Power consumption		Approx. 0.2 W
External dimensions		46 (W) × 90 (H) × 20 (D) mm, not including protrusions
Weight		Approx. 120 g
Utility nuts		Size: M3, 6 places

Hold down: to press and hold down a button for at least one second.
Press twice: to press a button switch twice within 0.5 seconds.

8-3. CTRS-CDV010A Product Specifications

The specifications apply to the state in which the temperature has stabilized after a preheating time of 30 minutes.

Item		Strain measurement	Voltage measurement
Number of input channels		4	
Input connector	**Connector shape**	NDIS4109 receptacle model: EPRC07-RX9FNDIS	
	Compatible plug	NDIS4109 plug model: EPRC07-P9MNDIS	
Measuring targets		Strain gages (A separate bridge box is necessary.) Strain-gage transducers	Voltage
Compatible bridge resistance		When bridge excitation is set to 2 V 120 to 1000 ohm When bridge excitation is set to 5 V 350 to 1000 ohm	–
Gage factor		2.00 Fixed	–
Bridge excitation/sensor excitation		2 VDC, 5 VDC	2 VDC, 5 VDC *1 OFF(0 V)
		A maximum of 20 mA per channel can be output.	
Input impedance		–	3.6 Mohm ± 10 %
Input modes		Balanced differential input	
Measuring range	**Setting method**	Any range method or OFF	
	Settable range	Minimum: 1000 × 10^{-6} strain Maximum: 50000 × 10^{-6} strain	Minimum: 1 V Maximum: 50 V
	Setting steps	・1000 to 10000 × 10^{-6} strain 100 × 10^{-6} strain steps ・10000 to 50000 × 10^{-6} strain 1000 × 10^{-6} strain steps	・1 to 10 V 0.1 V steps ・10 to 50 V 1 V steps
Range accuracy		Within ± 0.2 % FS	
Nonlinearity		Within ± 0.1 % FS	
Temperature stability	**Zero point**	Within ±(0.009 % FS + 0.9 × 10^{-6} strain)/°C	Within±(0.009 %FS + 0.21 mV)/°C
	Sensitivity	Within ± 0.03 %/°C	
Time stability	**Zero point**	Within ±(0.09 % FS + 9 × 10^{-6} strain)/8H	Within±(0.09 %FS + 0.1 mV)/8H
	Sensitivity	Within ± 0.3 %/8H	
Balance adjustment	**Setting**	For each channel, ON, OFF, or NONE can be selected. ON: Execute balance adjustment and set the measured value to zero. OFF: Do not execute balance adjustment again. NONE: Balance adjustment can be disabled to check the initial unbalanced value (input voltage).	
	Operating method	Execute the balance operation by using the control software (Only when online control is performed by a PC.) or operate the special-remote-control BAL switch.	
	Adjustment method	Auto balance (saved in nonvolatile memory)	
	Adjustment range	Within ± 10000 × 10^{-6} strain	Within ± 10 V
	Accuracy	Within ± (0.1% FS + 2 × 10^{-6} strain)	Within ± 0.1 % FS
	NONE accuracy	Within ± 1 % FS (When the bridge resistance is 350 ohm)	Within ± 0.2 % FS
Input range		Within ±60000 × 10^{-6} strain	Within ± 60 V
Common-mode input voltage range		–	Within ± 20 V
Absolute maximum rating	**Input**	± 5 V	± 70 V
Frequency response		DC to 20 kHz, −3 ± 1 dB (at 20 kHz)	

*1) When the sensor excitation is 2VDC, the positive side of the sensor excitation is + 1 V and the negative side is -1 V.
When the sensor excitation is 5VDC, the positive side of the sensor excitation is + 2.5 V and the negative side is -2.5 V.

The specifications apply to the state in which the temperature has stabilized after a preheating time of 30 minutes.

Item		Strain measurement	Voltage measurement
Low-pass filter	**Transfer characteristics**	Fifth-order Butterworth	
	Cutoff frequency	10, 20, 50, 100, 200, 500, 1k, 2k, 5k, 10k Hz and FLAT, AUTO FLAT： The cutoff frequency is set to approximately 25 kHz. AUTO： The cutoff frequency is set to approximately 1/4 the specified sampling frequency.	
	Amplitude ratio at cutoff point	−3 ± 1 dB	
	Attenuation characteristics	−30 ± 3 dB/oct. Excluding cutoff frequencies over 5 kHz.	
High-pass filter	**Cutoff frequency**	0.2, 1 Hz and OFF	
A/D conversion	**Resolution**	24 bit	
	Method	synchronous sampling of all channels	
Indicator		Status LED, Channel-status LED	
Other functions	**Input resistance check functions**	Bridge resistance check function Accuracy within ± 2 % Used for sensor connection checks	
	TEDS	Read the TEDS information and apply it to the measurement conditions [*3]	
Power supply		Supplied by the CTRS-100A or CTRS-BATT010A	
Power consumption		Approx. 2.1 W (when supplying 12 VDC)	
Operating temperature and humidity range		−10 to 50 °C, 20 to 90% (non-condensing)	
Storage temperature range		−20 to 60 °C	
Vibration resistance		49.0 m/s^2 (5G), 5 to 200 Hz	
Shock resistance		490 m/s^2 (50 G), 11 msec or less, Harf sine wave	
External dimensions		26.6(W) mm × 92(H) mm × 94(D) mm not including protrusions or protectors	
Weight		Approx. 240 g	
Utility nuts		Size: M4, 6 places	

8-4. CTRS-CVPS010A Product Specifications

Item		Details
Number of input channels		4
Input connector	**Connector shape**	NDIS4109 receptacle model: EPRC07-RX9FNDIS
	Compatible plug	NDIS4109 plug model: EPRC07-P9MNDIS
Measuring targets		Voltage
Sensor excitation		DC 5 V, 10 V[*1], OFF (0 V) Channels 1 and 2 can output up to 35 mA, and channels 3 and 4 can output up to 15 mA.
Input impedance		3.6 MΩ±10 %
Input modes		Balanced differential input
Measuring range	**Setting method**	Any range method or OFF
	Settable range	Minimum：0.2 V Maximum：50 V
	Setting steps	・0.2～10 V 0.1 V steps ・10～50 V 1 V steps
Range accuracy		Within ±0.2 %FS
Nonlinearity		Within ±0.1 %FS
Temperature stability	**Zero point**	Within ±(0.009 %FS + 0.21 mV)/ °C
	Sensitivity	Within ±0.03 %/°C
Time stability	**Zero point**	Within ±(0.09 %FS + 0.1 mV)/8H
	Sensitivity	Within ±0.3 %/8H
Balance adjustment	**Setting**	For each channel, ON, OFF, or NONE can be selected. ON: Execute balance adjustment and set the measured value to zero. OFF: Do not execute balance adjustment again. NONE: Balance adjustment can be disabled to check the initial unbalanced value (input voltage).
	Operating method	Execute the balance operation by using the control software[*3] or operate the special-remote-control BAL switch.
	Adjustment method	Auto balance (saved in nonvolatile memory)
	Adjustment range	Within ±10 V
	Accuracy	Within ±0.1 %FS
	NONE accuracy	Within ±0.2 %FS

*1) When the sensor excitation is 5VDC, the positive side of the sensor excitation is +5 V and the negative side is 0 V.
When the sensor excitation is 10VDC, the positive side of the sensor excitation is +10 V and the negative side is 0 V

