HIOKI

Instruction Manual

2300

SMART SITE

HIOKI E. E. CORPORATION

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Contents

Introduction

Thank you for purchasing the HIOKI "2300 Smart Site". To obtain maximum performance from the instrument, please read this manual first, and keep it handy for future reference.

When you receive the instrument, inspect it carefully to ensure that no damage occurred during shipping. In particular, check the accessories, panel switches, and connectors. If damage is evident, or if it fails to operate according to the specifications, contact your dealer or Hioki representative.

Safety Notes

⚠DANGER

This instrument is designed to comply with IEC 61010 Safety Standards, and has been thoroughly tested for safety prior to shipment. However, mishandling during use could result in injury or death, as well as damage to the instrument. Using the instrument in a way not described in this manual may negate the provided safety features. Be certain that you understand the instructions and precautions in the manual before use. We disclaim any responsibility for accidents or injuries not resulting directly from instrument defects.

This manual contains information and warnings essential for safe operation of the instrument and for maintaining it in safe operating condition. Before using it, be sure to carefully read the following safety precautions.

Safety Symbols

⚠	In the manual, the ⚠ symbol indicates particularly important information that the user should read before using the instrument. The ⚠ symbol printed on the instrument indicates that the user should refer to a corresponding topic in the manual (marked with the ⚠ symbol) before using the relevant function.
⏚	Indicates a grounding terminal.
⊕	Indicates a protective conductor terminal.
⎓	Indicates DC (Direct Current).
∼	Indicates AC (Alternating Current).
I	Indicates the ON side of the power switch.
○	Indicates the OFF side of the power switch.

The following symbols in this manual indicate the relative importance of cautions and warnings.

⚠ DANGER	Indicates that incorrect operation presents an extreme hazard that could result in serious injury or death to the user.
⚠ WARNING	Indicates that incorrect operation presents a significant hazard that could result in serious injury or death to the user.
⚠ CAUTION	Indicates that incorrect operation presents a possibility of injury to the user or damage to the instrument.
NOTE	Indicates advisory items related to performance or correct operation of the instrument.

Other Symbols

🛇	Indicates the prohibited action.
❖	Indicates the reference.

Accuracy

We define measurement tolerances in terms of f.s. (full scale), rdg. (reading) and dgt. (digit) values, with the following meanings:

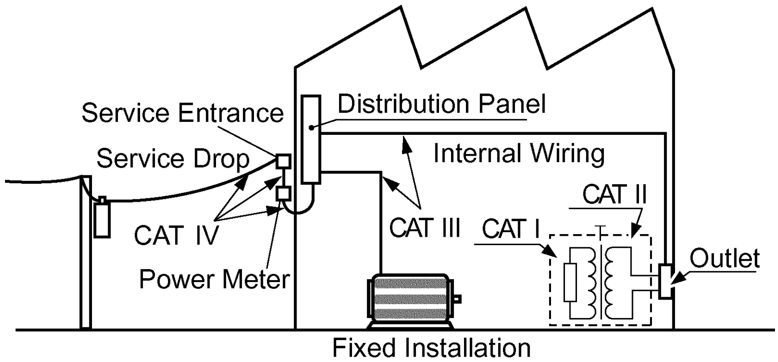
f.s. (maximum display value or scale length)	The maximum displayable value or scale length. This is usually the name of the currently selected range.
rdg. (reading or displayed value)	The value currently being measured and indicated on the measuring instrument.
dgt. (resolution)	The smallest displayable unit on a digital measuring instrument, i.e., the input value that causes the digital display to show a "1" as the least-significant digit.

Measurement categories (Overvoltage categories)

Model 2301-20, 2302-20, 2303-20, 2304-20, 2304-21 and 2305-20 comply with CAT I safety requirements.
Model 2331-20 and 2332-20 comply with CAT III safety requirements.
To ensure safe operation of measurement instruments, IEC 61010 establishes safety standards for various electrical environments, categorized as CAT I to CAT IV, and called measurement categories. These are defined as follows.

CAT I	Secondary electrical circuits connected to an AC electrical outlet through a transformer or similar instrument.
CAT II	Primary electrical circuits in equipment connected to an AC electrical outlet by a power cord (portable tools, household appliances, etc.) CAT II covers directly measuring electrical outlet receptacles.
CAT III	Primary electrical circuits of heavy equipment (fixed installations) connected directly to the distribution panel, and feeders from the distribution panel to outlets.
CAT IV	The circuit from the service drop to the service entrance, and to the power meter and primary overcurrent protection instrument (distribution panel).

Higher-numbered categories correspond to electrical environments with greater momentary energy. So a measurement instrument designed for CAT III environments can endure greater momentary energy than a instrument designed for CAT II.
Using a measurement instrument in an environment designated with a higher-numbered category than that for which the instrument is rated could result in a severe accident, and must be carefully avoided.
Never use a CAT I measuring instrument in CAT II, III, or IV environments.
The measurement categories comply with the Overvoltage Categories of the IEC60664 Standards.



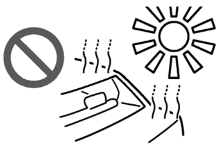
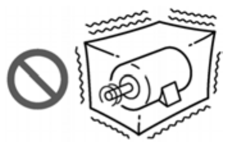
Notes on Use

Follow these precautions to ensure safe operation and to obtain the full benefits of the various functions.

Instrument Installation

Operating temperature and humidity: 0 to 50°C (32 to 122°F), 80% RH (non-condensating)

Avoid the following locations that could cause an accident or damage to the instrument.

	Exposed to direct sunlight Exposed to high temperature	 	In the presence of corrosive or explosive gases
	Exposed to liquids Exposed to high humidity or condensation		Exposed to strong electromagnetic fields Near electromagnetic radiators
	Exposed to high levels of particulate dust When the module is used in a dusty environment, place it in a dustproof case and take measures to ensure heat dissipation.		Subject to vibration

CAUTION

Do not allow the instrument to get wet, and do not take measurements with wet hands.
The instrument may be damaged.

To avoid damage to the instrument, protect it from physical shock when transporting and handling.
Be especially careful to avoid physical shock from dropping.

Do not obstruct the ventilation holes.
Ventilation holes for heat radiation are provided on the top and rear panels of the instrument. Leave sufficient space around the ventilation holes and install the instrument with the holes unobstructed. Installation of the instrument with the ventilation holes obstructed may cause a malfunction or fire.

When using the instrument in the case, drill ventilation holes.
Drill ventilation holes or install a ventilation fan to prevent heat buildup.

⚠CAUTION

Only use sensors dedicated to the type of module.
To avoid damaging the instrument, do not connect any other sensors than those dedicated to the instrument to its input terminals. Further, do not connect any other signal sources to the terminals, as such signals may lead to module damage due to excessive voltage or current.

Wiring

⚠WARNING

- **A qualified electrician shall perform the wiring to prevent electric shock.**
- **Avoid live-line electrical work to prevent electric shock and accidents due to short-circuiting.**
- **Ensure that the power supply, input, and output are correctly wired according to the wiring diagram. (See the section on "Preparations" for each module.) This will prevent fire, malfunction, and errors.**
  Connect the module to a power source that matches the rating in order to prevent fire.
- **Do not work on live lines. Such work may result in electric shock or short-circuiting.**
- **Use cables of the proper sizes for the rated current. This will prevent entire system errors and fire resulting from broken wire.**
- **Use crimp connectors suitable for the cable sizes. This will prevent module errors and fire due to broken wires.**
- **When tightening the screws, confirm that all screws are securely tightened. A loose screw may result in module errors, fire, or electric shock.**
- **Tighten the screws within the specified torque. Excessive torque may damage the terminals. Inadequate torque may result in module errors, fire, or electric shock.**
- **Ensure that the power supply module and input are OFF until all wiring work is finished. This will prevent module trouble and electric shock.**
- **Ensure that the power supply module and input are OFF when connecting or disconnecting the module to the system. This will prevent electric shock, errors, and malfunction.**
- **Avoid using an unused terminal for relaying or any other purpose to prevent electric shock, errors, and malfunction.**

CAUTION

- If power supply noise poses a problem, use of a noise filter is recommended.
- When the power and signal lines may be subject to a lightning-induced surge, install a lightning arrester between another instrument or module connected to this module and line to protect the system.
- Avoid stepping on or pinching cables, which could damage the cable insulation.
- Keep the cables well away from heat sources, as bare conductors could be exposed if the insulation melts.

Preliminary Checks

WARNING

Before using the instrument, make sure that the insulation on the cables is undamaged and that no bare conductors are improperly exposed. Using the product in such conditions could cause an electric shock, so contact your dealer or Hioki representative for repair.

CAUTION

To prevent an electric shock accident, confirm that the white or red portion (insulation layer) inside the cable is not exposed. If a color inside the cable is exposed, do not use the cable.

Before using the instrument the first time, verify that it operates normally to ensure that the no damage occurred during storage or shipping. If you find any damage, contact your dealer or Hioki representative.

Service

Cleaning

To clean the instrument, wipe it gently with a soft cloth moistened with water or mild detergent. Never use solvents such as benzene, alcohol, acetone, ether, ketones, thinners or gasoline, as they can deform and discolor the case.

Service

WARNING

Never modify the instrument. Only Hioki service engineers should disassemble or repair the instrument. Failure to observe these precautions may result in fire, electric shock, or injury.

- If the instrument seems to be malfunctioning, confirm that the cables are not open circuited before contacting your dealer or Hioki representative.
- When sending the instrument for repair, pack carefully to prevent damage in transit. Include cushioning material so the instrument cannot move within the package. Be sure to include details of the problem. Hioki cannot be responsible for damage that occurs during shipment.
- When transporting the module or a 2300 Smart Site, tape the front of the module or take similar measures to avoid losing internal components.
- The instrument contains a built-in backup lithium battery, which offers a service life of about five years. If the date and time deviate substantially when the instrument is switched on, it is the time to replace that battery. Contact your dealer or Hioki representative.

2301-20 HUMIDITY MODULE 1

1.1 Overview

1.1.1 Product Overview

- The 2301-20 is a measurement module of Hioki "Smart Site" (remote measurement system).
- This module measures and records temperature and humidity at regular intervals.
- The 2301-20 is used with the power supply module, communications module, and module base.

Number of measurement channels	Temperature 1 CH + Humidity 1 CH
Measurement range	-40.0 to 85.0°C, 0.0 to100.0%RH

(Conceptual image)

1.1.2 Major Features

- **The recording interval is selectable from 1 second to 60 minutes.**
- **The maximum, minimum, and average measurements during the recording interval can be recorded (with sampling once a second).**
- **The module has an alarm output terminal.**

The capacitive humidity sensor for this module has the following features relating to humidity measurement:

- Stable characteristics
- Wide measurement range
- Long service life
- Quick response
- Resistance to condensation

Rough Estimate of Storable Data Quantity and Time

Action at memory full: Continue recording (Endless)

	Recording Mode		
	Instantaneous Value	MAX/MIN/AVE	Instantaneous Value + MAX/MIN/AVE
Quantity of storable data	26000	13000	10000
Recording interval			
1 sec.	7.5 hours	3.5 hours	2.5 hours
2 sec.	14.5 hours	7 hours	5.5 hours
5 sec.	1.5 days	18 hours	14.5 hours
10 sec.	3 days	1.5 days	1 day
15 sec.	4.5 days	2 days	1.5 days
20 sec.	6 days	3 days	2 days
30 sec.	9 days	4.5 days	3.5 days
1 min.	18 days	9 days	7 days
2 min.	36 days	18 days	14 days
5 min.	92 days	46 days	36 days
10 min.	184 days	92 days	73 days
15 min.	277 days	138 days	110 days
20 min.	369 days	184 days	147 days
30 min.	554 days	277 days	221 days
60 min.	1109 days	554 days	443 days

NOTE

When the alarm log is ON, the higher the number of alarms generated, the smaller the recording period. (Approx. 1 of the data per alarm)

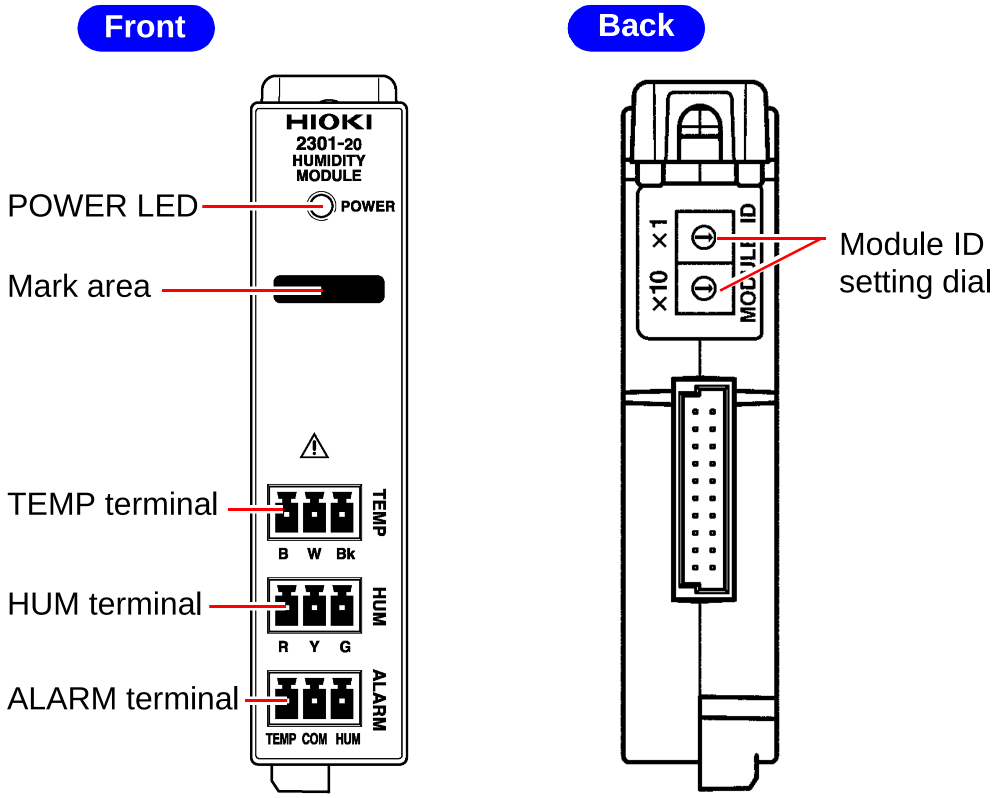
Action at memory full: Stop recording (Memory full stop)

	Recording Mode		
	Instantaneous Value	MAX/MIN/AVE	Instantaneous Value + MAX/MIN/AVE
Quantity of storable data	30000	15000	12000
Recording interval			
1 sec.	8.5 hours	4 hours	3 hours
2 sec.	17 hours	8.5 hours	6.5 hours
5 sec.	1.5 days	21 hours	17 hours
10 sec.	3.5 days	1.5 days	1.5 days
15 sec.	5 days	2.5 days	2 days
20 sec.	7 days	3.5 days	2.5 days
30 sec.	10 days	5 days	4 days
1 min.	21 days	10 days	8 days
2 min.	42 days	21 days	17 days
5 min.	106 days	53 days	42 days
10 min.	213 days	106 days	85 days
15 min.	319 days	159 days	127 days
20 min.	426 days	213 days	170 days
30 min.	639 days	319 days	255 days
60 min.	1279 days	639 days	511 days

NOTE

When the alarm log is ON, the higher the number of alarms generated, the smaller the recording period. (Approx. 1 of the data per alarm)

1.1.3 Name and Function of the Parts

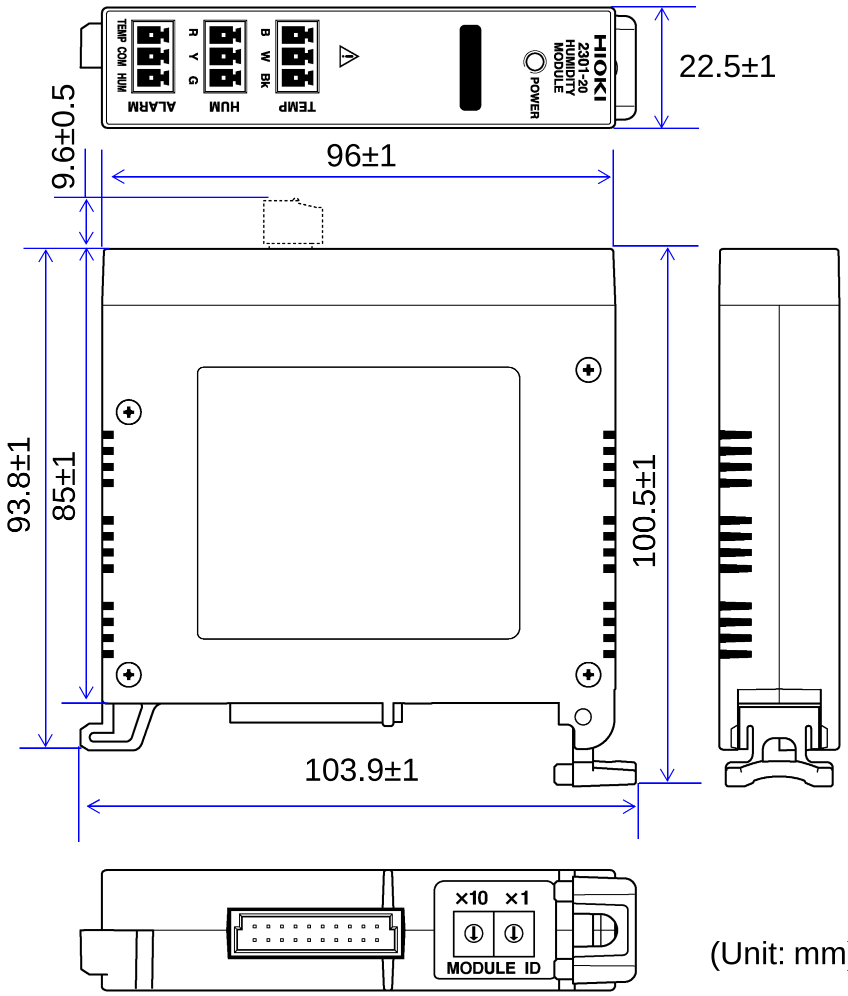


POWER LED	Goes on or flashes when power is supplied to the module. Remains on, flashes, or changes to another color according to the state of the module. **POWER LED indication** Lit in green : Data being recorded. Flashing in green : Standing by. Lit in yellow : Alarm output. Flashing in yellow: Overrange detected. Lit in red : Non-recoverable error occurred.*1 Flashing in red : Recoverable error occurred.*2
Mark area	Use this area to make a note of the object to measure or the module ID. Use an ink pen, since pencil lead may rub off.
TEMP terminal	Connect the temperature sensor to this terminal.
HUM terminal	Connect the humidity sensor to this terminal.
ALARM terminal	Connect the alarm output cable to this terminal.
Module ID setting dial	Use the dial to set the module's identification No.

*1: The module needs repair. Contact your dealer or Hioki representative.
*2: The same module ID may be used by another module.

1

1.1.4 Dimension Diagrams



(Unit: mm)

1.1.5 Accessory and Option

Accessories

Ferrite clamp 1
Terminal block 3

Option

9764-50 HUMIDIDTY SENSOR

1.2 Settings

1.2.1 Setting the Module ID

You can connect up to 63 measurement modules to one communications module.

Setting Procedure
Use the module ID setting dial to set the ID No. of the module to a number from 01 and to 63. (You cannot set a number other than the above.)

NOTE

- Ensure that the set ID is not used for any other module connected to the same communications module.
- The ID numbers of modules need not be consecutive.
- Setting the ID to 99, then turning on the power resets all internal settings to the defaults.
- The module ID and COM ID are not related and can be set independently.

1.3 Preparations

1.3.1 Installing the Module

(1) Installing the Module Base

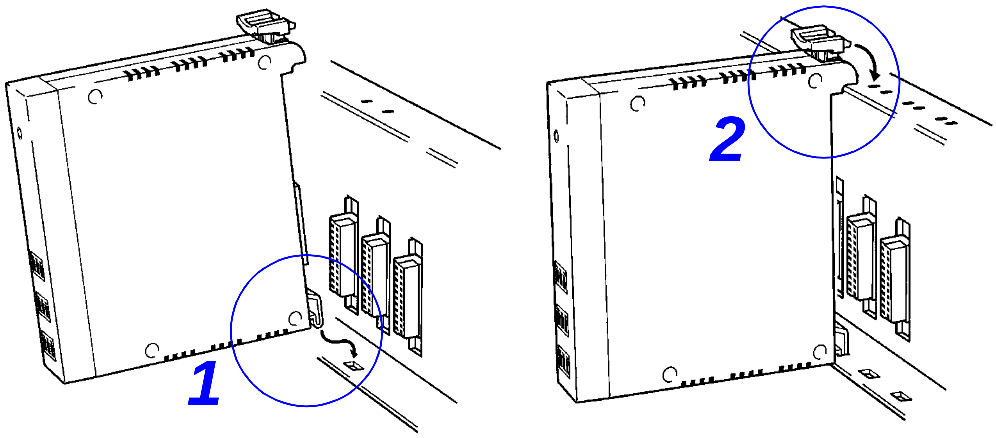
⚠CAUTION

Do not mount the module base on the ceiling where it may fall off.

Fasten the module base to a DIN rail or the wall according to the procedure described in the **19 "2391-01, 2391-02, 2391-03 MODULE BASE"(P.305)** or **20 "2392-01/02 MODULE BASE"(P.319)** series MODULE BASE instruction manual.

(2) Mounting a Module on the Module Base

Mount a module on the module base as shown below. Ensure that the lever clicks.



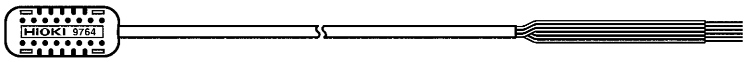
1.3.2 Connecting Input/Output Cables

(1) Connecting Sensor Cables to the Terminal Block

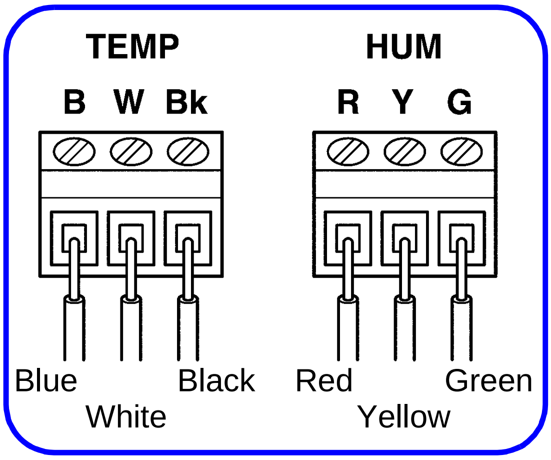
CAUTION

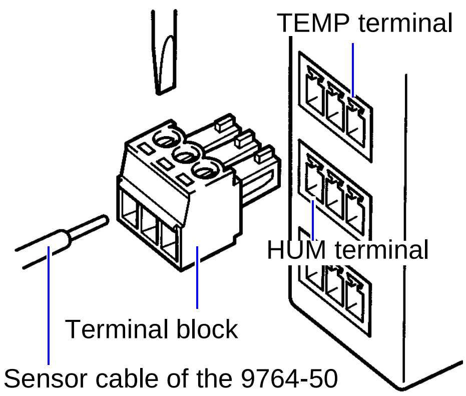
- The TEMP terminal and HUM terminal are not insulated from each other. Avoid short-circuiting.
- Be sure to connect the cables to matching connectors to prevent damage to the module or sensor.

Connect the 9764-50 HUMIDIDTY SENSOR to the module by following the procedure below.



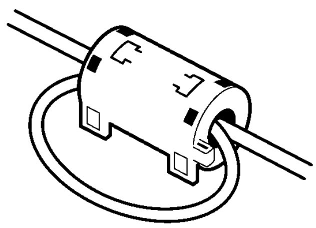
1. Use a flat blade screwdriver to loosen the screws on the terminal block.
2. Insert a cable into the terminal block, then tighten the screws (at a tightening torque of 0.25 N•m).
3. Connect the terminal block to the TEMP terminal, and HUM terminal.





NOTE

- In case of external noise, wind the cable around the ferrite clamp supplied as an accessory as shown below.

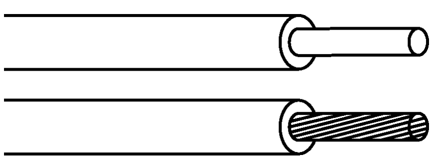


- Note that measurement may be adversely affected by external noise or the electromagnetic environment when using a cable longer than 3 meters.

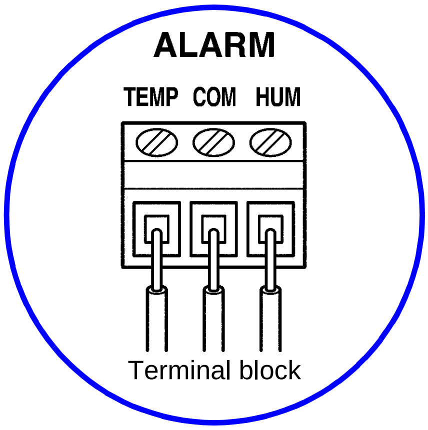
(2) Connecting Cables to the ALARM Terminal (Alarm output)

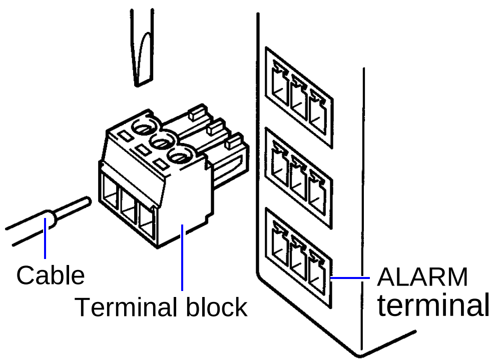
Recommended Cable

Single-wire	: 0.14 to 1.5 mm^2
Stranded-wire	: 0.14 to 1.5 mm^2
AWG	: 26 to 16
Cable strip length	: 5 mm (0.2")

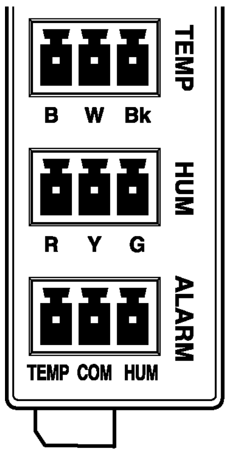


1. Use a flat blade screwdriver to loosen the screws on the terminal block.
2. Insert a cable for alarm output into the terminal block, then tighten the screws (at a tightening torque of 0.25 N•m).
3. Connect the terminal block to the ALARM terminal.





(3) The Location of the Input/Output Cable



TEMP terminal (Input)	**B**	**W**	**Bk**
	Blue	White	Black
HUM terminal (Input)	**R**	**Y**	**G**
	Red	Yellow	Green
ALARM terminal (output)	**TEMP**	**COM**	**HUM**
	Alarm output	Common	Alarm output

NOTE The TEMP and HUM terminals are used to connect the optional 9764-50 HUMIDIDTY SENSOR.

9764-50 HUMIDIDTY SENSOR

CAUTION

- To avoid damaging the 2301-20, only connect the 9764-50 HUMIDIDTY SENSOR to the TEMP and HUM terminals. Moreover, do not input other signals to these terminals.
- If the sensor is used or stored outside the operating or storage ranges, sensor accuracy may be adversely affected and you may not get accurate measurements even within the one-year guaranteed period of accuracy.
- Hioki is not liable for any problems caused by sensor use or storage outside the operating or storage ranges.
- When not using the 9764-50 HUMIDIDTY SENSOR, seal it in a plastic bag and store it in a cool, dark place.
- Be careful to avoid condensation on the sensor. If condensation occurs, you may not get accurate measurements. Condensation is likely to occur when the sensor is subject to rapid changes in temperature.

1.4 Others

1.4.1 Alarm output

WARNING

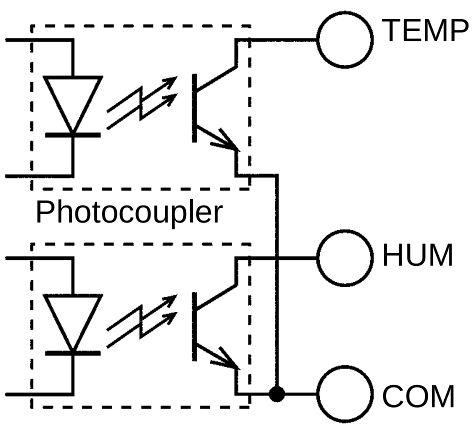
Ensure that the input does not exceed the maximum input voltage or current to avoid module damage, short-circuiting and electric shock resulting from heat building.

Output method	Open collector
Maximum input voltage / current	30 V, 20 mA max.
Signal logic	Enabled: ON Disabled: OFF

(1) Internal Circuit

The alarm output circuit is configured as shown below.

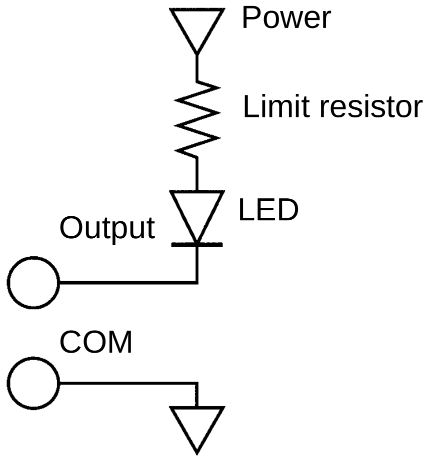
<Internal circuit>



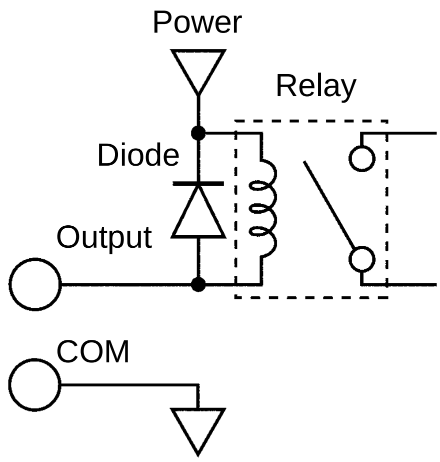
NOTE

- Signal logic indicates the signal state in which a signal's function is enabled.
- The output transistor works as a switch between signal output and ground in the module. When output becomes enabled, the switch is turned on and current flows from the output signal to COM in the module. Therefore, a relay or LED lamp can be connected directly to the output terminal (P.20).

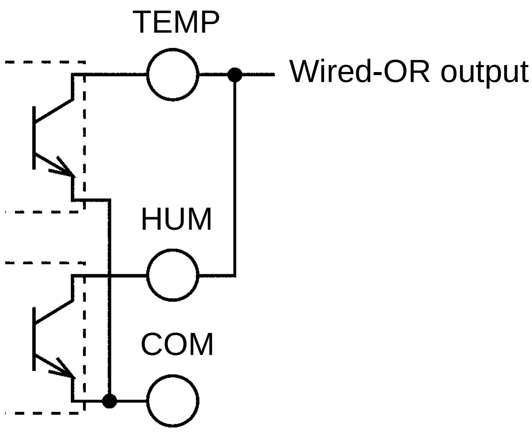
<Circuit diagram>



Connecting LED



Connecting relay



Using on Wired-OR Logic

NOTE

- When connecting a relay or LED lamp, ensure that the relay or lamp operates at up to 30 V and 20 mA. When connecting a relay, be sure to use a diode to absorb counter electromotive force.
- Open collector output operates on wired-OR logic by short-circuiting TEMP and HUM. Moreover, it enables the signal if an alarm occurs in either channel.

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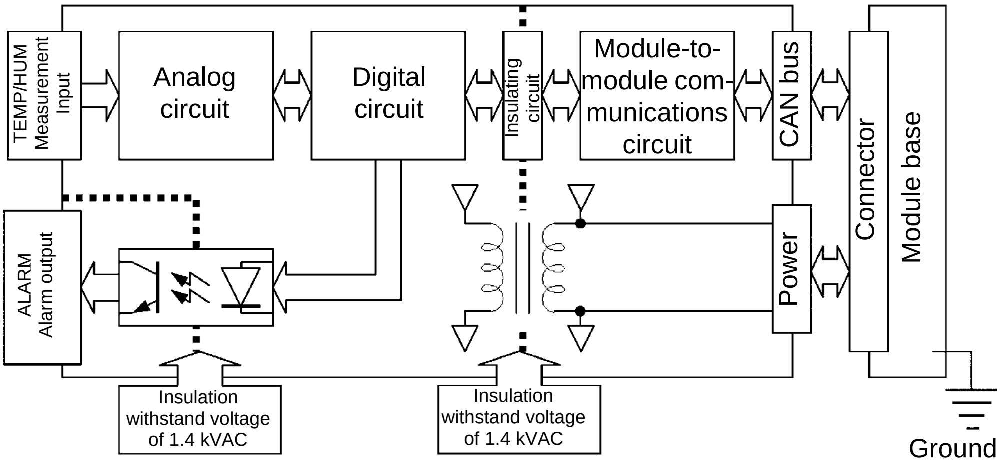
1.4.2 Insulation of Internal Circuit

In the 2301-20, the input circuit and alarm output are insulated from the CAN bus as shown in the block diagram below. (Withstand voltage: 1.4 kVAC, 50/60 Hz, Response current: 5 mA, 1 minute)



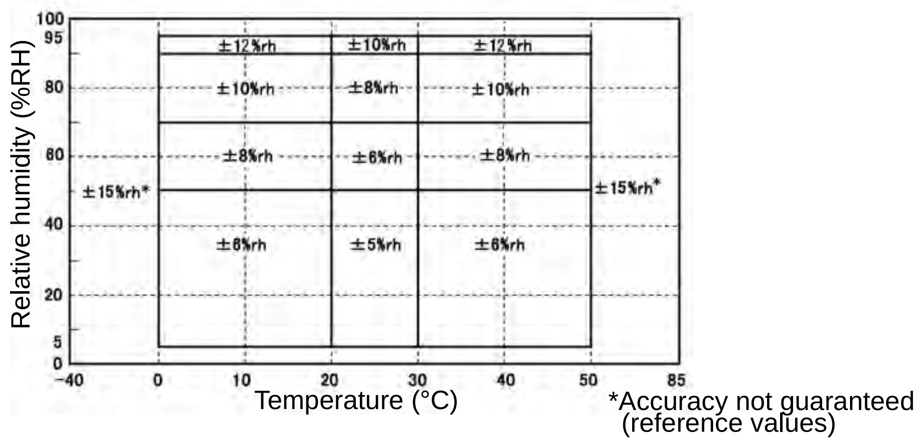
NOTE

The COM terminal of the alarm output terminal is used for both TEMP and HUM.

1.5 Specifications

1.5.1 Basic Specifications

Sensor type	9764-50 HUMIDIDTY SENSOR
Number of inputs	Temperature 1 CH + Humidity 1 CH
Measurement range	-40.0 to 85.0°C Resolution: 0.1°C, 0.0 to 100.0%RH Resolution: 0.1%RH (Display range: -10.0 to 110.0%RH)
Measurement accuracy	Temperature -40.0 to -0.1°C ±1.0°C 0.0 to 35.0°C ±0.5°C 35.1 to 70.0°C ±1.0°C 70.1 to 85.0°C ±2.0°C Humidity



Period of guaranteed accuracy	1 year
Sampling	1 time / sec.
Input terminal	3 Input terminal block × 2

1.5.2 Function Specifications

Execute the functions from the PC application via communications.

Monitoring function

This function outputs the current measured values (instantaneous values).

Measured value recording function

Measurements are recorded at a set recording interval.	
Real-time management	This is automatically set from the PC application at the start of recording.
Recording start	Immediate start/Reserved-time start
Recording end	Manual end/Reserved-time end
Operation when memory is full	Memory full stop /Endless ♦Set the condition before the start of recording.
Recording interval	1/2/5/10/15/20/30 sec., 1/2/5/10/15/20/30/60 min.

Recording mode	• Instantaneous value • MAX/MIN/AVE • Instantaneous value + MAX/MIN/AVE Total 3 modes ♦Set the mode before the start of recording.
Recorded data	One data set contains time and temperature/humidity information (One channel each). ♦Data is scaled if scaling is ON.
Recording capacity	512 k bytes Flash memory
Quantity of recorded data	• Instantaneous value recording mode: 30,000 data × 2 CH • MAX/MIN/AVE recording mode: 15,000 data × 2 CH • Instantaneous value + MAX/MIN/AVE recording mode: 12,000 data × 2 CH
Power outage protection	After recovering from a power outage, the instrument automatically returns to the state held before the outage.

Alarm judgment and recording function

Alarm judgment is made at every sampling, and the history will be recorded in flash memory if the measured value recording function remains active.	
Judgment method	Criterion threshold can be set to either Hi or Lo. The instantaneous value at every sampling is judged (effective in any measurement mode).
Recorded data	One data set contains time, generation/reversion, CH and judgment threshold.
Alarm output	Alarm output × 2 CH ♦Output is turned ON when an alarm (Hi or Lo) occurs. Whether to hold the alarm output can be selected. The reset switch or a command can be used to reset alarms.

1.5.3 General Specifications

Clock accuracy	±100 ppm (Reference value at temperature from 0 to 50°C (32 to 122°F) without the communications module)
Backup	Recorded data (saved in flash memory) ♦Data loss for up to 2 minutes before and after a power outage may occur.
Communication interface	CAN bus
Maximum rated voltage to earth	33 Vrms, 70 VDC
Alarm output	Open collector: 30 VDC, 20 mA max.
Rated supply voltage	5 V±0.3 VDC
Maximum rated Power	1.4 W
Dielectric strength	1.4 kVAC Between input and alarm output, Input/Output and CAN bus (50/60 Hz, Response current 5 mA, one minutes
Dimensions	Approx. 22.5W × 96H × 85D mm (0.89"W × 3.78"H × 3.35"D) (excluding projections)
Mass	Approx. 120 g (4.2 oz.)
Accessories	Ferrite clamp.. 1 Terminal block.. 3
Option	9764-50 HUMIDIDTY SENSOR
Operational ranges for temperature and humidity	0 to 50°C (32 to 122°F), 80%RH or less (with no condensation)
Temperature and humidity ranges for storage	-10 to 50°C (14 to 122°F), 80%RH or less (with no condensation)
Operating environment	Indoors, altitude up to 2000 m (6562-ft.)
Standards applying	Safety EN61010, Pollution degree 2, Measurement Category I (anticipated transient overvoltage 330 V) EMC EN61326, CLASS A

1.5.4 9764-50 HUMIDIDTY SENSOR Specifications

Operational ranges for temperature and humidity	-40 to 85°C (-40 to 185°F), 0.0 to 100.0%RH (with no condensation)
Temperature and humidity ranges for storage	-40 to 85°C (-40 to 185°F), 0.0 to 100.0%RH (with no condensation)
Response time	Temperature: Approx. 100 sec., Humidity: Approx.300 sec.
Temperature sensor	Thermistor
Humidity sensor	High polymer film (capacitive humidity sensor)
Cord length	Approx. 3 m
Dimensions	Sensor, Approx. 30W × 13H × 8D mm (1.18"W × 0.51"H × 0.31"D)
Long time stability	±1%RH (5 years at 25°C (77°F), 50%RH, reference value)

The 2301-20 may indicate a humidity measurement below zero or above 100%RH. These values indicate a change in low or high humidity levels, and do not indicate actual humidity (since values over 100% and lower than 0% are impossible).

2302-20 Pt MODULE 2

2.1 Overview

2.1.1 Product Overview

- The 2302-20 is a measurement module of Hioki "Smart Site" (remote measurement system).
- This module measures and records temperature at regular intervals.
- The 2302-20 is used with the power supply module, communications module, and module base.

Usable Temperature sensor	Platinum resistance thermometer sensor (Selectable between Pt100 and JPt100)
Number of measurement channels	Temperature 2 CH
Measurement range	-100.0 to 300.0°C

(Conceptual image)

2.1.2 Major Features

- **The recording interval is selectable from 1 second to 60 minutes.**
- **The maximum, minimum, and average measurements during the recording interval can be recorded (with sampling once a second).**
- **The module has an alarm output terminal.**
Rough Estimate of Storable Data Quantity and Time.