Item		Details
Input range		Within ±60 V
Common-mode input voltage range		Within ±20 V
Absolute maximum rating	**Input**	±70 V
Frequency response		DC to 20 kHz, −3 ± 1 dB (at 20 kHz)
Low-pass filter	**Transfer characteristics**	Fifth-order Butterworth
	Cutoff frequency	10, 20, 50, 100, 200, 500, 1k, 2k, 5k, 10k Hz and FLAT, AUTO FLAT： The cutoff frequency is set to approximately 25 kHz. AUTO： The cutoff frequency is set to approximately 1/4 the specified sampling frequency.
	Amplitude ratio at cutoff point	-3±1 dB
	Attenuation characteristics	The cutoff frequency： 5kHz or less -30±3 dB/oct. exceeds 5kHz -30(+3, -9) dB/oct.
High-pass filter	**Cutoff frequency**	0.2, 1 Hz and OFF
A/D conversion	**Resolution**	24 bit
	Method	Synchronous sampling of all channels
Indicator		Status LED, Channel-status LED
Other function	**TEDS**	Read the TEDS information and apply it to the measurement conditions *3
Power supply		Supplied by the CTRS-100A or CTRS-BATT010A
Power consumption		Approx. 3.2 W (when supplying 12 VDC)
Operating temperature and humidity range		−10 to 50 °C, 20 to 90% (non-condensing)
Storage temperature range		−20 to 60 °C
Vibration resistance		49.0 m/s^2 (5G), 5 to 200 Hz
Shock resistance		490 m/s^2 (50 G), 11 msec or less, Harf sine wave
External dimensions		26.6(W) mm × 92(H) mm × 94(D) mm not including protrusions or protectors
Weight		Approx. 240 g
Utility nuts		Size: M4, 6 places

8-5. CTRS-CTA010A Product Specifications

Item		Details
Number of input channels		4
Input connector[*1]	**Connector shape**	Push-in spring connection
	Connection capacity	Conductor cross section solid / flexible 0.2 mm^2...1.5 mm^2 Conductor cross section AWG / kcmil 24…16 Stripping length 8 mm
Measuring targets		Thermocouples
Measuring targets		K, T, J, N (Thermocouple resistance 1 kohm or less.)
Measuring range		K: －200 to 1370.0 ˚C　　T: －200 to 400.0 ˚C J: －200 to 1200.0 ˚C　　N: －200 to 1300.0 ˚C
Resolution		0.1 ˚C
Accuracy	**Extarnal reference junction conpensator**	Above −100 ˚C　Within ±0.1 %rdg ± 0.4 ˚C Below −100 ˚C　Within ±0.2 %rdg ± 0.6 ˚C
	Internal reference junction conpensator	Ambient temperature　15 to 35 ˚C Above −100 ˚C　Within ±0.1 %rdg ± 1.4 ˚C Below −100 ˚C　Within ±0.2 %rdg ± 1.6 ˚C
		Ambient temperature　－10 to 50 ˚C Above −100 ˚C　Within ±0.1 %rdg ± 2.4 ˚C Below −100 ˚C　Within ±0.2 %rdg ± 2.6 ˚C
Sampling system		Scanning
Inside sampling frequencies		Approx. 2.0 Hz, approx 0.5 Hz
Indicator		State indicator LED
Check functions		Burnout check
Withstand voltage		500 VAC for 1 min. between input and case(output)
Power supply		Supplied by the CTRS-100A or CTRS-BATT010A
Power consumption		Approx. 0.7 W (when supplying 12 VDC)
Operating temperature and humidity range		−10 to 50 ˚C, 20 to 90 % (non-condensing)
Strage temperature range		−20 to 60 ˚C
Vibration resistance		49.0 m/s^2 (5 G), 5 to 200 Hz
Shock resistance		490 m/s^2 (50 G), 11 msec or less, Harf sine wave
External dimensions		26.6(W) × 92(H) × 94(D) mm　not including protrusions or protectors 26.6(W) × 92(H) × 127(D) mm　not including protrusions or protectors, including the temperature measuring adapter
Weight		Approx 240 g, not including the temperature measuring adapter Approx 260 g, include the temperature measuring adapter
Utility nuts		Size: M4, 6 places

*1)　Mounted on Temperature measuring adapter.

8-6. CTRS-SYNC010A Product Specifications

Item		Details
Connector		Synchronous input connector Synchronous output connector
Indicator		Status LED REMOTE LED
Operating switch	**4-bit DIP switch**	ETHERNET-USB communication switch: 1 bit Device ID setting: 2 bits Reserved: 1 bit
Synchronous operation function	**Number of units that can be connected**	A maximum of four units can be connected in a cascade by using synchronous cable.
	Recorded data	Recorded data can be saved to the SD card for each CTRS-100A as a separate file. Or recorded to a PC (only when online control is performed by the PC).
Ethernet communication		Communication is possible by connecting a communication cable. * Ethernet communication is possible at a distance of up to 53 m by extending the communication cable by using an RJ-45 relay connector (Kyowa recommended items) and LAN cable (Kyowa recommended items).
Distance between devices		2 m or less
Power supply		Supplied by the CTRS-100A or CTRS-BATT010A
Operating temperature and humidity range		−10 to 50 °C, 20 to 90 % (non-condensing)
Storage temperature range		−20 to 60 °C
Vibration resistance		49.0 m/s^2 (5 G), 5 to 200 Hz
Shock resistance		490 m/s^2 (50 G), 11 msec or less, Harf sine wave
Power consumption		Approx. 0.3 W
External dimensions		26.6 (W) × 92 (H) × 94 (D) mm, not including protrusions or protectors
Weight		Approx. 200 g
Utility nuts		Size: M4, 6 places

8-7. CTRS-BATT010A Product Specifications

Item	Details
Type of battery	Lithium-ion battery United Nations Recommendations on the Transport of Dangerous Goods UN 38.3 safety tests: passed The UN 38.3 safety test certification and a certificate of Safe Transport of Chemical Goods (Test Report) issued by the Shanghai Research Institute of Chemical Industry, China: received
Input (DC IN)	10 to 30 VDC Connector: ECP.1S.302.CLL (LEMO) Compatible plug: FFA.1S.302.CLA□□□ (LEMO) * □□□ stands for the collet type, size number, etc.
Output	Voltage 0 VDC Current Maximum: 2.5 A (ambient temperature: 0 to 40 °C) Maximum: 1.5 A (ambient temperature: −10 to 0 °C) Maximum: 2.0 A (ambient temperature: 40 to 50 °C)
Operating switch	Battery-check switch Press once : remaining battery power check The battery-check LED indicates the remaining battery power. Hold down (for approximately one second) : battery health check The battery-check LED indicates the battery health.
Indicator	Status LEDs 1 During external-power operation: lit up in blue During battery operation: lit up in purple (The LED flashes purple when the remaining battery power is less than 30 %.) When an error occurs: flashes red Battery-check LEDs: 3 When checking the remaining battery power (lit up in blue): ● / ● / ● 100 to 70 % ● / ● / - 69 to 30 % ● / - / - 29 to 0 % * Flashes red at 5 % or less When checking the battery health (lit up in purple): ● / ● / ● Good ● / ● / - Caution ● / - / - Replacement required When an error occurs: flash red (all 3) (●: lit up, -: off)