Action at memory full: Continue recording (Endless)

	Recording Mode		
	Instantaneous Value	MAX/MIN/AVE	Instantaneous Value + MAX/MIN/AVE
Quantity of storable data	26000	13000	10000
Recording interval			
1 sec.	7.5 hours	3.5 hours	2.5 hours
2 sec.	14.5 hours	7 hours	5.5 hours
5 sec.	1.5 days	18 hours	14.5 hours
10 sec.	3 days	1.5 days	1 day
15 sec.	4.5 days	2 days	1.5 days
20 sec.	6 days	3 days	2 days
30 sec.	9 days	4.5 days	3.5 days
1 min.	18 days	9 days	7 days
2 min.	36 days	18 days	14 days
5 min.	92 days	46 days	36 days
10 min.	184 days	92 days	73 days
15 min.	277 days	138 days	110 days
20 min.	369 days	184 days	147 days
30 min.	554 days	277 days	221 days
60 min.	1109 days	554 days	443 days

NOTE

When the alarm log is ON, the higher the number of alarms generated, the smaller the recording period. (Approx. 1 of the data per alarm)

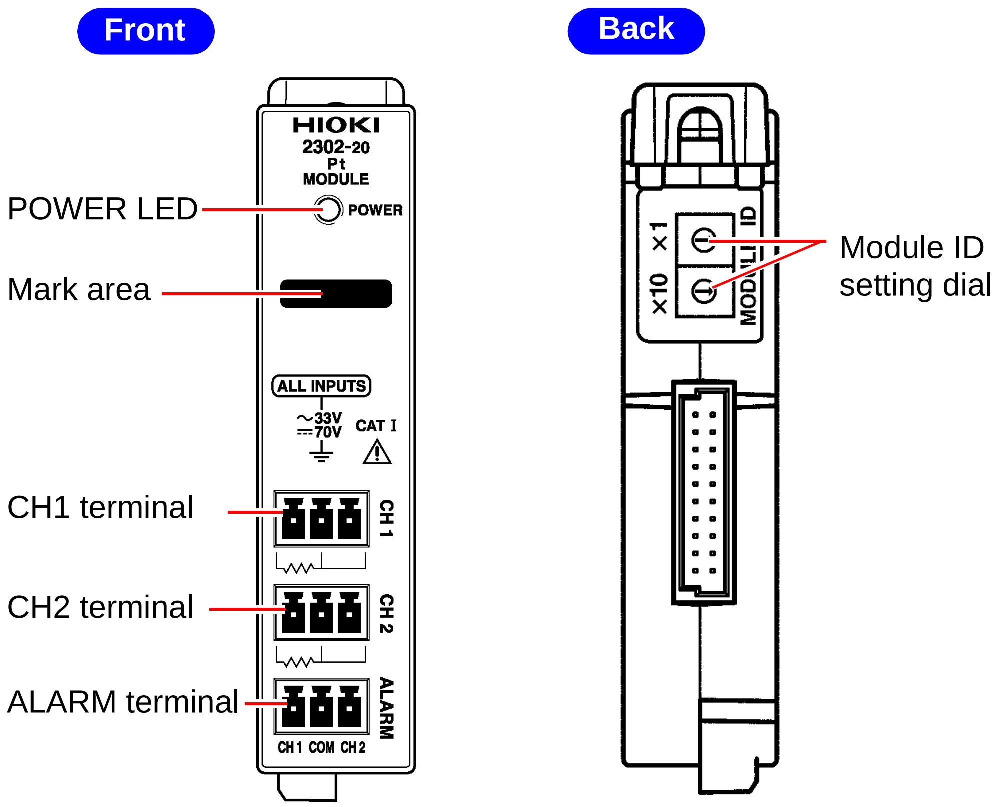
Action at memory full: Stop recording (Memory full stop)

	Recording Mode		
	Instantaneous Value	MAX/MIN/AVE	Instantaneous Value + MAX/MIN/AVE
Quantity of storable data	30000	15000	12000
Recording interval			
1 sec.	8.5 hours	4 hours	3 hours
2 sec.	17 hours	8.5 hours	6.5 hours
5 sec.	1.5 days	21 hours	17 hours
10 sec.	3.5 days	1.5 days	1.5 days
15 sec.	5 days	2.5 days	2 days
20 sec.	7 days	3.5 days	2.5 days
30 sec.	10 days	5 days	4 days
1 min.	21 days	10 days	8 days
2 min.	42 days	21 days	17 days
5 min.	106 days	53 days	42 days
10 min.	213 days	106 days	85 days
15 min.	319 days	159 days	127 days
20 min.	426 days	213 days	170 days
30 min.	639 days	319 days	255 days
60 min.	1279 days	639 days	511 days

NOTE

When the alarm log is ON, the higher the number of alarms generated, the smaller the recording period. (Approx. 1 of the data per alarm)

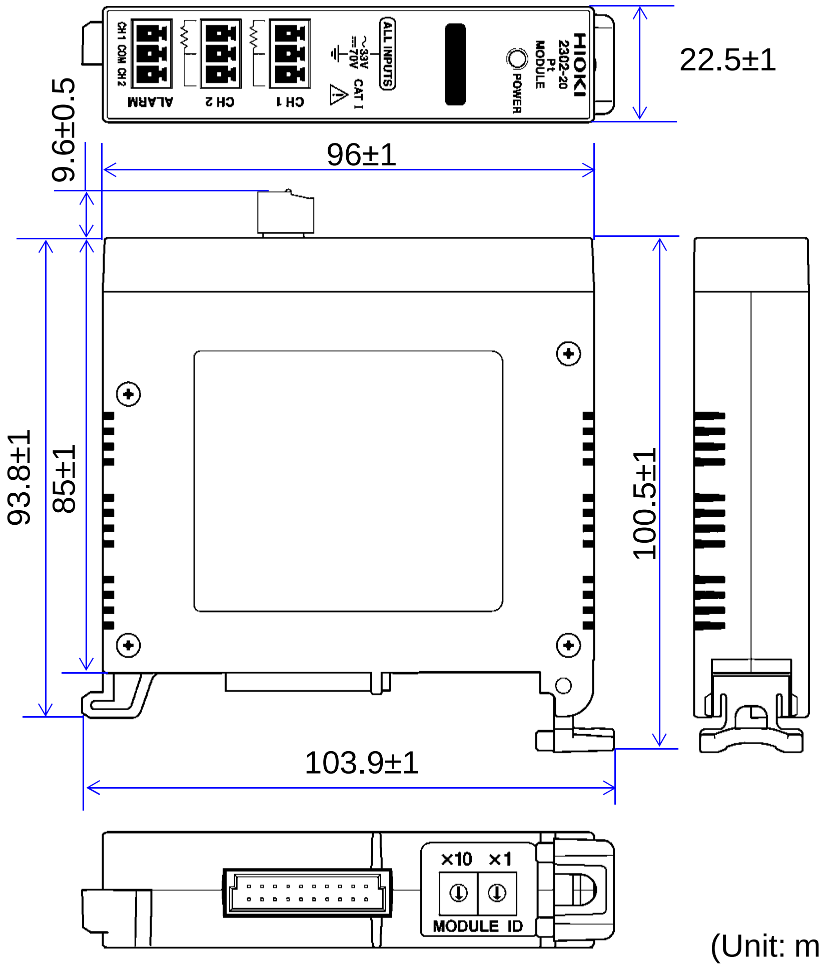
2.1.3 Name and Function of the Parts



POWER LED	Goes on or flashes when power is supplied to the module. Remains on, flashes, or changes to another color according to the state of the module. **POWER LED indication** Lit in green : Data being recorded. Flashing in green : Standing by. Lit in yellow : Alarm output. Flashing in yellow: Overrange detected. Lit in red : Non-recoverable error occurred. *1 Flashing in red: Recoverable error occurred. *2
Mark area	Use this area to make a note of the object to measure or the module ID. Use an ink pen, since pencil lead may rub off.
CH1 terminal	Connect the platinum resistance thermometer sensor to this terminal. (Channel 1)
CH2 terminal	Connect the platinum resistance thermometer sensor to this terminal. (Channel 2)
ALARM terminal	Connect the alarm output cable to this terminal. This terminal is electrically insulated from the CH1 and CH2 terminals.
Module ID setting dial	Use the dial to set the module's identification No.

*1: The module needs repair. Contact your dealer or Hioki representative.
*2: The same module ID may be used by another module.

2.1.4 Dimension Diagrams



(Unit: mm)

2.1.5 Accessory and Option

Accessories

Ferrite clamp 2
Terminal block 3

Option

None

2.2 Settings

2.2.1 Setting the Module ID

You can connect up to 63 measurement modules to one communications module.

Setting Procedure

Use the module ID setting dial to set the ID No. of the module to a number from 01 and to 63. (You cannot set a number other than the above.)

NOTE

- Ensure that the set ID is not used for any other module connected to the same communications module.
- The ID numbers of modules need not be consecutive.
- Setting the ID to 99, then turning on the power resets all internal settings to the defaults.
- The module ID and COM ID are not related and can be set independently.

2.3 Preparations

2.3.1 Installing the Module

(1) Installing the Module Base

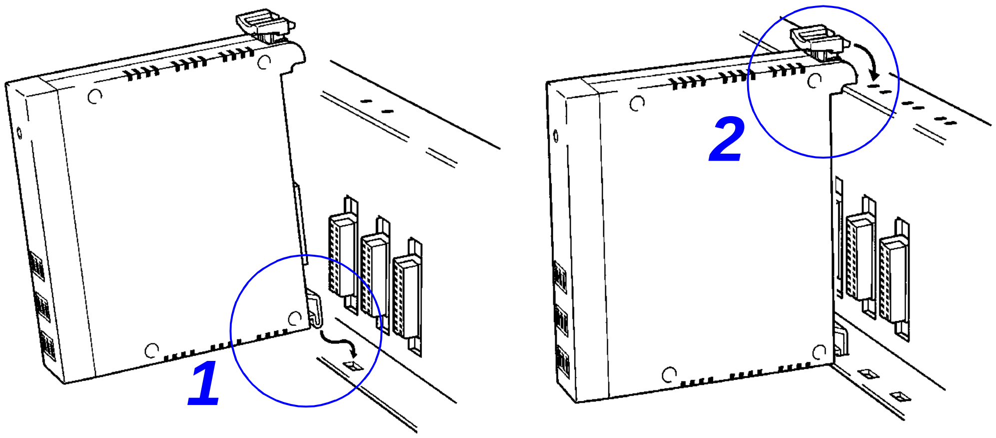
CAUTION

Do not mount the module base on the ceiling where it may fall off.

Fasten the module base to a DIN rail or the wall according to the procedure described in the **19 "2391-01, 2391-02, 2391-03 MODULE BASE"(P.305)** or **20 "2392-01/02 MODULE BASE"(P.319)** series MODULE BASE instruction manual.

(2) Mounting a Module on the Module Base

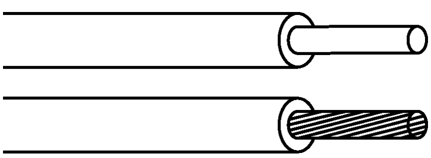
Mount a module on the module base as shown below. Ensure that the lever clicks.



2.3.2 Connecting Input/Output Cables

Recommended Cable

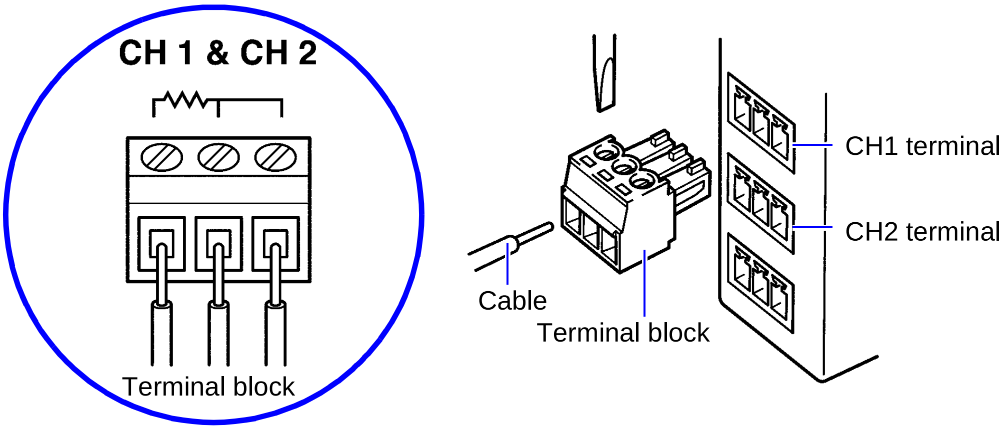
Single-wire	: 0.14 to 1.5 mm^2
Stranded-wire	: 0.14 to 1.5 mm^2
AWG	: 26 to 16
Cable strip length	: 5 mm (0.2")



(1) Connecting Cables to the CH1 and CH2 Terminals (Temperature Sensor Signal Input)

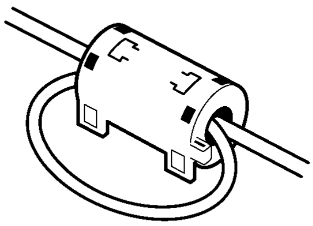
CAUTION The CH1 and CH2 terminals are not insulated from each other. Avoid short-circuiting.

1. Use a flat blade screwdriver to loosen the screws on the terminal block.
2. Insert a cable for input temperature sensor signal into the terminal block, then tighten the screws (at a tightening torque of 0.25 N•m).
3. Connect the terminal block to the CH1 or CH2 terminal.



NOTE

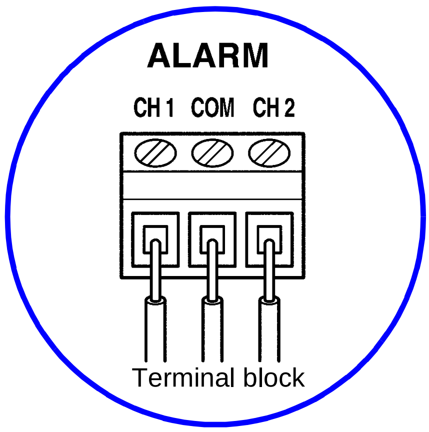
- The CH1 and CH2 terminals are not insulated from each other. When measuring two measurement points having a potential difference, use an electrically insulated sensor or another Pt module, since measurements may be adversely affected.
- In case of external noise, wind the cable around the ferrite clamp supplied as an accessory as shown below.

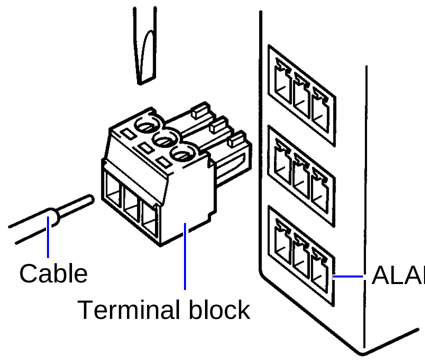


- Note that measurement may be adversely affected by external noise or the electromagnetic environment when using a cable longer than 3 meters.

(2) Connecting Cables to the ALARM Terminal (Alarm output)

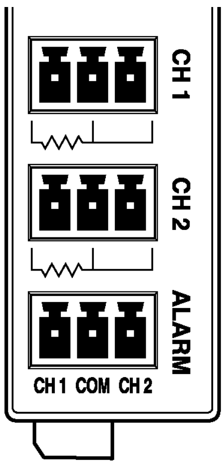
1. Use a flat blade screwdriver to loosen the screws on the terminal block.
2. Insert a cable for alarm output into the terminal block, then tighten the screws (at a tightening torque of 0.25 N•m).
3. Connect the terminal block to the ALARM terminal.





Connect the cable for CH1 output to CH1 and COM; and connect the cable for CH2 output to CH2 and COM.

(3) The Location of the Input/Output Cable



CH1 terminal (Input)	**Left**	**Center**	**Right**
	Resistance thermometer sensor input (A)	Resistance thermometer sensor input (B)	Conductor input (B)
CH2 terminal (Input)	**Left**	**Center**	**Right**
	Resistance thermometer sensor input (A)	Resistance thermometer sensor input (B)	Conductor input (B)
ALARM terminal (output)	**CH1**	**COM**	**CH2**
	Alarm output	Common	Alarm output

Temperature Sensor

⚠CAUTION

Only connect the Pt100 or JPt100 sensor to the CH1 and CH2 terminals to avoid damaging the 2302-20. Moreover, do not input other signals to these terminals.

2.4 Others

2.4.1 Alarm output

(1) Output Rating

WARNING

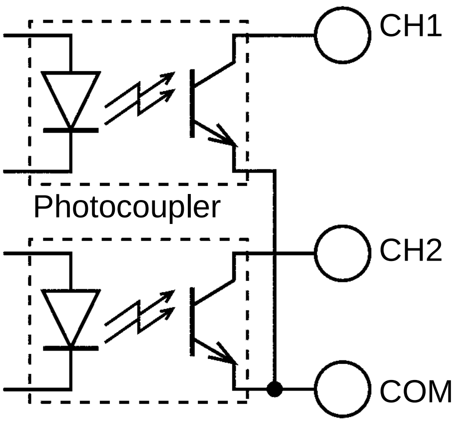
Ensure that the input does not exceed the maximum input voltage or current to avoid module damage, short-circuiting and electric shock resulting from heat building.

Output method	Open collector
Maximum input voltage / current	30 V, 20 mA max.
Signal logic	Enabled: ON Disabled: OFF

(1) Internal Circuit

The alarm output circuit is configured as shown below.

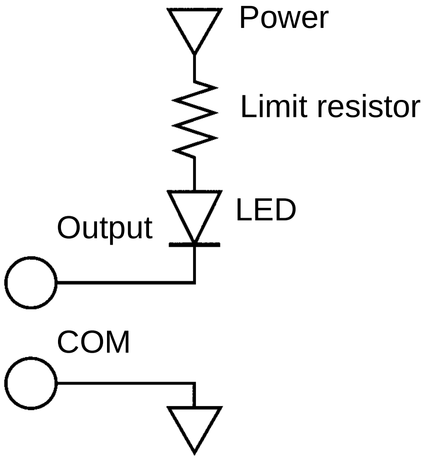
<Internal circuit>



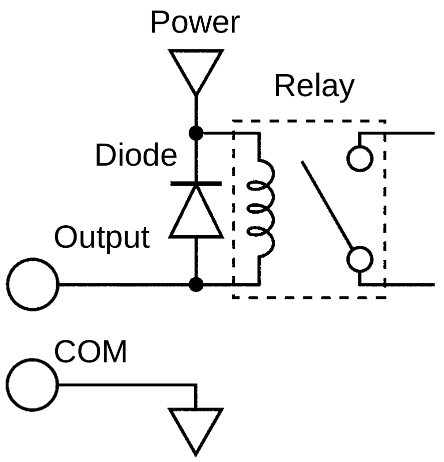
NOTE

- Signal logic indicates the signal state in which a signal's function is enabled.
- The output transistor works as a switch between signal output and ground in the module. When output becomes enabled, the switch is turned on and current flows from the output signal to COM in the module. Therefore, a relay or LED lamp can be connected directly to the output terminal (P.35).

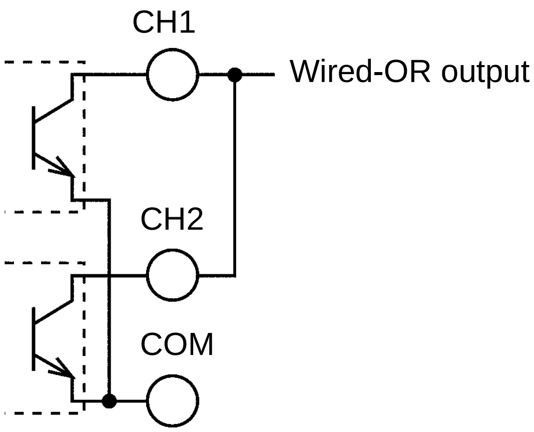
<Circuit diagram>



Connecting LED



Connecting relay



Using on Wired-OR Logic

NOTE

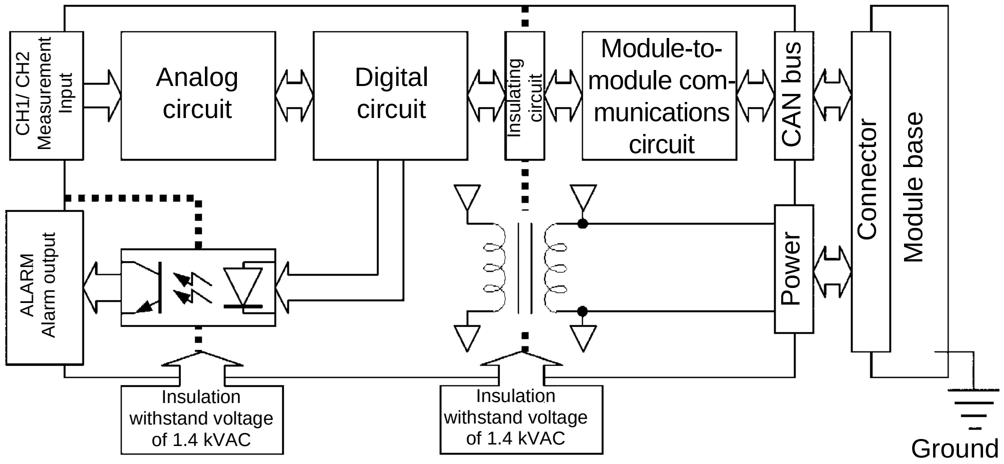
- When connecting a relay or LED lamp, ensure that the relay or lamp operates at up to 30 V and 20 mA. When connecting a relay, be sure to use a diode to absorb counter electromotive force.
- Open collector output operates on wired-OR logic by short-circuiting CH1 and CH2. Moreover, it enables the signal if an alarm occurs in either channel.

2.4.2 Insulation of Internal Circuit

CAUTION

The CH1 and CH2 terminals are not insulated from each other.
When connecting signals different in potential to these terminals, use an additional measurement module or insulate the signals externally before connection to the terminals. This will prevent module errors and malfunction.

In the 2302-20, the input circuit and alarm output are insulated from the CAN bus as shown in the block diagram below. (Withstand voltage: 1.4 kVAC, 50/60 Hz, Response current: 5 mA, 1 minute)



NOTE

The COM terminal of the alarm output terminal is used for both CH1 and CH2.

2.5 Specifications

2.5.1 Basic Specifications

Sensor type	Platinum resistance thermometer sensor Pt100 (3-wire sensor) / JPt100 (3-wire sensor, JIS C 1604-1997)
Number of inputs	2 CH
Measurement current	0.5 mA
Measurement range	-100.0 to 300.0°C, Resolution: 0.1°C
Measurement accuracy	±0.1%rdg.±0.4°C
Influence of radiated radio-frequency electromagnetic field	±2°C at 10 V/m
Period of guaranteed accuracy	1 year
Sampling	1 time / sec.
Input terminal	3 Input terminal block × 2

2.5.2 Function Specifications

Execute the functions from the PC application via communications.

Monitoring function

This function outputs the current measured values (instantaneous values).

Measured value recording function

Measurements are recorded at a set recording interval.	
Real-time management	This is automatically set from the PC application at the start of recording.
Recording Start	Immediate start/Reserved-time start
Recording End	Manual end/Reserved-time end
Operation when memory is full	Memory full stop /Endless ♦Set the condition before the start of recording.
Recording interval	1/2/5/10/15/20/30 sec., 1/2/5/10/15/20/30/60 min.
Recording mode	• Instantaneous value • MAX/MIN/AVE • Instantaneous value + MAX/MIN/AVE Total 3 modes ♦Set the mode before the start of recording.
Recorded data	One data set contains time and temperature/humidity information (Two channel each). ♦Data is scaled if scaling is ON.
Recording capacity	512 k bytes Flash memory
Quantity of recorded data	• Instantaneous value recording mode: 30,000 data × 2 CH • MAX/MIN/AVE recording mode: 15,000 data × 2 CH • Instantaneous value + MAX/MIN/AVE recording mode: 12,000 data × 2 CH
Power outage protection	After recovering from a power outage, the instrument automatically returns to the state held before the outage.

Alarm judgment and recording function

Alarm judgment is made at every sampling, and the history will be recorded in flash memory if the measured value recording function remains active.	
Judgment method	Criterion threshold can be set to either Hi or Lo. The instantaneous value at every sampling is judged (effective in any measurement mode).
Recorded data	One data set contains time, generation/reversion, CH and judgment threshold information.
Alarm output	Alarm output × 2 CH ♦Output is turned ON when an alarm (Hi or Lo) occurs. Whether to hold the alarm output can be selected. The reset switch or a command can be used to reset alarms.

2.5.3 General Specifications

Clock accuracy	±100 ppm (Reference value at temperature from 0 to 50°C (32 to 122°F) without the communications module)
Backup	Recorded data (saved in flash memory) ♦Data loss for up to 2 minutes before and after a power outage may occur.
Communication interface	CAN bus
Maximum rated voltage to earth	33 Vrms, 70 VDC
Alarm output	Open collector: 30 VDC, 20 mA max.
Rated supply voltage	5 V±0.3 VDC
Maximum rated power	1.4 W
Dielectric strength	1.4 kVAC Between input and alarm output, Input/Output and CAN bus (50/60 Hz, Response current 5 mA, one minutes
Dimensions	Approx. 22.5W × 96H × 85D mm (0.89"W × 3.78"H × 3.35"D) (excluding projections)
Mass	Approx. 120 g (4.2 oz.)
Accessories	Ferrite clamp........2 Terminal block........3
Operational ranges for temperature and humidity	0 to 50°C (32 to 122°F), 80%RH or less (with no condensation)
Temperature and humidity ranges for storage	-10 to 50°C (14 to 122°F), 80%RH or less (with no condensation)
Operating environment	Indoors, altitude up to 2000 m (6562-ft.)
Standards applying	Safety EN61010, Pollution Degree 2, Measurement Category I, (anticipated transient overvoltage 330 V), EMC EN61326, CLASS A

2303-20 TC MODULE 3

3.1 Overview

3.1.1 Product Overview

- The 2303-20 is a measurement module of Hioki "Smart Site" (remote measurement system).
- This module measures and records temperature at regular intervals.
- One module can be used for measurement at two locations.
- The 2303-20 is used with the power supply module, communications module, and module base.

Usable Temperature sensor	Thermocouple (Selectable between K, E, J, T and R)
Number of measurement channels	Temperature 2 CH
Measurement range	-100.0 to 1600.0°C

(Conceptual image)

3.1.2 Major Features

- **The recording interval is selectable from 1 second to 60 minutes.**
- **The maximum, minimum, and average measurements during the recording interval can be recorded (with sampling once a second).**
- **The module has an alarm output terminal.**

Rough Estimate of Storable Data Quantity and Time

Action at memory full: Continue recording (Endless)

	Recording Mode		
	Instantaneous Value	MAX/MIN/AVE	Instantaneous Value + MAX/MIN/AVE
Quantity of storable data	26000	13000	10000
Recording interval			
1 sec.	7.5 hours	3.5 hours	2.5 hours
2 sec.	14.5 hours	7 hours	5.5 hours
5 sec.	1.5 days	18 hours	14.5 hours
10 sec.	3 days	1.5 days	1 day
15 sec.	4.5 days	2 days	1.5 days
20 sec.	6 days	3 days	2 days
30 sec.	9 days	4.5 days	3.5 days
1 min.	18 days	9 days	7 days
2 min.	36 days	18 days	14 days
5 min.	92 days	46 days	36 days
10 min.	184 days	92 days	73 days
15 min.	277 days	138 days	110 days
20 min.	369 days	184 days	147 days
30 min.	554 days	277 days	221 days
60 min.	1109 days	554 days	443 days

NOTE

When the alarm log is ON, the higher the number of alarms generated, the smaller the recording period. (Approx. 1 of the data per alarm)

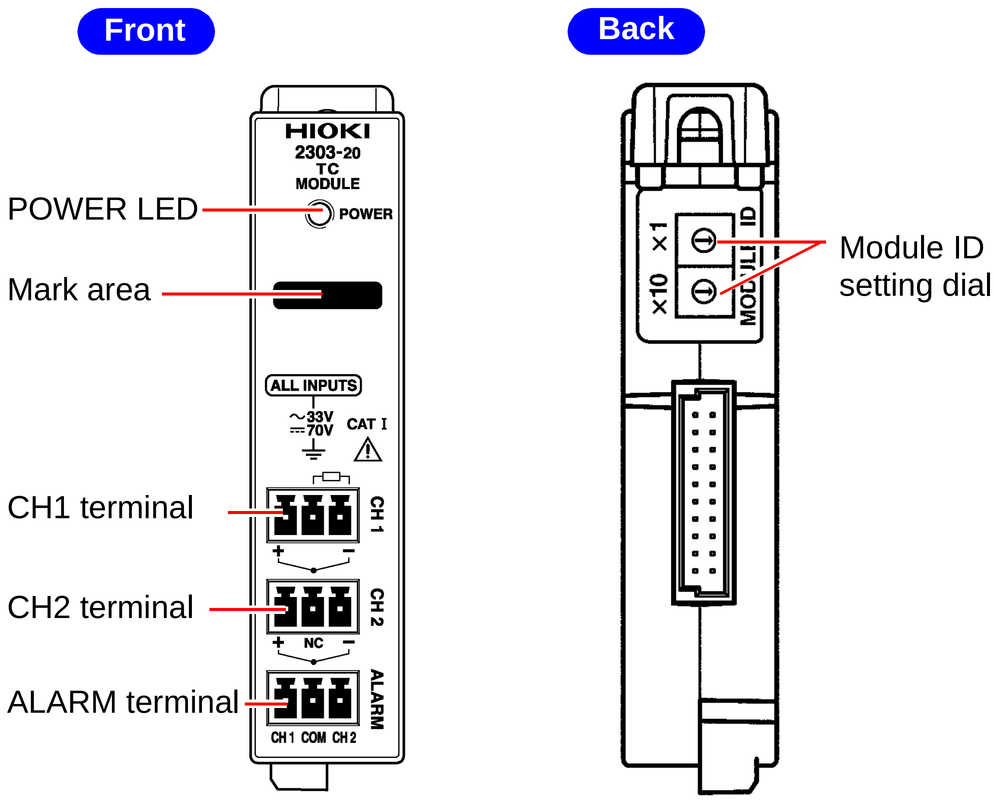
Action at memory full: Stop recording (Memory full stop)

	Recording Mode		
	Instantaneous Value	MAX/MIN/AVE	Instantaneous Value + MAX/MIN/AVE
Quantity of storable data	30000	15000	12000
Recording interval			
1 sec.	8.5 hours	4 hours	3 hours
2 sec.	17 hours	8.5 hours	6.5 hours
5 sec.	1.5 days	21 hours	17 hours
10 sec.	3.5 days	1.5 days	1.5 days
15 sec.	5 days	2.5 days	2 days
20 sec.	7 days	3.5 days	2.5 days
30 sec.	10 days	5 days	4 days
1 min.	21 days	10 days	8 days
2 min.	42 days	21 days	17 days
5 min.	106 days	53 days	42 days
10 min.	213 days	106 days	85 days
15 min.	319 days	159 days	127 days
20 min.	426 days	213 days	170 days
30 min.	639 days	319 days	255 days
60 min.	1279 days	639 days	511 days

NOTE

When the alarm log is ON, the higher the number of alarms generated, the smaller the recording period. (Approx. 1 of the data per alarm)

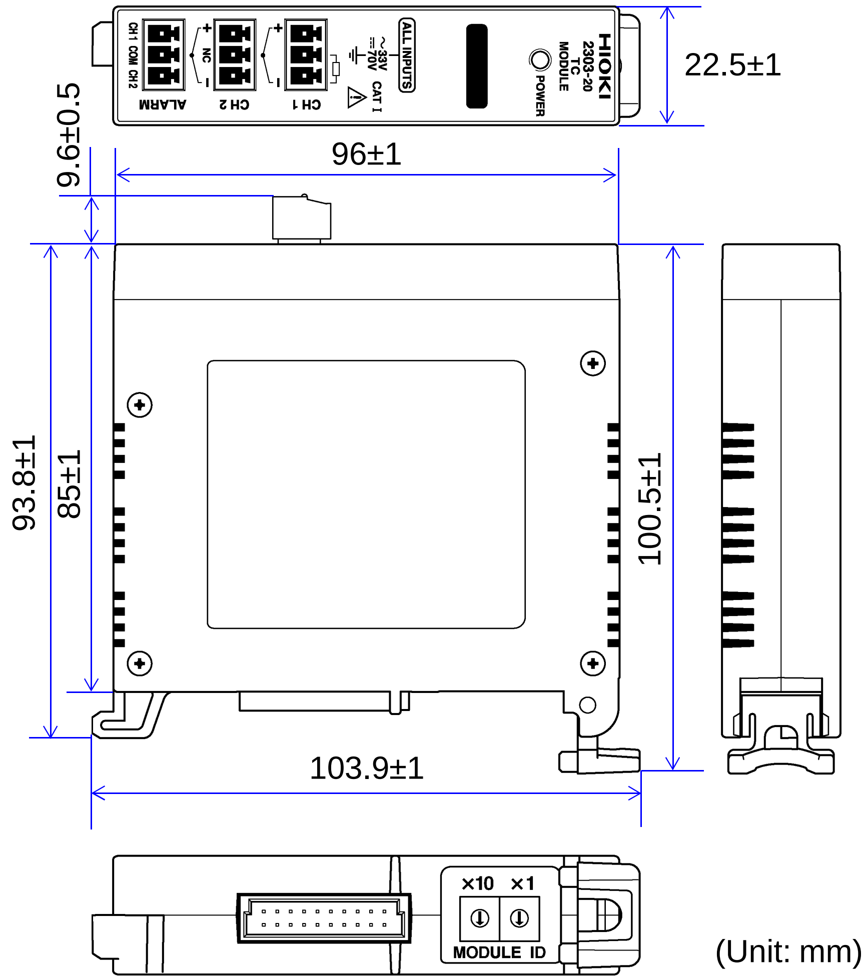
3.1.3 Name and Function of the Parts



POWER LED	Goes on or flashes when power is supplied to the module. Remains on, flashes, or changes to another color according to the state of the module. **POWER LED indication** Lit in green : Data being recorded. Flashing in green : Standing by. Lit in yellow : Alarm output. Flashing in yellow: Overrange detected. Lit in red : Non-recoverable error occurred. *1 Flashing in red : Recoverable error occurred. *2
Mark area	Use this area to make a note of the object to measure or the module ID. Use an ink pen, since pencil lead may rub off.
CH1 terminal	Connect a thermocouple and external RJC (reference junction compensation) sensor to this terminal (channel 1).
CH2 terminal	Connect a thermocouple to this terminal (channel 2).
ALARM terminal	Connect the alarm output cable to this terminal. This terminal is electrically insulated from the CH1 and CH2 terminals.
Module ID setting dial	Use the dial to set the module's identification No.

*1: The module needs repair. Contact your dealer or Hioki representative.
*2: The same module ID may be used by another module.

3.1.4 Dimension Diagrams



3.1.5 Accessory and Option

Accessories

External RJC (reference junction compensation) sensor 1
Ferrite clamp 2
Terminal block 3

Option

None

3.2 Settings

3.2.1 Setting the Module ID

You can connect up to 63 measurement modules to one communications module.

Setting Procedure

Use the module ID setting dial to set the ID No. of the module to a number from 01 and to 63. (You cannot set a number other than the above.)

NOTE

- Ensure that the set ID is not used for any other module connected to the same communications module.
- The ID numbers of modules need not be consecutive.
- Setting the ID to 99, then turning on the power resets all internal settings to the defaults.
- The module ID and COM ID are not related and can be set independently.

3.3 Preparations

3.3.1 Installing the Module

(1) Installing the Module Base

CAUTION

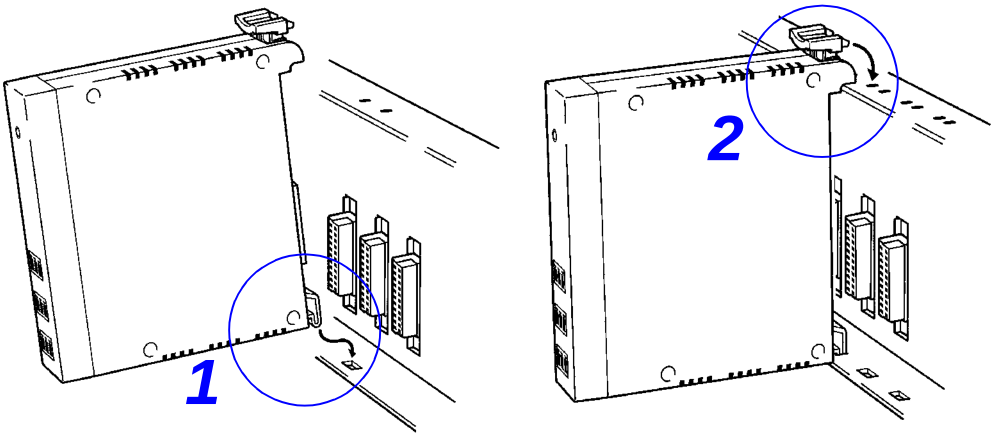
Do not mount the module base on the ceiling where it may fall off.

3

Fasten the module base to a DIN rail or the wall according to the procedure described in the **19 "2391-01, 2391-02, 2391-03 MODULE BASE"(P.305)** or **20 "2392-01/02 MODULE BASE"(P.319)** series MODULE BASE instruction manual.

(2) Mounting a Module on the Module Base

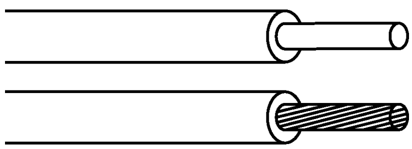
Mount a module on the module base as shown below. Ensure that the lever clicks.



3.3.2 Connecting Input/Output Cables

Recommended Cable

Single-wire	: 0.14 to 1.5 mm^2
Stranded-wire	: 0.14 to 1.5 mm^2
AWG	: 26 to 16
Cable strip length	: 5 mm (0.2")

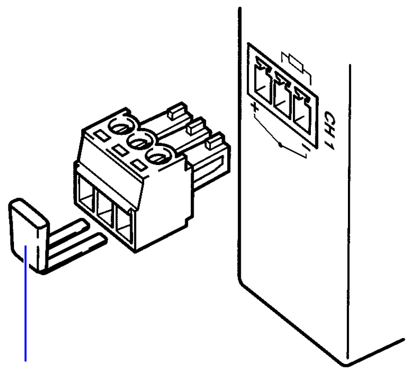


(1) Connecting Cables to the CH1 and CH2 Terminals (Thermocouple Signal Input)

⚠CAUTION

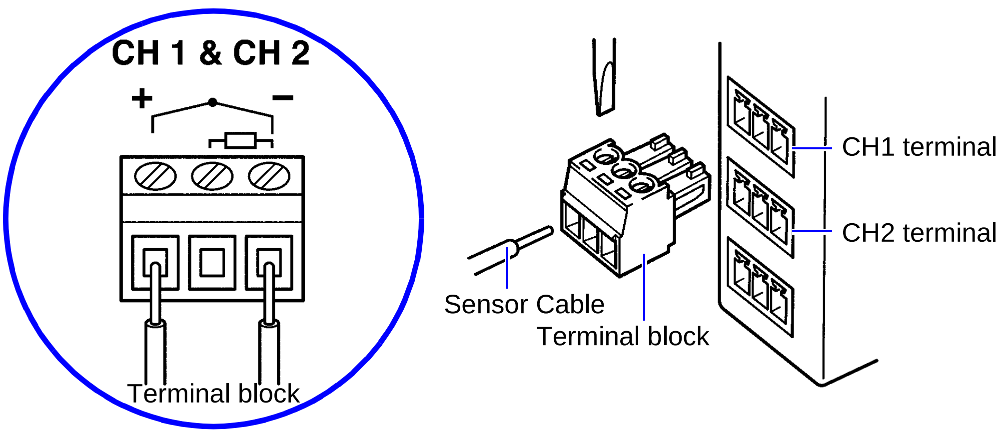
- The CH1 and CH2 terminals are not insulated from each other. Avoid short-circuiting.
- Do not add power to external RJC (reference junction compensation) sensor. It becomes impossible to do a correct measurement by the sensor's breaking.

1. Use a flat blade screwdriver to loosen the screws on the terminal block.
2. Insert an external RJC (reference junction compensation) sensor into the CH1 terminal.



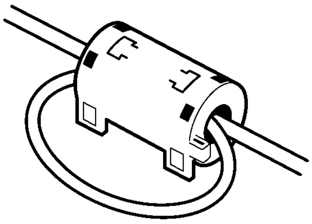
External RJC (reference junction compensation) sensor

3. Insert a sensor cable into the terminal block, then tighten the screws (at a tightening torque of 0.25 N•m).
4. Connect the terminal block to the CH1 or CH2 terminal.



NOTE

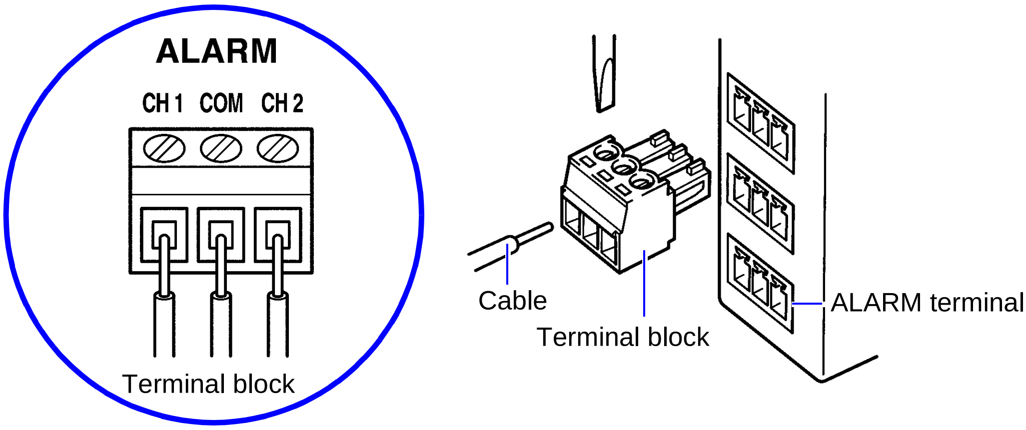
- The CH1 and CH2 terminals are not insulated from each other. Use an electrically insulated sensor or another TC module, since measurements may be adversely affected.
- In case of external noise, wind the cable around the ferrite clamp supplied as an accessory as shown below.



- Note that measurement may be adversely affected by external noise or the electromagnetic environment when using a cable longer than 3 meters.