Item		Details
Charging time[*1]	**When charging the battery alone**	4.5 hours or less (ambient temperature 10 to 40 °C) 7.0 hours or less (ambient temperature 0 to 10 °C)
	When supplying power to the system and charging the battery at the same time	7.0 hours or less (ambient temperature 10 to 40 °C) 10.0 hours or less (ambient temperature 0 to 10 °C) [*2]
Discharge time		During 2.5 A (25 W) output : 60 minutes or more During 0.5 A (5 W) output : 300 minutes or more * When using a new battery at an ambient temperature of 25 ± 10 °C (Reference) The power consumption of each unit is as follows: CTRS-100A 3.5 W CTRS-CDV010A 2.1 W CTRS-SYNC010A 0.3 W Because the total power consumption in the case of analog measurement on 32 channels + the use of synchronous unit is approximately 18.5 W, operation for 80 minutes or more is possible.
Operating temperature range	**Charging**	0 to 40 °C
	Discharging	−10 to 50 °C
Operating humidity range		20 to 90 % (non-condensing)
Storage temperature range		−20 to 50 °C * In the case of long-term storage for one month or more, avoid high temperatures or humidity, and store the unit at 40 °C or less.
Vibration resistance		49.0 m/s^2 (5 G), 5 to 200 Hz
Shock resistance		490 m/s^2 (50 G), 11 msec or less, Harf sine wave
External dimensions		53.2(W) × 92(H) × 94(D) mm * Not including protrusions or protectors
Weight		Approx. 570 g
Utility nuts		Size: M4, 12 places
Battery pack replacement		Handled by us (Replacement by the user is not possible.)

*1) If the battery is hot, it may stop charging before it is fully charged for safety reasons. This is not a malfunction.

*2) Depending on the environment, charging may stop before the battery is fully charged for safety reasons. This is not a malfunction.

8-8. CTRS-WLAN010A/011A/012A Product Specifications

Item		CTRS-WLAN010A (for Japan)	CTRS-WLAN011A (for U.S.)	CTRS-WLAN012A (for Thailand and EU)
Supported functions		Collection of recorded data, Measurement condition setting, Real-time monitor *1		
Operating switches		WIRELESS switch : Enable / disable wireless LAN unit operation SETUP switch : Use "Easy connection function" *2 RESET switch : Restore SSID and security key to factory default		
Indicator		Status LED, Wireless LAN status LED (2.4 GHz, 5 GHz)		
Redio section	Compliance standards	IEEE802.11 (a / b / g / n / ac) *3		
	Frequency	2.4 GHz, 5 GHz		
	Channel	[2.4 GHz] 1 to 13 ch [5 GHz] 36, 40, 44, 48 ch (W52) *4	[2.4 GHz] 1 to 11 ch [5 GHz] 36, 40, 44, 48 ch (W52) *4 149,153,157,161,165 ch (W58) *4	[2.4 GHz] 1 to 13 ch [5 GHz] 36, 40, 44, 48 ch (W52) *4
	Security	WPA2-PSK(AES), WPA-PSK(AUTO/TKIP) *5, None		
	Network type	Access point		
	Number of simultaneous connection to a PC	1		
	Antenna	Built-in antenna		
	Available area *6	Japan	The United States	Thailand
	Other function	Easy connection function, DHCP server function *7		
Power supply		Supplied by the CTRS-100A or CTRS-BATT010A		
Power consumption		Approx. 2.5 W		
Operationg temperature range		−10 to 50 °C		
Operating humidity range		20 to 90 % (non-condensing)		
Storage temperature range		−20 to 60 °C		
Vibration resistance		49.0 m/s^2 (5 G), 5 to 200 Hz		
Shock resistance		490 m/s^2 (50 G), 11 msec or less, Harf sine wave		
External dimentions		26.6 (W)×92 (H)×94 (D) mm, Not including protrusions or protectors		
Weight		Approx. 200 g		
Utility nuts		Size: M4, 6 places		

*1) Depending on the radio wave environment of the installation location, the monitor may stop due to a decrease in the transfer speed of wireless LAN communication.

*2) By communicating with WPS (Wi-Fi Protected Setup) compatible devices, it is possible to easily make complicated settings for wireless LAN security.(Equivalent to WPS 2.0)

*3) IEEE802.11 (a / b / g / n / ac) is a wireless LAN standard established by the 802 Committee, which establishes LAN technology standards at the IEEE (Institute of Electrical and Electronics Engineers).

*4) The 5 GHz band channel (W52) is for indoor use only. (Outdoor use prohibited)

*5) If the security method is WPA-PSK (AUTO / TKIP), the "Easy connection function" cannot be used.

*6) It can only be used in countries where radio waves are certified.

*7) The IP address of the wireless connection device (PC) can be set automatically.

8-9. CTRS-CAG010A Product Specifications

Item	Details
Number of CAN ports	2
CAN port connector	ECB.1B.303 LEMO made (applicable plug FGB.1B.303CLAD62Z)
CAN protocol	ISO/DIS 11898-1 compliant *Support for CAN and CAN FE Frames
Supported physical layer	ISO 11898-2 and ISO 11898-5 *Low Speed CAN not supported
Termination resistor	Implementation (Select ON/OFF)
Commnunication speed	1000, 800, 500, 250, 125, 100, 83.3, 62.5, 50, 33.3, 25, 20, 10 kbps
CAN FD data bit rate	5, 4, 2, 1, 0.5 Mbps, OFF *Limited by communication speed. Refer to the configurable CAN FD data bit rate setting table
CAN recording mode	Selected CAN ID mode
	All CAN ID mode *CAN trigger is not available
Liston only mode	Select ON/OFF *CAN data output is not available
CAN data output	UP to 32 message of arbitrary CAN data can be output at one time
CAN data output timing	Output at start / Output at stop / Interval / Manual
CAN trigger	Received CAN message can be used as trigger source
CAN trigger type	Manual / Digital / Analog / Composite
Other function	Automatic communication speed survey
Power supply	Supplied by the CTRS-100A or CTRS-BATT010A
Power consumption	Approx. 0.6W (when supplying DC 12V)
Operating temperature and humidity range	-10 to 50°C, 20 to 90%(non-condensing)
Storage temperature range	-20 to 60°C
Vibration resistance	49.0 m/s2 (5 G), 5 to 200 Hz
Shock resistance	490 m/s2 (50 G), 11 msec. or less, Half sine wave
External dimensions	26.6 (W) × 92 (H) × 94 (D) mm, not including protrusions or protectors
Weight	Approx. 220 g
Utility nuts	Size: M4, 6 places

The configurable CAN FD data bit rate table

Communication speed [kbps]	CAN FD data bit rate [Mbps]
1000, 800	2, 1, OFF
500, 250	5, 4, 2, 1, 0.5, OFF
125	2, 1, 0.5, OFF
100, 83.3, 62.5	1, 0.5, OFF
50, 33.3	0.5, OFF
25, 20, 10	OFF

8-10. CTRS-CAG011A Product Specifications

Item	Details
Number of CAN ports	2
CAN port connector	ECB.1B.303 LEMO made (applicable plug FGB.1B.303CLAD62Z)
CAN protocol	ISO/DIS 11898-1 compliant *Support for CAN and CAN FE Frames
Supported physical layer	ISO 11898-2 and ISO 11898-5 *Low Speed CAN not supported
Termination resistor	Implementation (Select ON/OFF)
Commnunication speed	1000, 800, 500, 250, 125, 100, 83.3, 62.5, 50, 33.3, 25, 20, 10 kbps
CAN FD data bit rate	5, 4, 2, 1, 0.5 Mbps, OFF *Limited by communication speed. Refer to the configurable CAN FD data bit rate setting table
CAN recording mode	Selected CAN ID mode
	All CAN ID mode *CAN trigger is not available
Liston only mode	Select ON/OFF *CAN data output is not available
CAN data output	UP to 32 message of arbitrary CAN data can be output at one time
CAN data output timing	Output at start / Output at stop / Interval / Manual
CAN trigger	Received CAN message can be used as trigger source
CAN trigger type	Manual / Digital / Analog / Composite
Other function	Automatic communication speed survey

The configurable CAN FD data bit rate table

Communication speed [kbps]	CAN FD data bit rate [Mbps]
1000, 800	2, 1, OFF
500, 250	5, 4, 2, 1, 0.5, OFF
125	2, 1, 0.5, OFF
100, 83.3, 62.5	1, 0.5, OFF
50, 33.3	0.5, OFF
25, 20, 10	OFF

Item	Details
Number of GPS port	1
Recordable GPS data	Latitude, longitude, number of received satellites, positioning status, time, speed, azimuth, altitude above sea level, geoid height, horizontal accuracy loss rate, position accuracy loss rate, vertical accuracy loss rate, etc. *Saving format: NMEA
GPS correction function	CTRS-100A Internal time(every hour), Sampling clock(at the start of recording)
Time synchronization measurement	Set the start time of recording to the time data received by GPS.
GPS data update rate	5 times/second
Position accuracy	2.5m (CEP) *The above values are for reference only, and the accuracy is not guaranteed. This accuracy may not be satisfied depending on the installation condition of the antenna, measurement environment, etc. *CEP is an abbreviation for Circular Error Probability, which means that 50% of the data is contained within the radius of the circle indicated by the number.
Power supply	Supplied by the CTRS-100A or CTRS-BATT010A
Power consumption	Approx. 0.7W (when supplying DC 12V)
Operating temperature and humidity range	-10 to 50°C, 20 to 90%(non-condensing)
Storage temperature range	-20 to 60°C
Vibration resistance	49.0 m/s2 (5 G), 5 to 200 Hz
Shock resistance	490 m/s2 (50 G), 11 msec. or less, Half sine wave
External dimensions	26.6 (W) × 92 (H) × 94 (D) mm, not including protrusions or protectors
Weight	Approx. 220 g
Utility nuts	Size: M4, 6 places

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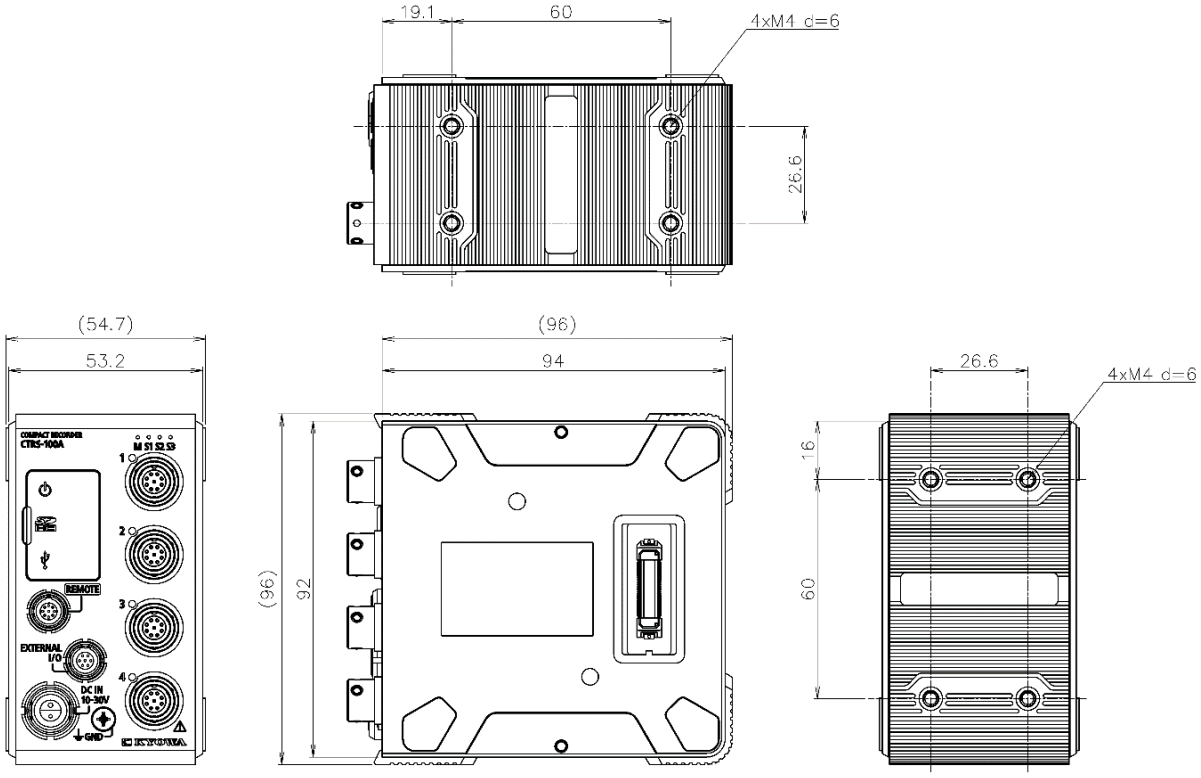
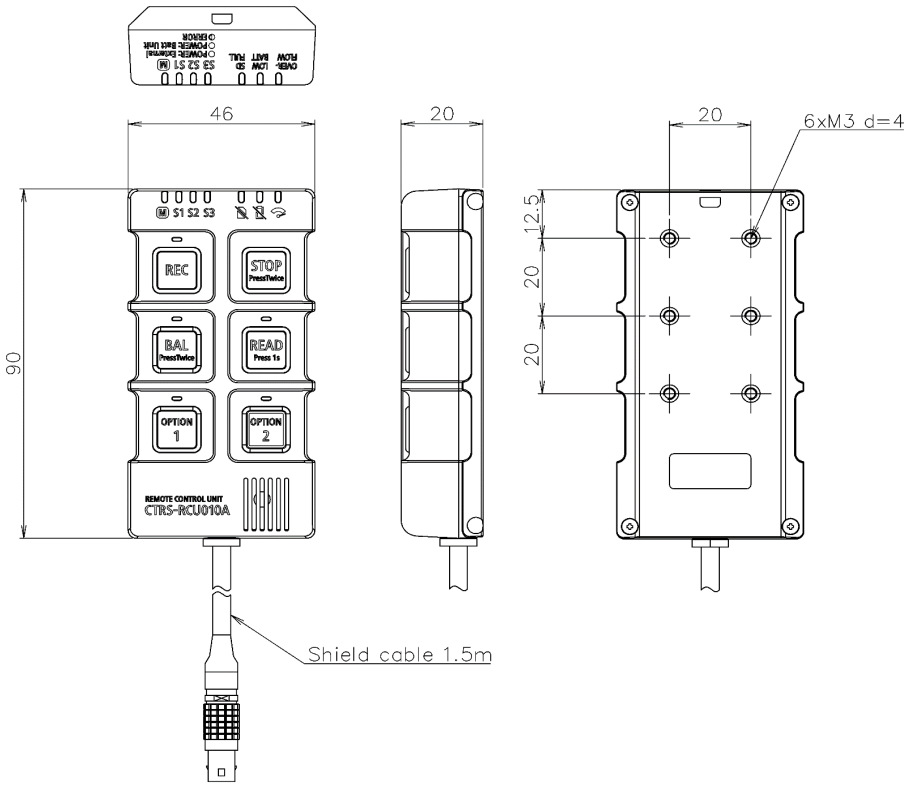
9. EXTERNAL VIEWS