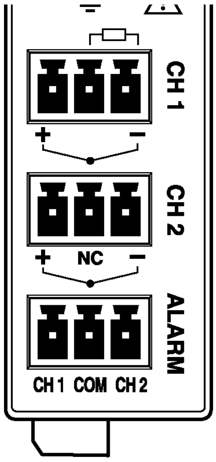
(2) Connecting Cables to the ALARM Terminal (Alarm output)

1. Use a flat blade screwdriver to loosen the screws on the terminal block.
2. Insert a cable for alarm output into the terminal block, then tighten the screws (at a tightening torque of 0.25 N•m).
3. Connect the terminal block to the ALARM terminal.



Connect the cable for CH1 output to CH1 and COM; and connect the cable for CH2 output to CH2 and COM.

(3) The Location of the Input/Output Cable



CH 1 terminal (Input)	**+**		**-**
	Thermocouple input (+)	External RJC sensor	Thermocouple input (-), External RJC sensor
CH 2 terminal (Input)	**+**	**NC**	**-**
	Thermocouple input (+)	-	Thermocouple input (-)
ALARM terminal (output)	**CH1**	**COM**	**CH2**
	Alarm output	Common	Alarm output

Temperature Sensor

⚠CAUTION

Only connect the K, E, J, T or R thermocouple sensor, or the sensor supplied for external RJC (reference junction compensation) sensor to the CH1 and CH2 terminals to avoid damaging the 2303-20. Moreover, do not input other signals to these terminals.

3.4 Others

3.4.1 Alarm output

(1) Output Rating

WARNING

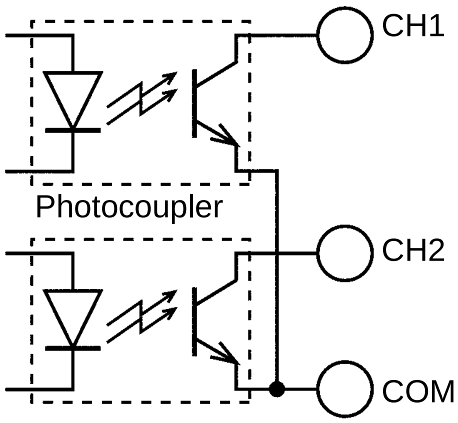
Ensure that the input does not exceed the maximum input voltage or current to avoid module damage, short-circuiting and electric shock resulting from heat building.

Output method	Open collector
Maximum input voltage / current	30 V, 20 mA max.
Signal logic	Enabled: ON Disabled: OFF

(2) Internal Circuit

The alarm output circuit is configured as shown below.

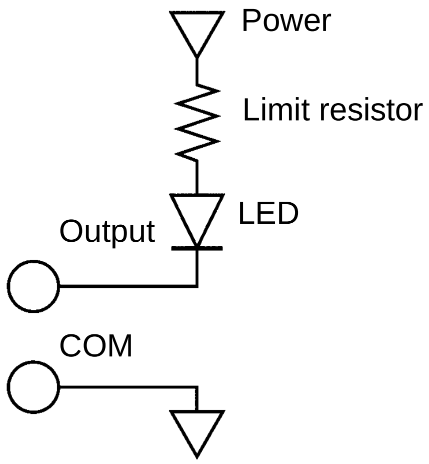
<Internal circuit>



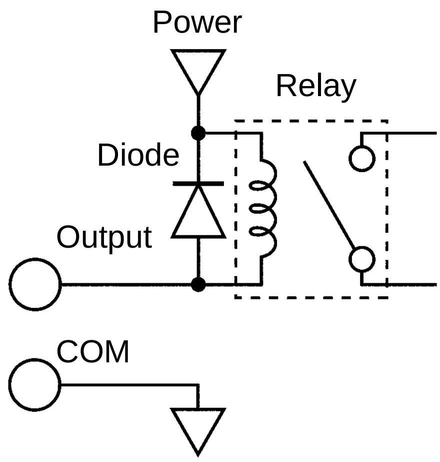
NOTE

- Signal logic indicates the signal state in which a signal's function is enabled.
- The output transistor works as a switch between signal output and ground in the module. When output becomes enabled, the switch is turned on and current flows from the output signal to COM in the module. Therefore, a relay or LED lamp can be connected directly to the output terminal (P.50).

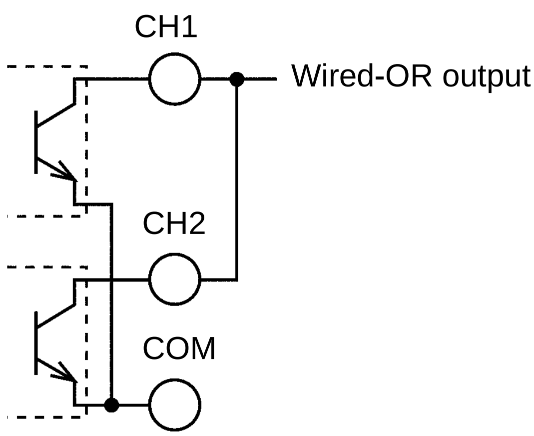
<Circuit diagram>



Connecting LED



Connecting relay



Using on Wired-OR Logic

NOTE

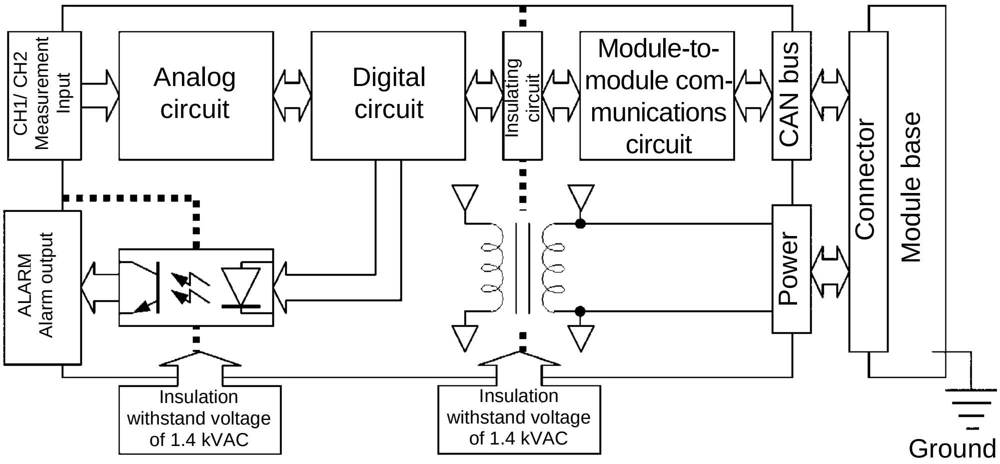
- When connecting a relay or LED lamp, ensure that the relay or lamp operates at up to 30 V and 20 mA. When connecting a relay, be sure to use a diode to absorb counter electromotive force.
- Open collector output operates on wired-OR logic by short-circuiting CH1 and CH2. Moreover, it enables the signal if an alarm occurs in either channel.

3.4.2 Insulation of Internal Circuit

CAUTION

The CH1 and CH2 terminals are not insulated from each other.
When connecting signals different in potential to these terminals, use an additional measurement module or insulate the signals externally before connection to the terminals. This will prevent module errors and malfunction.

In the 2303-20, the input circuit and alarm output are insulated from the CAN bus as shown in the block diagram below. (Withstand voltage: 1.4 kVAC, 50/60 Hz, Response current: 5 mA, 1 minute)



NOTE

The COM terminal of the alarm output terminal is used for both CH1 and CH2.

3.5 Specifications

3.5.1 Basic Specifications

Sensor type	Thermocouple (K, E, J, T, R)
Number of inputs	2 CH
Reference junction compensation accuracy	±2.0°C (Reference junction compensation range: 0 to 50°C (32 to 122°F) Pt. allowance:±0.2%rdg. (including ±0.5°C)
Temperature of guaranteed accuracy	23±5°C (73±8.5°F) (Module temperature)
Warm-up time	1 hour
Period of guaranteed accuracy	1 year
Sampling	1 time / sec.
Input terminal	3 Input terminal block × 2

Others measurement function

Thermocouple type	K, E, J	T	R
Measurement range(°C)	-100.0 to 1000.0°C	-100.0 to 400.0°C	0.0 to 1600.0°C
Measurement resolution(°C)	0.1°C		0.3°C (to 100) 0.2°C (to 1000) 0.1°C (to 1600)
Measurement accuracy(°C)	±0.1%f.s.±2.0°C		±6°C (to 100) ±4°C (to 1000) ±2.5°C (to 1600)
Temperature coefficient(°C/°C)	±0.05°C		±0.3°C
Influence of radiated radio-frequency electromagnetic field(°C)	±10°C		±60°C

- Module measurement accuracy is including RJC accuracy.
- This applies when inserting an external RJC into pins center and right terminals of CH1.
- Temperature coefficient is added from 0 to 18°C, 28 to 50°C (32 to 64°F, 82 to 122°F) to the measurement accuracy.
- Influence of radiated radio-frequency electromagnetic field shows the amount of the influence in 10 V/m.

3.5.2 Function Specifications

Execute the functions from the PC application via communications.

Monitoring function

This function outputs the current measured values (instantaneous values).

Measured value recording function

Measurements are recorded at a set recording interval.	
Real-time management	This is automatically set from the PC application at the start of recording.
Recording start	Immediate start/Reserved-time start
Recording end	Manual end/Reserved-time end
Operation when memory is full	Memory full stop /Endless ♦Set the condition before the start of recording.
Recording interval	1/2/5/10/15/20/30 sec., 1/2/5/10/15/20/30/60 min.
Recording mode	• Instantaneous value • MAX/MIN/AVE • Instantaneous value + MAX/MIN/AVE Total 3 modes ♦Set the mode before the start of recording.
Recorded data	One data set contains time and temperature/humidity information (2 channel each). ♦Data is scaled if scaling is ON.
Recording capacity	512 k bytes Flash memory
Quantity of recorded data	• Instantaneous value recording mode: 30,000 data × 2 CH • MAX/MIN/AVE recording mode: 15,000 data × 2 CH • Instantaneous value + MAX/MIN/AVE recording mode: 12,000 data × 2 CH
Power outage protection	After recovering from a power outage, the instrument automatically returns to the state held before the outage.

Alarm judgment and recording function

Alarm judgment is made at every sampling, and the history will be recorded in flash memory if the measured value recording function remains active.	
Judgment method	Criterion threshold can be set to either Hi or Lo. The instantaneous value at every sampling is judged (effective in any measurement mode).
Recorded data	One data set contains time, generation/reversion, CH and judgment threshold information.

3.5.3 General Specifications

Clock accuracy	±100 ppm (Reference value at temperature from 0 to 50°C (32 to 122°F) without the communications module)
Backup	Recorded data (saved in flash memory) ♦Data loss for up to 2 minutes before and after a power outage may occur.
Communication interface	CAN bus
Maximum rated voltage to earth	33 Vrms, 70 VDC (Total of input voltage)
Alarm output	Open collector: 30 VDC, 20 mA max.
Rated supply voltage	5 V±0.3 VDC
Maximum rated power	1.4 W
Dielectric strength	1.4 kVAC Between input and alarm output, Input/Output and CAN bus (50/60 Hz, Response current 5 mA, one minutes).

Dimensions	Approx. 22.5W × 96H × 85D mm (0.89"W × 3.78"H × 3.35"D) (excluding projections)
Mass	Approx. 120 g (4.2 oz.)
Accessories	Ferrite clamp.....2 External RJC (reference junction compensation) sensor .....1 Terminal block.....3
Operational ranges for temperature and humidity	0 to 50°C (32 to 122°F), 80%RH or less (with no condensation)
Temperature and humidity ranges for storage	-10 to 50°C (14 to 122°F), 80%RH or less (with no condensation)
Operating environment	Indoors, altitude up to 2000 m (6562-ft.)
Standards applying	Safety EN61010, Pollution Degree 2, Measurement Category I, (anticipated transient overvoltage 330 V) EMC EN61326, CLASS A

2304-20 PULSE MODULE 4

4.1 Overview

4.1.1 Product Overview

- The 2304-20 is a measurement module of the Hioki "Smart Site" (remote measurement system).
- This module measures and records current pulses, voltage pulses and no-voltage contact output at regular intervals. For example, the 2304-20 can be used to measure pulse output from a watthour meter or flowmeter.
- The 2304-20 is used with the power supply module, communications module, and module base.

Usable current sensor	9766 CLAMP ON SENSOR
Number of measurement channels	1channel for voltage/ contact pulse+1channel for current pulse
Measurement range	16,000 k pulse/interval
Input pulse	4 kHz max. (voltage/contact) 40 Hz max. (current)

(Conceptual image)

4.1.2 Major Features

- **The recording interval is selectable from 1 second to 60 minutes.**
- **The totals of measurements made during a recording interval can be recorded (with sampling once a second).**
- **The module has an alarm output terminal.**
- **The specified clamp sensor also makes it possible to count the current pulses output from the watt-hour meter without disconnecting the cables.**

Rough Estimate of Storable Data Quantity and Time

Action at memory full: Continue recording (Endless)

	Recording Mode
	Instantaneous Value
Quantity of storable data	26000
Recording interval	
1 sec.	7.5 hours
2 sec.	14.5 hours
5 sec.	1.5 days
10 sec.	3 days
15 sec.	4.5 days
20 sec.	6 days
30 sec.	9 days
1 min.	18 days
2 min.	36 days
5 min.	92 days
10 min.	184 days
15 min.	277 days
20 min.	369 days
30 min.	554 days
60 min.	1109 days

NOTE

When the alarm log is ON, the higher the number of alarms generated, the smaller the recording period.

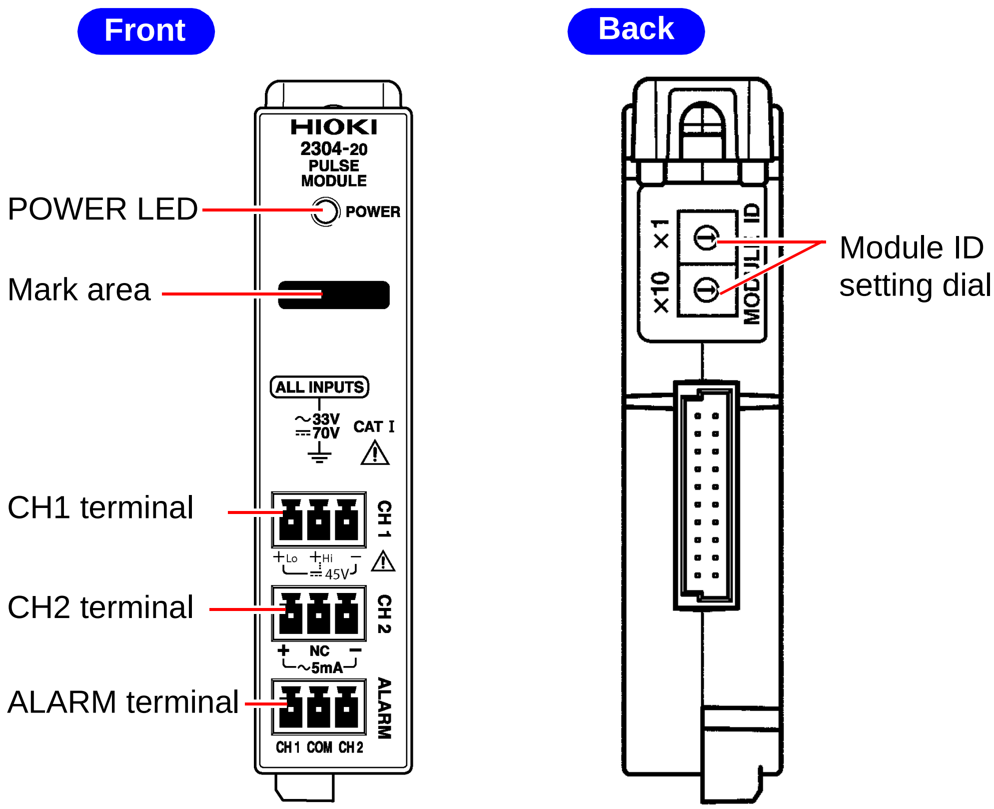
Action at memory full: Stop recording (Memory full stop)

	Recording Mode
	Instantaneous Value
Quantity of storable data	30000
Recording interval	
1 sec.	8.5 hours
2 sec.	17 hours
5 sec.	1.5 days
10 sec.	3.5 days
15 sec.	5 days
20 sec.	7 days
30 sec.	10 days
1 min.	21 days
2 min.	42 days
5 min.	106 days
10 min.	213 days
15 min.	319 days
20 min.	426 days
30 min.	639 days
60 min.	1279 days

NOTE

When the alarm log is ON, the higher the number of alarms generated, the smaller the recording period.

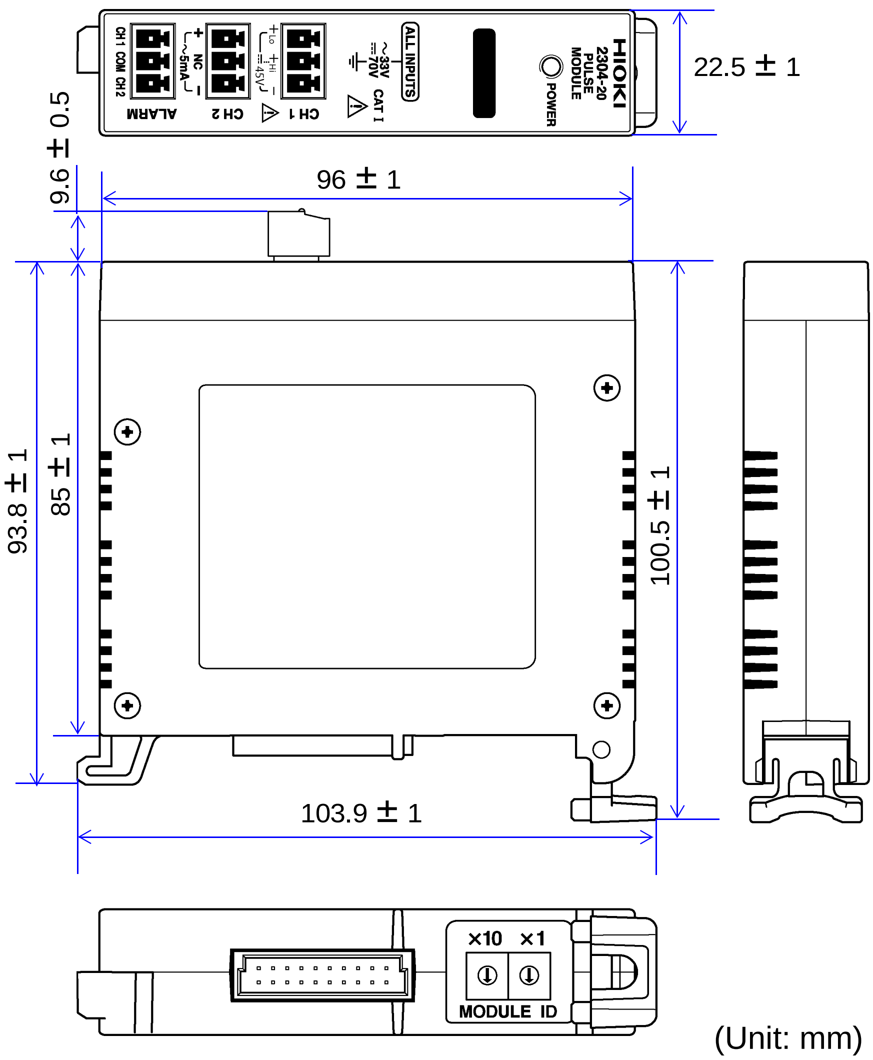
4.1.3 Name and Function of the Parts



POWER LED	Goes on or flashes when power is supplied to the module. Remains on, flashes, or changes to another color according to the state of the module. **POWER LED indication** Lit in green : Data being recorded. Flashing in green : Standing by. Lit in yellow : Alarm output. Lit in red : Non-recoverable error occurred. *1 Flashing in red: Recoverable error occurred. *2
Mark area	Use this area to make a note of the object to measure or the module ID. Use an ink pen, since pencil lead may rub off.
CH1 terminal	Connect the voltage pulse signal or contact pulse signal to this terminal (channel 1).
CH2 terminal	Connect the current sensor for current pulse signal input (9766 CLAMP ON SENSOR) to this terminal (channel 2).
ALARM terminal	Connect the alarm output cable to this terminal. This terminal is electrically insulated from the CH1 and CH2 terminals.
Module ID setting dial	Use the dial to set the module's identification No.

*1: The module needs repair. Contact your dealer or Hioki representative.
*2: The same module ID may be used by another module.

4.1.4 Dimension Diagrams



(Unit: mm)

4.1.5 Accessory and Option

Accessories

Ferrite clamp 2

Terminal block 3

Option

9766 CLAMP ON SENSOR (For current pulse detection)

4.2 Settings

4.2.1 Setting the Module ID

You can connect up to 63 measurement modules to one communications module.

Setting Procedure

Use the module ID setting dial to set the ID No. of the module to a number from 01 and to 63. (You cannot set a number other than the above.)

NOTE

- Ensure that the set ID is not used for any other module connected to the same communications module.
- The ID numbers of modules need not be consecutive.
- Setting the ID to 99, then turning on the power resets all internal settings to the defaults.
- The module ID and COM ID are not related and can be set independently.

4.3 Preparations

4.3.1 Installing the Module

(1) Installing the Module Base

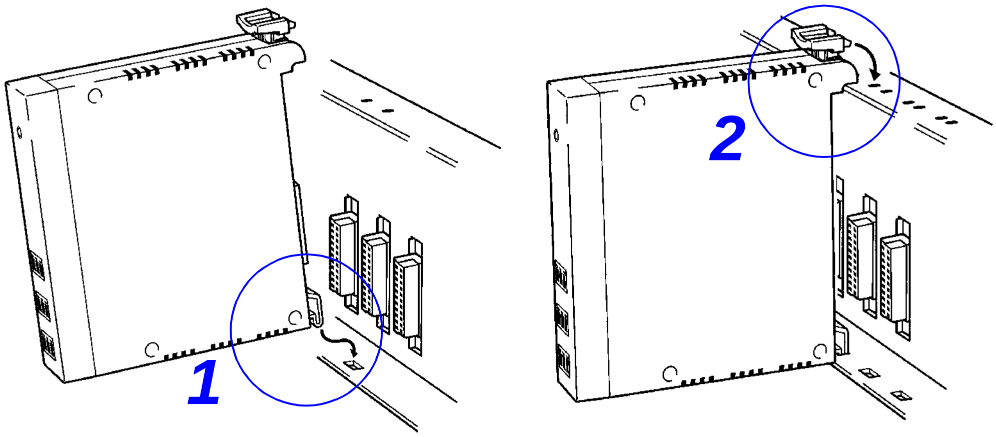
⚠CAUTION

Do not mount the module base on the ceiling where it may fall off.

Fasten the module base to a DIN rail or the wall according to the procedure described in the **19 "2391-01, 2391-02, 2391-03 MODULE BASE"(P.305)** or **20 "2392-01/02 MODULE BASE"(P.319)** series MODULE BASE instruction manual.

(2) Mounting a Module on the Module Base

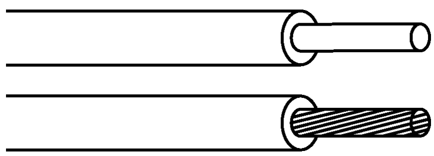
Mount a module on the module base as shown below. Ensure that the lever clicks.



4.3.2 Connecting Input/Output Cables

Recommended Cable

Single-wire	: 0.14 to 1.5 mm^2
Stranded-wire	: 0.14 to 1.5 mm^2
AWG	: 26 to 16
Cable strip length	: 5 mm (0.2")

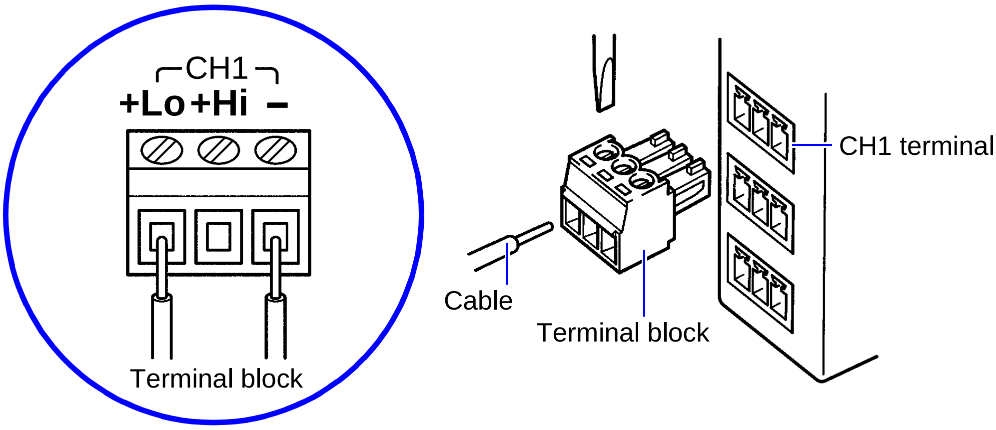


(1) Connecting to CH1 Terminal (voltage/ contact pulse signals input)

CAUTION

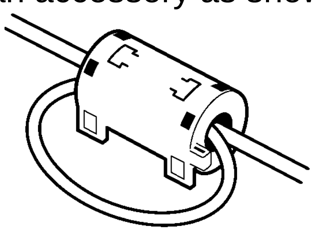
- The CH1 and CH2 terminals are not insulated from each other. Avoid short-circuiting.
- Note that the instrument may be damaged if the applied voltage exceeds the measurement range.

1. Use a flat blade screwdriver to loosen the screws on the terminal block.
2. Insert the cable for voltage or contact pulse signal input into the terminal block, then tighten the screws into the terminal block (at tightening torque of 0.25 N•m).
   For most cases, voltage or contact pulse signals can be detected when the module is operated with the positive terminal connected to +Lo.
   To connect the positive terminal of a voltage pulse signal, select either +Lo or +Hi according to the threshold voltage.
   Always connect the positive terminal of a no-voltage contact to +Lo.
   ❖ **(4) "Connection Locations of Input/output Cables"(P.65)**
3. Connect the terminal block to the CH1 terminal.



NOTE

- In case of external noise, wind the cable around the ferrite clamp supplied as an accessory as shown below.



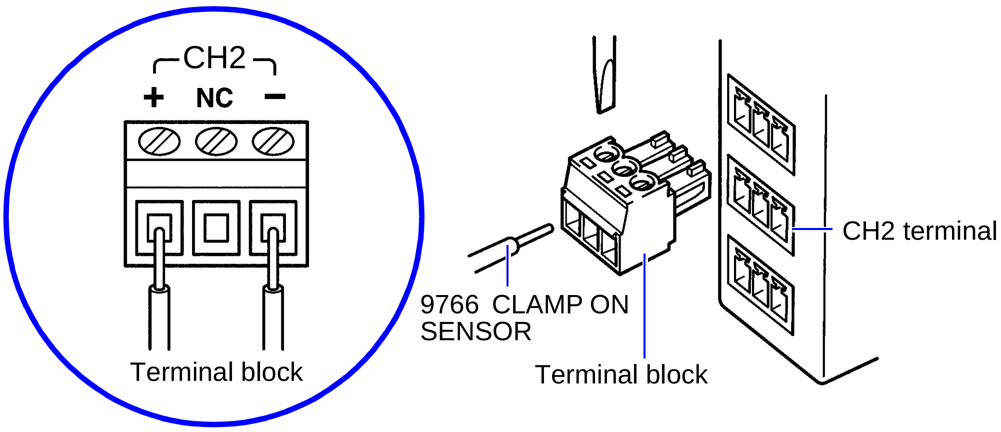
- Note that measurement may be adversely affected by external noise or the electromagnetic environment when using a cable longer than 3 meters.

(2) Connecting to CH2 Terminal (9766 CLAMP ON SENSOR)

CAUTION

- If power supply noise poses a problem, use of a noise filter is recommended.
- The core end of the clamp sensor is not insulated. To prevent injury, avoid short-circuiting a charged part of the object to be measured with the core.
- When the power and signal lines may be subject to a lightning-induced surge, install a lightning arrester between another device or module connected to this module and line to protect the system.
- Use the specified clamp sensor for this module only. Do not connect any other current sensor directly to the module. Use of other sensors may result in excessive input and damage the module.
- Be careful to avoid dropping the clamps or otherwise subjecting them to mechanical shock, which could damage the mating surfaces of the core and adversely affect measurement.
- Measurements are degraded by dirt on the mating surfaces of the clamp-on sensor, so keep the surfaces clean by gently wiping with a soft cloth.

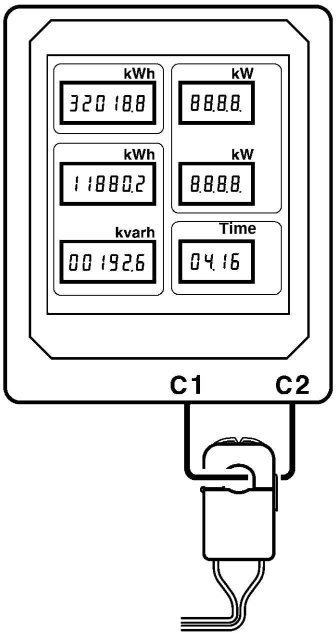
1. Use a flat blade screwdriver to loosen the screws on the terminal block.
2. Insert the 9766 CLAMP ON SENSOR into the terminal block, then tighten the screws into the terminal block (at tightening torque of 0.25 N•m).
3. Connect the terminal block to the CH2 terminal.



NOTE

- Use only the 9766 CLAMP ON SENSOR for current pulse input.
- The clamp sensor connection is irrespective of polarity.
- Attach the clamp around only one conductor. Single-phase (2-wire) cables clamped together will not produce any reading.

Connecting the Energy Meter and 9766



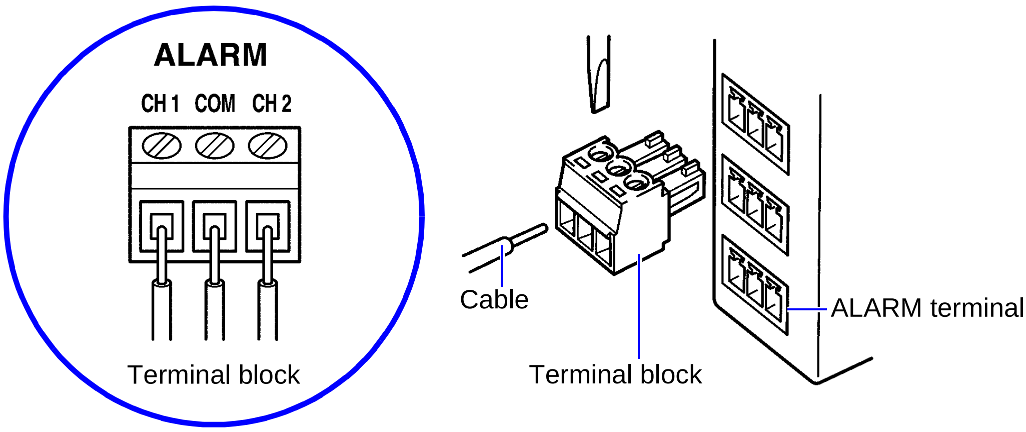
9766 CLAMP ON SENSOR

1. Connect the supplied connection cables to the C1 and C2 terminals of the energy meter. For more information on the cable connection, see the operating manual for the composite power utility meter.
2. Connect the extension cable to the 9766.
3. Connect the other end of the extension cable to this module.
4. Open the clamp core of the 9766 and clamp the connection cable. Be sure to lock the clamp. The clamp does not have a spring.
5. Make sure the clamp core end is closed tightly.

NOTE This module detects very small pulse currents. Excessive static electricity near the measuring terminal or the 9766 CLAMP ON SENSOR or use of the module in a strong magnetic field may result in pulse detection errors.

(3) Connecting Cables to the ALARM Terminal (Alarm output)

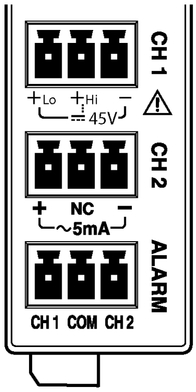
1. Use a flat head screwdriver to loosen the screws on the supplied terminal block.
2. Insert the cable for alarm output into the terminal block, then tighten the screws (at tightening torque of 0.25 N•m).
3. Connect the terminal block to the ALARM terminal.
   For the output of CH1, connect the cables to CH1 and COM, and for the output of CH 2, connect the cables to CH2 and COM.



Connect the cable for CH1 output to CH1 and COM; connect the cable for CH2 output to CH2 and COM.

❖ (1) "Connecting to CH1 Terminal (voltage/ contact pulse signals input)"(P.62)

(4) Connection Locations of Input/output Cables



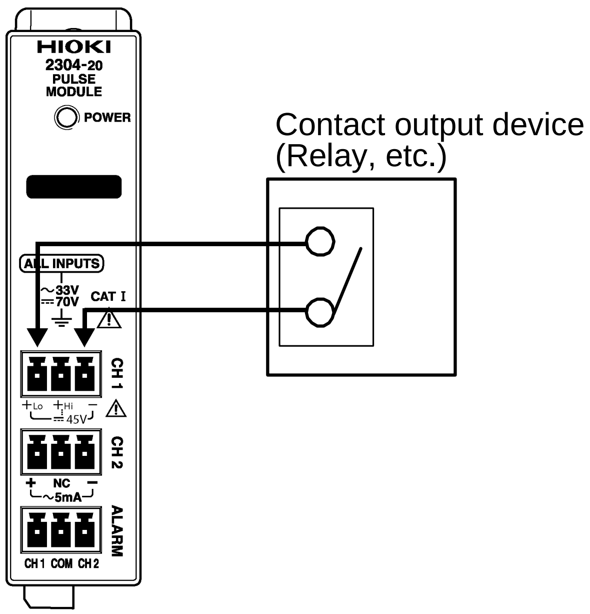
CH1 terminal (input)	**+ Lo**	**+ Hi**	**-**
	Voltage/ contact input (+) L:0 V to 0.2 V H:1.5 V to 45 V	Voltage input (+) L:0 V to 4 V H:10 V to 45 V	Voltage/ contact input (-)
CH2 terminal (input)	**+ Lo**	**NC**	**-**
	9766 input (+)	Not in use	9766 input (-)
ALARM terminal (output)	**CH1**	**COM**	**CH2**
	Alarm output	Common	Alarm output

4.4 Others

4.4.1 Examples of Voltage/Contact Output Device Connection

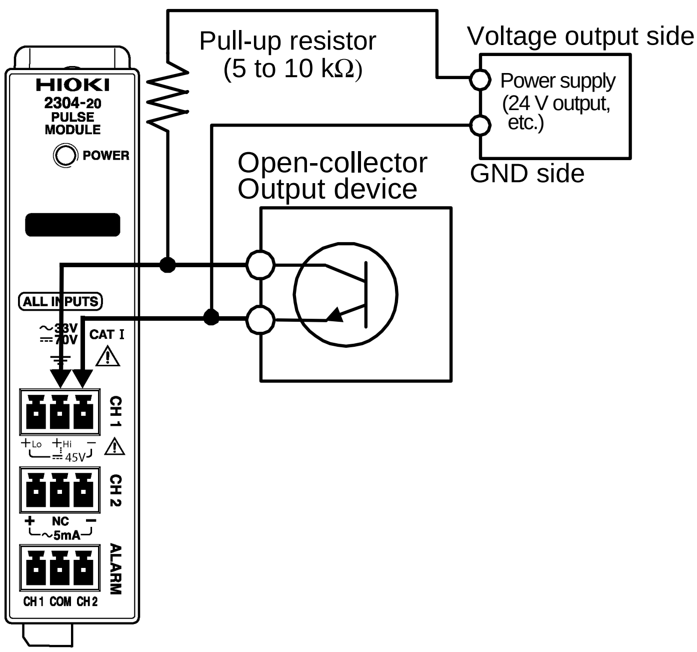
(1) Contact Output Devices (Relays, Open-Collector Output, Etc.)

Connect a contact output device to "+Lo" and "-" of CH1.



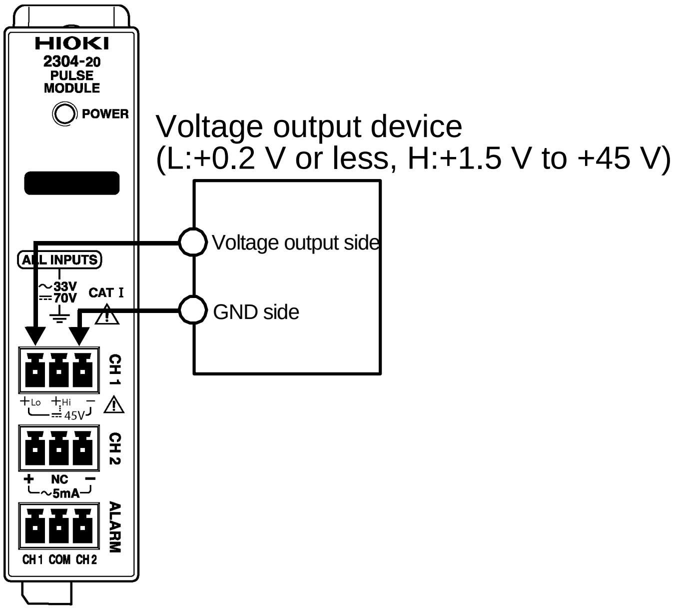
(2) Open-Collector Device (When ON Resistance Is Large)

Some open-collector devices may have such a high ON resistance that pulse signals cannot be detected by the method of (1). To couple the module to such devices, prepare a power supply of 10 to 45 V and a resistor, make pull-up as illustrated below, and connect cables to +Hi and - of CH1.



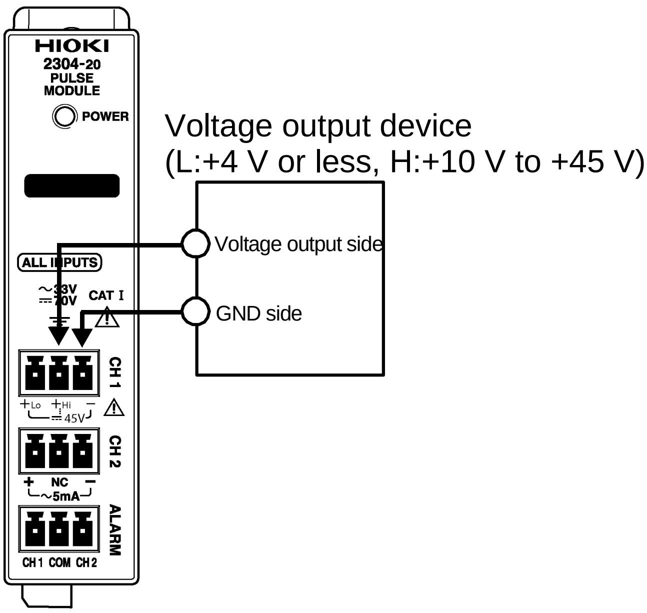
(3) Voltage Output Device (L: +0.2 V or Less, H: +1.5 to +45 V)

A device that outputs a voltage within the threshold ranges indicated above should be coupled to +Lo and - of CH1.



(4) Voltage Output Device (L: +4 V or Less, H: +10 to +45 V)

A device that outputs a voltage within the threshold ranges indicated above should be coupled to +Hi and - of CH1.



4.4.2 Alarm output

(1) Output Rating

WARNING

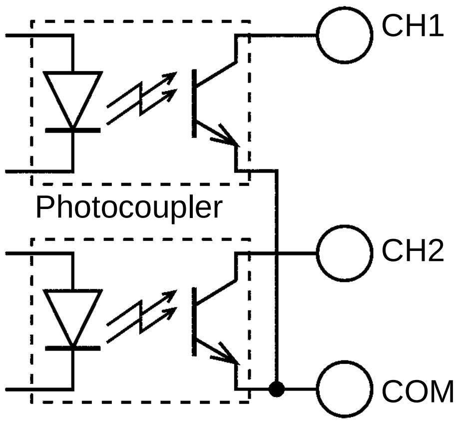
Ensure that the input does not exceed the maximum input voltage or current to avoid module damage, short-circuiting and electric shock resulting from heat building.

Output method	Open collector
Maximum input voltage / current	30 V, 20 mA max.
Signal logic	Enabled: ON Disabled: OFF

(1) Internal Circuit

The alarm output circuit is configured as shown below.

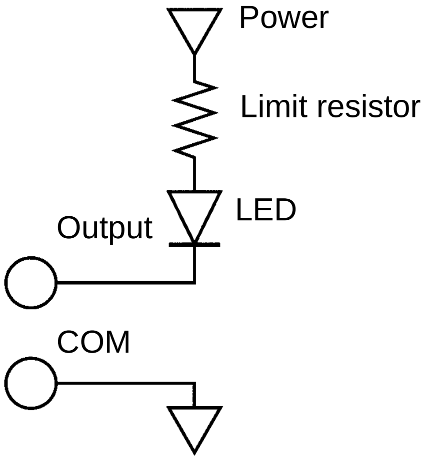
<Internal circuit>



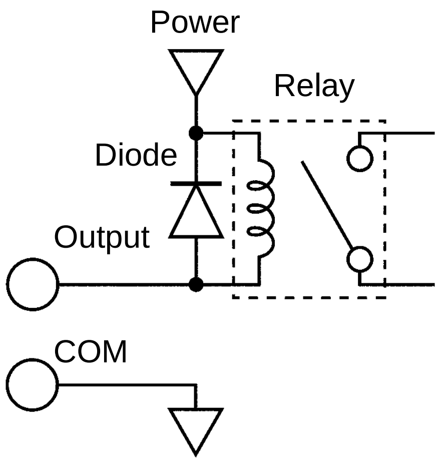
NOTE

- Signal logic indicates the signal state in which a signal's function is enabled.
- The output transistor works as a switch between signal output and ground in the module. When output becomes enabled, the switch is turned on and current flows from the output signal to COM in the module. Therefore, a relay or LED lamp can be connected directly to the output terminal (P.69).

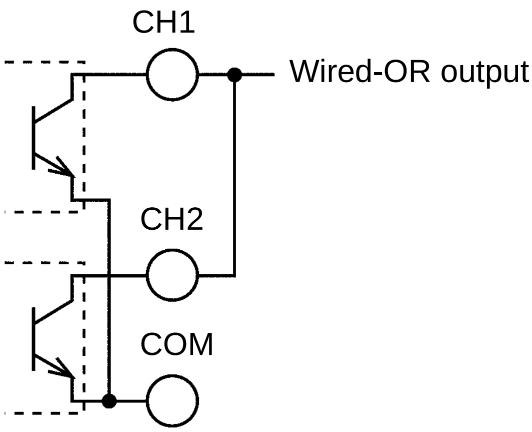
<Circuit diagram>



Connecting LED



Connecting relay



Using on Wired-OR Logic

NOTE

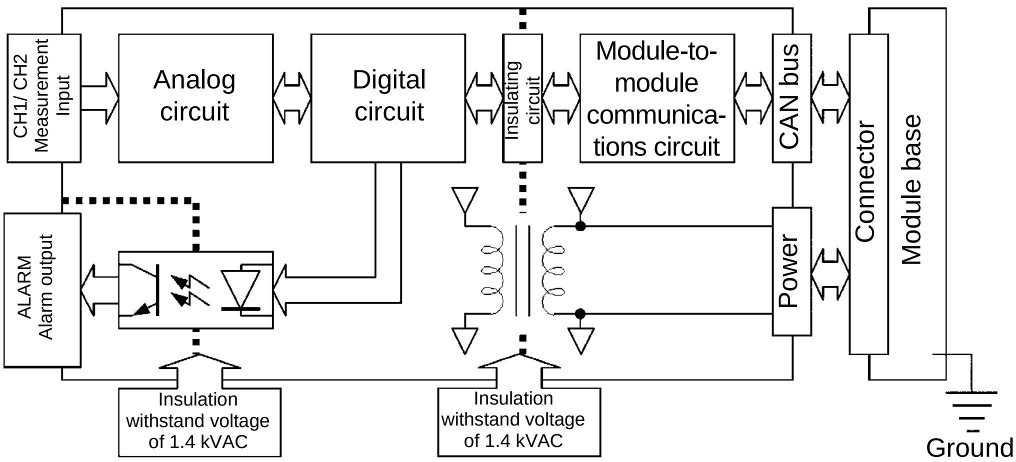
- When connecting a relay or LED lamp, ensure that the relay or lamp operates at up to 30 V and 20 mA. When connecting a relay, be sure to use a diode to absorb counter electromotive force.
- Open collector output operates on wired-OR logic by short-circuiting CH1 and CH2. Moreover, it enables the signal if an alarm occurs in either channel.

4.4.3 Insulation of Internal Circuit

CAUTION

The CH1 and CH2 terminals are not insulated from each other.
When measuring two measurement points having a potential difference, equalize the ground level potential of these two points, or use another 2304-20 Module, since measurements may be adversely affected.

In the 2304-20, the input circuit and alarm output are insulated from the CAN bus as shown in the block diagram below. (Withstand voltage: 1.4 kVAC, 50/60 Hz, Response current: 5 mA, 1 minute)



NOTE

The COM terminal of the alarm output terminal is used for both CH1 and CH2.

4.5 Specifications

4.5.1 Basic Specifications

Number of inputs	Voltage or no-voltage contact pulse input × 1 channel Clamp-type current pulse input × 1CH (Detected using externally connected 9766 CLAMP ON SENSOR.) ♦Simultaneous detection on 2 channels is also possible.
Measurement range	Voltage/no-voltage contact pulse up to 4 kHz (Input terminals set by commands) • Lo range, no-voltage contact terminals Voltage pulse A pulse is counted when the voltage level changes from L to H. L: +0.0 to +0.2 V H: +1.5 to +45 V (Logic in the range from +0.2 to +1.5 V is indefinite.) No-voltage contact pulse: A pulse is counted when the circuit between the terminals changes from a short circuit to an open circuit. Contact Detection Level: short circuit of 500 Ω or less open circuit of 500 kΩ or more • High range, terminals Voltage pulse A pulse is counted when the voltage level changes from L to H. L: +0.0 to +4.0 V H: +10.0 to +45 V (Logic in the range from +4.0 to +10.0V is indefinite.) • Current pulse Detected current range 10 to 20 mAp-p Pulse width 12.5 ms or more Pulse interval 25 ms or more, 40 Hz max. Rise/fall speed 0.8 ms or less ♦With the 9766 CLAMP ON SENSOR, in a magnetic field of 50 A/m AC or less
Filter	Effective for voltage/no-voltage contact pulse input (set by a command). • For mechanical contact Pulse width: 20 ms or more Pulse separation: 40 ms or more (Frequency: 25 Hz or less) ♦No filter for current pulse input
Measurement accuracy	±100 ppm rdg. ±1 dgt., Recording interval accuracy: ±2 ms Display range: Total of each channel at every interval (16,000,000 max.)
Guaranteed accuracy period	1 year
Sampling	1 time / sec.
Input terminal	3 Input terminal block × 2

4

4.5.2 Function Specifications

Execute the functions from the PC application via communications.

Monitoring function

This function outputs the current measured values (instantaneous values).

Measured value recording function

Measurements are recorded at a set recording interval.	
Real-time management	This is automatically set from the PC application at the start of recording.
Recording start	Immediate start/Reserved-time start
Recording end	Manual end/Reserved-time end
Operation when memory is full	Memory full stop /Endless ♦Set the condition before the start of recording.
Recording interval	1/2/5/10/15/20/30 sec., 1/2/5/10/15/20/30/60 min.
Recording mode	Instantaneous value recording mode (Total during the interval)
Recorded data	One data set contains time, recording data (for 2 channels).
Recording capacity	512 k bytes Flash memory
Quantity of recorded data	Instantaneous value recording mode: 30,000 data × 2 CH
Power outage protection	After recovering from a power outage, the instrument automatically returns to the state held before the outage.

Alarm judgment and recording function

Alarm judgment is made at every sampling, and the history will be recorded in flash memory if the measured value recording function remains active.	
Judgment method	Criterion threshold can be set to either Hi or Lo. Hi: The total at every sampling is judged within the interval. Lo: The total is judged at every interval.
Recorded data	One data set contains time, generation/reversion, CH and judgment threshold.
Alarm output	Alarm output × 2 CH ♦Output is turned ON when an alarm (Hi or Lo) occurs. Whether to hold the alarm output can be selected. The reset switch or a command can be used to reset alarms.

4.5.3 General Specifications

Clock accuracy	±100 ppm (Reference value at temperature from 0 to 50°C without the communications module)
Backup	Recorded data (saved in flash memory) ♦Data loss for up to 2 minutes before and after a power outage may occur.
Communication interface	CAN bus
Maximum rated voltage to earth	33 Vrms, 70 VDC
Maximum input voltage	Voltage/contact side 45 VDC
Alarm output	Open collector: 30 VDC, 20 mA max.
Rated supply voltage	5 VDC±0.3 V
Maximum rated power	1.4 W

Dielectric strength	1.4 kVAC (Between input and alarm output, Input/Output and CAN bus) (50/60 Hz, Response current 5 mA, one minutes)
Dimensions	Approx.22.5W × 96H × 85D mm (0.89"W × 3.78"H × 3.35"D)(excluding projections)
Mass	Approx.120 g (4.2 oz.)
Accessories	Ferrite clamp........ 2 Terminal block 3
Option	9766 CLAMP ON SENSOR (For current pulse detection)
Operating temperature and humidity	0 to 50°C (32 to 122°F), 80%RH or less (non-condensating)
Storage temperature and humidity	-10 to 50°C (14 to 122°F), 80%RH or less (non-condensating)
Operating environment	Indoors, altitude up to 2000 m (6562-ft.)
Applicable standards	Safety EN61010, Pollution degree 2, Measurement Category I (anticipated transient overvoltage 330 V)

2304-21 PULSE MODULE 5

5.1 Overview

5.1.1 Product Overview

- The 2304-21 is a measurement module of the Hioki "Smart Site" (remote measurement system).
- This module measures and records voltage pulses and no-voltage contact output at regular intervals. For example, the 2304-21 can be used to measure pulse output from a watthour meter or flowmeter.
- The 2304-21 is used with the power supply module, communications module, and module base.

Number of measurement channels	2 channels for voltage/contact pulse
Measurement range	16,000 k pulse/interval
Input pulse	4 kHz max. (voltage/contact)

(Conceptual image)

5.1.2 Major Features

- **The recording interval is selectable from 1 second to 60 minutes.**
- **The totals of measurements made during a recording interval can be recorded (with sampling once a second).**
- **The module has an alarm output terminal.**

Rough Estimate of Storable Data Quantity and Time

Action at memory full: Continue recording (Endless)

	Recording Mode
	Instantaneous Value
Quantity of storable data	26000
Recording interval	
1 sec.	7.5 hours
2 sec.	14.5 hours
5 sec.	1.5 days
10 sec.	3 days
15 sec.	4.5 days
20 sec.	6 days
30 sec.	9 days
1 min.	18 days
2 min.	36 days
5 min.	92 days
10 min.	184 days
15 min.	277 days
20 min.	369 days
30 min.	554 days
60 min.	1109 days

NOTE

When the alarm log is ON, the higher the number of alarms generated, the smaller the recording period.

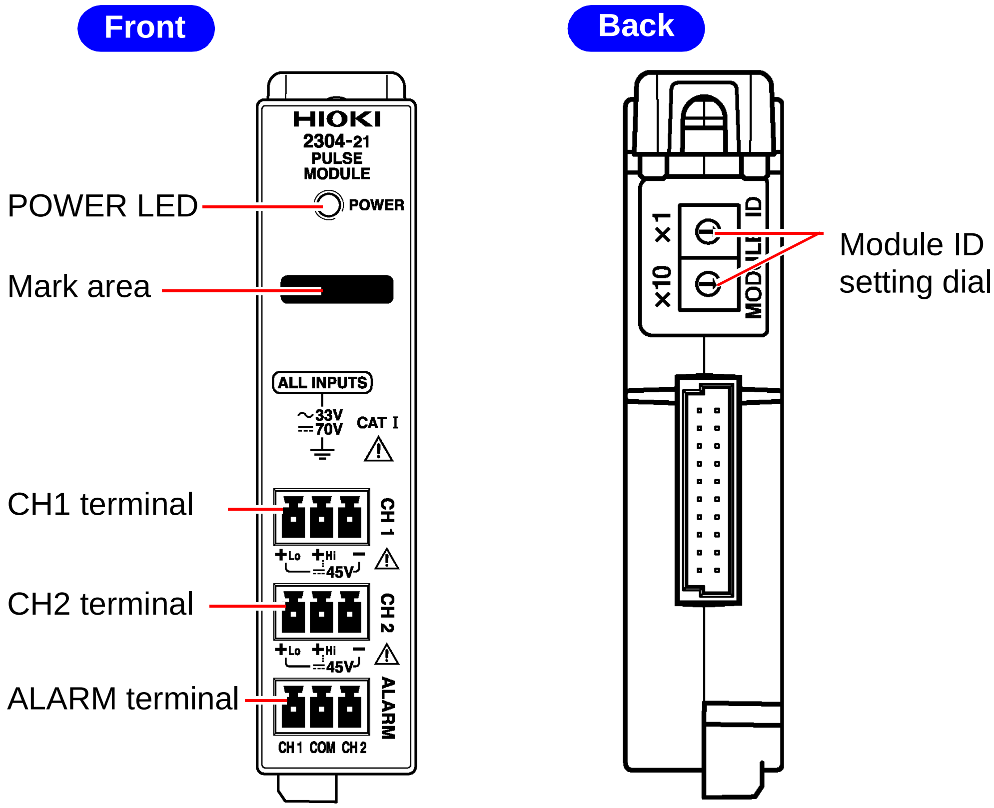
Action at memory full: Stop recording (Memory full stop)

	Recording Mode
	Instantaneous Value
Quantity of storable data	30000
Recording interval	
1 sec.	8.5 hours
2 sec.	17 hours
5 sec.	1.5 days
10 sec.	3.5 days
15 sec.	5 days
20 sec.	7 days
30 sec.	10 days
1 min.	21 days
2 min.	42 days
5 min.	106 days
10 min.	213 days
15 min.	319 days
20 min.	426 days
30 min.	639 days
60 min.	1279 days

NOTE

When the alarm log is ON, the higher the number of alarms generated, the smaller the recording period.

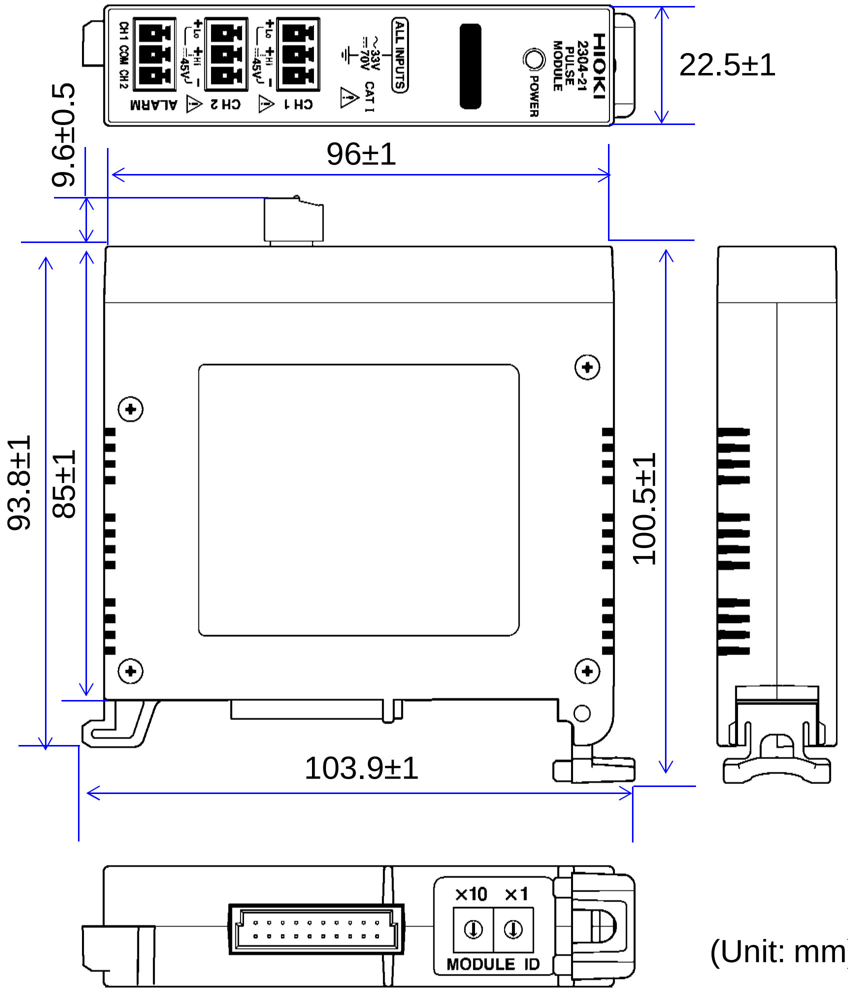
5.1.3 Name and Function of the Parts



POWER LED	Goes on or flashes when power is supplied to the module. Remains on, flashes, or changes to another color according to the state of the module. **POWER LED indication** Lit in green : Data being recorded. Flashing in green : Standing by. Lit in yellow : Alarm output. Lit in red : Non-recoverable error occurred. *1 Flashing in red: Recoverable error occurred. *2
Mark area	Use this area to make a note of the object to measure or the module ID. Use an ink pen, since pencil lead may rub off.
CH1 terminal	Connect the voltage pulse signal or contact pulse signal to this terminal (channel 1).
CH2 terminal	Connect the voltage pulse signal or contact pulse signal to this terminal (channel 2).
ALARM terminal	Connect the alarm output cable to this terminal. This terminal is electrically insulated from the CH1 and CH2 terminals.
Module ID setting dial	Use the dial to set the module's identification No.

*1: The module needs repair. Contact your dealer or Hioki representative.
*2: The same module ID may be used by another module.

5.1.4 Dimension Diagrams



(Unit: mm)

5.1.5 Accessory and Option

Accessories

Terminal block 3
Ferrite clamp 2

Option

None

5.2 Settings

5.2.1 Setting the Module ID

You can connect up to 63 measurement modules to one communications module.

Setting Procedure

Use the module ID setting dial to set the ID No. of the module to a number from 01 and to 63. (You cannot set a number other than the above.)

NOTE

- Ensure that the set ID is not used for any other module connected to the same communications module.
- The ID numbers of modules need not be consecutive.
- Setting the ID to 99, then turning on the power resets all internal settings to the defaults.
- The module ID and COM ID are not related and can be set independently.

5.3 Preparations

5.3.1 Installing the Module

(1) Installing the Module Base

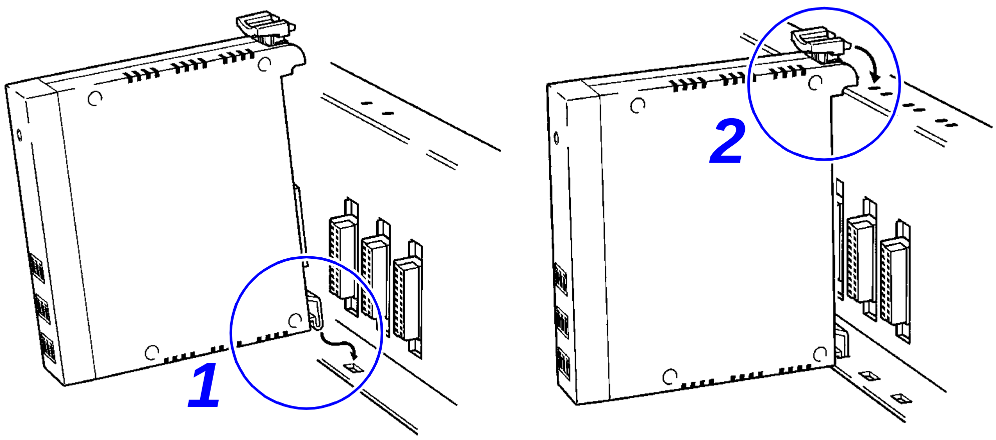
CAUTION

Do not mount the module base on the ceiling where it may fall off.

Fasten the module base to a DIN rail or the wall according to the procedure described in the **19 "2391-01, 2391-02, 2391-03 MODULE BASE"(P.305)** or **20 "2392-01/02 MODULE BASE"(P.319)** series MODULE BASE instruction manual.

(2) Mounting a Module on the Module Base

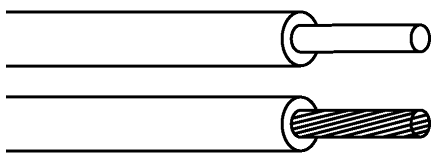
Mount a module on the module base as shown below. Ensure that the lever clicks.



5.3.2 Connecting Input/Output Cables

Recommended Cable

Single-wire	: 0.14 to 1.5 mm^2
Stranded-wire	: 0.14 to 1.5 mm^2
AWG	: 26 to 16
Cable strip length	: 5 mm (0.2")

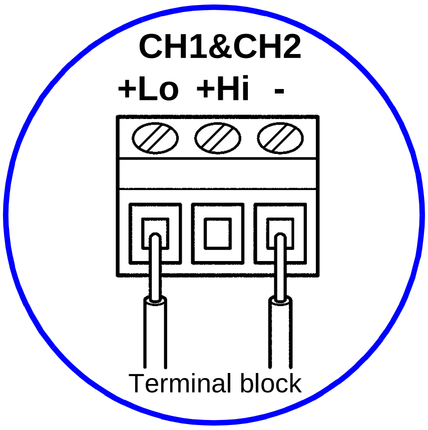


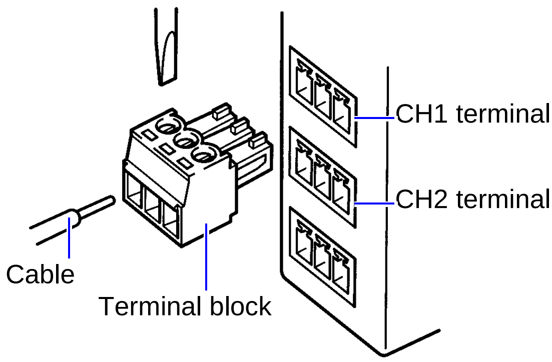
(1) Connecting to CH1 and CH2 Terminals (voltage/contact pulse signals input)

CAUTION

- The CH1 and CH2 terminals are not insulated from each other. Avoid short-circuiting.
- Note that the instrument may be damaged if the applied voltage exceeds the measurement range.

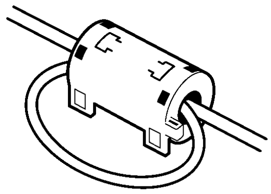
1. Use a flat blade screwdriver to loosen the screws on the terminal block.
2. Insert the cable for voltage or contact pulse signal input into the terminal block, then tighten the screws into the terminal block (at tightening torque of 0.25 N•m).
   For most cases, voltage or contact pulse signals can be detected when the module is operated with the positive terminal connected to +Lo.
   To connect the positive terminal of a voltage pulse signal, select either +Lo or +Hi according to the threshold voltage.
   Always connect the positive terminal of a no-voltage contact to +Lo
3. Connect the terminal block to the CH1 or CH2 terminal.





NOTE

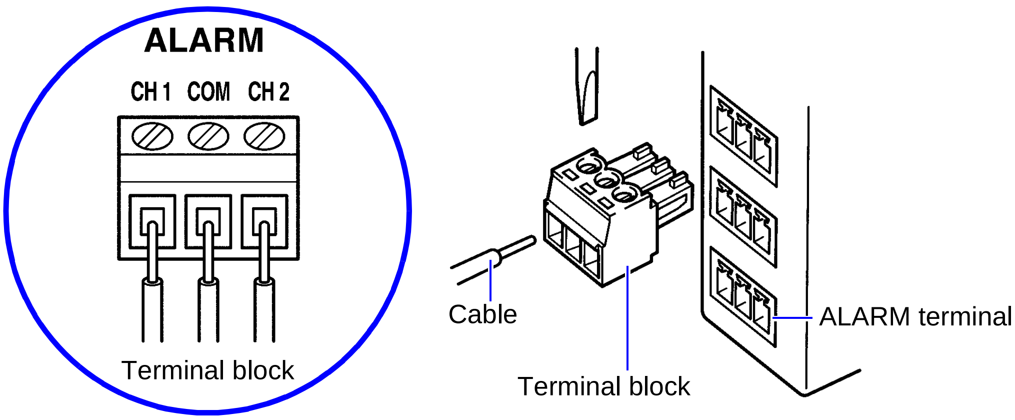
- There is no insulation between terminals CH1 and CH2. When measurement is conducted for two points with a difference in potential, the measured value may be affected. To avoid this, use electrically insulated sensors, or a further instrument.
- In case of external noise, wind the cable around the ferrite clamp supplied as an accessory as shown below.



- Note that measurement may be adversely affected by external noise or the electromagnetic environment when using a cable longer than 3 meters.

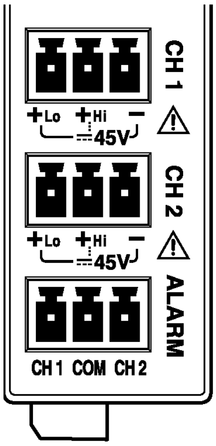
(2) Connecting Cables to the ALARM Terminal (Alarm output)

1. Use a flat head screwdriver to loosen the screws on the supplied terminal block.
2. Insert the cable for alarm output into the terminal block, then tighten the screws (at tightening torque of 0.25 N•m).
3. Connect the terminal block to the ALARM terminal.



Connect the cable for CH1 output to CH1 and COM; connect the cable for CH2 output to CH2 and COM.

(3) Connection Locations of Input/output Cables



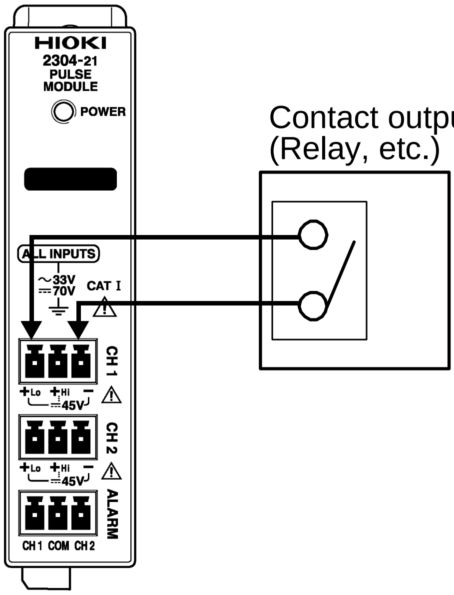
CH1 terminal (input)	+ Lo	+ Hi	−
	Voltage/ contact input (+) L:0 V to 0.2 V H:1.5 V to 45 V	Voltage input(+) L:0 V to 4 V H:10 V to 45 V	Voltage/ contact input (−)
CH2 terminal (input)	+ Lo	+ Hi	−
	Voltage/ contact input (+) L:0 V to 0.2 V H:1.5 V to 45 V	Voltage input(+) L:0 V to 4 V H:10 V to 45 V	Voltage/ contact input (−)
ALARM terminal (output)	CH1	COM	CH2
	Alarm output	Common	Alarm output

5.4 Others

5.4.1 Examples of Connections According to Type of Device Coupled

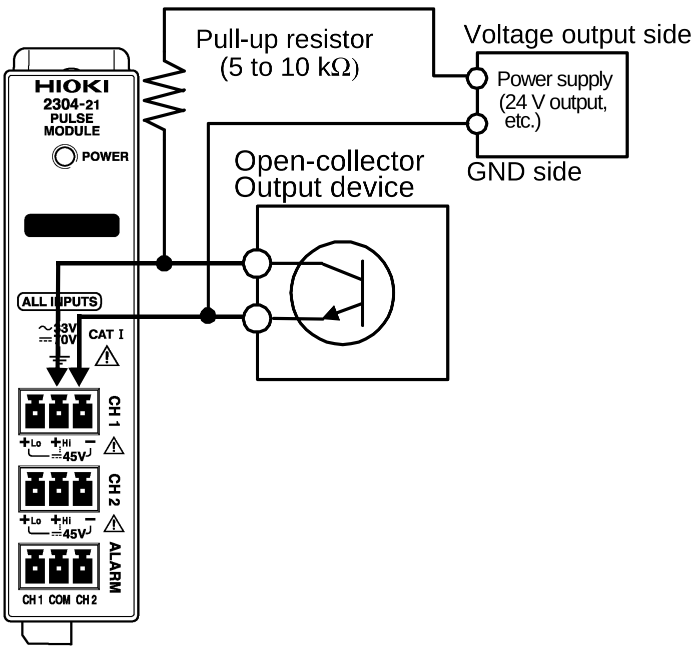
(1) Contact Output Devices (Relays, Open-Collector Output, Etc.)

Connect a contact output device to "+Lo" and "-" of CH1.



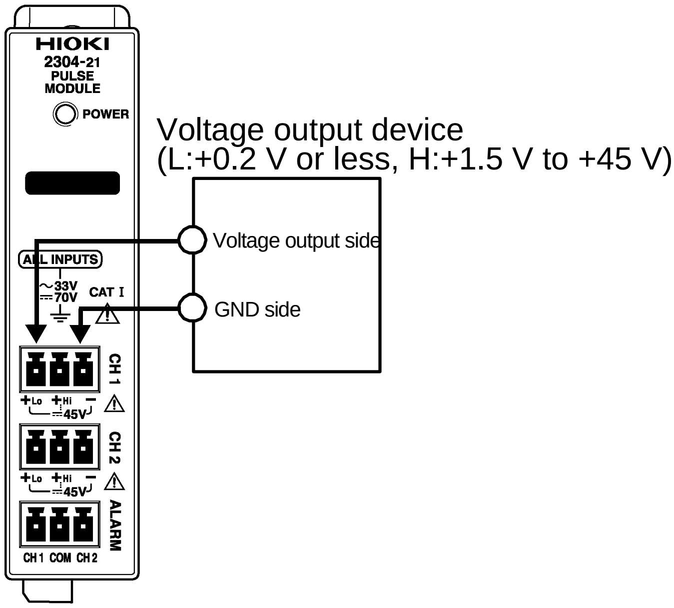
(2) Open-Collector Device (When ON Resistance Is Large)

Some open-collector devices may have such a high ON resistance that pulse signals cannot be detected by the method of (1). To couple the module to such devices, prepare a power supply of 10 to 45 V and a resistor, make pull-up as illustrated below, and connect cables to +Hi and - of CH1.



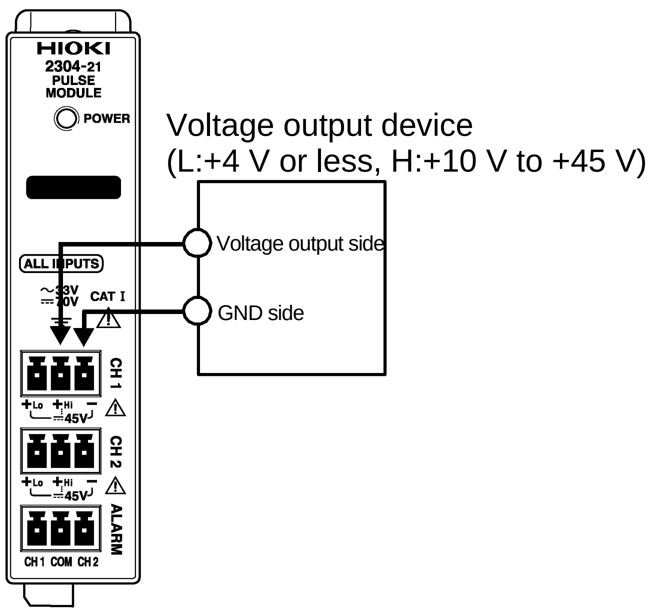
(3) Voltage Output Device (L: +0.2 V or Less, H: +1.5 to +45 V)

A device that outputs a voltage within the threshold ranges indicated above should be coupled to +Lo and - of CH1.



(4) Voltage Output Device (L: +4 V or Less, H: +10 to +45 V)

A device that outputs a voltage within the threshold ranges indicated above should be coupled to +Hi and - of CH1.



5.4.2 Alarm output

(1) Output Rating

WARNING

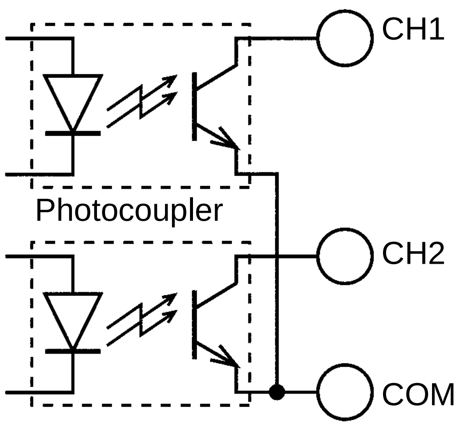
Ensure that the input does not exceed the maximum input voltage or current to avoid module damage, short-circuiting and electric shock resulting from heat building.

Output method	Open collector
Maximum input voltage / current	30 V, 20 mA max.
Signal logic	Enabled: ON Disabled: OFF

(1) Internal Circuit

The alarm output circuit is configured as shown below.

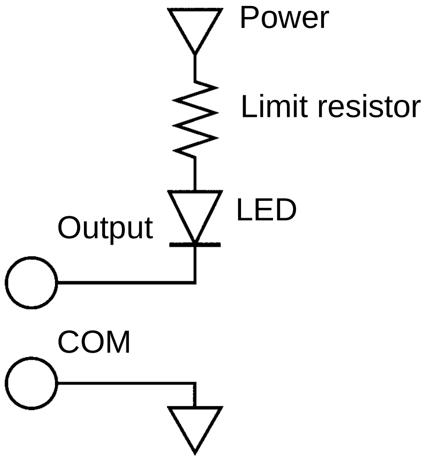
<Internal circuit>



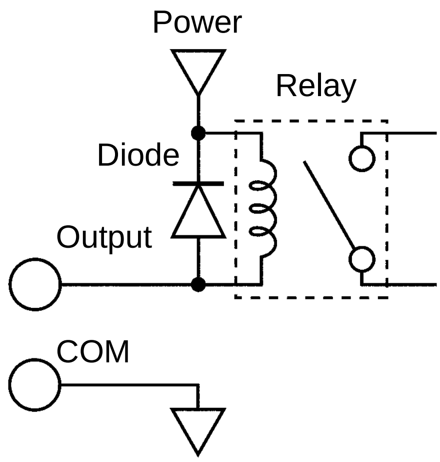
NOTE

- Signal logic indicates the signal state in which a signal's function is enabled.
- The output transistor works as a switch between signal output and ground in the module. When output becomes enabled, the switch is turned on and current flows from the output signal to COM in the module. Therefore, a relay or LED lamp can be connected directly to the output terminal (P.88).

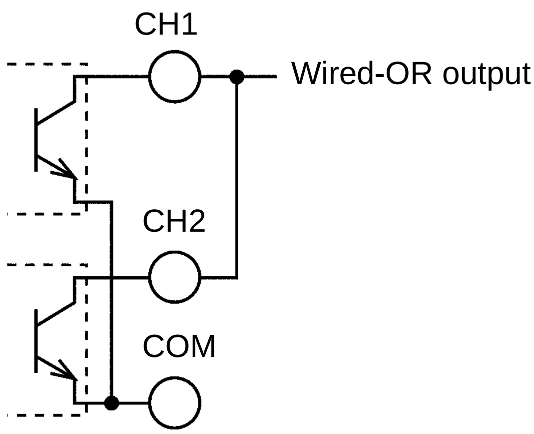
<Circuit diagram>



Connecting LED



Connecting relay



Using on Wired-OR Logic

NOTE

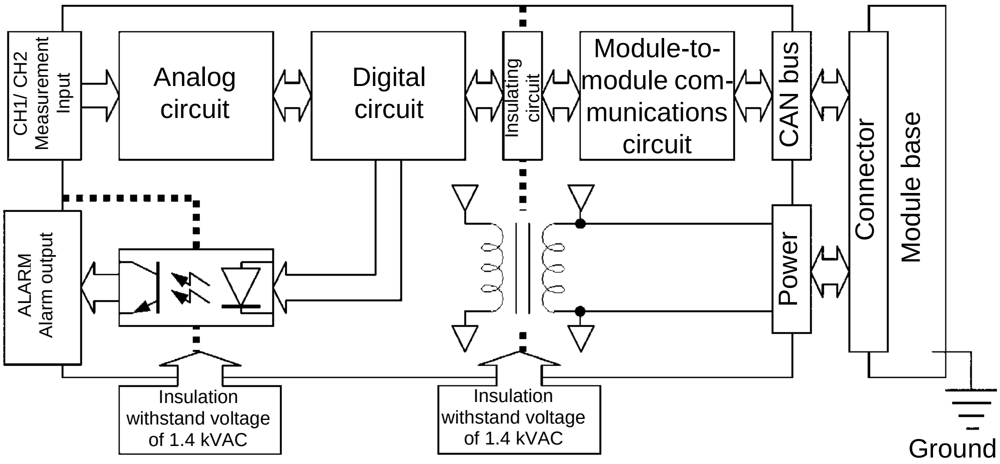
- When connecting a relay or LED lamp, ensure that the relay or lamp operates at up to 30 V and 20 mA. When connecting a relay, be sure to use a diode to absorb counter electromotive force.
- Open collector output operates on wired-OR logic by short-circuiting CH1 and CH2. Moreover, it enables the signal if an alarm occurs in either channel.

5.4.3 Insulation of Internal Circuit

CAUTION

The CH1 and CH2 terminals are not insulated from each other.
When measuring two measurement points having a potential difference, equalize the ground level potential of these two points, or use another 2304-21 Module, since measurements may be adversely affected.

In the 2304-21, the input circuit and alarm output are insulated from the CAN bus as shown in the block diagram below. (Withstand voltage: 1.4 kVAC, 50/60 Hz, Response current: 5 mA, 1 minute)



NOTE

The COM terminal of the alarm output terminal is used for both CH1 and CH2.

5.5 Specifications

5.5.1 Basic Specifications

Number of inputs	Voltage or no-voltage contact pulse input x 2 channels
Measurement range	Voltage/no-voltage contact pulse up to 4 kHz (Input terminals set by commands) • Lo range, no-voltage contact terminals Voltage pulse A pulse is counted when the voltage level changes from L to H. L: +0.0 to +0.2 V H: +1.5 to +45 V (Logic in the range from +0.2 to +1.5V is indefinite.) No-voltage contact pulse: A pulse is counted when the circuit between the terminals changes from a short circuit to an open circuit. Contact Detection Level: short circuit of 500 Ω or less open circuit of 500 kΩ or more • High range, terminals Voltage pulse A pulse is counted when the voltage level changes from L to H. L: +0.0 to +4.0 V H: +10.0 to +45 V (Logic in the range from +4.0 to +10.0V is indefinite.)
Filter	Effective for voltage/no-voltage contact pulse input (set by a command). • For mechanical contact Pulse width: 20 ms or more Pulse separation: 40 ms or more (Frequency: 25 Hz or less)
Measurement accuracy	±1 dgt. Recording interval accuracy: ±2 ms Display range: Total of each channel at every interval (16,000,000 max.)
Clock accuracy	±100 ppm (Reference value at temperature from 0 to 50°C without the communications module)
Guaranteed accuracy period	1 year
Sampling	1 time / sec.
Input terminal	3 Input terminal block × 2

5.5.2 Function Specifications

Execute the functions from the PC application via communications.

Monitoring function

This function outputs the current measured values (instantaneous values).

Measured value recording function

Measurements are recorded at a set recording interval.	
Real-time management	This is automatically set from the PC application at the start of recording.
Recording start	Immediate start/Reserved-time start
Recording end	Manual end/Reserved-time end
Operation when memory is full	Memory full stop /Endless ♦Set the condition before the start of recording.
Recording interval	1/2/5/10/15/20/30 sec., 1/2/5/10/15/20/30/60 min.

Recording mode	Instantaneous value recording mode (Total during the interval)
Recorded data	One data set contains time, recording data (for 2 channels).
Recording capacity	512 k bytes Flash memory
Quantity of recorded data	Instantaneous value recording mode: 30,000 data × 2 CH
Power outage protection	After recovering from a power outage, the instrument automatically returns to the state held before the outage.

Alarm judgment and recording function

Alarm judgment is made at every sampling, and the history will be recorded in flash memory if the measured value recording function remains active.	
Judgment method	Criterion threshold can be set to either Hi or Lo. Hi: The total at every sampling is judged within the interval. Lo: The total is judged at every interval.
Recorded data	One data set contains time, generation/reversion, CH and judgment threshold.
Alarm output	Alarm output × 2 CH ♦Output is turned ON when an alarm (Hi or Lo) occurs. Whether to hold the alarm output can be selected. The reset switch or a command can be used to reset alarms.

5.5.3 General Specifications

Backup	Recorded data (saved in flash memory) ♦Data loss for up to 2 minutes before and after a power outage may occur.
Communication interface	CAN bus
Maximum rated voltage to earth	33 Vrms, 70 VDC
Maximum input voltage	45 VDC
Alarm output	Open collector: 30 VDC, 20 mA max.
Rated supply voltage	5 VDC±0.3 V
Maximum rated power	1.4 W
Dielectric strength	1.4 kVAC (Between input and alarm output, Input/Output and CAN bus) (50/60 Hz, Response current 5 mA, one minutes)
Dimensions	Approx.22.5W × 96H × 85D mm (0.89"W × 3.78"H × 3.35"D)(excluding projections)
Mass	Approx.120 g (4.2 oz.)
Accessories	Terminal block .... 3 Ferrite clamp 2
Operating temperature and humidity	0 to 50°C (32 to 122°F), 80%RH or less (non-condensating)
Storage temperature and humidity	-10 to 50°C (14 to 122°F), 80%RH or less (non-condensating)
Operating environment	Indoors, altitude up to 2000 m (6562-ft.)
Applicable standards	Safety EN61010 Pollution degree 2, Measurement Category I (anticipated transient overvoltage 330 V) EMC EN61326, Class A

2305-20 INSTRUMENTATION MODULE 6

6.1 Overview

6.1.1 Product Overview

- The 2305-20 is a measurement module of Hioki "Smart Site" (remote measurement system).
- This module measures and records DC analog signal at regular intervals.
- This module measures up to ±50 VDC and 100 mADC (including 1 V to 5 VDC and 4 mA to 20 mADC) used for instrumentation.
- One module can be used for measurement at two locations.
- The 2304-21 is used with the power supply module, communications module, and module base.