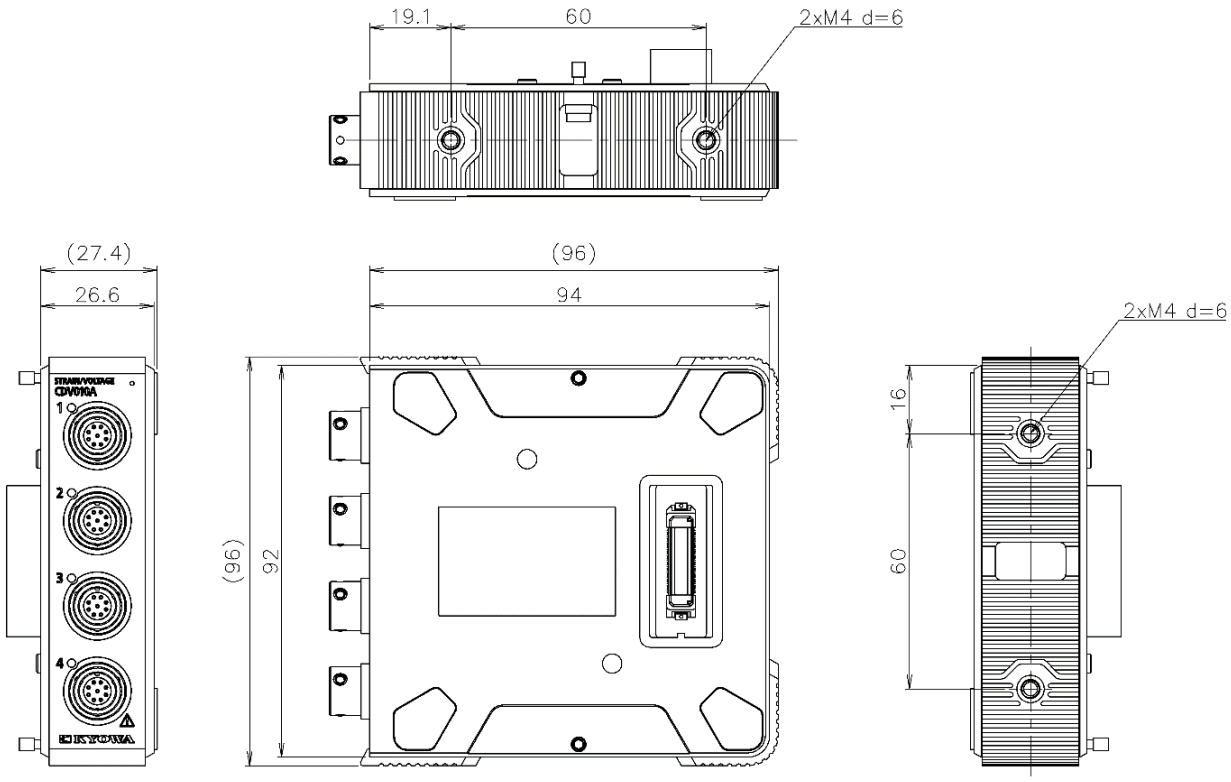
9-1. CTRS-100A External Views



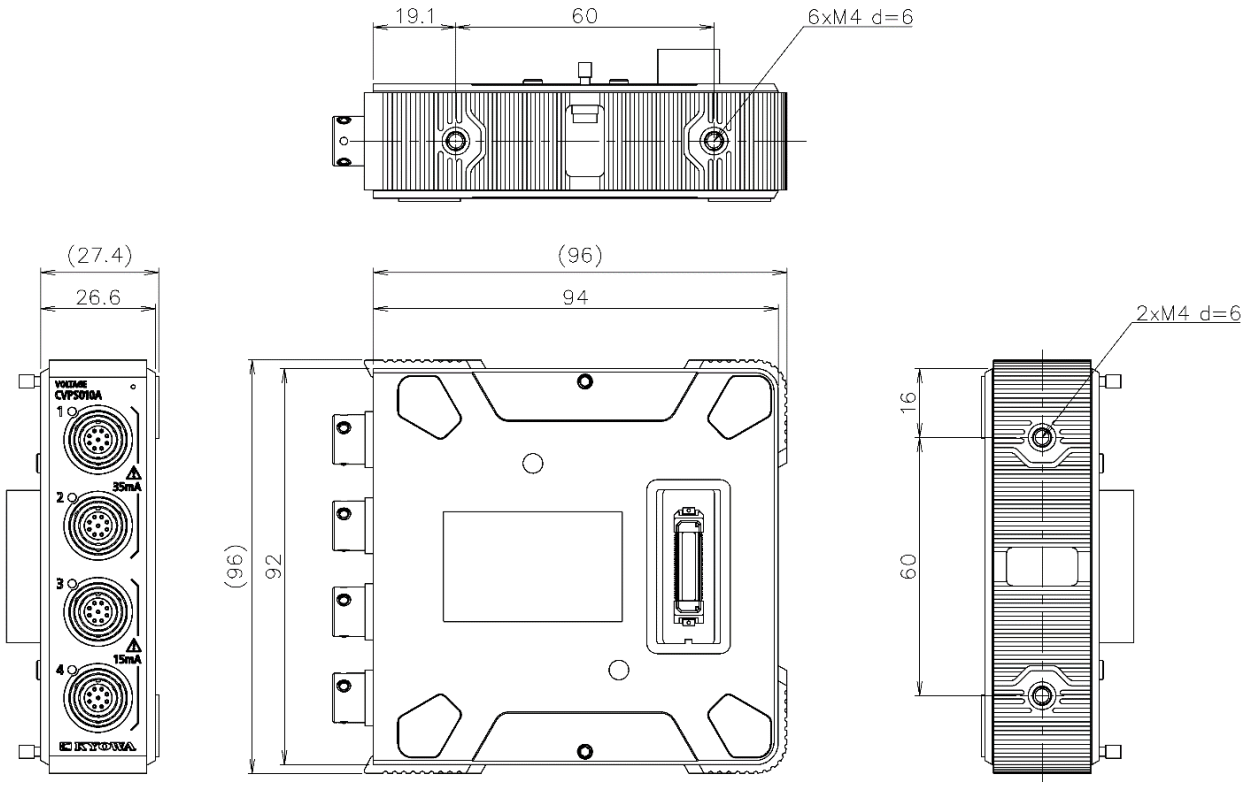
9-2. CTRS-RCU010A External Views



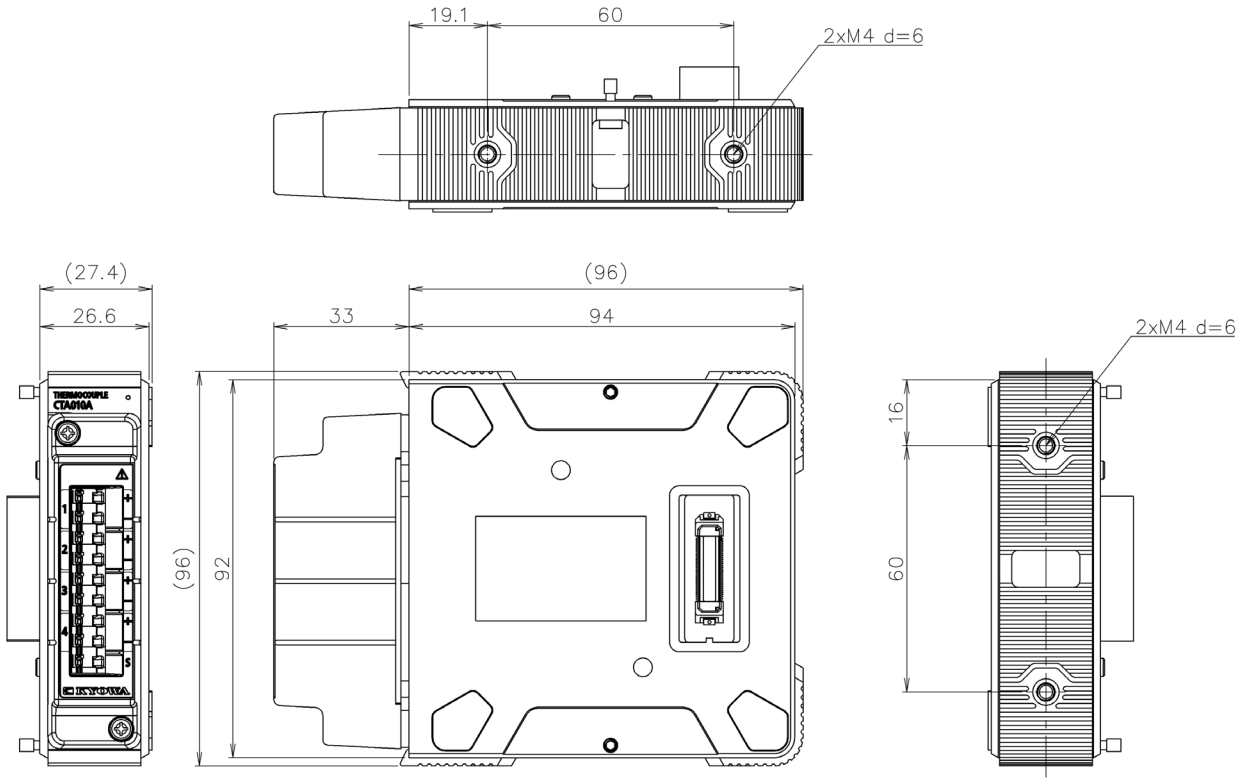
9-3. CTRS-CDV010A External Views



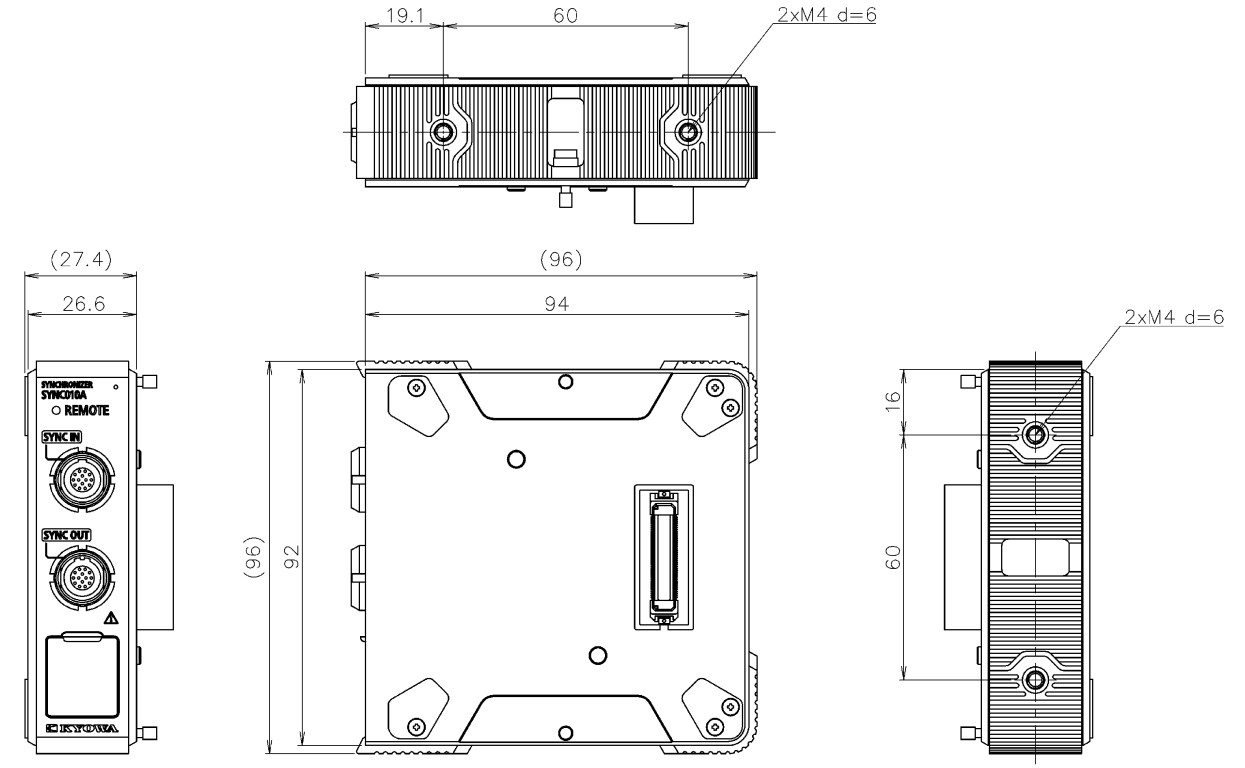
9-4.CTRS-CVPS010A External Views



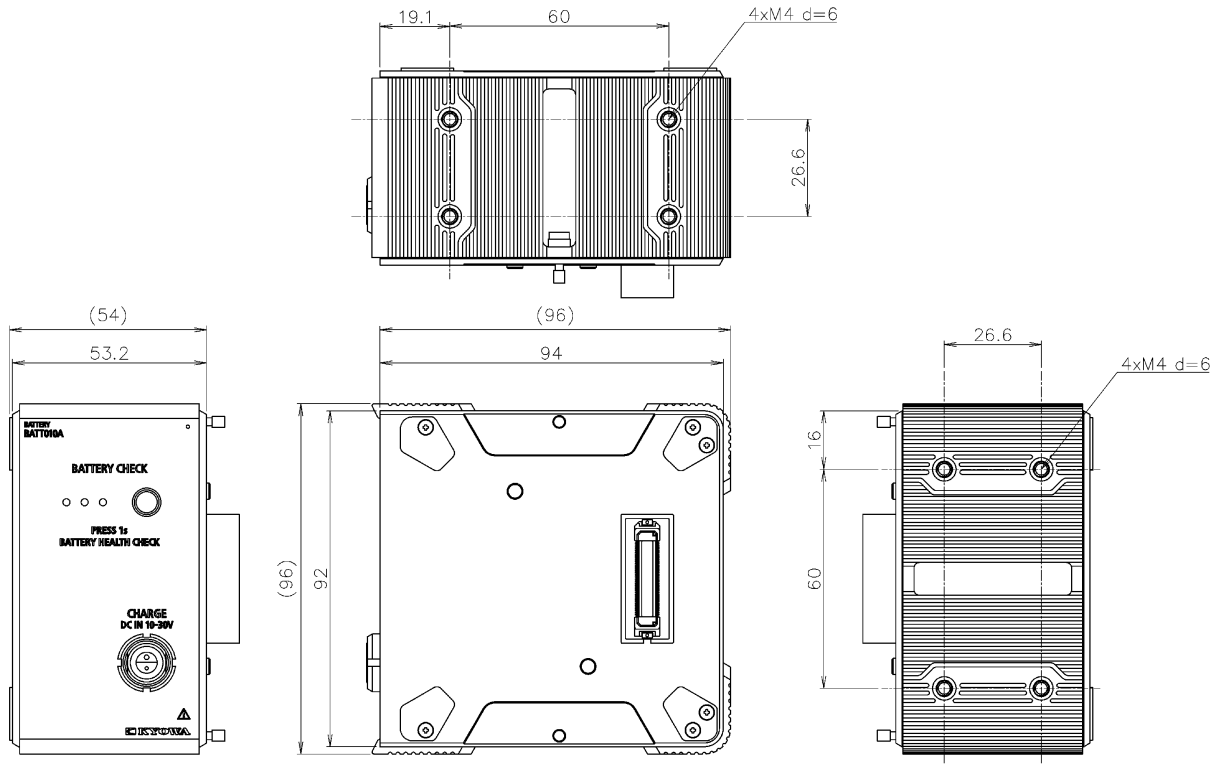
9-5. CTRS-CTA010A External Views



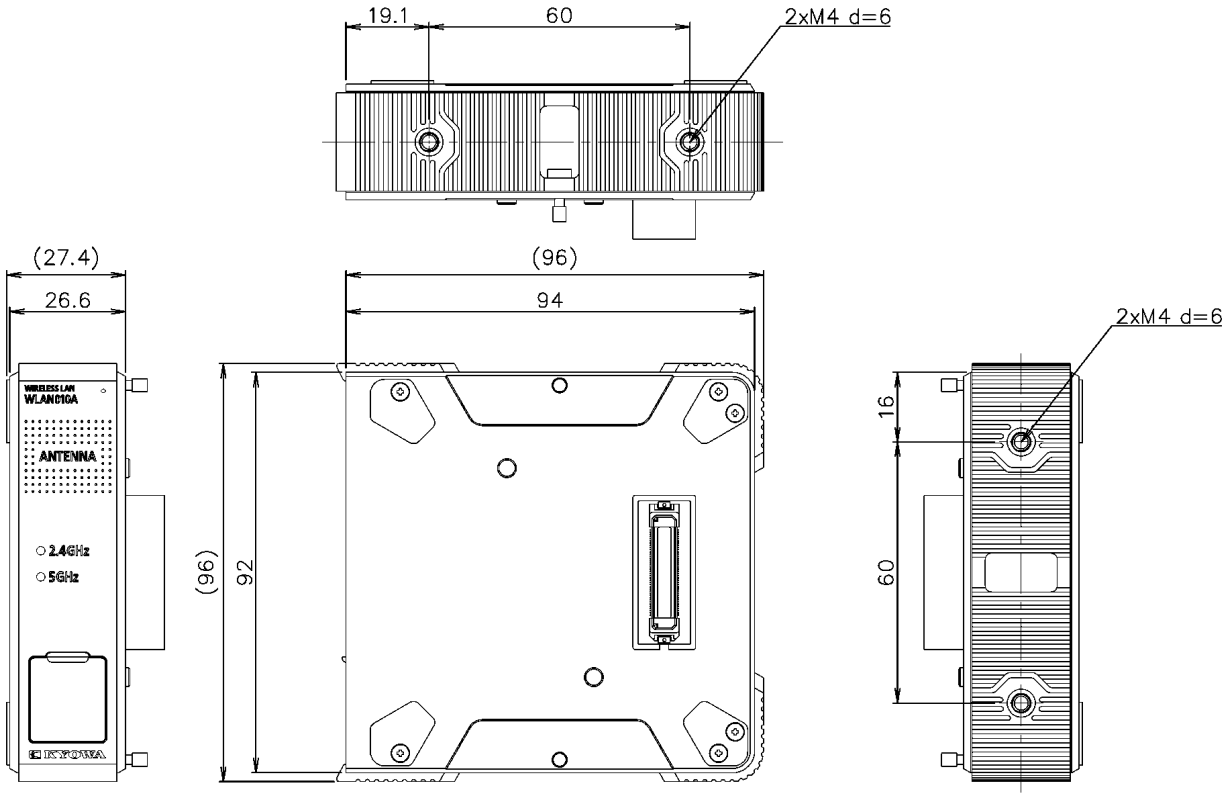
9-6. CTRS-SYNC010A External Views



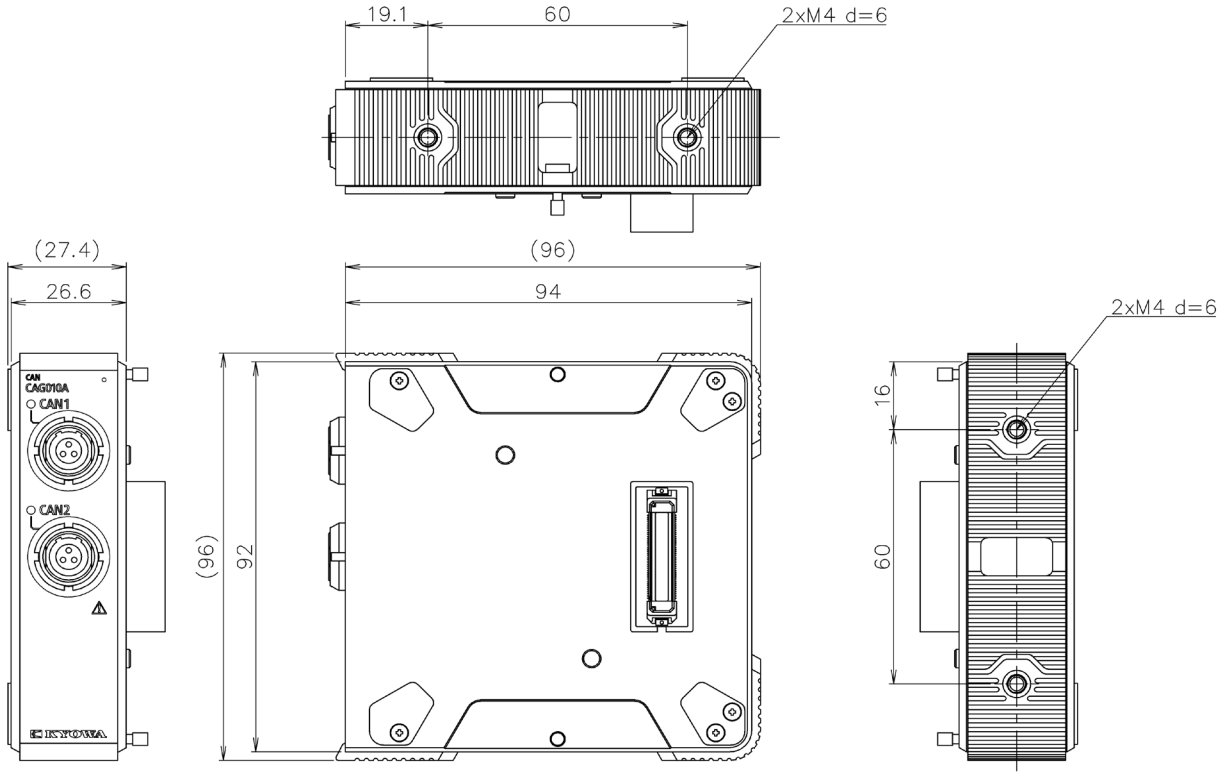
9-7. CTRS-BATT010A External Views



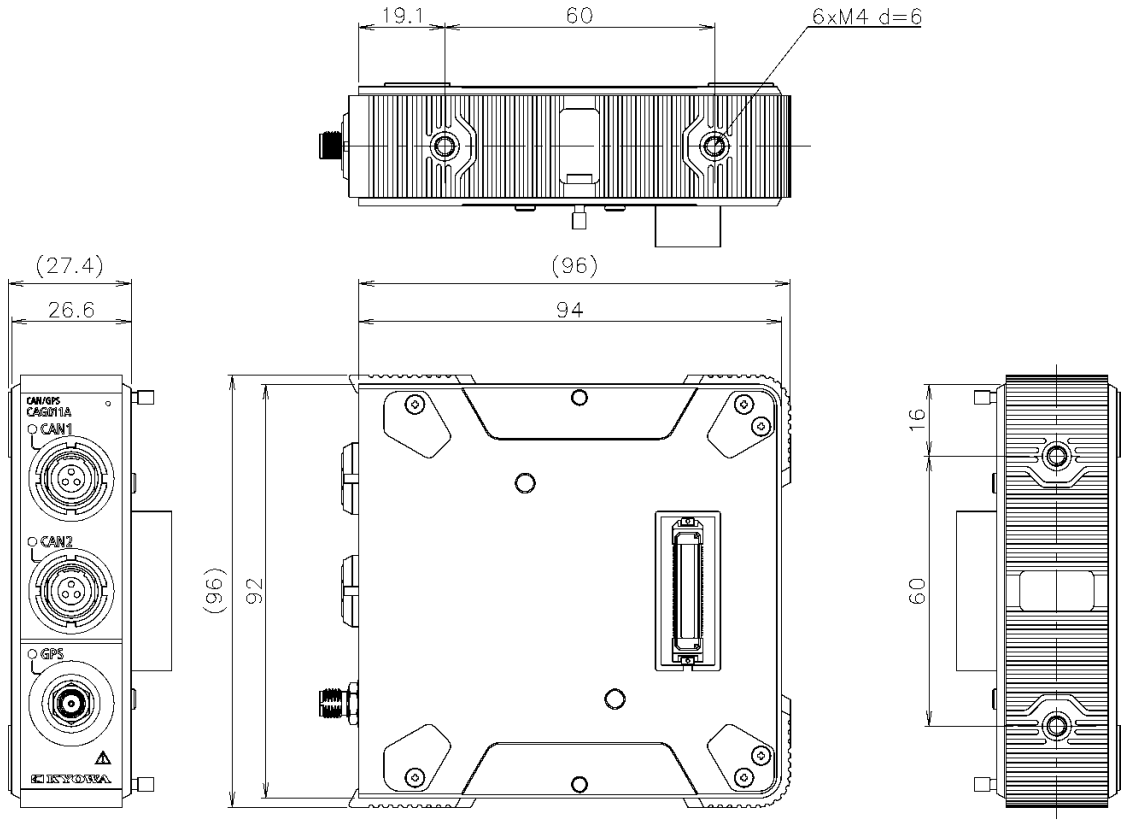
9-8. CTRS-WLAN010A/011A/012A External Views



9-9. CTRS-CAG010A External Views



9-10. CTRS-CAG011A External Views



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10. TECHNICAL INFORMATION

10-1. Cable calibration value

The cable calibration value is calculated by using the following equation.

$$\text{Cable calibration value} = 1 + \frac{\text{Cable reciprocating resistance } (\Omega)}{\text{Bridge input resistance } (\Omega)} \quad \cdots \quad (1)$$

When using the U-136 cable

The calibration values for representative bridge resistances are as shown in the table below.

Table 10-1. U-136 cable correction values (representative values)

Cable model / Bridge resistance	U-136
120 Ω	1.00090
350 Ω	1.00031
1000 Ω	1.00011

The U-136 reciprocating resistance is approximately 108 mΩ. In the case of use with a bridge resistance value other than those shown above, calculate the correction value by using equation (1).