Number of measurement channels	(Voltage / Current) 2 CH
Measurement range	±50 mV / 500 mV / 5 V / 50 V, -2 mA to +110 mA

(Conceptual image)

6.1.2 Major Features

- **The recording interval is selectable from 1 second to 60 minutes.**
- **The maximum, minimum, and average measurements during the recording interval can be recorded (with sampling once a second).**
- **The module has an alarm output terminal.**

Rough Estimate of Storable Data Quantity and Time

Action at memory full: Continue recording (Endless)

	Recording Mode		
	Instantaneous Value	MAX/MIN/AVE	Instantaneous Value +MAX/MIN/AVE
Quantity of storable data	26000	13000	10000
Recording interval			
1 sec.	7.5 hours	3.5 hours	2.5 hours
2 sec.	14.5 hours	7 hours	5.5 hours
5 sec.	1.5 days	18 hours	14.5 hours
10 sec.	3 days	1.5 days	1 day
15 sec.	4.5 days	2 days	1.5 days
20 sec.	6 days	3 days	2 days
30 sec.	9 days	4.5 days	3.5 days
1 min.	18 days	9 days	7 days
2 min.	36 days	18 days	14 days
5 min.	92 days	46 days	36 days
10 min.	184 days	92 days	73 days
15 min.	277 days	138 days	110 days
20 min.	369 days	184 days	147 days
30 min.	554 days	277 days	221 days
60 min.	1109 days	554 days	443 days

NOTE

When the alarm log is ON, the higher the number of alarms generated, the smaller the recording period. (Approx. 1 of the data per alarm)

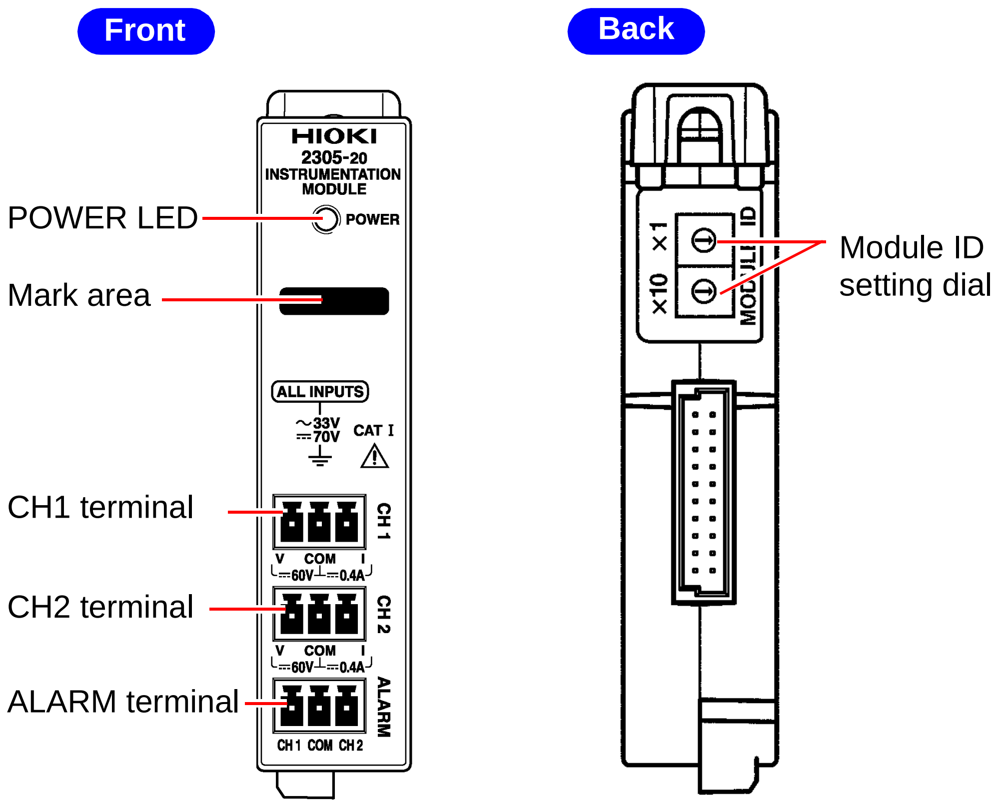
Action at memory full: Stop recording (Memory full stop)

	Recording Mode		
	Instantaneous Value	MAX/MIN/AVE	Instantaneous Value +MAX/MIN/AVE
Quantity of storable data	30000	15000	12000
Recording interval			
1 sec.	8.5 hours	4 hours	3 hours
2 sec.	17 hours	8.5 hours	6.5 hours
5 sec.	1.5 days	21 hours	17 hours
10 sec.	3.5 days	1.5 days	1.5 days
15 sec.	5 days	2.5 days	2 days
20 sec.	7 days	3.5 days	2.5 days
30 sec.	10 days	5 days	4 days
1 min.	21 days	10 days	8 days
2 min.	42 days	21 days	17 days
5 min.	106 days	53 days	42 days
10 min.	213 days	106 days	85 days
15 min.	319 days	159 days	127 days
20 min.	426 days	213 days	170 days
30 min.	639 days	319 days	255 days
60 min.	1279 days	639 days	511 days

NOTE

When the alarm log is ON, the higher the number of alarms generated, the smaller the recording period. (Approx. 1 of the data per alarm)

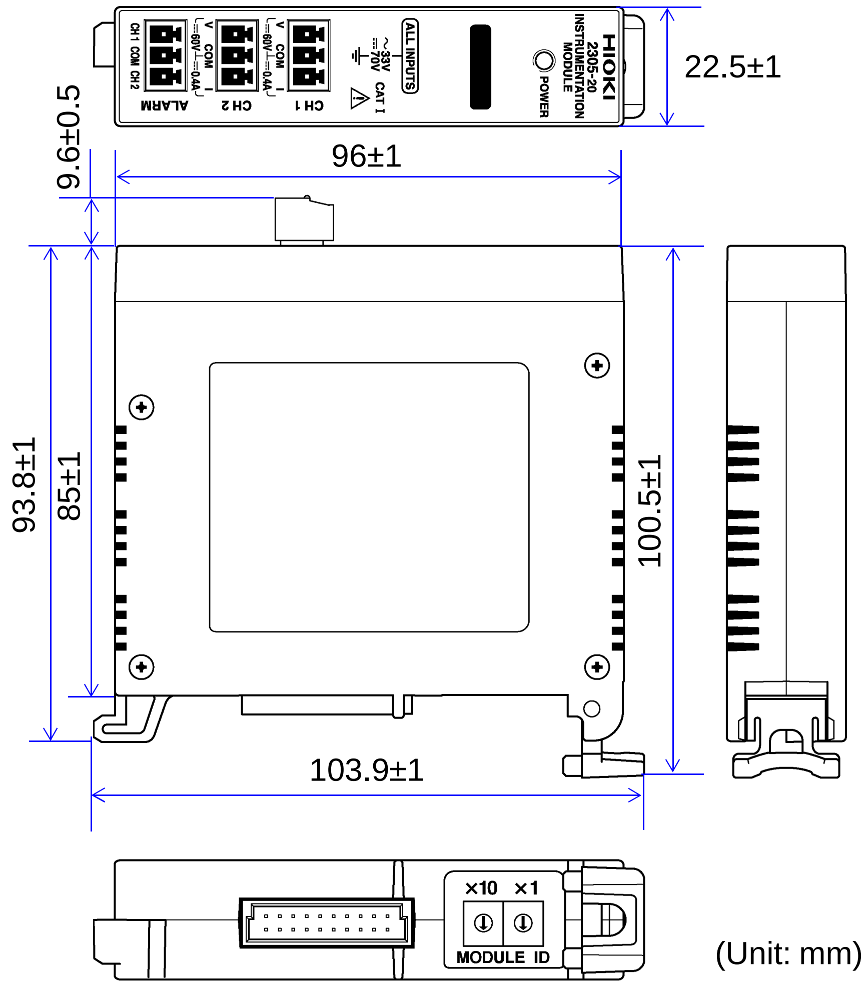
6.1.3 Name and Function of the Parts



POWER LED	Goes on or flashes when power is supplied to the module. Remains on, flashes, or changes to another color according to the state of the module. **POWER LED indication** Lit in green : Data being recorded. Flashing in green : Standing by. Lit in yellow : Alarm output. Flashing in yellow: Overrange detected. Lit in red : Non-recoverable error occurred. *1 Flashing in red : Recoverable error occurred. *2
Mark area	Use this area to make a note of the object to measure or the module ID. Use an ink pen, since pencil lead may rub off.
CH1 terminal	Connect a DC voltage signal or DC current signal to this terminal (channel 1).
CH2 terminal	Connect a DC voltage signal or DC current signal to this terminal (channel 2).
ALARM terminal	Connect the alarm output cable to this terminal. This terminal is electrically insulated from the CH1 and CH2 terminals.
Module ID setting dial	Use the dial to set the module's identification No.

*1: The module needs repair. Contact your dealer or Hioki representative.
*2: The same module ID may be used by another module.

6.1.4 Dimension Diagrams



(Unit: mm)

6.1.5 Accessory and Option

Accessories

Ferrite clamp 2
Terminal block 3

Option

None

6.2 Settings

6.2.1 Setting the Module ID

You can connect up to 63 measurement modules to one communications module.

Setting Procedure

Use the module ID setting dial to set the ID No. of the module to a number from 01 and to 63. (You cannot set a number other than the above.)

NOTE

- Ensure that the set ID is not used for any other module connected to the same communications module.
- The ID numbers of modules need not be consecutive.
- Setting the ID to 99, then turning on the power resets all internal settings to the defaults.
- The module ID and COM ID are not related and can be set independently.

6.3 Preparations

6.3.1 Installing the Module

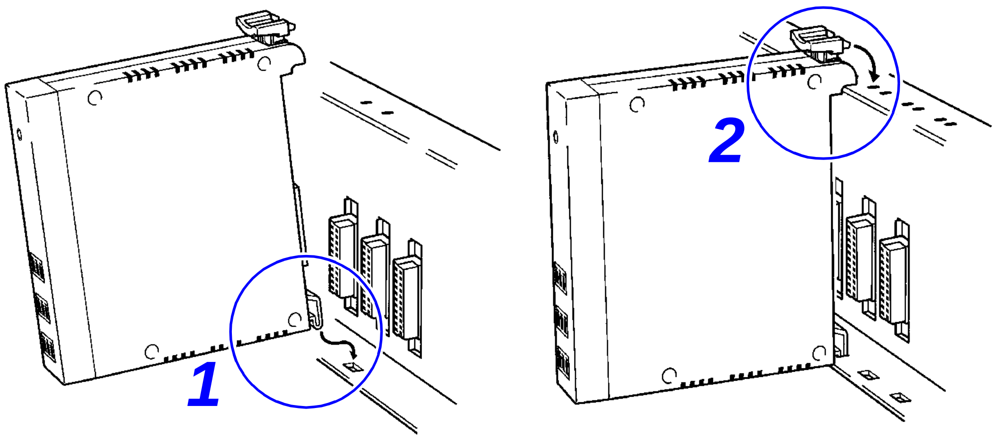
CAUTION

Do not mount the module base on the ceiling where it may fall off.

Fasten the module base to a DIN rail or the wall according to the procedure described in the **19 "2391-01, 2391-02, 2391-03 MODULE BASE"(P.305)** or **20 "2392-01/02 MODULE BASE"(P.319)** series MODULE BASE instruction manual.

(1) Mounting a Module on the Module Base

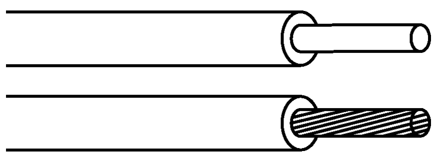
Mount a module on the module base as shown below. Ensure that the lever clicks.



6.3.2 Connecting Input/Output Cables

Recommended Cable

Single-wire	: 0.14 to 1.5 mm^2
Stranded-wire	: 0.14 to 1.5 mm^2
AWG	: 26 to 16
Cable strip length	: 5 mm (0.2")

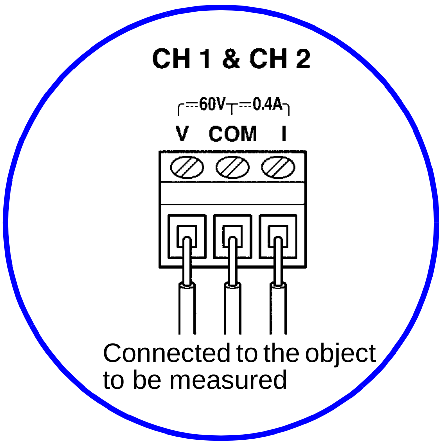


(1) Connecting Cables to the CH1, CH2 Terminals (DC Current / Voltage Signal Input)

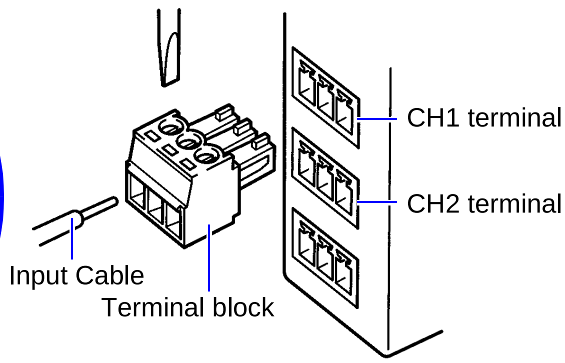
WARNING

Maximum input voltage and current is ±60 V / ±0.4 A.Ensure that the input does not exceed the maximum input voltage or current to avoid module damage, short-circuiting and electric shock resulting from heat building.

1. Use a flat blade screwdriver to loosen the screws on the terminal block.
2. Insert a cable for DC voltage or DC current signal input into the terminal block, then tighten the screws (at a tightening torque of 0.25 N•m).
3. Connect the terminal block to the CH 1 or CH 2 terminal.

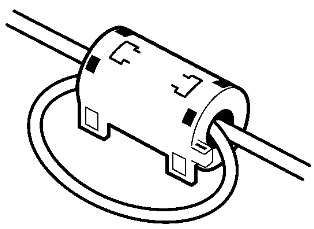


Terminal block



NOTE

- One channel is used for measuring current or voltage.
- The CH1 and CH2 terminals are not insulated from each other. When measuring two measurement points having a potential difference, equalize the ground level potential of these two points, or use another 2305-20, since measurements may be adversely affected.
- In case of external noise, wind the cable around the ferrite clamp supplied as an accessory as shown below.



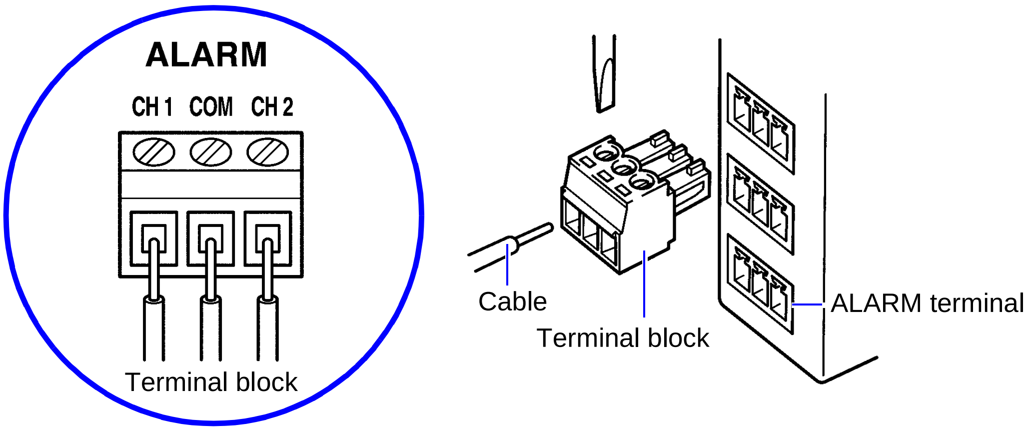
- Note that measurement may be adversely affected by external noise or the electromagnetic environment when using a cable longer than 3 meters.

(2) Connecting Cables to the ALARM Terminal (Alarm output)

1. Use a flat blade screwdriver to loosen the screws on the terminal block.

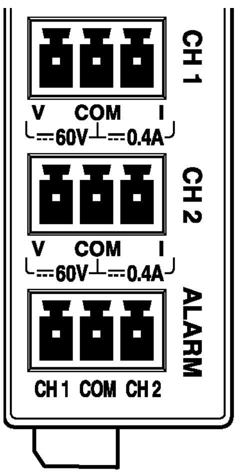
2. Insert a cable for alarm output into the terminal block, then tighten the screws (at a tightening torque of 0.25 N•m).

3. Connect the terminal block to the ALARM terminal.



Connect the cable for CH1 output to CH1 and COM; and connect the cable for CH2 output to CH2 and COM.

(3) The Location of the Input/Output Cable



CH 1 terminal (Input)	**V**	**COM**	**I**
	DC voltage input	Common	DC current input
CH 2 terminal (Input)	**V**	**COM**	**I**
	DC voltage input	Common	DC current input
ALARM terminal (output)	**CH1**	**COM**	**CH2**
	Alarm output	Common	Alarm output

6.4 Others

6.4.1 Alarm Output

(1) Output Rating

WARNING

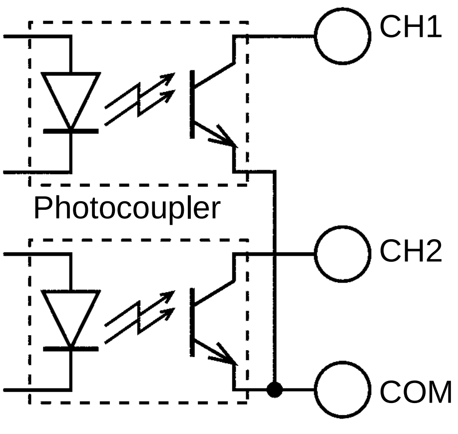
Ensure that the input does not exceed the maximum input voltage or current to avoid module damage, short-circuiting and electric shock resulting from heat building.

Output method	Open collector
Maximum input voltage / current	30 V, 20 mA max.
Signal logic	Enabled: ON Disabled: OFF

(2) Internal Circuit

The alarm output circuit is configured as shown below.

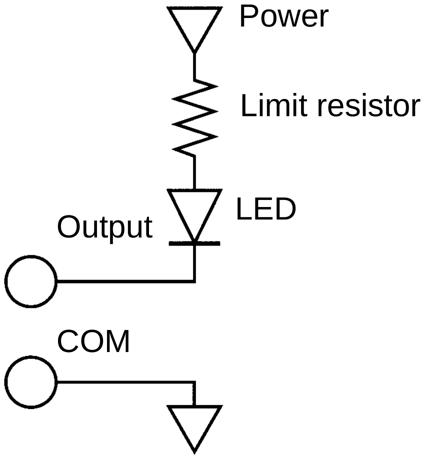
<Internal circuit>



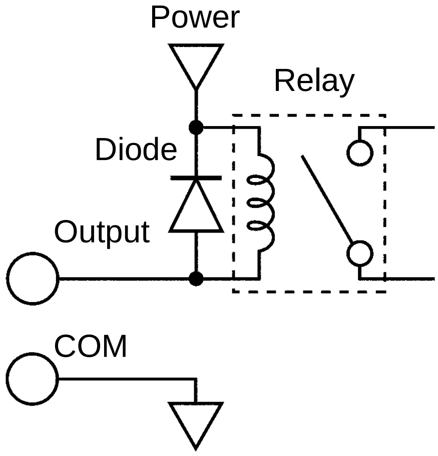
NOTE

- Signal logic indicates the signal state in which a signal's function is enabled.
- The output transistor works as a switch between signal output and ground in the module. When output becomes enabled, the switch is turned on and current flows from the output signal to COM in the module. Therefore, a relay or LED lamp can be connected directly to the output terminal (P.103).

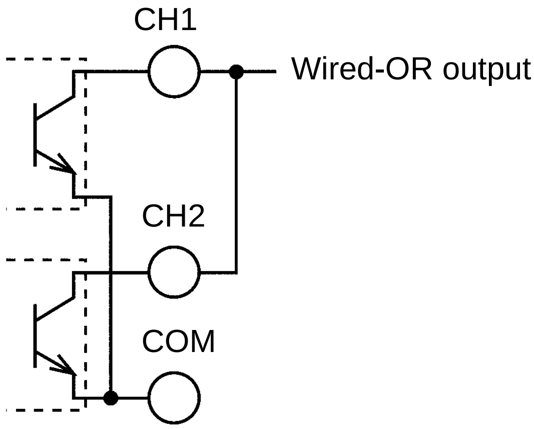
<Circuit diagram>



Connecting LED



Connecting relay



Using on Wired-OR Logic

NOTE

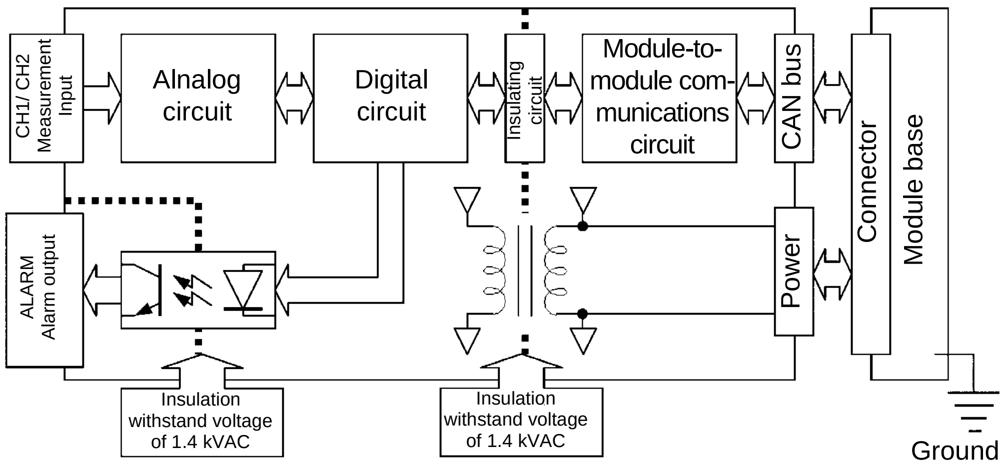
- When connecting a relay or LED lamp, ensure that the relay or lamp operates at up to 30 V and 20 mA. When connecting a relay, be sure to use a diode to absorb counter electromotive force.
- Open collector output operates on wired-OR logic by short-circuiting CH 1 and CH 2. Moreover, it enables the signal if an alarm occurs in either channel.

6.4.2 Insulation of Internal Circuit

CAUTION

The CH1 and CH2 terminals are not insulated from each other.
When connecting signals different in potential to these terminals, use an additional measurement module or insulate the signals externally before connection to the terminals. This will prevent module errors and malfunction.

In the 2305-20, the input circuit and alarm output are insulated from the CAN bus as shown in the block diagram below. (Withstand voltage: 1.4 kVAC, 50/60 Hz, Response current: 5 mA, 1 minute)



NOTE

The COM terminal of the alarm output terminal is used for both CH1 and CH2.

6.5 Specifications

6.5.1 Basic Specifications

Number of inputs	(Current or voltage) × 2 CH
Measurement range	Voltage: ±50 mV / ±500 mV / ±5 V / ±50 V Current: -2 mA to 110 mA ♦3½ digits resolution, set the measurement functions (including the range) before the start of recording.
Measurement accuracy	±0.3%rdg. ±5 dgt.
Period of guaranteed accuracy	1 year
Influence of radiated radio-frequency electromagnetic field	±30dgt. at 10 V/m
Sampling	1 time / sec.
Input terminal	3 Input terminal block × 2
Warm-up time	1 hour

6.5.2 Function Specifications

Execute the functions from the PC application via communications.

Monitoring function

This function outputs the current measured values (instantaneous values).

Measured value recording function

Measurements are recorded at a set recording interval.	
Real-time management	This is automatically set from the PC application at the start of recording.
Recording start	Immediate start/Reserved-time start
Recording end	Manual end/Reserved-time end
Operation when memory is full	Memory full stop /Endless ♦Set the condition before the start of recording.
Recording interval	1/2/5/10/15/20/30 sec., 1/2/5/10/15/20/30/60 min.
Recording mode	• Instantaneous value • MAX/MIN/AVE • Instantaneous value + MAX/MIN/AVE Total 3 modes ♦Set the mode before the start of recording.
Recorded data	One data set contains time and temperature/humidity information (2 channel each). ♦Data is scaled if scaling is ON.
Recording capacity	512 k bytes Flash memory
Quantity of recorded data	• Instantaneous value recording mode: 30,000 data × 2 CH • MAX/MIN/AVE recording mode: 15,000 data × 2 CH • Instantaneous value + MAX/MIN/AVE recording mode: 12,000 data × 2 CH
Power outage protection	After recovering from a power outage, the instrument automatically returns to the state held before the outage.

Alarm judgment and recording function

Alarm judgment is made at every sampling, and the history will be recorded in flash memory if the measured value recording function remains active.	
Judgment method	Criterion threshold can be set to either Hi or Lo. The instantaneous value at every sampling is judged (effective in any measurement mode.).
Recorded data	One data set contains time, generation/reversion, CH and judgment threshold.
Alarm output	Alarm output × 2 CH ♦Output is turned ON when an alarm (Hi or Lo) occurs. Whether to hold the alarm output can be selected. The reset switch or a command can be used to reset alarms.

6.5.3 General Specifications

Clock accuracy	±100 ppm (Reference value at temperature from 0 to 50°C (32 to 122°F) without the communications module)
Backup	Recorded data (saved in flash memory) ♦Data loss for up to 2 minutes before and after a power outage may occur.
Communication interface	CAN bus
Input resistance	Voltage input: 960 kΩ±5% (5 V, 50 V range), 10 MΩ min. (50 mV, 500 mV range) Current input: 10 Ω±5%
Maximum input voltage / current	Voltage input: ±60 VDC Current input: ±0.4 ADC
Maximum rated voltage to earth	33 Vrms, 70 VDC (Total with input voltage)
Alarm output	Open collector: 30 VDC, 20 mA max.
Rated supply voltage	5 V±0.3 VDC
Maximum rated power	1.4 W
Dielectric strength	1.4 kVAC Between input and alarm output, Input/Output and CAN bus (50/60 Hz, Response current 5 mA, one minutes
Dimensions	Approx. 22.5W × 96H × 85D mm, (0.89"W × 3.78"H × 3.35"D) (excluding projections)
Mass	Approx. 120 g (4.2 oz.)
Accessories	Ferrite clamp........2 Terminal block........3
Operational ranges for temperature and humidity	0 to 50°C (32 to 122°F), 80%RH or less (with no condensation)
Temperature and humidity ranges for storage	-10 to 50°C (14 to 122°F), 80%RH or less (with no condensation)
Operating environment	Indoors, altitude up to 2000 m (6562-ft.)
Standards applying	Safety EN61010, Pollution Degree 2, Measurement Category I (anticipated transient overvoltage 330 V) EMC EN61326, CLASS A

2306-20 MULTIFUNCTION MODULE

7

7.1 Overview

7.1.1 Product Overview

The 2306-20 is a measurement module of Hioki "Smart Site" (remote measurement system).
This module measures and records DC analog signal at regular intervals.
This module is used in temperature measurement with a thermocouple or a 3-wire platinum
resistance as well as to measure 1 V to 5 VDC and 4 mA to 20 mA DC used for instrumentation.
One module can be used for measurement at eight locations, and the items to be measured can be selected for each CH. All the CH are insulated from each other and can be used with the power supply module, communications module, and module base.

Number of measurement channels	8CH
Measurement items	The following items can be selected for each CH. Thermocouple: K/E/J/T/R 3-wire platinum resistance: Pt100/JPt100 Direct voltage Direct Current
Measurement range	Thermocouple: -200 to1700°C 3-wire platinum resistance: -200 to 800°C Direct voltage: ±50 mV/500 mV/5 V/50 V Direct Current: ±30 mA

7.1.2 Major Features

- **The recording interval is selectable from 1 second to 60 minutes.**
- **The maximum, minimum, and average measurements during the recording interval can be recorded (with sampling once a second).**
- **The digital filter function makes stable measurement possible without the interference of utility frequency noise (50/60 Hz). (with sampling once a 2 sec.)**

Rough Estimate of Storable Data Quantity and Time

Action at memory full: Continue recording (Endless)

	Recording Mode		
	Instantaneous Value	MAX/MIN/AVE	Instantaneous Value +MAX/MIN/AVE
Quantity of storable data	49140	18900	14430
Recording interval			
1 sec.	13 hours	5 hours	4 hours
2 sec.	1 days	10.5 hours	8 hours
5 sec.	2.5 days	1 days	20 hours
10 sec.	5.5 days	2 days	1.5 days
15 sec.	8.5 days	3 days	2.5 days
20 sec.	11 days	4 days	3 days
30 sec.	17 days	6 days	5 days
1 min.	34 days	13 days	10 days
2 min.	68 days	26 days	20 days
5 min.	171 days	66 days	50 days
10 min.	341 days	131 days	100 days
15 min.	512 days	197 days	150 days
20 min.	683 days	263 days	200 days
30 min.	1024 days	394 days	301 days
60 min.	2048 days	788 days	601 days

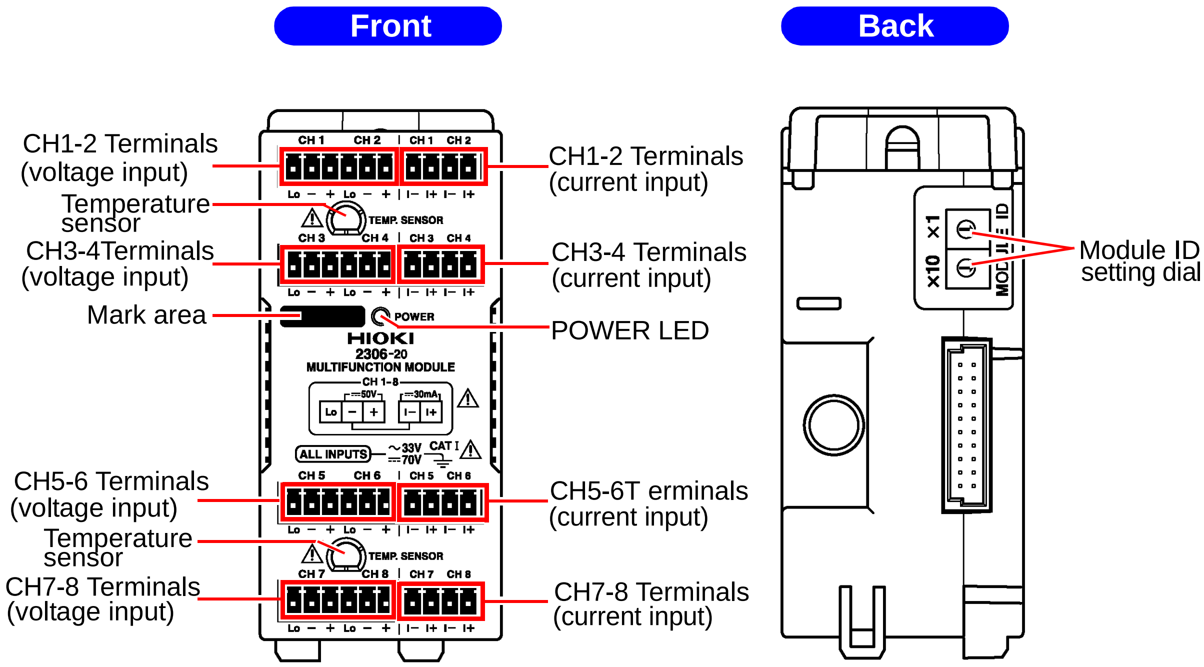
Action at memory full: Stop recording (Memory full stop)

	Recording Mode		
	Instantaneous Value	MAX/MIN/AVE	Instantaneous Value +MAX/MIN/AVE
Quantity of storable data	50778	19530	14911
Recording interval			
1 sec.	14 hours	5 hours	4 hours
2 sec.	1 days	10.5 hours	8 hours
5 sec.	2.5 days	1 days	20.5 hours
10 sec.	5.5 days	2 days	1.5 days
15 sec.	8.5 days	3 days	2.5 days
20 sec.	11.5 days	4.5 days	3 days
30 sec.	17.5 days	6.5 days	5 days
1 min.	35 days	13.5 days	10 days
2 min.	71 days	27 days	20.5 days
5 min.	176 days	68 days	52 days
10 min.	353 days	136 days	104 days
15 min.	529 days	203 days	155 days
20 min.	705 days	271 days	207 days
30 min.	1058 days	407 days	311 days
60 min.	2116 days	814 days	621 days

NOTE

When the alarm log is ON, the higher the number of alarms generated, the smaller the recording period. (Approx. 1 of the data per alarm)

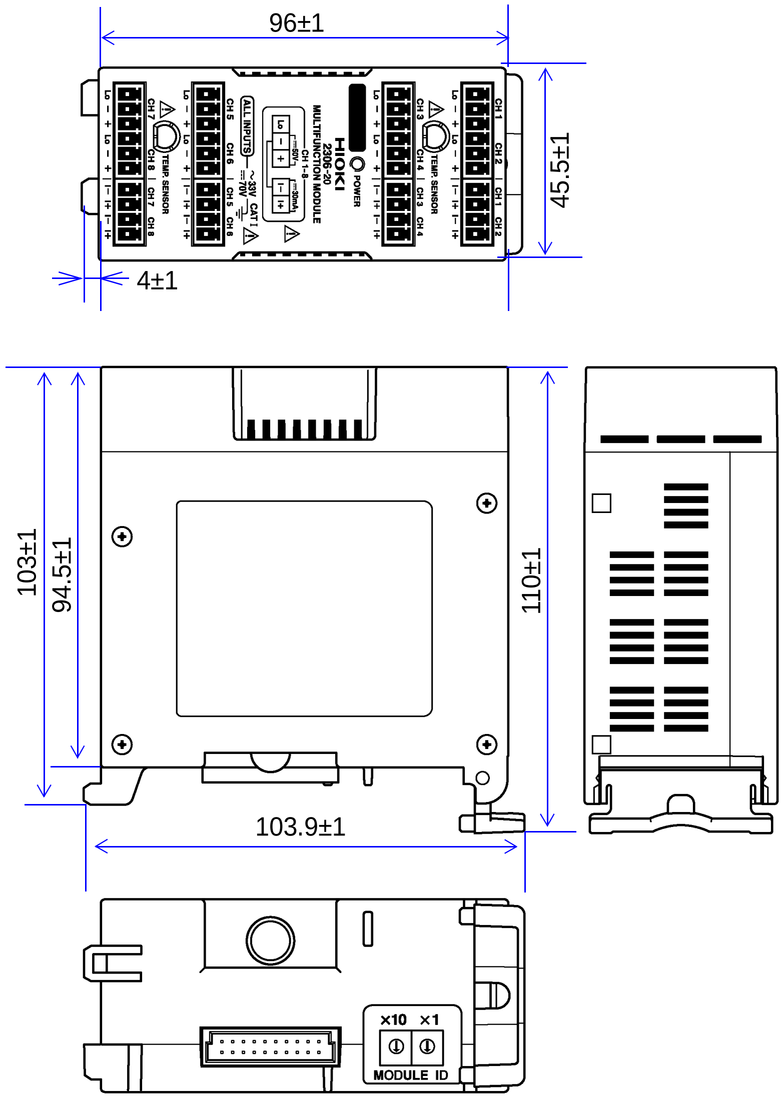
7.1.3 Name and Function of the Parts



POWER LED	Goes on or flashes when power is supplied to the module. Remains on, flashes, or changes to another color according to the state of the module. **POWER LED indication** Lit in green : Data being recorded. Flashing in green : Standing by. Flashing in yellow: Overrange detected., Broken wires in the thermocouple Lit in red : Non-recoverable error occurred. *1 Flashing in red : Recoverable error occurred. *2
Mark area	Use this area to make a note of the object to measure or the module ID. Use an ink pen, since pencil lead may rub off.
CH 1-8 Terminals (voltage input)	Connect a thermocouple, 3-wire platinum resistance, or DC voltage signal to these terminals.
CH 1-8 Terminals (current input)	DC current signal to these terminals.
Temperature sensor	Thermocouple temperature measurement sensor (reference junction compensation: internal). *3
Module ID setting dial	Use the dial to set the module's identification No.

*1 The module needs repair. Contact your dealer or Hioki representative.
*2 The same module ID may be used by another module.
*3 Do not touch or blow strongly at the instrument during recording.
Accurate measurement may be disrupted.

7.1.4 Dimension Diagrams



(Unit:mm)

7.1.5 Accessory and Option

Accessories

Terminal block (6 polarities)..4
Terminal block (4 polarities)..4
Sticker for the terminal block 1

Option

None

7.2 Settings

7.2.1 Setting the Module ID

You can connect up to 63 measurement modules to one communications module.

Setting Procedure

Use the module ID setting dial to set the ID No. of the module to a number from 01 and to 63. (You cannot set a number other than the above.)

NOTE

- Ensure that the set ID is not used for any other module connected to the same communications module.
- The ID numbers of modules need not be consecutive.
- Setting the ID to 99, then turning on the power resets all internal settings to the defaults.
- The module ID and COM ID are not related and can be set independently.

7.3 Preparations

7.3.1 Installing the Module

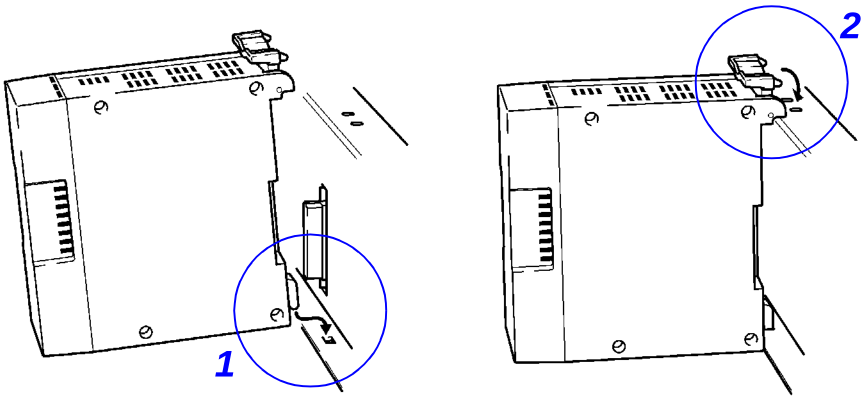
(1) Mounting a Module on the Module Base

CAUTION Do not mount the module base on the ceiling where it may fall off.

Fasten the module base to a DIN rail or the wall according to the procedure described in the **19 "2391-01, 2391-02, 2391-03 MODULE BASE"(P.305)** or **20 "2392-01/02 MODULE BASE"(P.319)** series MODULE BASE instruction manual.

(2) Mounting a Module on the Module Base

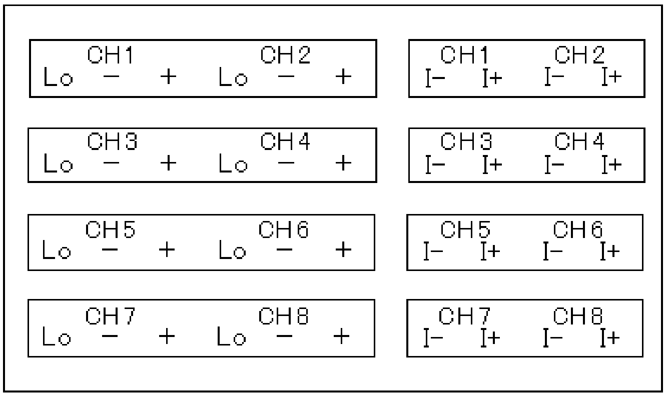
Mount a module on the module base as shown below. Ensure that the lever clicks.

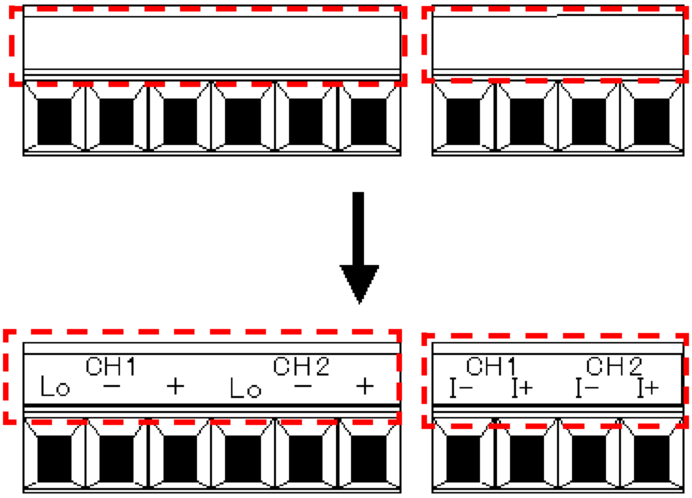


7.3.2 Paste the seal to the terminal block.

The module comes with a seal for the terminal block. Attaching the seal to the terminal block makes cable connection easier.

Sticker for the terminal block

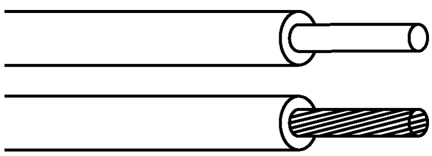




7.3.3 Connecting Input/Output Cables

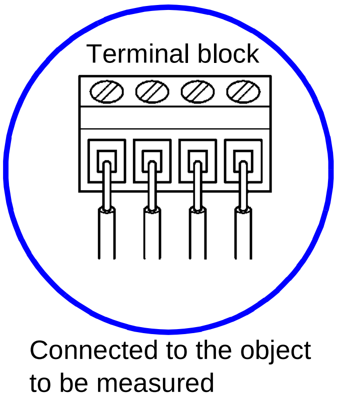
Recommended Cable

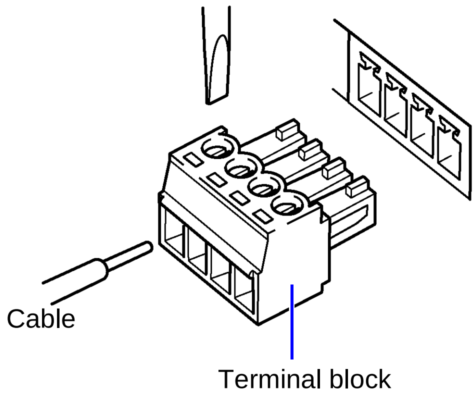
Single-wire	: 0.14 to 1.5 mm^2
Stranded-wire	: 0.14 to 1.5 mm^2
AWG	: 26 to 16
Cable strip length	: 5 mm (0.2")



7.3.4 Procedure for connecting to the terminal

1. Use a flat blade screwdriver to loosen the screws on the terminal block.
2. Connect the input cable to the terminal block and tighten the screws on the block. (at a tightening torque of 0.25 N•m).
3. Connect the terminal block to the module.