When using the U-138 cable

The correction values for representative bridge resistances are as shown in the table below.

Table 10-2. U-138 cable correction values (representative values)

Cable model / Bridge resistance	U-138
120 Ω	1.00095
350 Ω	1.00033
1000 Ω	1.00011

The U-138 reciprocating resistance is approximately 114 mΩ. In the case of use with a bridge resistance value other than those shown above, calculate the correction value by using equation (1).

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11. APPENDIX

11-1. Special CTRS-RCU010A Operations

When using the remote control unit CTRS-RCU010A, the operations below can be performed by pressing specific buttons at the same time.

Initializing to the factory settings

Operating method

Turn on the power supply while simultaneously pressing
REC + STOP + OPTION 1 + OPTION 2.

The CTRS-100A is initialized to the factory settings.
For details on the procedure, see "7-2. Initializing the CTRS-100A" on page 7-3.

Writing a condition setting file

Operating method

While on standby (while recording and monitoring operations are stopped)
hold down STOP + READ for one second.

The measurement settings currently set for the CTRS-100A will be written to the SD card as a measurement condition file and saved.

Reading a network setting file

Operating method

Turn on the power supply while simultaneously pressing STOP + OPTION 1.

This method is for performing a remote control operation to read a network setting file that has already been saved to the SD card.
For details on the procedure, see "2-11-2. Wired LAN connection" on page 2-32.

Firmware update

Operating method

Turn on the power supply while simultaneously pressing BAL + OPTION 1.

It is possible to perform a remote control operation to execute a firmware update after saving an update file to the SD card.
For information on updates, check our website:
https://www.kyowa-ei.com/eng/product/category/acquisition/s_ctrs-100_series/index.html

11-2. Estimated operating time when using the battery unit

When supplying power from the battery unit CTRS-BATT010A, the estimated operating time can be calculated from the following formula.

Operating time (minutes) = 1500 / total power consumption of each unit (W)

* Ambient temperature 25 ± 10 ° C, when using a new battery

For example, when one CTRS-100A (3.5W) and seven CTRS-CDV010A (2.1W) are connected and used, the total power consumption is 18.2 W, so the estimated operating time is as follows.

1500 / 18.2 = 82.4 (minutes)

However, the operating time varies depending on the deterioration status of the battery and the load connection status to each unit, so please consider it as a guide only.

11-3. About the size of the recording file