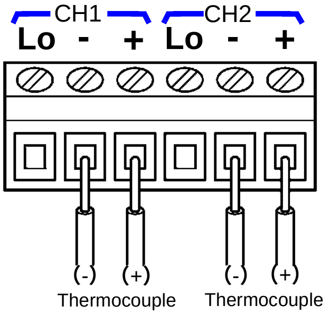




NOTE

When connecting the terminal block to the instrument or when the instrument is recording, do not touch the temperature sensor. Touching the temperature sensor may cause the thermocouple measurement to be inaccurate.

(1) Temperature measurement with a thermocouple

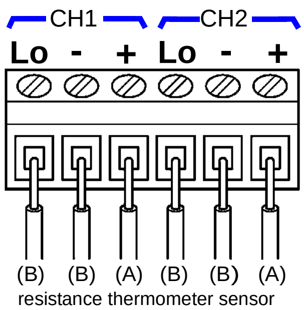


CH1			CH2		
Lo	-	+	Lo	-	+
Not connected	GND terminal	Measurement terminal	Not connected	GND terminal	Measurement terminal

NOTE

- The CH are insulated from each other.
- Note that measurement may be adversely affected by external noise or the electromagnetic environment when using a cable longer than 3 meters.

(2) Temperature measurement with 3-wire platinum resistance thermometer sensor



CH1			CH2		
Lo	-	+	Lo	-	+
Measurement terminal (B)*	Measurement terminal (B)*	Measurement terminal (A)*	Measurement terminal (B)*	Measurement terminal (B)*	Measurement terminal (A)*

*The Resistance thermometer sensor JIS Z 8704 terminal signals are principally using A (red) and B (white). The 3-wire IEC type is different (the colors are opposite), caution is necessary.

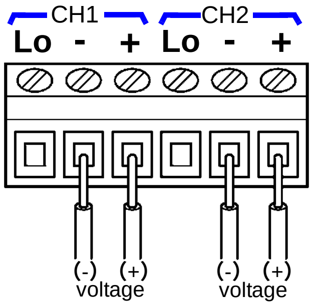
NOTE

- The CH are insulated from each other.
- Note that measurement may be adversely affected by external noise or the electromagnetic environment when using a cable longer than 3 meters.
- The measurement current for the 3-wire platinum resistance thermometer sensor is 1 mA.

(3) Direct voltage Measurement

CAUTION

The maximum input voltage is ±50 V. Ensure that the input does not exceed the maximum input voltage to avoid instrument damage, short-circuiting and electric shock resulting from heat building.



CH1			CH2		
Lo	-	+	Lo	-	+
Not connected	GND terminal	Measurement terminal	Not connected	GND terminal	Measurement terminal

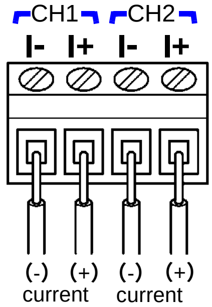
NOTE

- The CH are insulated from each other.
- Note that measurement may be adversely affected by external noise or the electromagnetic environment when using a cable longer than 3 meters.

(4) Direct Current Measurement

CAUTION

- The maximum input current is ±30 mA. Do not input voltage into the current measurement terminal to avoid module damage and short-circuiting resulting from heat building.
- The current measurement terminal has a built-in fuse (250 mA, 125 V). Improper input of voltage signals to the current measurement terminal will lead to a broken fuse and damage of the terminal.



CH1		CH2	
I-	I+	I-	I+
GND terminal	Measurement terminal	GND terminal	Measurement terminal

NOTE

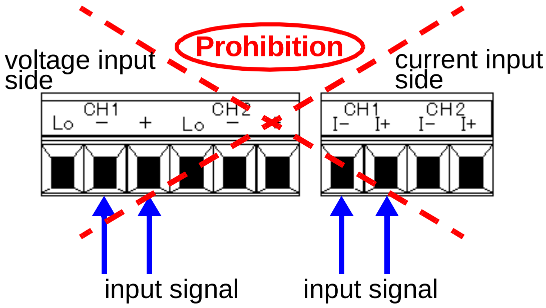
- The CH are insulated from each other.
- Note that measurement may be adversely affected by external noise or the electromagnetic environment when using a cable longer than 3 meters.

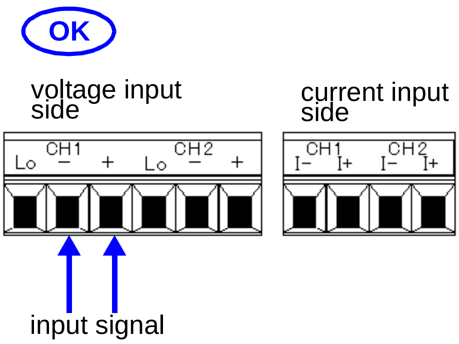
⚠CAUTION

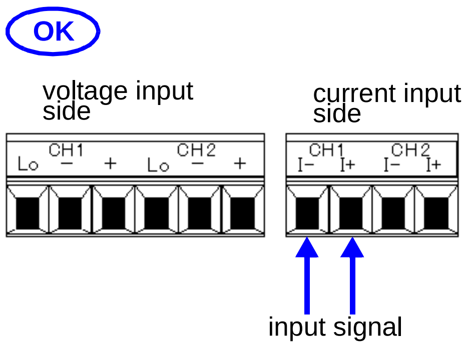
All the CH are insulated from each other, but within not within the same CH (voltage input side and the current input side). If an input signal is applied to both the voltage input side and the current input side within the same CH, a short circuit will occur in the internal circuit leading to the following

- Instrument damage and errors in the measured values.
- Damage of modules connected to the instrument.

The instrument allows measurement items to be chosen for each of the CH but only 1 item can be chosen. Avoid applying input signal to both the voltage input side and current input side within the same CH.

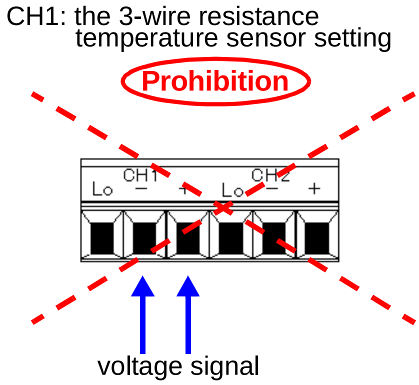


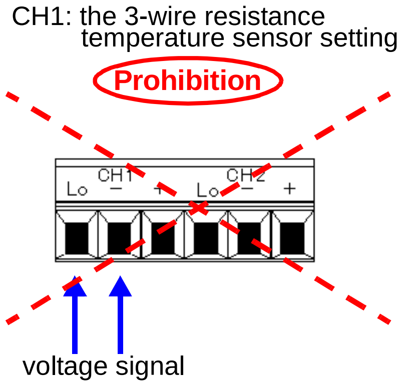




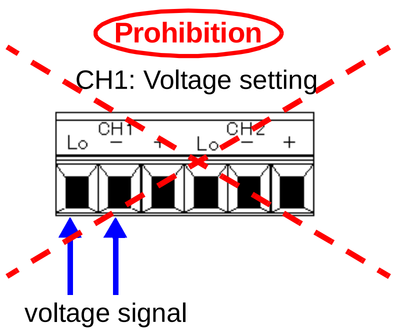
CAUTION

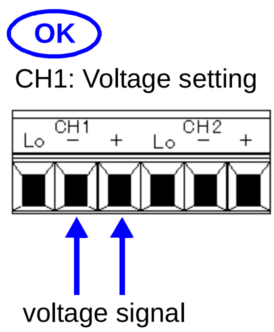
Before starting to record the measured values using the instrument, set the measurement items of each CH from the PC. In order to avoid damage to the instrument and modules connected to the instrument, do not input signals that are different from the measured items set.
E.g. if the wrong voltage is inputted into CH1 which has a 3-wire resistance temperature sensor, the instrument and modules connected to the instrument will be damaged.





To prevent damage to the system, please connect the wires properly.





7

7.4 Digital filter

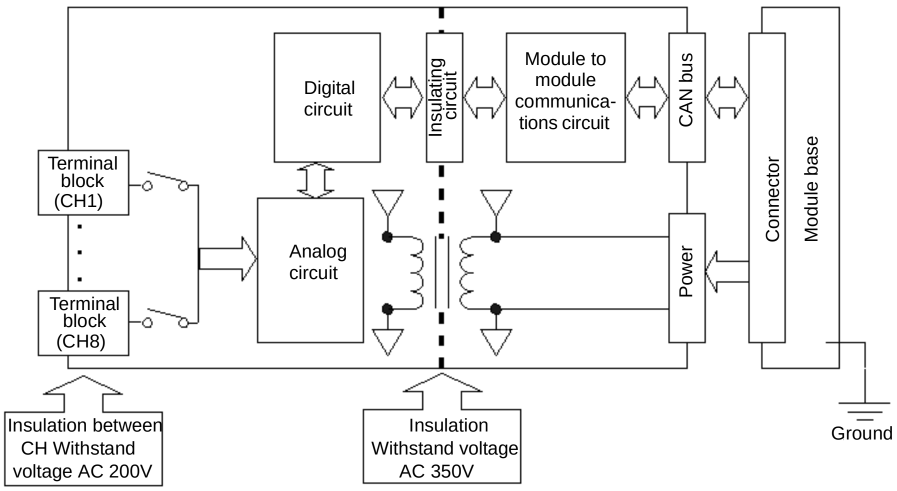
The digital filter can be set to remove noise produced by the input signal and enable even and highly accurate measurements to be taken. Setting the digital filter before starting the recording process is recommended (Measurement sampling is 1 time/2 sec.)

Setting the Digital Filter	Explanation
OFF (Default settings)	Digital filter is not used. Guaranteed accuracy of measurement is only possible under a good environment with no noise. Uneven measurements, especially when thermocouple is used, frequently occur due to influence of external noise from utility electricity and inverter, etc. Measurement sampling is 1 time/sec.
60 Hz	In areas where the utility frequency is 60 Hz (West Japan), noise removal effect is most effective. High frequency noise (in the double-digit kHz range) from inverters etc. will not affect the performance. Measurement sampling is 1 time per 2 sec.
50 Hz	In areas where the utility frequency is 60 Hz (East Japan), noise removal effect is most effective. High frequency noise (in the double-digit kHz range) from inverters etc. will not affect the performance. Measurement sampling is 1 time per 2 sec.
10 Hz	The most effective setting for noise removal in both East and West Japan and can remove both 50Hz and 60Hz utility frequencies. High frequency noise (in the double-digit kHz range) from inverters etc. will not affect the performance. Measurement sampling is 1 time per 10 sec.

7.5 Others

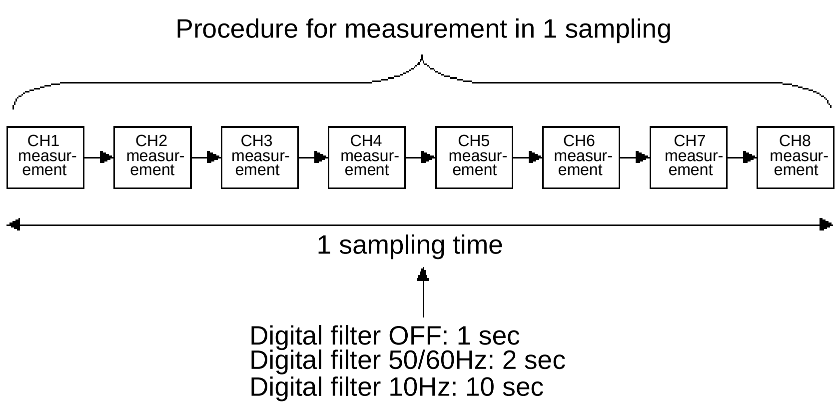
7.5.1 Insulation of Internal Circuit

In the 2306-20, the input circuit and input channels are insulated from the CAN bus as shown in the block diagram below.
Dielectric strength
Between input circuit and CAN bus: AC350 V (50/60 Hz, Response current: 5 mA, 6 sec.)
Between input channels: AC200 V (50/60 Hz, Response current: 5 mA, 6 sec.)



7.5.2 Measurement method

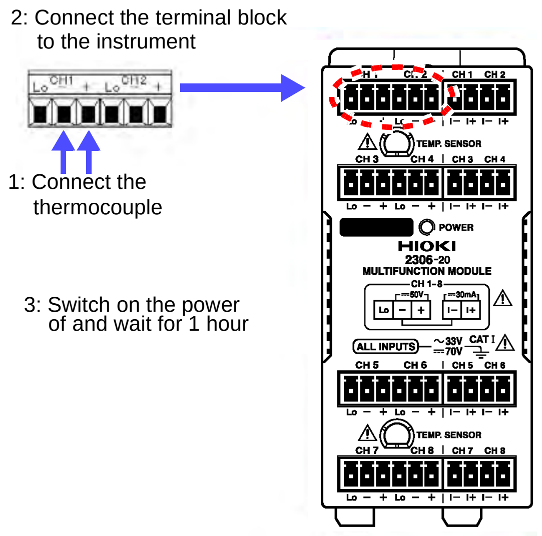
Measurement for CH1-CH8 within 1 sampling time is taken according to the following procedure.
Measurements for the 8CH are not taken simultaneously.



E.g. When the digital filter is set to 10 Hz, the time for 1 sampling is 10 seconds. At this time, the time lag in measurement between CH1 and CH8 is approximately 7 seconds.

7.5.3 Pre-heating time before the start of recording

For the measured values to meet the desired level of measurement accuracy, the instrument needs to be pre-heated for 10 minutes after it is switched on. In the case of temperature measurement with a thermocouple (reference junction compensation: internal), a 1 hour pre-heating period is necessary. Connect the thermocouple to the terminal block and the terminal block to the instrument before pre-heating for 1 hour. Pre-heating that is necessary for the temperatures of the measurement terminal (reference junction) and the instrument to become even.

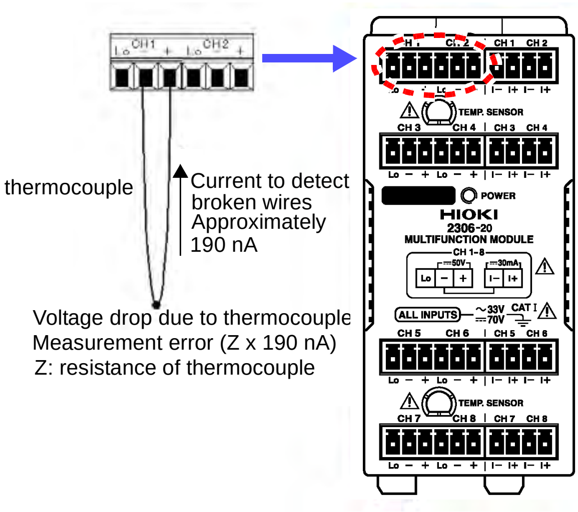


*Alternation of the reference junction compensation between internal and external is possible

Internal	Reference junction is compensated in the instrument. Measurement accuracy is the added value of temperature measurement accuracy and reference junction compensation accuracy.
External	Junction reference is not compensated in the instrument. External reference junction compensation device is required. Measurement accuracy is only the temperature measurement accuracy.

7.5.4 Function to detect broken wires when using a thermocouple

When the function to detect broken wires is used, the POWER LED will flash in yellow whenever the thermocouple is broken. In addition, an alarm signal is also sent to the PC (communications module). A small current of approximately 120 nA is sent through the thermocouple to detect for broken wires.
Set the detecting function to OFF when the thermocouple is long or has a high resistance to prevent measurement error.



7

7.6 Specifications

7.6.1 Basic Specifications

Input type	Floating input, scanning by PhotoMOS Relay method, insulation of all CH
Number of input CH	8CH (thermocouple, 3-wire measurement resistance, direct voltage, direct current can be chosen for each of the CH
Measurement parameter	Thermocouple (K, E, J, T, R) JIS C1602-1995 3-wire measurement resistance (Pt100, JPt100, measurement current 1 mA) in accordance with JIS C1604-1997 Direct voltage Direct current

Measurement ranges/ Measurable range/ Resolution/Measurement accuracy

Measurement parameter	Range	Measurable range	Resolution	Measurement accuracy
Thermocouple (Does not include reference junction compensation accuracy)	K	-200°C to 1350°C	0.1°C	±0.25% rdg.±1°C
	E	-200°C to 1000°C	0.1°C	
	J	-200°C to 1200°C	0.1°C	
	T	-200°C to 400°C	0.1°C	
	R	0°C to 1700°C	0.1°C	±0.25% rdg.±2°C (Regulated at 400°C or more)
3-wire	Pt100	-200°C to 800°C	0.1°C	±0.25% rdg.±0.5°C
	JPt100	-200°C to 500°C	0.1°C	
Direct voltage (± 50000 count)	50 mV	-50 mV to 50 mV	1 µV	±0.25% rdg.±40 dgt.
	500 mV	-500 mV to 500 mV	10 µV	±0.25% rdg.±10 dgt.
	5 V	-5 V to 5 V	100 µV	
	50V	-50 V to 50 V	1 mV	
Direct current (± 30000 count)	30 mA	-30 mA to 30 mA	1 µA	±0.25% rdg.±10 dgt.

Effect of conducted radio-frequency electro-magnetic field	Within ±15°C at 3 V (measuring with the thermocouple) Within ±2°C at 3 V (3-wire measurement resistance)
Reference Junction Compensation	Alternation between internal and external possible (measuring with the thermocouple)
Reference Junction Compensation Accuracy	±1°C (Reference junction compensation: Added to thermocouple measurement accuracy when used internally)
Accuracy guarantee for temperature	23°C±5°C
Temperature	(Measurement accuracy × 0.04) /°C is added to measurement accuracy (Measurement accuracy × 0.1) /°C is added to measurement accuracy (3-wire measurement resistance)
Digital filter	OFF/50 Hz/60 Hz/10 Hz
Pre-heating time	10 minute 1 hour (reference junction compensation: internal)
Guaranteed accuracy period	1 year
Sampling	1 time/ 1sec (Measuring 8CH with the scan method) 1 time/ 2 sec when the digital filter 50/60 Hz is set 1 time/ 20 sec when the digital filter 10 Hz is set

Input resistance	1 MΩ±10% (when broken wire detection function is set at OFF for voltage measurement and thermocouple measurement) 850 kΩ±10% (when broken wire detection function is set at ON for thermocouple measurement) 2 MΩ±10% (for 3-wire measurement resistance) Approx. 5 Ω (for current measurement terminal) * Shunt resistance 3.3 Ω (0.75 W), in-built fuse (125 V, 0.25 A, non-detachable)
Normal mode removal comparison	Above 50 dB (For an input of 50 Hz, digital filter is set at 50 Hz) (For an input of 60 Hz, digital filter is set at 60 Hz)
Common mode removal comparison	Above 80dB (50 Hz/60 Hz, for signal source resistance of below 100 Ω, digital filter is set to OFF) Above 140dB (50 Hz, for signal source resistance of below 100 Ω, digital filter is 50 Hz setting, 50 mV) (60 Hz, for signal source resistance of below 100 Ω, digital filter is 60 Hz setting, 60 mV)
Maximum capacity input	Voltage input terminal: DC±50 V Current input terminal: DC±30 mA

7.6.2 Function Specifications

Execute the functions from the PC application via communications.

Monitoring function

This function outputs the current measured values (instantaneous values).

Measured value recording function

Measurements are recorded at a set recording interval.	
Real-time management	This is automatically set from the PC application at the start of recording.
Recording start	Immediate start/Reserved-time start
Recording end	Manual end/Reserved-time end
Operation when memory is full	Memory full stop /Endless ♦Set the condition before the start of recording.
Recording interval	1/2/5/10/15/20/30 sec., 1/2/5/10/15/20/30/60 min.
Recording mode ド	Instantaneous value/ MAX, MIN, AVE/ Instantaneous value, MAX, MIN, AVE/ Total 3 modes ♦Set the mode before the start of recording.
Recorded data	One data set contains time and temperature/humidity information (8 channel each). ♦Data is scaled if scaling is ON.
Recording capacity	2 M bytes Flash memory
Quantity of recorded data	• Instantaneous value recording mode 50,778 data × 8CH • MAX/MIN/AVE recording mode19,530 data × 8CH • Instantaneous value + MAX/MIN/AVE recording mode14,911 data × 8CH
Power outage protection	After recovering from a power outage, the instrument automatically returns to the state held before the outage.

Alarm judgment and recording function

Alarm judgment is made at every sampling, and the history will be recorded in flash memory if the measured value recording function remains active.	
Judgment method	Criterion threshold can be set to either Hi or Lo. The instantaneous value at every sampling is judged (effective in any measurement mode.).
Recorded data	One data set contains time, generation/reversion, CH and judgment threshold.

7.6.3 General Specifications

Clock accuracy	±100 ppm (Reference value at temperature from 0 to 50°C (32 to 122°F) without the communications module)
Dimensions	Approx.45.5 W × 96 H × 94.5 D mm (1.79"W × 3.78"H × 3.72"D) (excluding projections)
Mass	Approx.290 g (10.2 oz)
Backup	Recorded data (saved in flash memory) ♦Data loss for up to 2 minutes before and after a power outage may occur.
Communication interface	CAN bus
Maximum rated voltage to earth	33 Vrms, 70 VDC
Rated supply voltage	5 V ±0.3 VDC
Maximum rated power	2.5 W
Dielectric strength	350 V AC Between input and CAN bus (50/60 Hz, Response current 5 mA, 6 sec) 200 V AC Between input and channels (50/60 Hz, Response current 5 mA, 6 sec)
Operating environment	Indoors, altitude up to 2000 m (6562-ft.)
Operational ranges for temperature and humidity	0 to 50°C (32 to 122°F), 80%RH or less (with no condensation)
Temperature and humidity ranges for storage	-10 to 50°C (14 to 122°F), 80%RH or less (with no condensation)
Accessories	Terminal block (6 polarities, 4 polarities: 4 each) Sticker for the terminal block
Standards applying	Safety EN61010, Pollution Degree 2 Measurement Category I (anticipated transient overvoltage 330 V) EMC EN61326 Class A

2321-20 WAVEFORM MODULE

8

8.1 Overview

8.1.1 Product Overview

The 2321-20 is a measurement module of the Hioki "Smart Site" (remote measurement system). This module records the measured value taken with respect to the data in high speed sampling at regular intervals, and at the same time measures the waveform value that is the same as the value set under the trigger condition.

Number of measuring CH	Analog 2CH (insulation among CH), Logic 4ch × 2
Range	50 V/20 V/10 V/5 V/2 V/1 V/500 mV/200 mV/100 mV/50 mV * Measurement can be taken up to 110% of each range
Low pass filter	OFF/5 Hz/50 Hz/500 Hz/5 kHz (Frequency -3 dB)

8.1.2 Major Features

- **Simultaneous recordings of intervals and waveform.**
- **For interval recording, the recording interval can be chosen from between 1 second to 60 minutes.**
  Data that can be recorded is the peak, bottom, mean value, RMS value, etc of the waveform, instantaneous value taken at 1 sec interval during sampling, maximum, minimum and mean value of the logic data.
- **When recording the waveform, the sampling frequency can be chosen from a range of 2.5 µs to 100 ms for each CH. Maximum word limit for waveform recording is 32000.**
- **Equipped with external trigger input terminal and external trigger output terminal.**

Rough Estimate of Storable Data Quantity and Time

(1) Interval recording

Action at memory full: Continue recording (Endless)

	Recording Mode		
	Instantaneous Value	MAX/MIN/AVE	Instantaneous Value + MAX/ MIN/AVE
Quantity of storable data	5300	2000	1500
Recording interval			
1 sec.	80 min.	30 min.	25 min.
2 sec.	2.5 hours	1 hours	50 min.
5 sec.	7 hours	2.5 hours	2 hours
10 sec.	14.5 hours	5.5 hours	4 hours
15 sec.	22 hours	8.5 hours	6.5 hours
20 sec.	1 day	11 hours	8.5 hours
30 sec.	1.5 day	17 hours	13 hours
1 min.	3.5 day	1 day	1 day
2 min.	7 day	2.5 day	2 day
5 min.	18 day	7 day	5 day
10 min.	37 day	14 day	11 day
15 min.	55 day	21 day	16 day
20 min.	74 day	28 day	22 day
30 min.	111 day	43 day	33 day
60 min.	222 day	85 day	65 day

Action at memory full: Stop recording (Memory full stop)

	Recording Mode		
	Instantaneous Value	MAX/MIN/AVE	Instantaneous Value +MAX/MIN/AVE
Quantity of storable data	6100	2300	1800
Recording interval			
1 sec.	1.5 hours	35 min.	30 min.
2 sec.	3 hours	70 min.	60 min.
5 sec.	8.5 hours	3 hours	2.5 hours
10 sec.	17 hours	6.5 hours	5 hours
15 sec.	1 day	9.5 hours	7.5 hours
20 sec.	1 day	13 hours	10 hours
30 sec.	2 day	19.5 hours	15 hours
1 min.	4 day	1.5 day	1 day
2 min.	8.5 day	3 day	2.5 day
5 min.	21 day	8 day	6 day
10 min.	43 day	16 day	13 day
15 min.	64 day	25 day	19 day
20 min.	85 day	33 day	25 day
30 min.	128 day	49 day	38 day
60 min.	256 day	98 day	75 day

(2) Waveform recording

Memory division values: 2/4/8/16/32
(Independent settings for the sets of CH1+CHA and CH2+CHB are possible)

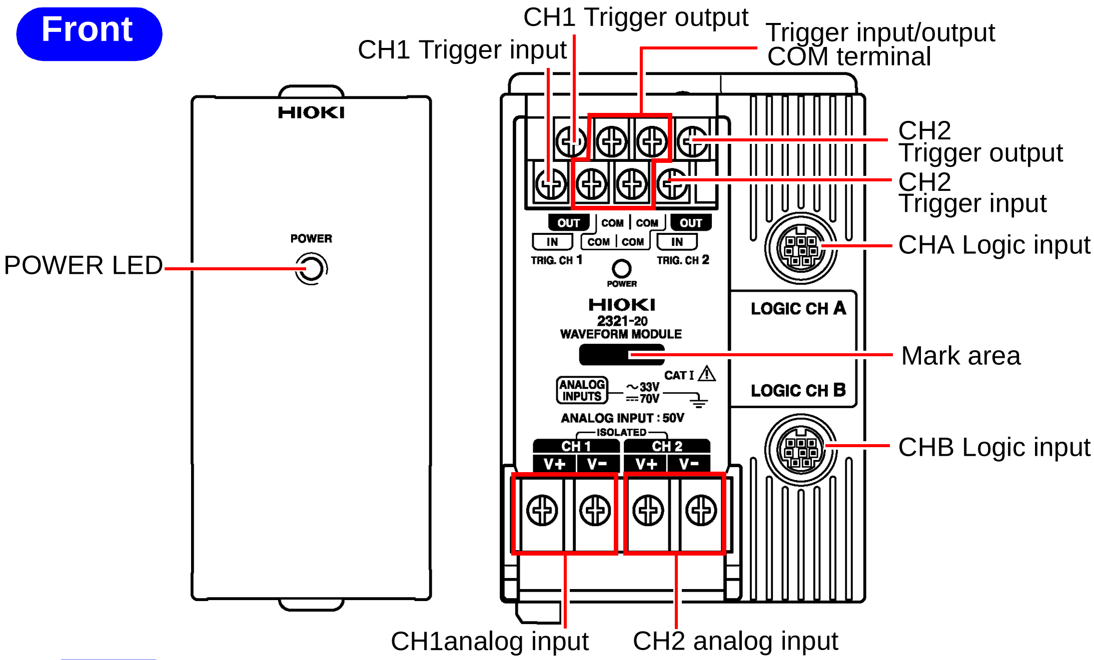
Division values	2	4	8	16	32
Number of words (per 1CH)	32,000	16,000	8,000	4,000	2,000

NOTE

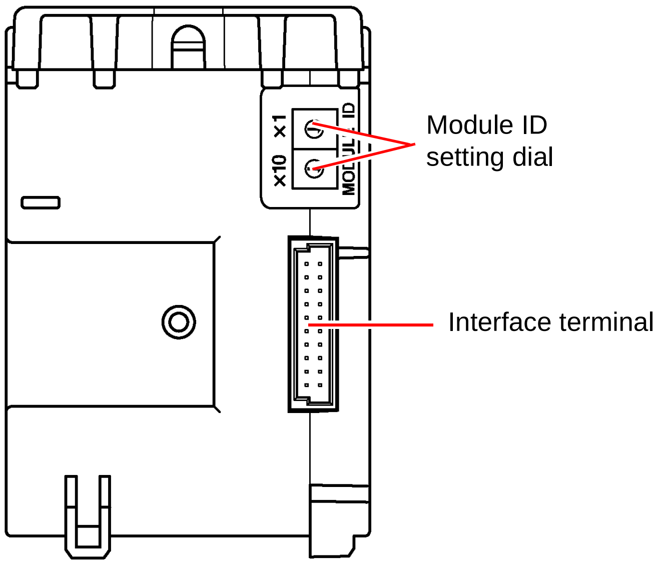
- All waveform data will be erased when memory division is changed.
- All waveform data will be erased when range is changed.

8.1.3 Name and Function of the Parts

Front



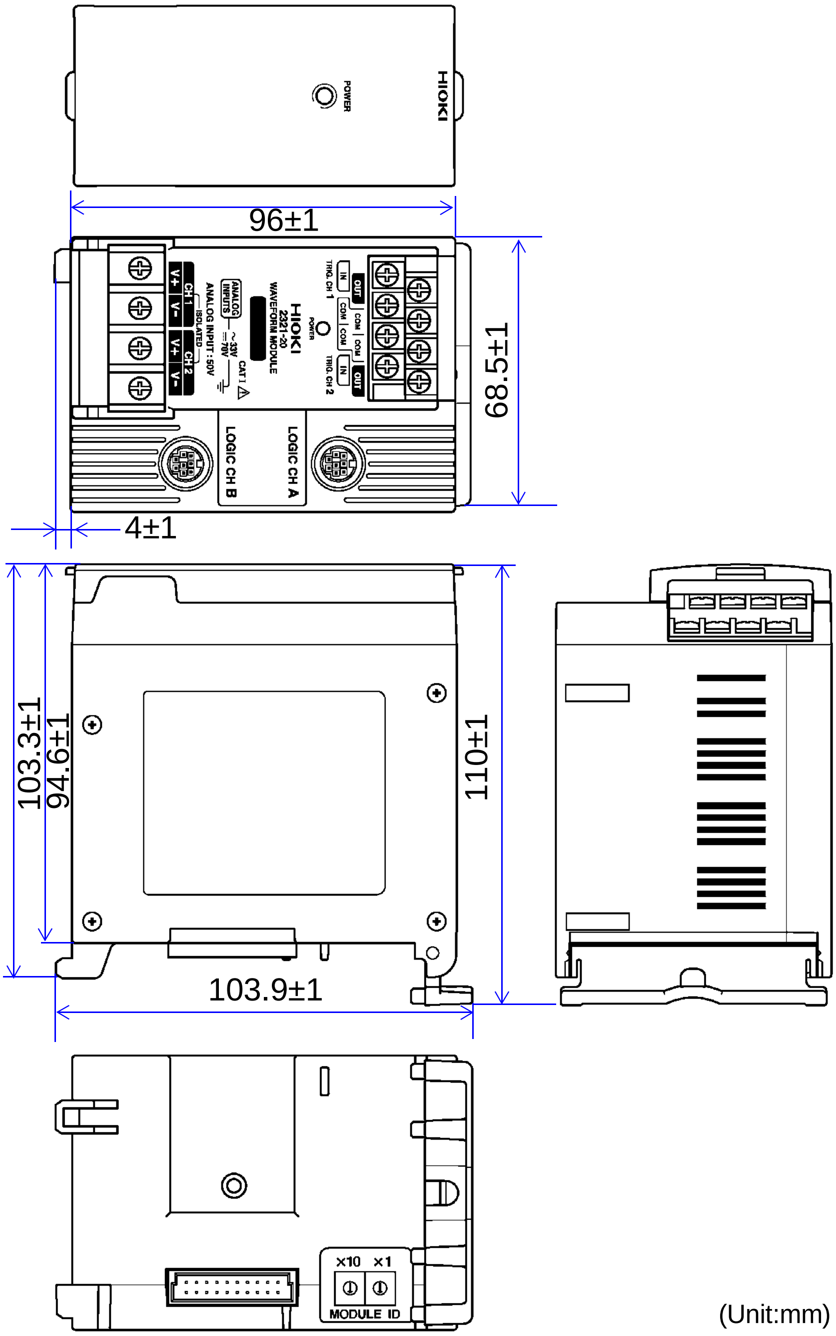
Back



POWER LED	Goes on or flashes when power is supplied to the module. Remains on, flashes, or changes to another color according to the state of the module. **POWER LED indication** Lit in green : Data being recorded. (trigger waiting time) Flashing in green : Standing by. Lit in yellow : TRIG.OUT output. Lit in red : Non-recoverable error occurred. *1 Flashing in red : Recoverable error occurred. *2
Mark area	Use this area to make a note of the object to measure or the module ID. Use an ink pen, since pencil lead may rub off.
CH1 analog input	Input voltage signal (Channel 1)
CH2 analog input	Input voltage signal (Channel 2)
CHA Logic input	Connect the 9320-01 or the MR9321-01 and input the logic signal. (Channel A)
CHB Logic input	Connect 9320-01 or MR9321-01 and input the logic signal. (Channel B)
CH1 Trigger input	Input trigger signal in CH1 or CHA.
CH1 Trigger output	Voltage is discharged when trigger is set at CH1 or CHA.
CH2 Trigger input	Input trigger signal in CH2 or CHB
CH2 Trigger output	Voltage is discharged when trigger is set at CH2 or CHB.
Trigger input/output COM terminal	Terminal with low electric potential common to all trigger input/output
Module ID setting dial	Set IC (identification) number.

*1: The module needs repair. Contact your vendor (agent) or nearest Hioki office.
*2: The same module ID may be used by another module.

8.1.4 Dimension Diagrams



(Unit:mm)

8.1.5 Accessory and Option

Accessories

None

Option

9320-01	LOGIC PROBE
MR9321-01	LOGIC PROBE
9765	CLAMP ON SENSOR (For CT secondary side)
9695-02	CLAMP ON SENSOR
9695-03	CLAMP ON SENSOR
9661-01	CLAMP ON SENSOR
9238-01	CLAMP SENSOR CABLE

8.2 Settings

Setting the Module ID

You can connect up to 63 measurement modules to one communications module.

Setting Procedure

Use the module ID setting dial to set the ID No. of the module to a number from 01 and to 63. (You cannot set a number other than the above.)

NOTE

- Ensure that the set ID is not used for any other module connected to the same communications module.
- The ID numbers of modules need not be consecutive.
- Setting the ID to 99, then turning on the power resets all internal settings to the defaults.
- The module ID and COM ID are not related and can be set independently.

8.3 Preparations

8.3.1 Installing the Module

(1) Installing the Module Base

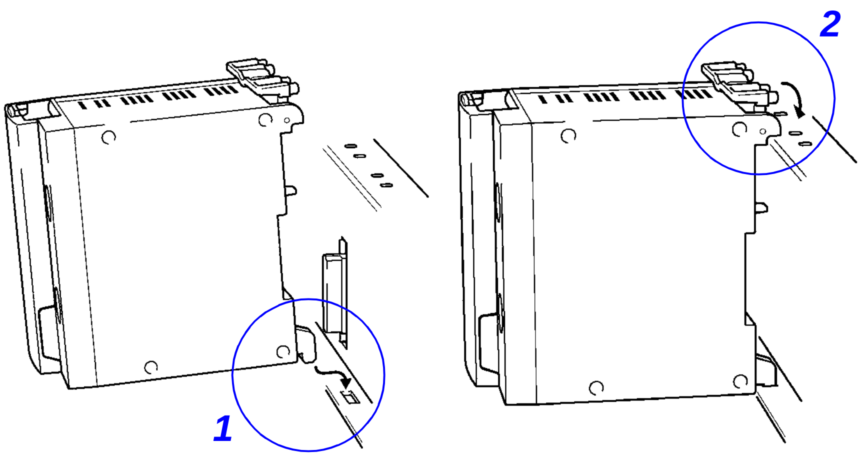
CAUTION

Do not mount the module base on the ceiling where it may fall off.

Fasten the module base to a DIN rail or the wall according to the procedure described in the 19 "2391-01, 2391-02, 2391-03 MODULE BASE"(P.305) or 20 "2392-01/02 MODULE BASE"(P.319) series Module Base instruction manual.

(2) Mounting a Module on the Module Base

Mount a module on the module base as shown below. Ensure that the lever clicks.

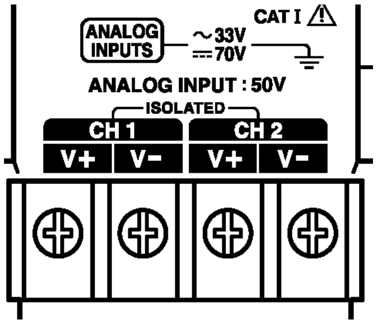


8.3.2 Connect the signal input cable

(1) Analog input

When recording the analog signal, connect the voltage cable to the analog input terminal of the instrument. Analog input terminals CH1 and CH2 will be insulated.

Current waveform can be recorded when Hioki's clamp sensors are used. Connect the clamp sensors K, L to the V+, V- of the instrument respectively. Use M3.5 screws for the terminal base. We recommend using a round solderless terminal (RAV 1.25-3.5) for the connection.
We also recommend using JIS C3307 600 V vinyl insulated wires 0.9 mm^2 or more.



Clamp Sensors:
9695-02 (50 A), 9695-03 (100 A), 9661-01 (500 A), 9765 (5 A, For CT secondary side)

Terminals
M3.5 screws are used for the terminal blocks for this module and the clamp sensors. For connection, a round crimp connector (RAV 1.25-3.5) is recommended.

Cables
The 9695-02 and 9695-03 use terminal blocks. Therefore, various types of cables may be usable.
Cables equivalent to or better than 600 V vinyl-insulated 0.9 mm^2 or 300 V vinyl-insulated 0.75 mm^2 are recommended.

NOTE

Note that measurement may be adversely affected by external noise or the electromagnetic environment when using cable longer than 3 meters.

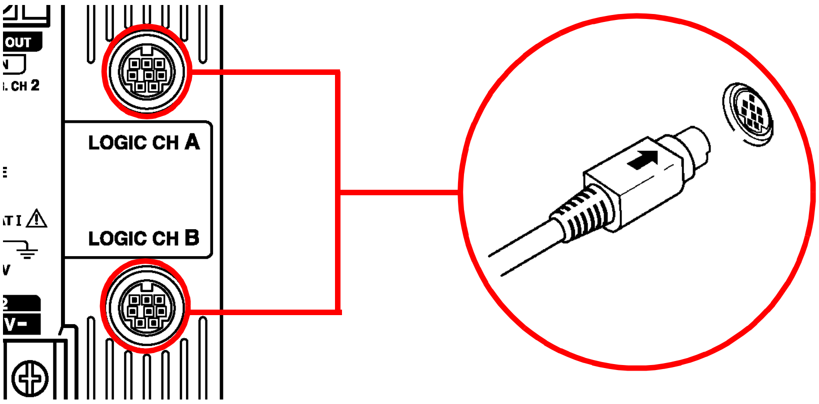
(2) Logic input

Connecting to the Logic probe

- Connect the Model 9320-01 and Model MR9321-01 logic probe when recording the logic.
- 2 logic probes can be connected to the instrument. 1 logic probe can record 4CH of logic waveform and 2 logic probes can record 8CH of logic waveform.

CAUTION

- In the logic input area, two logic probes can be connected, but LOGIC CHA and CHB in the internal circuit is not insulated (common to GND). As the Model 9320/9320-01 does not have an insulated circuit, circuit accidents may occur when voltage of a different GND level is inputted.
- Do not connect logic probes not specified by Hioki to the logic input area.



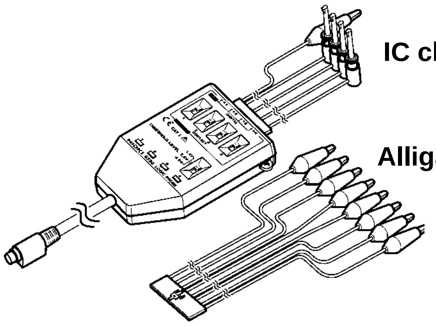
NOTE

When the Model 9323 converter cables are used for the connection, Model 9320 and MR9321 logic probes can be used in the instrument.

Model 9320-01 LOGIC PROBE

- When measuring digital signals (Digital input)
  Turn the input switch to DIGITAL. Use an IC clip read at the end. Connect the alligator clip to the circuitground.Use the threshold value selector to select the threshold value.
- When measuring the contact signal (Contact input)
  Turn the input switch to CONTACT and use an alligator clip at the end. A [H] signal is given when the input terminal is connected with the GND.