The approximate size of each recorded file can be determined by the following formula.

Size of ks3 file (analog data)

When CAN data is not recorded:

Number of CHs * 4 bytes * Number of data + condition infometion size

When CAN data is recorded:

(Number of CHs * 4 bytes + 8 bytes) * Number of data + condition infometion size

The condition information size depending on the set conditions, but it is generally several tens of kilobytes.

[Example]

●If 1,000 pieces of data are recorded for 1 CH, the file size will be about 59 KB.

●If 1,000 pieces of data are recorded for 4 CH, the file size will be about 84 KB.

●If 1,000 pieces of data are recorded for 32 CH, the file size will be about 312 KB.

(In the above case, CAN and GPS data are not recorded.)

Size of kc3 file (CAN data)

(Size of CAN data + 24 bytes) * Number of CAN data + Condition information size

The condition information size depending on the set conditions, but it is generally several hundred kilobytes.

[Example]

●If one type of message is set and 1000 pieces of 64-byte CAN data are recorded, the file size is approximately 540 KB.

●If 1024 types of message are set and 1000 pieces of 64-byte CAN data are recorded, the file size is approximately 1 MB.

Size of NMEA file (GPS data)

Maximum value: 1620 bytes * recording time (seconds)

Note that the above calculations are maximum values only, and actual size will vary depending on the content of the data recorded.