	Digital input Threshold value	Contact input Detecting resistance value	
1.4 V range	1.4 V ±0.3 V	more than 1.5 kΩ less than 500 Ω	opened (Output L) shorted (Output H)
2.5 V range	2.5 V ±0.4 V	more than 3.5 kΩ less than 1.5 kΩ	opened (Output L) shorted (Output H)
4.0 V range	4.0 V ±0.5 V	more than 25 kΩ less than 8 kΩ	opened (Output L) shorted (Output H)



NOTE

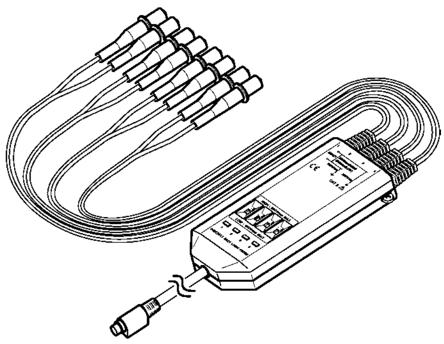
Please refer to the instruction manual for the 9320-01 logic probe for more information about the 9320-01 logic probe.

Model MR9321-01 LOGIC PROBE

- Set the input selector in accordance with the measured voltage.
  LOW range: On/off for 100 VAC and 24 VDC, etc.
  HIGH range: On/off for 200 VAC, etc.
- Since the inputs are bipolar, polarity should be disregarded.
- Because the inputs are insulated, each channel is connect-able to independent potential points.

The number of channels	4 (insulated)	
Input voltage range	LOW	HIGH
Input resistance	More than 30 kΩ	More than 100 kΩ
Sensitivity (Output: L)	0 to 10 VAC ± (0 to15) VDC	0 to 30 VAC ± (0 to 43) VDC
Sensitivity (Output: H)	60 to 150 VAC ± (20 to150) VDC	170 to 250 VAC (70 to 250) VDC
Response time(↥) (↧)	Less than 1 ms Less than 3 ms with 100 VDC	Less than 1 ms Less than 3 ms with 200 VDC
Maximum input voltage	150 Vrms	250 Vrms
Maximum rated voltage to earth	250 Vrms	
Dielectric strength	AC2.3 kV/1min (between unit and channels, between channels)	
Insulation resistance	More than 100 MΩ/DC500 V (between unit and channels, between channels)	

This device detects absolute values so that negative DC voltages can be applied. The above values for AC voltages are those obtained with sine wave signals of 50/60 Hz.



NOTE

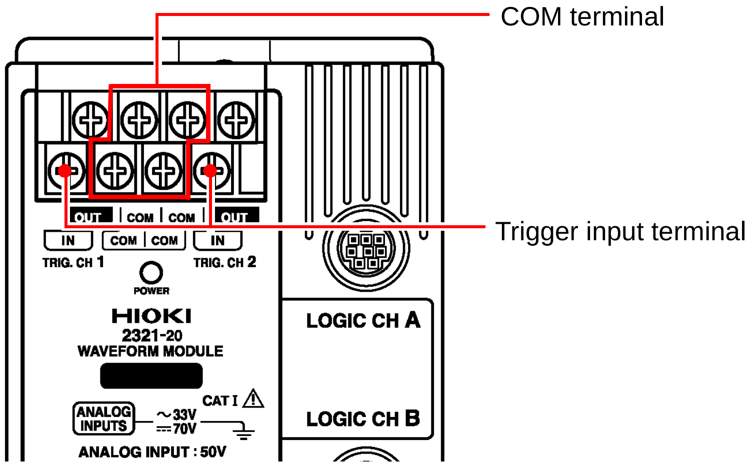
Please refer to the instruction manual for 9320-01 logic probe for more information about the 9320-01 logic probe.

8.3.3 Connect the trigger input signal

CAUTION

Do not input voltage greater than +10 V in the trigger input terminal. Instrument damage, short-circuiting and electric shock resulting from heat building may occur.

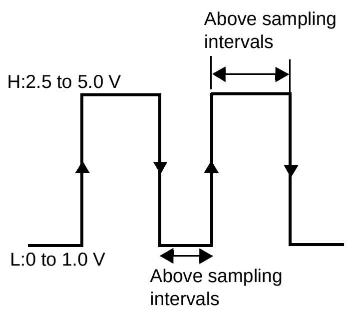
- External input signal can be used as a trigger.
- A few of these instruments can be used for parallel simultaneous measurements.

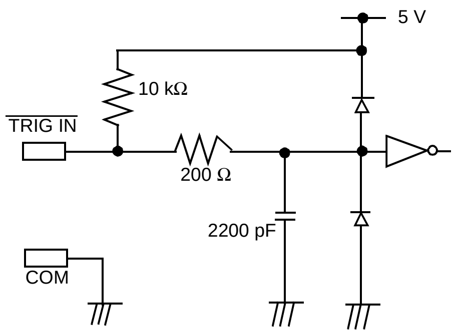


Signal input method

The trigger is activated by either short circuiting/opening the trigger input terminal and COM terminal, or by inputting L level (0 to 1.0 V) and H level (2.5 to 5.0 V) signals.
Start trigger and stop trigger and the respective slopes (rise/fall) can be chosen.

Useable voltage region	L level 0.0 to 1.0 V H level 2.5 to 5.0 V
Pulse width	Above the sampling interval specified for waveform recording.
Maximum input voltage	+10 V
Terminal blocks	M3.0 screw, round solderless terminal (RAV 1.25-3) recommended (at a tightening torque of 0.5 N•m)
Cables	Cross-section of the conductor: 0.75 mm or more Recommended: control vinyl insulated sheathed cable CVV 1.25 mm^2



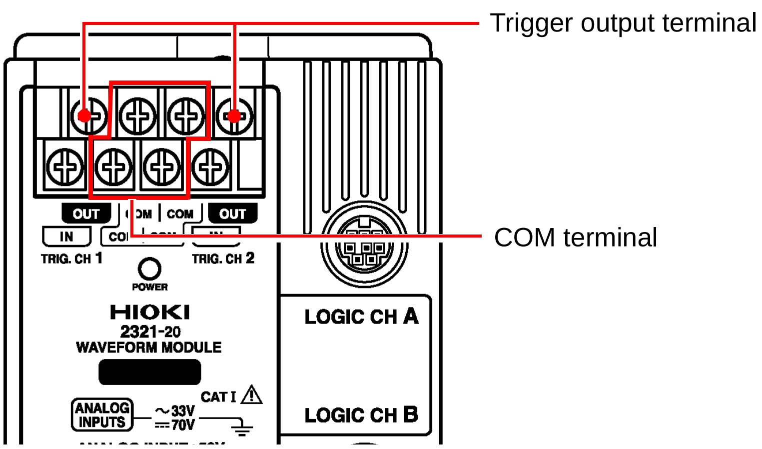


8.3.4 Connect the trigger output signal

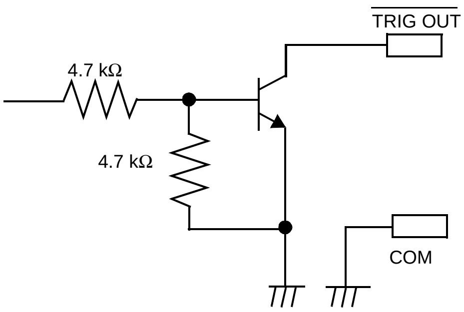
⚠CAUTION

Do not input voltage greater than +30 V in the trigger output terminal. Instrument damage, short-circuiting and electric shock resulting from heat building may occur.

- When the trigger is activated, a signal is given out.
- A few of these instruments can be used for parallel simultaneous measurements.

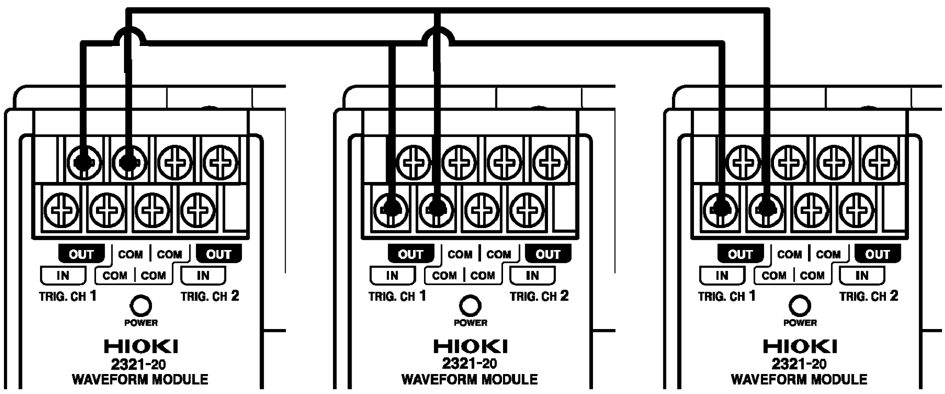


Output signal	Open collector output Active LOW
Output Time	Waveform retrieval / output time specification (range within 1 to 255 s)/PC Reset by application
Maximum input voltage	+30 V/ 500 mA MAX
Terminal blocks	M3.0 screw, round solderless terminal (RAV 1.25-3) recommended (at a tightening torque of 0.5 N•m)
Cables	Cross-section of the conductor: 0.75 mm or more Recommended: control vinyl insulated sheathed cable CVV 1.25 mm^2



Example of using a few the Model 2321-20 to perform parallel simultaneous measurement

To take parallel simultaneous measurement, connect 2321-20 (A) [TRIG. CH1 OUT] to output trigger signal and 2321-20 (B) and 2321-20 (C) [TRIG. CH1 IN] to input trigger as shown in the diagram. For 2321-20 (B) and 2321-20 (C) for inputting external trigger, set the external trigger of the start trigger to [ON Fall].



2321-20 (A) 2321-20 (B) 2321-20 (C)

When the trigger condition for CH1 of 2321-20 (A) is met and the trigger is activated, trigger output terminal the signal for [TRIG. CH1 OUT] will change. The [TRIG. CH1 IN] of CH1 of 2321-20 (B) and 2321-20 (C) will receive the pulse signal of 2321-20 (A) and start the measurement.

8.4 Recording data

When [Start recording] is activated from the PC application, the recording functions of (a) to (c) will be activated.

(a) Measured value recording: Records measured values under conditions set at each pre-set interval.

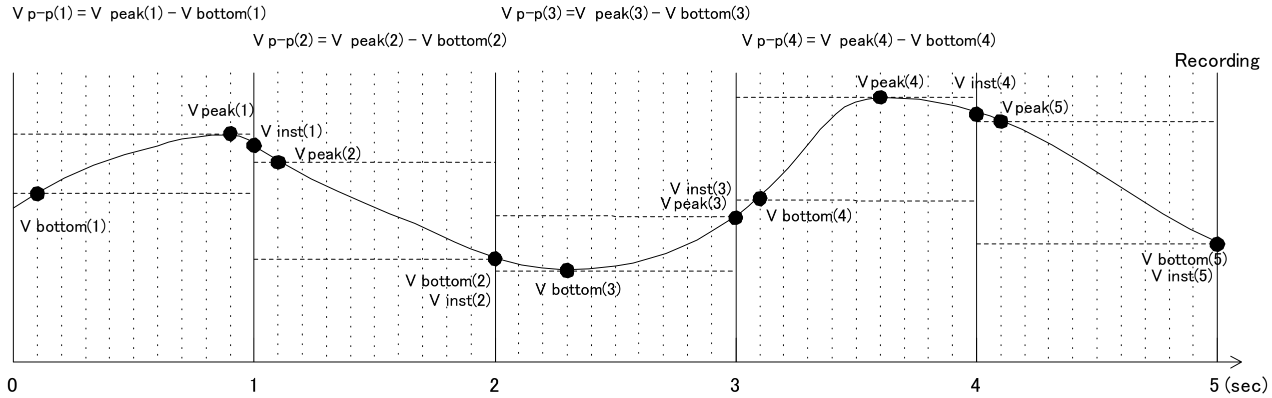
Recording contents	1 Data → time interval values of measured values (according to the recording mode)
Measured value	Peak value of analog waveform in 1 sec (Peak), Minimum value (Bottom), Peak-peak value (p-p), Crest Factor (CF), Mean (MEAN), root mean square value (RMS), analog waveform per second, and instantaneous value of logic waveform (INST)
Recording mode	Instantaneous value of each measured value at each interval, MAX/MIN/AVE, MAX/MIN/AVE + instantaneous value (instantaneous value at each interval only for logic)

* Recording mode can be chosen from the PC application

NOTE

The definitions of the parameters for the measured value are as follows:
Ap: the bigger figure in the absolute value for Peak and Bottom
CF: Ap divided by RMS
MEAN: Simple average of the sampling data
RMS:1-second root mean square value (no sampling gap)
Others: Refer to the example below

[Example] 5 seconds recording interval, sampling at 100 ms



(b) Waveform recording: Records analog waveform and logic waveform which correspond to pre-set trigger condition.

About the trigger

- Trigger is a function which measures the start and stop timings of recording using special signals. A trigger is said to be activated when the recording starts or stops with the use of a special signal.
- In the 2321-20 waveform module, both the start and stop measurement triggers can be set.

Recording contents	1 data→time start trigger is activated, trigger type, waveform data (analog waveform + logic waveform)
Start/stop of waveform recording	Recording starts when the start trigger is activated and ends when the stop trigger is activated or when the pre-set data length is reached.
Pre-trigger/ Post-trigger functions	Recording can be carried out even when the start trigger is not activated in the pre-trigger region, and in the post-trigger region after the stop trigger has been activated. Pre-trigger length and post-trigger length (set the sampling value) can be set optionally.

NOTE

When setting the pre-trigger, even if the start trigger is activated within the following time periods (pre-trigger waiting time), the pre-trigger is not and waveform data will not be recorded.

- After [Start recording] is activated to when pre-trigger has passed.
- After waveform recording has stopped to when post-trigger has passed.

Settings for recording

The following parameters can be set independently for the CH1 + CHA and CH2 + CHB sets.

Memory Division

Memory is divided and used according to the table below.
The maximum recordable length is set as the limit for data length (number of words) that can be pre-set.

Memory division values and maximum recordable length

Division values	2	4	8	16	32
Number of words	32,000	16,000	8,000	4,000	2,000

Sampling speed

Sampling speed to retrieve data can be chosen from below.
400 kS/s, 200 kS/s, 100 kS/s, 50 kS/s, 40 kS/s, 20 kS/s, 10 kS/s, 5 kS/s, 4 kS/s, 2 kS/s, 1 kS/s, 500 S/s, 400 S/s, 200 S/s, 100 S/s, 50 S/s, 40 S/s, 20 S/s, 10 S/s

Trigger types and setting items

Refer to the table below

Trigger types and setting items

Type 1	Type 2	Setting items
Analog	Level	Slopes (rise/fall), level
	Window	In/out, upper level/lower level
Logic	--	Pattern (1, 0, ×), AND/OR
External	--	Slopes (rise/fall) Analog option
Timer	--	Interval (1/2/5/10/15/20/30/60, 1 day) Set the start time in the case of 1 day setting
Software	--	--
CH synchronization	--	--
Measured value	Level	Slopes (rise/fall), level
	Window	In/out, upper level/lower level

*Software trigger is a trigger controlled by PC application and is equivalent to the manual trigger.
*Either one from Type 2 can be selected.
*OR/AND can be selected for the start trigger.
*AND/OR of bit can be set for the logic pattern.
*Only a software trigger can activate a trigger when not recording.
*All sources can set IN USE/NOT IN USE.
*When all triggers are NOT IN USE, only interval data is recorded.
*Analog option is only available during the OR setting.

Pre-trigger/post-trigger	Pre-trigger length and post-trigger length can be set as long as the data length is not exceeded. *Pre-trigger can be set for all triggers but there are limitations for post-trigger setting. ❖ **"Trigger correspondence table"(P.143)**
Trigger filter	A trigger can be activated when the trigger condition continues for a certain period of sampling time. Trigger filter can be set within a sampling area of 0 to 255.

Trigger output	When the start trigger is activated, TRIG. OUT terminal becomes active (Open collector ON). Trigger output time can be chosen from the following: • Continuation of output (reset from PC application) • Specified output time (1 to 255 s, reset from PC application) • During waveform retrieval (from start trigger to stop trigger or maximum recordable length)

Trigger correspondence table

			Stop trigger (end of waveform recording)					Trigger setting items	
			Analog		Logic	External	CH synchro-nization	Trigger filter	Post-trigger
			Level	Window	Pattern				
Start trigger (start of waveform recording)	Analog	Level	●	●	●	●	×	●	●
		Window	●	●	●	●	×	●	●
	Logic	Pattern	●	●	●	●	×	●	●
	External	--	●	●	●	●	×	×	●
	timer	--	×	×	×	×	×	×	×
	software	--	×	×	×	×	×	×	×
	CH synchro-nization	--	×	×	×	×	●	×	×
	Measured value	Level	×	×	×	×	×	×	×
		Window	×	×	×	×	×	×	×

(● indicates that setting is possible)
* Stop trigger only available in OR setting

NOTE

All waveform data will be erased when setting is changed.

(c) Alarm setting/recording function

Start trigger, and power outage/restoration are identified as alarm, and during the availability of recording function, are recorded as flash memory.

Start trigger:

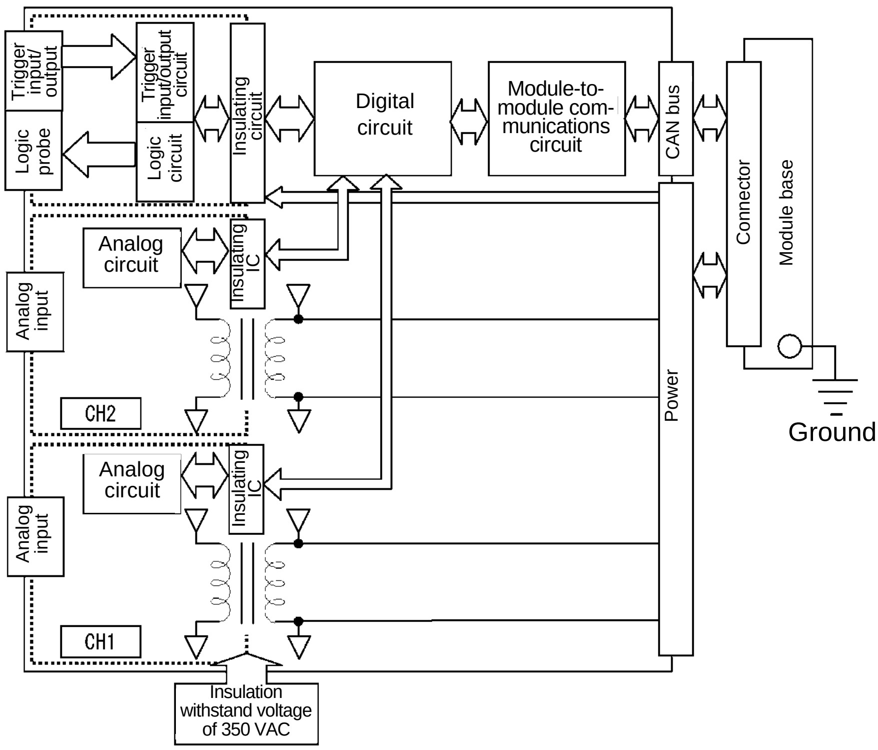
Identification method	For the analog trigger and logic trigger, the instantaneous value of each sampling is identified, while for the measured value trigger, the measured value at each second is identified. In both cases, it is effective for the respective mode.
Recording contents	Data → time, CH, trigger type (Type 1) Waveform recording is carried out under the conditions pre-set (b).
Power outage	Identification method, a power outage/restoration is identified after power has been restored. Recording contents: One Data set contains time and outage/restoration.

8.5 Insulation of Internal Circuit

CAUTION

Logic probe input terminals, trigger input terminals, and terminals are not insulated from each other. Errors and malfunctions, electric shocks may occur if the polarity of the input signals and potential difference to earth are inaccurate.

The instrument is insulated as shown in the diagram: internal analog circuit - between CAN bus, logic analog circuit/trigger output circuit - between CAN bus, and analog input circuit - between logic probe input circuit and trigger input circuit (dielectric strength AC 350 V, 50/60 Hz, response current 5 mA, 1 minute)



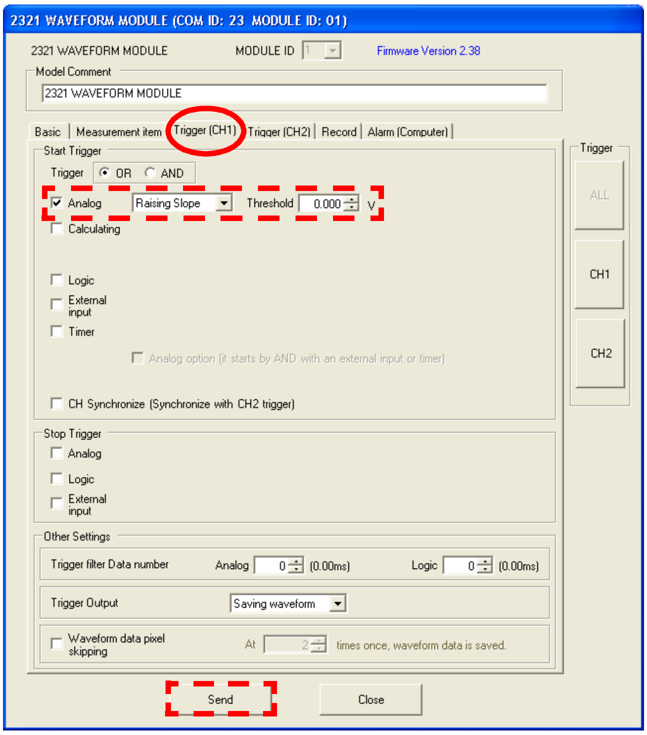
NOTE

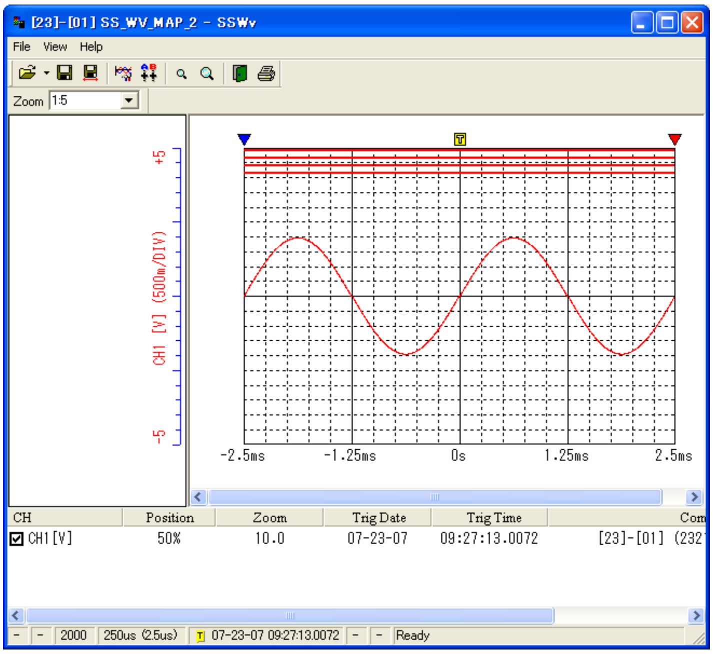
The COM terminal in the trigger input area is common to CH1 and CH2.

8.6 Trigger application example

[Example 1] Retrieve data when input has exceeded a certain level

To retrieve waveform when input signal has exceeded a certain level, the following analog trigger must be set. The example shows data retrieval when pre-set voltage exceeds 0 V.





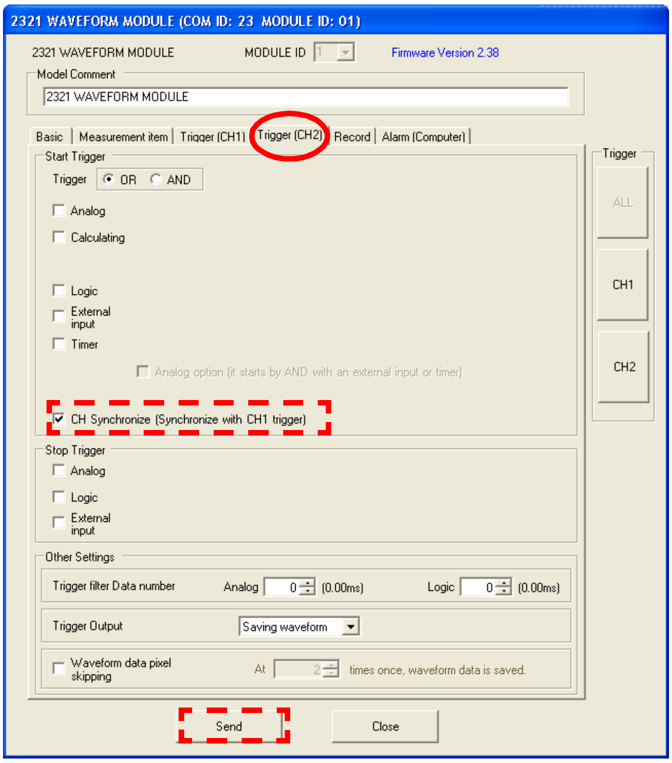
To retrieve data before the trigger is activated, pre-trigger must also be set.

The following settings for analog trigger can also be set besides [rise].

Rise	Data retrieval when input signal has exceeded a certain level
Fall	Data retrieval when input signal is below a certain level
Window (OUT)	Data retrieval when input signal is outside a certain region
Window (IN)	Data retrieval when input signal is within a certain region

[Example 2] Data retrieval when CHs are synchronized

To simultaneously retrieve data between CHs and to see the correlation between the data, the following setting is necessary.
The example shows the case when trigger is activated in CH1, and data is simultaneously retrieved in CH2.
(setting for CH1 trigger is optional)



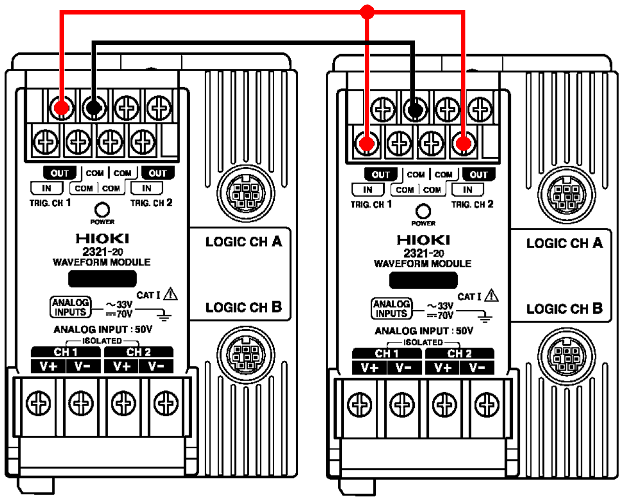
[Example 3] Data retrieval when modules are synchronized

The procedures for the simultaneous retrieval of data between synchronized modules are as follows:
The following explains the procedures for retrieving data by synchronizing the ID2 module to the CH1 trigger of ID1 module.

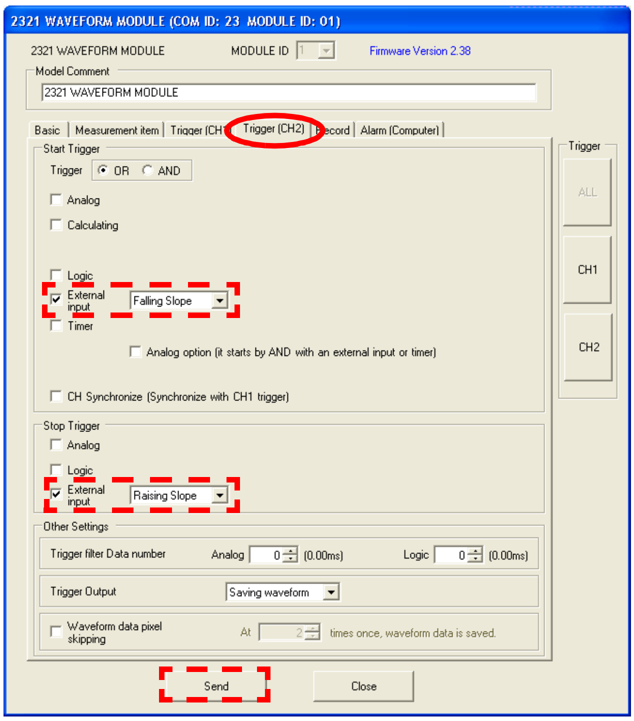
Procedures

1. Connect the external trigger terminal.

Input the TRIG. OUT of ID1, CH1 to TRIG. IN of ID2



2. Set ID2 to the fall value of the external trigger. In addition, if both data retrieval periods need to be the same, the stop trigger can be set to the rise value of the external trigger.



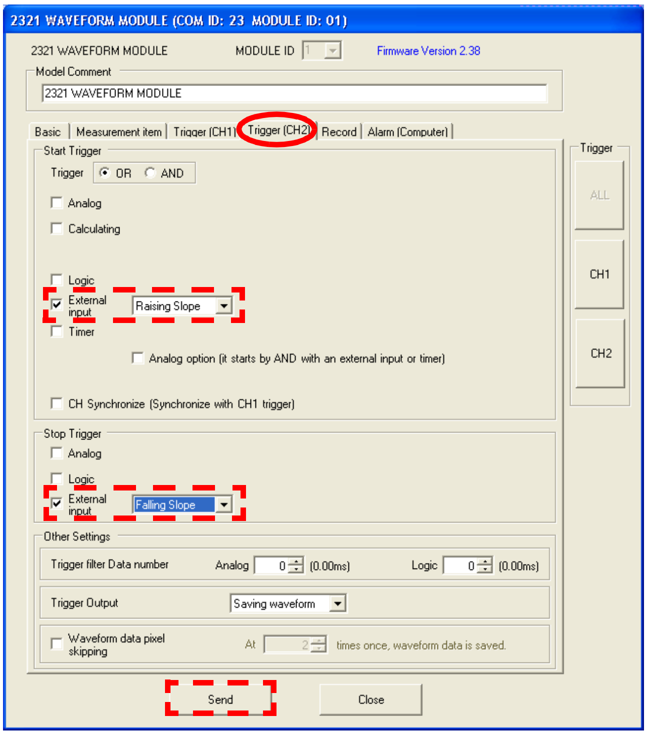
[Example 4] Data retrieval only during the period when the external signal is inputted

The following are the procedures for retrieving data only during the period when the external signal is inputted.

Procedures

1. Connect the external signal to the TRIG. IN terminal of the CH you wish to activate the trigger on.

2. Perform the following setting when data retrieval is required only during a period of high level external signals.



[Example 5] Monitoring the power of a voltage dip

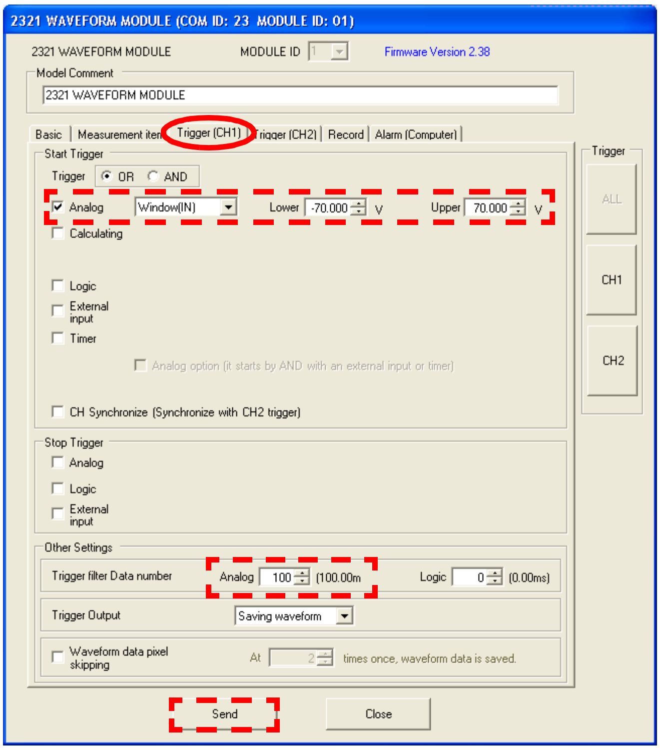
The following are the procedures to monitor the power of a voltage dip.

Procedures

1. As the input voltage region of the 2321-20 is ±50 V, connect the tip of the input terminal to a step-down transformer to reduce the voltage to ±50 V.

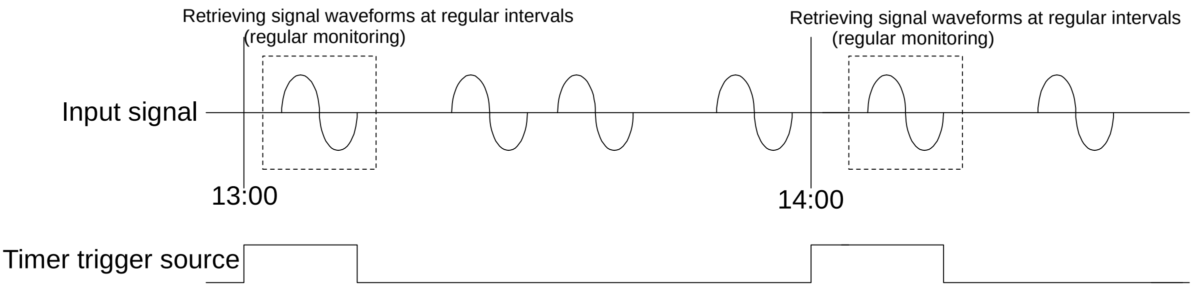
2. Set scaling.

3. Set the window in of the analog, trigger filter.
Set the voltage level to a level that the trigger cannot fall below, and the power frequency of the trigger filter to above half-wave (above 10 ms for 50 Hz and above 8.4 ms for 60 Hz). The trigger will be activated when the voltage is above half-wave and below the pre-set level.

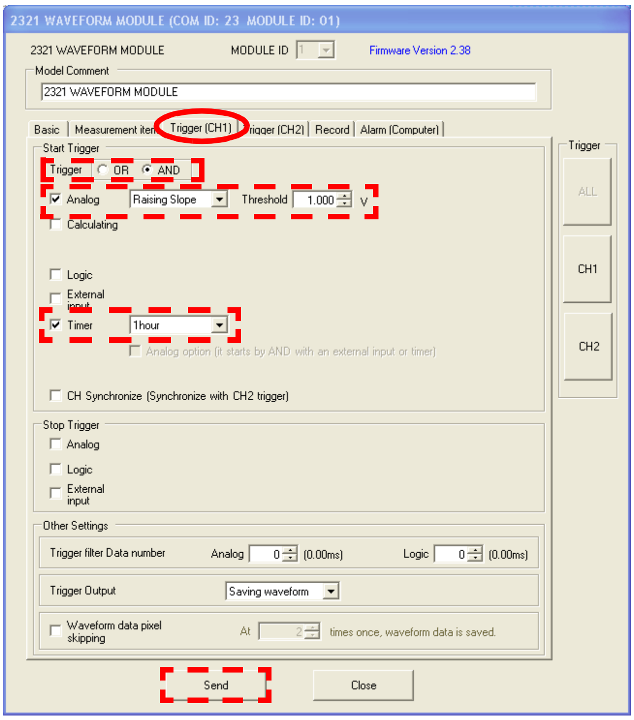


[Example 6] Data retrieval at regular intervals

To retrieve analog data regularly (every hour in the example), analog trigger, timer trigger, and AND settings required, as shown in the following waveform example.

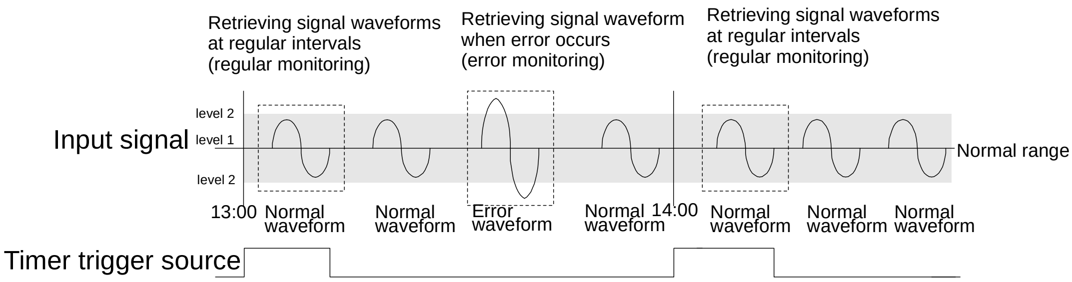


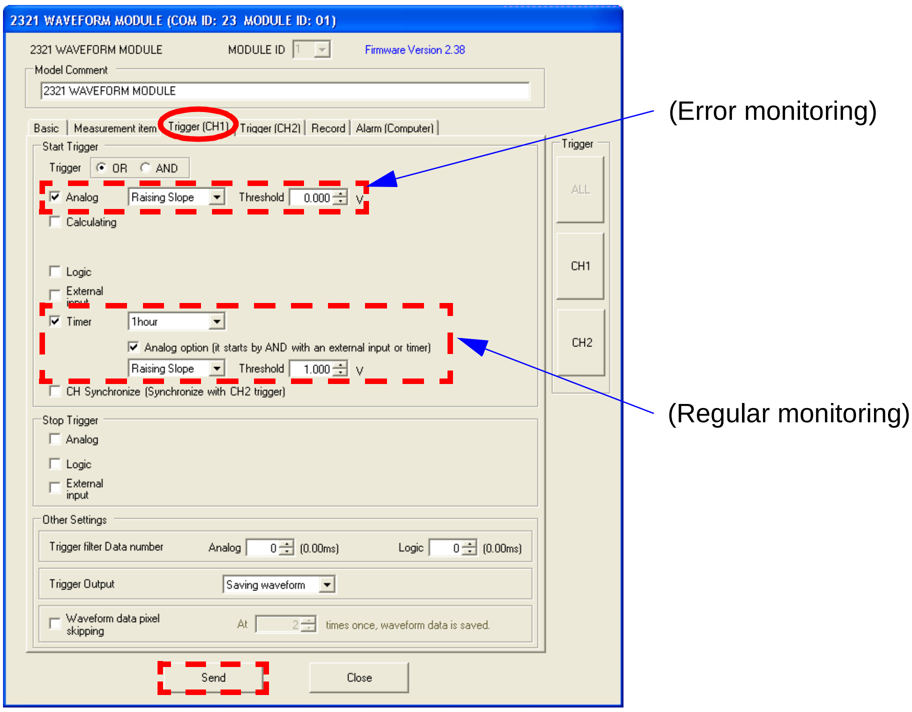
Setting example is as follows.



[Example 7] Data retrieval at regular intervals as well as when error occurs

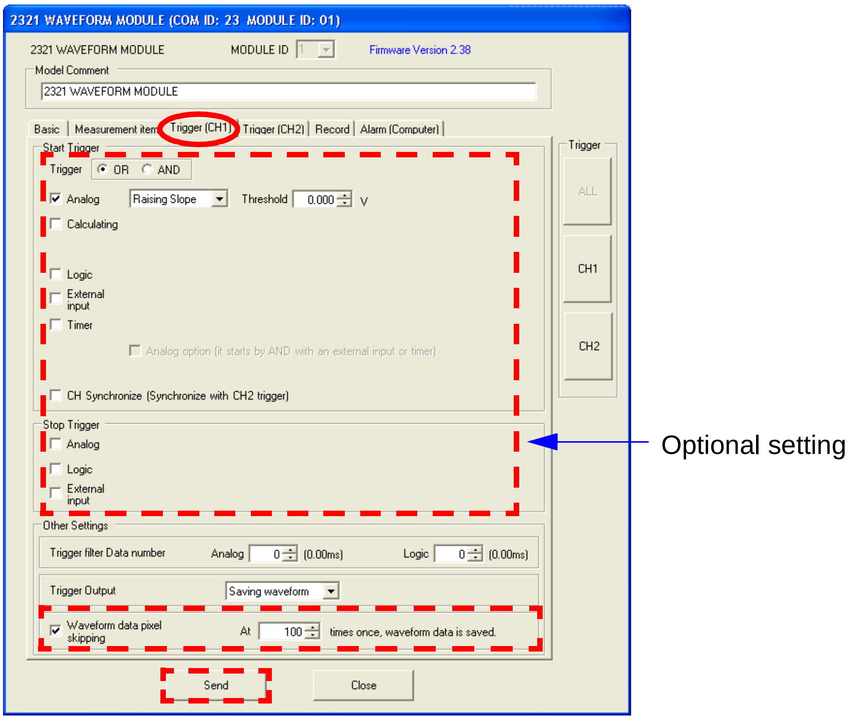
To retrieve analog data regularly (every hour in the example) and also during the period when an error has occurred, setting for the retrieval of data is as follows.





[Example 8] Saving culled data

To save culled data, waveform data culling function must be set. For example, when culling is set at 100, data is saved only once out of every 100 trigger occurrences.



8.7 Specifications

8.7.1 Basic Specifications

Instrument specifications

Number of inputs	Analog 1 input × 2CH Logic 4 inputs × 2CH
Maximum sampling rate	400 kS/s
Input terminal	voltage input (CH1, CH2) Logic input (CH A-1 to CH A-4, CH B-1 to CH B-4) External trigger input (CH1, CH2)
Output terminal	External trigger output (CH1, CH2)
Power outage protection	After recovering from a power outage, the instrument automatically returns to the state held before the outage.

Analog input specifications

Input terminal	Terminal block
Input resistance	1MΩ ±1%
Input capacity	10 pF ±5 pF (at 100 kHz)
Low pass filter	OFF/5 Hz ±50%/50 Hz ±50%/500 Hz ±50%/5 kHz ±50% (-3dB)
Range	50 V/20 V/10 V/5 V/2 V/1 V/500 mV/200 mV/100 mV/50 mV Indication possible up to 110% of each range
AD optical resolution	12bit
Accuracy	23 °C ± 5°C, set at 30 minutes after power is turned on.
DC accuracy	; ± 0.5%f.s. (filter 5 Hz ON)
Frequency	; DC - 40 kHz, at 40 kHz -3dB
Temperature	; at DC ± 0.03%f.s./ °C
Guaranteed accuracy period	1 year
Pre-heating time	30 minute
Noise	2 mVp-p (typ), 4 mVp-p (max) (at 50 mV range, filter OFF, input short circuit)
Common mode removal comparison	Above 80 dB (50/60 Hz signal source resistance below 100 Ω)
Input method	Uneven input (floating)
Maximum input voltage	AC33 Vrms DC70 V
Maximum rated voltage to earth	AC33 Vrms DC70 V

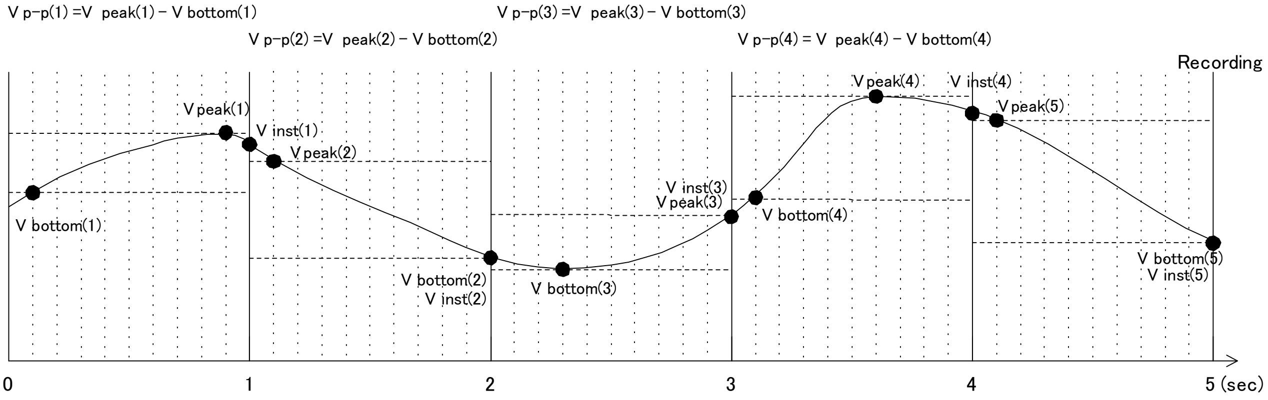
Logic input specifications

According to the specifications for Logic probe 9320-01, MR9321-01

Measured specifications

Measured value	The maximum value of an analog waveform in 1 second (Peak), the minimum value (Bottom), Peak-peak value (pp), maximum electric potential (Ap), crest Factor (CF), Mean (MEAN), root mean square value (RMS), analog waveform per second, and instantaneous value of logic waveform (INST)
RMS measurement	Calculation of 1 data per second at a fixed 10 kS (accuracy not specified)

[Example] 5 seconds recording interval, sampling at 100 ms



Trigger input/output specifications

Trigger input	Judgment level: L +0.0 V to +1.0 V, H +2.5 to +5.0 V (logically unspecified for the region +1.0 V to +2.5 V)
Pulse width	Above the sampling interval specified for waveform recording
Maximum input voltage	DC10 V
Trigger output	Open collector output DC30 V/500 mA MAX.

8.7.2 Function Specifications

Execute the functions from the PC application via communications.

Monitoring function

Output the current measured value

Recording function

Recording the measured values and waveforms under pre-set conditions

- Actual timing control: controlled by PC application
  Recording: start of trigger waiting: immediate start/start of pre-set time (start from suitable intervals).
  Recording: end of trigger waiting: manual finish/end at pre-set time
- Power outage strategy: after power is restored, automatic restoration to condition before the power outage.

Record of measured value

(Record measured values under conditions set at each pre-set interval)

Operation when memory is full	Memory full stop /Endless ♦Set the condition before the start of recording.
Recording interval	1/2/5/10/15/20/30 sec., 1/2/5/10/15/20/30/60 min.
Recording mode	Instantaneous value of the measured value at each interval, MAX/MIN/AVE, MAX/MIN/AVE + instantaneous value (instantaneous value at each interval only for logic). * Recording mode can be chosen from PC application.
Recorded data	One data set contains: Time, interval value of measured value (according to the recording mode) ♦Data is scaled if scaling is ON. (excluding CF, logic data)

Memory used	Flash memory
Recording capacity	512 kbyte

Waveform recording

(Record analog waveform and logic waveform that match the pre-set trigger conditions)

Memory used	SRAM
Maximum recording capacity	64,000 words/ CH
Maximum recording length	32,000 words/1 waveform data (Memory Division 2)
Operation under Memory full	New triggers will not be accepted Waveform data will be forwarded to the PC, and trigger will again be accepted once capacity is freed up in the memory.
Data eradication	When measurement parameters are changed, all the data will be eradicated.
Recording contents Waveform data	1. data⇒time of activation of start trigger, trigger type, waveform data ;from pre-trigger after the start trigger has been activated, to post-trigger after the stop trigger has been activated or up to the limit of the pre-set data length, analog waveform data + logic data *re-set data length is set as the limit. Triggers are not accepted while waiting for pre-trigger to be activated.
Settings for recording	The following parameters can be set independently for the CH1 + CHA and CH2 + CHB sets. In addition, all data will be eradicated when the following settings are changed.
Memory Division	Refer to Graph 1. maximum recording length (number of words) is set as the data length limit

Table 1: Memory division values and maximum recordable length

Division values	2	4	8	16	32
Number of words	32000	16000	8000	4000	2000

Sampling speed	400kS/s, 200kS/s, 100kS/s, 50kS/s, 40kS/s, 20kS/s, 10kS/s, 5kS/s, 4kS/s, 2kS/s, 1kS/s, 500S/s, 400S/s, 200S/s, 100S/s, 50S/s, 40S/s, 20S/s, 10S/s
Trigger types	• Analog (level or window), logic, external, timer, software (trigger controlled by PC application, equivalent to manual trigger), between CH, measured value (level or window) • OR/AND setting possible with start trigger • Setting of AND/OR of bit possible with Logic pattern • Only a software trigger can activate a trigger when not recording. • All sources can set IN USE/NOT IN USE. • When all triggers are NOT IN USE, only interval data is recorded. • Analog option is only available during the OR setting.
Pre-trigger/post-trigger	Pre-trigger length and post-trigger length can be set as long as the data length is not exceeded. *Pre-trigger can be set for all triggers but there are limitations for post-trigger setting. ❖ Refer to the "Table2: Trigger types and setting items"(P.156)
Trigger filter	Trigger filter can be set within a sampling area of 0 to 255.
Trigger output	Output starts when start trigger is activated Period of trigger output can be chosen from the following: Continuation of output (reset from PC application) Specified output time (1 to 255 s, reset from PC application) During waveform retrieval (from start trigger to stop trigger or maximum recordable length)
Culling of waveform data	preserving culled waveform data Setting possible from 2 to 32000 Culling does not apply to software trigger (Waveform data is constantly preserved during recording for software trigger)

Trigger types and setting items: Refer to the table 2 below

Table2: Trigger types and setting items

Type 1	Type 2	Setting items
Analog	Level	Slopes (rise/fall), level
	Window	In/out, upper level/lower level
Logic	--	Pattern (1, 0, ×), AND/OR
External	--	Slopes (rise/fall) Analog option
Timer	--	Interval (1/2/5/10/15/20/30/60, 1 day) Set the start time in the case of 1 day setting
Software	--	--
CH synchro-nization	--	--
Measured value	Level	Slopes (rise/fall), level
	Window	In/out, upper level/lower level

* Type 2 enables one of the following settings.

Trigger correspondence table 3: Refer to the table below (●indicates that setting is possible)

Table 3: Trigger correspondence

			Stop trigger (end of waveform recording)					Trigger setting items	
			Analog		Logic	External	CH syn-chroni-zation	Trigger filter	Post-trigger
			Level	Window	Pattern				
Start trigger (start of waveform recording)	Analog	Level	●	●	●	●	×	●	●
		Window	●	●	●	●	×	●	●
	Logic	Pattern	●	●	●	●	×	●	●
	External	--	●	●	●	●	×	×	●
	timer	--	×	×	×	×	×	×	×
	software	--	×	×	×	×	×	×	×
	CH synchro-nization	--	×	×	×	×	●	×	×
	Measured value	Level	×	×	×	×	×	×	×
		Window	×	×	×	×	×	×	×

* Stop trigger only available in OR setting

Alarm setting/recording function

Start trigger, and power outage/restoration are identified as alarm, and during the availability of recording function, are recorded as flash memory.

Start trigger	Identification method; For the analog trigger and logic trigger, the instantaneous value of each sampling is identified, while for the measured value trigger, the measured value at each second is identified. In both cases, it is effective for the respective mode. Recording contents; 1 Data set conttaintstime, CH, trigger type (Type 1) Waveform recording is carried out under the conditions pre-set.
Power outage	Identification method; power outage/restoration is identified after power has been restored.
Recording contents	1 Data set conttaintstime, generation/restoration

8.7.3 General Specifications

Clock accuracy	±100 ppm (Reference value at temperature from 0 to 50°C (32 to 122°F) without the communications module)
Dimensions	Approx. 68.5W × 96H × 94.5D mm (2.70"W × 3.78"H × 3.72"D) (including cover, excluding projections)
Mass	Approx. 345g (12.2 oz.) (including cover)
Backup Interval recording data Waveform data	Data and recording setting ; Data errors in the maximum 2 minutes before and after a power outage. ; Only data recorded before a power outage (waveform data still in the recording process will be lost) (For backup battery used, Battery life: approx. 10 years, Reference value at temperature 25°C (77°F))
Communication interface	CAN bus
Rated supply voltage	5 V±0.2 VDC
Maximum rated power	2.5 W
Dielectric strength	Between the analog CHs below, analog CH - between CAN bus, all logic types - between CAN bus, analog CH - all logic types AC 350 V 50/60 Hz, response current 5 mA, 1 minute analog 2CH Logic 4CH × 2, trigger input terminals, trigger output terminals (logic type).
Operating environment	Indoors, altitude up to 2000 m (6562-ft.)
Operational ranges for temperature and humidity	0 to 50°C (32 to 122°F), 80%RH or less (with no condensation)
Temperature and humidity ranges for storage	-10 to 60°C (14 to 140°F), 80%RH or less (with no condensation)
Options	9320-01 LOGIC PROBE, MR9321-01 LOGIC PROBE, 9765 CLAMP ON SENSOR, 9695-02 CLAMP ON SENSOR, 9695-03 CLAMP ON SENSOR, 9661-01 CLAMP ON SENSOR, CLAMP SENSOR CABLE
Standards applying	Safety EN61010, Pollution degree 2 Measurement Category I (anticipated transient overvoltage 330 V) EMC EN61326 Class A

8.8 Disposing of the Instrument

Before Disposing of the Instrument

The instrument contains a lithium battery for memory backup.

⚠WARNING

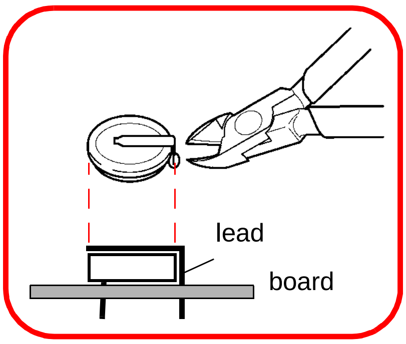
- **To avoid electric shock, turn off the power switch and disconnect the power cord and cables before removing the lithium battery.**
- **Battery may explode if mistreated. Do not short-circuit, recharge, disassemble or dispose of in fire.**

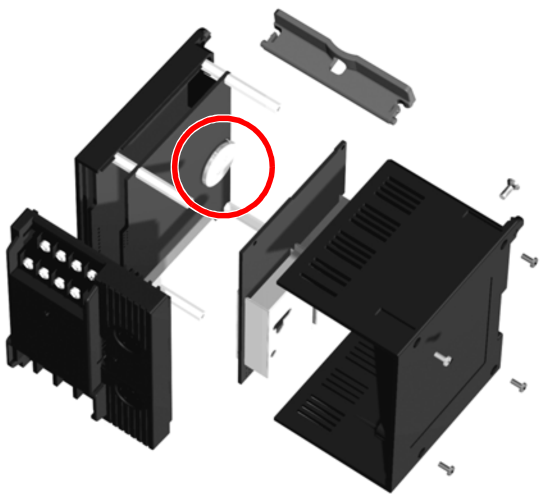
⚠CAUTION

When disposing of this instrument, remove the lithium battery and dispose of battery and instrument in accordance with local regulations.

Required tools:
- One Phillips screwdriver
- One pair of wirecutters

1. Remove the 5 screws securing the lower case.
2. Use wirecutters to clip both leads of the button style lithium battery.





The instrument contains a built-in backup lithium battery, which offers a service life of about ten years.
When waveform data is lost during a power outage, it is the time to change the batteries. Contact your dealer or Hioki representative.

CALIFORNIA, USA ONLY
This product contains a CR Coin Lithium Battery which contains Perchlorate Material - special handling may apply.
See www.dtsc.ca.gov/hazardouswaste/perchlorate

2331-20 POWER METER MODULE

9

9.1 Overview

9.1.1 Product Overview

- The 2331-20 is a measurement module of the Hioki "Smart Site" (remote measurement system).
- This module measures and records power at regular intervals.
- And the voltage, current, active power, power factor, active energy within an interval, and frequency are also can be measured.
- The 2331-20 is used with the power supply module, communications module, and module base.

Number of measurement circuits	(1P2W/1P3W/3P3W/3P4W) 1 circuit
Voltage input	100 V (70 to 130 VAC)/ 200 V (140 to 260 VAC) line
Current Input	Clamp sensor

(Conceptual image)

NOTE Do not use this module as a wattmeter or watt-hour meter for business transactions.

9.1.2 Major Features

- **This is a clamp-type wattmeter is used for a 100/200 VAC single-phase line to a 3-phase, 4-wire line.**
- **The recording interval is selectable from 1 second to 60 minutes.**
- **The maximum, minimum, and average measurements during the recording interval can be recorded (with sampling once a second).**
- **The module has an alarm output terminal.**

Rough Estimate of Storable Data Quantity and Time

Action at memory full: Continue recording (Endless)

1P2W			
	Recording Mode		
	Instantaneous Value	MAX/MIN/AVE	Instantaneous Value + MAX/MIN/AVE
Quantity of storable data	13000	5900	4600
Recording interval			
1 sec.	3.5 hours	1.5 hours	1 hour
2 sec.	7 hours	3 hours	2.5 hours
5 sec.	18 hours	8 hours	6 hours
10 sec.	1.5 days	16 hours	12.5 hours
15 sec.	2 days	1 day	19 hours
20 sec.	3 days	1 day	1 day
30 sec.	4.5 days	2 days	1.5 days
1 min	9 days	4 days	3 days
2 min.	18 days	8 days	6 days
5 min.	46 days	20 days	16 days
10 min.	92 days	41 days	32 days
15 min.	138 days	61 days	48 days
20 min.	184 days	82 days	64 days
30 min.	277 days	123 days	96 days
60 min.	554 days	246 days	192 days

NOTE

When the alarm log is ON, the higher the number of alarms generated, the smaller the recording period. (Approx. 1/2 of the data per alarm)

Action at memory full: Continue recording (Endless)

1P3W/3P3W			
	Recording Mode		
	Instantaneous Value	MAX/MIN/AVE	Instantaneous Value + MAX/MIN/AVE
Quantity of storable data	10000	4400	3400
Recording interval			
1 sec.	2.5 hours	1 hour	0.5 hours
2 sec.	5.5 hours	2 hours	1.5 hours
5 sec.	14.5 hours	6 hours	4.5 hours
10 sec.	1 day	12 hours	9.5 hours
15 sec.	1.5 days	18 hours	14 hours
20 sec.	2 days	1 day	19 hours
30 sec.	3.5 days	1.5 days	1 day
1 min	7 days	3 days	2 days
2 min.	14 days	6 days	4.5 days
5 min.	36 days	15 days	11 days
10 min.	73 days	30 days	23 days
15 min.	110 days	46 days	35 days
20 min.	147 days	61 days	47 days
30 min.	221 days	92 days	71 days
60 min.	443 days	184 days	143 days

NOTE

When the alarm log is ON, the higher the number of alarms generated, the smaller the recording period. (Approx. 1/2 of the data per alarm)

Action at memory full: Continue recording (Endless)

3P4W			
	Recording Mode		
	Instantaneous Value	MAX/MIN/AVE	Instantaneous Value +MAX/MIN/AVE
Quantity of storable data	8800	3500	2700
Recording interval			
1 sec.	2 hours	0.5 hours	0.5 hours
2 sec.	4.5 hours	1.5 hours	1.5 hours
5 sec.	12 hours	4.5 hours	3.5 hours
10 sec.	1 day	9.5 hours	7.5 hours
15 sec.	1.5 days	14.5 hours	11 hours
20 sec.	2 days	19.5 hours	15 hours
30 sec.	3 days	1.5 days	22.5 hours
1 min	6 days	2 days	1.5 days
2 min.	12 days	4 days	3.5 days
5 min.	30 days	12 days	9 days
10 min.	61 days	24 days	18 days
15 min.	92 days	36 days	28 days
20 min.	123 days	49 days	37 days
30 min.	184 days	73 days	56 days
60 min.	369 days	147 days	113 days

NOTE

When the alarm log is ON, the higher the number of alarms generated, the smaller the recording period. (Approx. 1/2 of the data per alarm)

Action at memory full: Stop recording (Memory full stop)

1P2W			
	Recording Mode		
	Instantaneous Value	MAX/MIN/AVE	Instantaneous Value +MAX/MIN/AVE
Quantity of storable data	15000	6800	5300
Recording interval			
1 sec.	4 hours	1.5 hours	1 hour
2 sec.	8.5 hours	3.5 hours	1.5 hours
5 sec.	21 hours	9 hours	7 hours
10 sec.	1.5 days	18.5 hours	14.5 hours
15 sec.	2.5 days	1 day	22 hours
20 sec.	3.5 days	1.5 days	1 day
30 sec.	5 days	2 days	1.5 days
1 min.	10 days	4.5 days	3.5 days
2 min.	21 days	9 days	7 days
5 min.	53 days	23 days	18 days
10 min.	106 days	47 days	37 days
15 min.	159 days	71 days	55 days
20 min.	213 days	94 days	74 days
30 min.	319 days	142 days	111 days
60 min.	639 days	284 days	222 days

NOTE

When the alarm log is ON, the higher the number of alarms generated, the smaller the recording period. (Approx. 1/2 of the data per alarm)

Action at memory full: Stop recording (Memory full stop)

1P3W/3P3W			
	Recording Mode		
	Instantaneous Value	MAX/MIN/AVE	Instantaneous Value +MAX/MIN/AVE
Quantity of storable data	12000	5100	3900
Recording interval			
1 sec.	3 hours	1 hour	1 hour
2 sec.	6.5 hours	2.5 hours	2 hours
5 sec.	17 hours	7 hours	5.5 hours
10 sec.	1 day	14 hours	11 hours
15 sec.	2 days	21 hours	16.5 hours
20 sec.	2.5 days	1 day	22 hours
30 sec.	4 days	1.5 days	1 day
1 min.	8 days	3.5 days	2.5 days
2 min.	17 days	7 days	5 days
5 min.	42 days	17 days	13 days
10 min.	85 days	35 days	27 days
15 min.	127 days	53 days	41 days
20 min.	170 days	71 days	55 days
30 min.	255 days	106 days	82 days
60 min.	511 days	213 days	165 days

NOTE

When the alarm log is ON, the higher the number of alarms generated, the smaller the recording period. (Approx. 1/2 of the data per alarm)

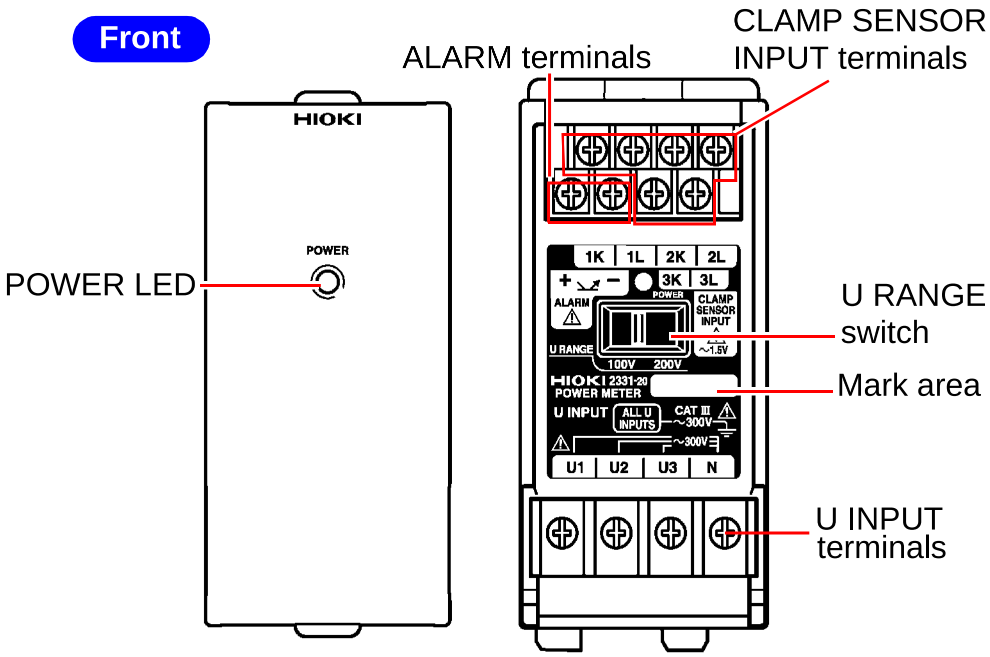
Action at memory full: Stop recording (Memory full stop)

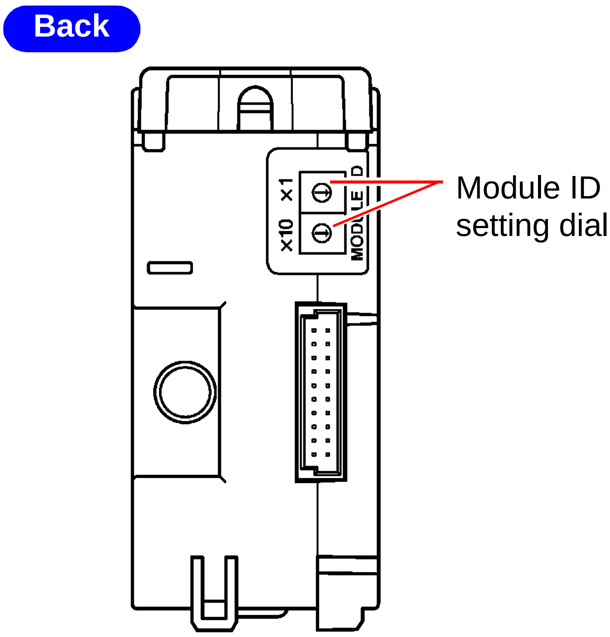
3P4W			
	Recording Mode		
	Instantaneous Value	MAX/MIN/AVE	Instantaneous Value +MAX/MIN/AVE
Quantity of storable data	10000	4000	3100
Recording interval			
1 sec.	2.5 hours	1 hour	0.5 hours
2 sec.	5.5 hours	2 hours	1.5 hours
5 sec.	14 hours	5.5 hours	4 hours
10 sec.	1 day	11 hours	8.5 hours
15 sec.	1.5 days	17 hours	13 hours
20 sec.	2 days	22.5 hours	17.5 hours
30 sec.	3.5 days	1 day	1 day
1 min.	7 days	2.5 days	2 days
2 min.	14 days	5 days	4 days
5 min.	35 days	14 days	10 days
10 min.	71 days	28 days	21 days
15 min.	106 days	42 days	32 days
20 min.	142 days	56 days	43 days
30 min.	213 days	85 days	65 days
60 min.	426 days	170 days	131 days

NOTE

When the alarm log is ON, the higher the number of alarms generated, the smaller the recording period. (Approx. 1/2 of the data per alarm)

9.1.3 Name and Function of the Parts



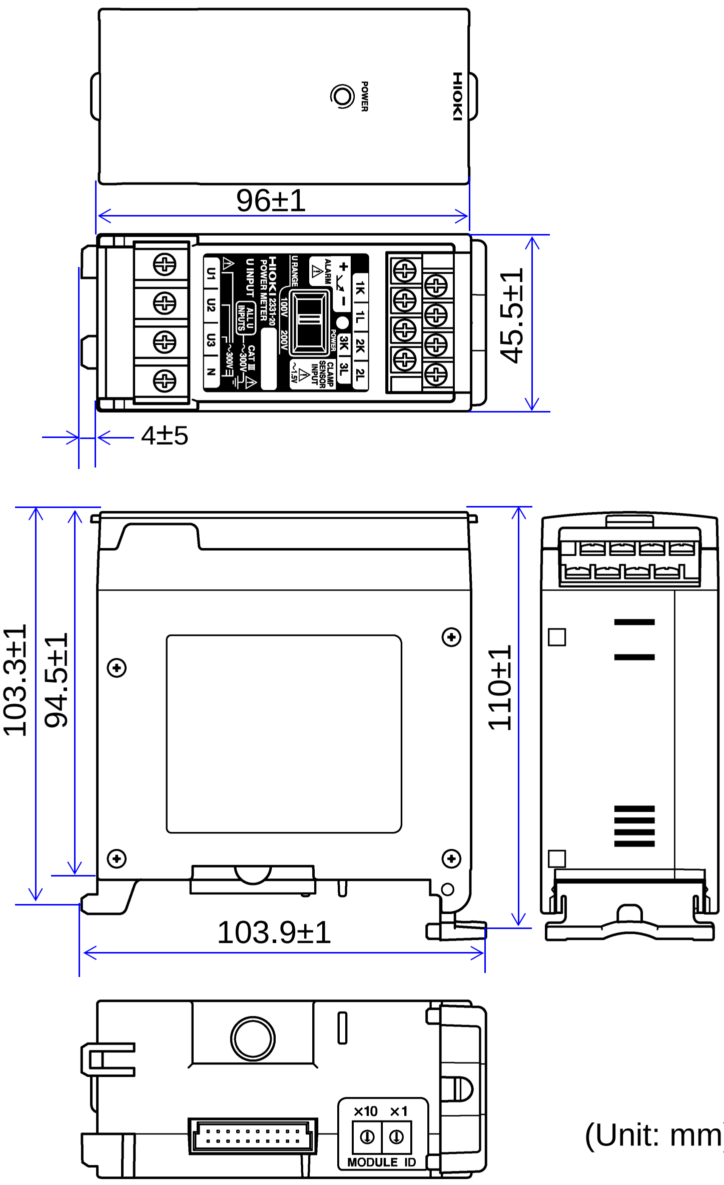


POWER LED	Goes on or flashes when power is supplied to the module. Remains on, flashes, or changes to another color according to the state of the module. **POWER LED indication** Lit in green : Data being recorded. Flashing in green : Standing by. Lit in yellow : Alarm output. Flashing in yellow: It indicates one of the following: • The voltage is outside the effective measurement range. • The current is out of range. • The active power is a negative value. Lit in red : Non-recoverable error occurred. *1 Flashing in red : Recoverable error occurred. *2
Mark area	Use this area to make a note of the object to measure or the module ID. Use an ink pen, since pencil lead may rub off.

CLAMP SENSOR INPUT terminals	Connect the output of clamp sensors to these terminals (for 3 channels).
U INPUT terminals	Connect voltages to be measured to these terminals.
ALARM terminals	Connect the alarm output cable to these terminals. These terminals are electrically insulated from the input terminals.
U RANGE switch	Select a voltage range of 100 V (70 to 130 VAC) or 200 V (140 to 260 VAC).
Module ID setting dial	Use the dial to set the module's identification No.

*1: The module needs repair. Contact your vendor (agent) or nearest Hioki office.
*2: The same module ID may be used by another module.

9.1.4 Dimension Diagrams



(Unit: mm)

9.1.5 Accessory and Option

Accessories

None

Option

9695-02	CLAMP ON SENSOR (50 Arms)
9695-03	CLAMP ON SENSOR (100 Arms)
9661-01	CLAMP ON SENSOR (500 Arms)
9765*	CLAMP ON SENSOR (5 Arms, For CT secondary side)
9238	CLAMP SENSOR CABLE
L9019-02	VOLTAGE CORD (Red/ Black)
L9019-03	VOLTAGE CORD (Red/ Black/ Yellow)
L9019-04	VOLTAGE CORD (Red/ Black/ Yellow/ Blue)

* Not complied with the CE marking.

When using Model 9765

DANGER

- **To avoid short circuits and potentially life-threatening hazards, never attach the product to a circuit that operates at more than 30 VAC, or over bare conductors.**
- **This product should only be connected to the secondary side of a breaker, so the breaker can prevent an accident if a short circuit occurs. Connections should never be made to the primary side of a breaker, because unrestricted current flow could cause a serious accident if a short circuit occurs.**

9.2 Settings

9.2.1 Setting the Module ID

You can connect up to 63 measurement modules to one communications module.

Setting Procedure

Use the module ID setting dial to set the ID No. of the module to a number from 01 and to 63. (You cannot set a number other than the above.)

NOTE

- Ensure that the set ID is not used for any other module connected to the same communications module.
- The ID numbers of modules need not be consecutive.
- Setting the ID to 99, then turning on the power resets all internal settings to the defaults.
- The module ID and COM ID are not related and can be set independently.

9.3 Preparations

DANGER

- **Note the following maximum input voltage.**
  U INPUT:AC300 Vrms, 424.3 V Peak
  CLAMP SENSOR INPUT: AC 1.5 Vrms, 2.2 V Peak
  ALARM:DC 30 V
  Attempting to measure voltage in excess of the maximum input could destroy the instrument and result in personal injury or death.
- **The maximum rated voltage between input terminals and ground is 300 VrmsAC. Attempting to measure voltages exceeding 300 VrmsAC. with respect to ground could damage the instrument and result in personal injury.**

CAUTION

- Do not connect to the instrument any current sensor other than the clamp sensor dedicated to the instrument. Other sensors could lead to instrument damage due to excessive input power.
- Avoid dropping the clamp or subjecting it to other impact, since this could damage the mating surface of the core and adversely affect measurement.
- Measurements are degraded by dirt on the mating surfaces of the clamp-on sensor, so keep the surfaces clean by gently wiping with a soft cloth.
- If the power supply produces noise, it is recommended to use a noise filter.
- If the power supply line or signaling line is likely to induce surges during electrical storms, etc., insert a dedicated lightning arrester between each line and the installed device to protect the module.

9.3.1 Installing the Module

(1) Installing the Module Base

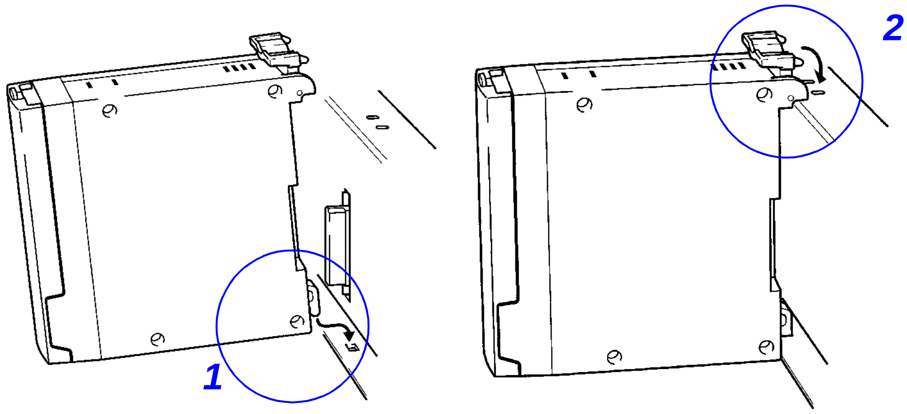
CAUTION

Do not mount the module base on the ceiling where it may fall off.

Fasten the module base to a DIN rail or the wall according to the procedure described in the **19 "2391-01, 2391-02, 2391-03 MODULE BASE"(P.305)** or **20 "2392-01/02 MODULE BASE"(P.319)** series MODULE BASE instruction manual.

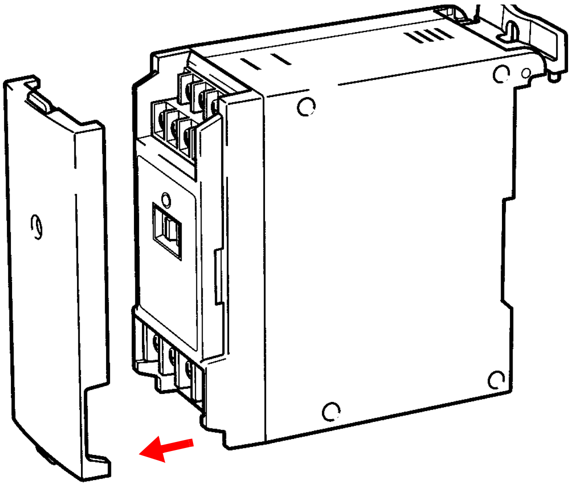
(2) Mounting a Module on the Module Base

Mount a module on the module base as shown below. Ensure that the lever clicks.



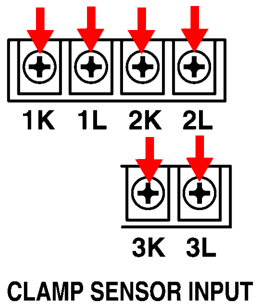
9.3.2 Connecting the Clamp Sensor to Module

1. Remove the cover from the module.



2. Connect the clamp sensor cables to the module's CLAMP SENSOR INPUT terminals (at a tightening torque of 0.5 N•m).

❖ **"Connection diagram"(P.176)**



Clamp Sensors:
9695-02 (50 A), 9695-03 (100 A), 9661-01 (500 A), 9765 (5 A, For CT secondary side)

Terminals
M3.0 screws are used for the terminal blocks for this module and the clamp sensors. For connection, a round crimp connector (RAV 1.25-3) is recommended.

Cables
The 9695-02 and 9695-03 use terminal blocks. Therefore, various types of cables may be usable.

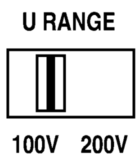
Cables equivalent to or better than 600 V vinyl-insulated 0.9 mm^2 or 300 V vinyl-insulated 0.75 mm^2 are recommended.
The 9238 CLAMP SENSOR CABLE (3 m) is optionally available.

NOTE

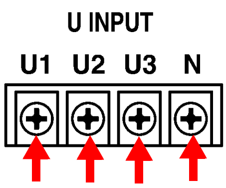
Note that measurement may be adversely affected by external noise or the electromagnetic environment when using cable longer than 3 meters.

9.3.3 Connecting the Voltage Cable to the Module

1. Use the U RANGE switch to select 100 V (70 to 130 VAC) or 200 V (140 to 260 VAC).



2. Connect voltage cables to the U INPUT terminals (at a tightening torque of 0.8 N•m).
❖ "Connection diagram"(P.176)



The terminal blocks use M3.5 screws. For connection, a round crimp connector (RAV 1.25-3.5) is recommended.
For wiring, cables equivalent to or better than 600 V vinyl-insulated 0.9 mm^2 is recommened.

9.3.4 Connecting Alarm Output

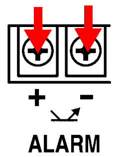
DANGER

Design the wiring to prevent short-circuiting of the ALARM and CLAMP SENSOR INPUT terminals, thus avoiding electric shock and accidents due to short-circuiting.

The terminal blocks use M3.0 screws (at a tightening torque of 0.5 N•m).
We recommend that you use a round crimp connector (RAV 1.25-3) for connection.
Open collector output (Rating: 30 VDC, 20 mA max.)

NOTE

- The ALARM terminals are electrically insulated from the U INPUT terminals and CLAMP SENSOR INPUT terminals.
- To avoid the effects of external noise, design the wiring so that cables connected to the ALARM terminals are separated from those for measurement, as well as cables connected to the CLAMP SENSOR INPUT terminals and voltage cables.



9.3.5 Connecting to the Measured Line

DANGER

- **In order to prevent electric shock and short-circuit accidents, shut off the power to the line to be measured before connecting the clamp sensors and voltage cords.**
- **The inputs of the U INPUT terminals U1-U3, and the N terminal are not insulated. To prevent electric shock, do not touch the terminals.**
- **The CLAMP SENSOR INPUT terminals are not insulated from the U INPUT terminals. Be careful to avoid electric shock and short-circuiting when using the U INPUT terminals.**
- **To avoid short circuits and potentially life-threatening hazards, never attach the clamp sensor to a circuit that operates at more than the maximum rated voltage, or over bare conductors.**
- **Clamp sensor should only be connected to the secondary side of a breaker, so the breaker can prevent an accident if a short circuit occurs. Connections should never be made to the primary side of a breaker, because unrestricted current flow could cause a serious accident if a short circuit occurs.**
- **If the secondary circuit is opened while electricity is being sent through the CT, very high and dangerous voltage may be generated at the secondary side terminal.**
- **Be sure to cover the measured line when live to avoid electric shock and short-circuiting.**

WARNING

When the clamp sensor is opened, do not allow the metal part of the clamp to touch any exposed metal, or to short between two lines, and do not use over bare conductors.

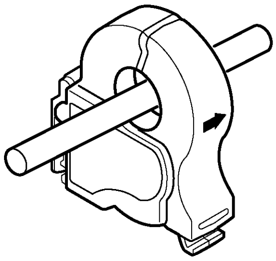
CAUTION

- Avoid stepping on or pinching cables, which could damage the cable insulation.
- Do not input voltage or current to the U INPUT terminals and CLAMP SENSOR INPUT terminals when module power is OFF. This will avoid damaging the module.

Connect the sensors and cables to the measured line according to the connection diagram.

1. Connect the clamp sensors to the line.

2. Connect the voltage cables to the line.



❖ **"Connection diagram"(P.176)**
❖ **Instruction manuals of the clamp sensors**

NOTE

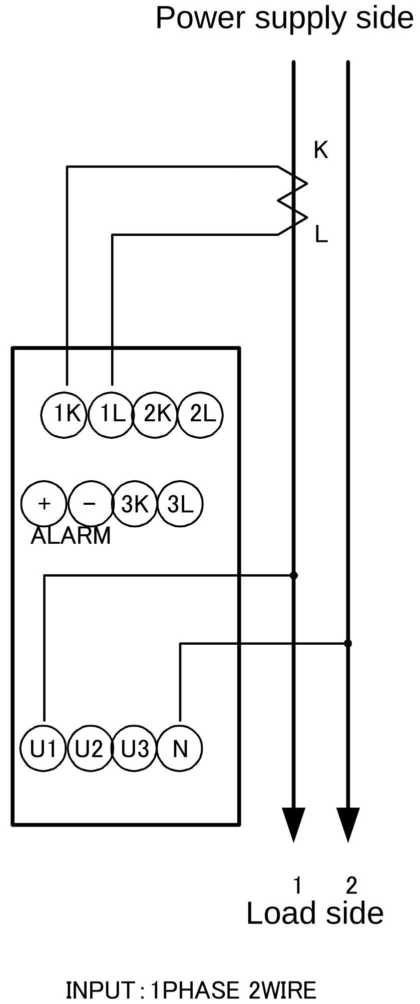
- Ensure that the measured line is correctly set and connection correctly made to ensure accurate measurement.
- Clamp the cladding of the wire by placing the clamp with the arrow on it facing the load side.
- This module can be used for a single-phase, 2-wire line to a 3-phase, 4-wire line. Each channel is not independent, however, and thus the module cannot be used as two single-phase watt-meters.
- When measuring a 3-phase line, be sure to align the phase sequence of the measured line with the order of measurement channels of the module.

Completing Measurement

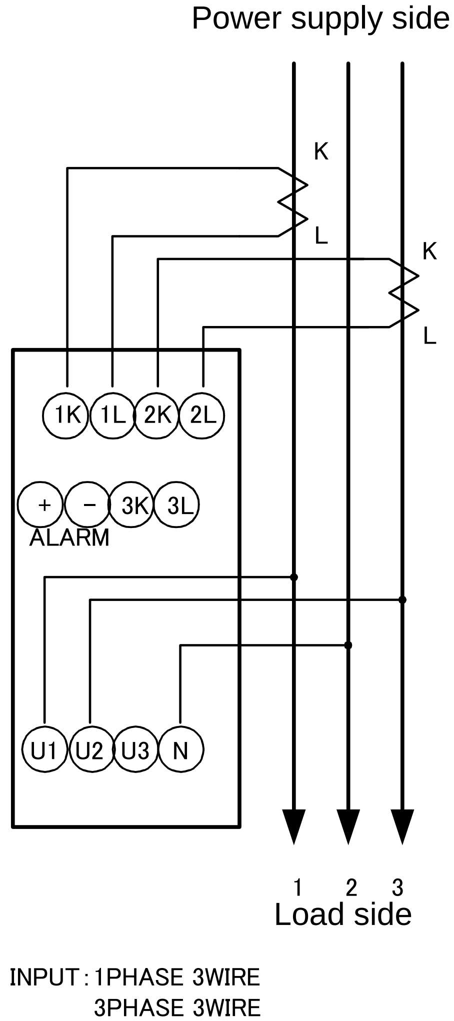
1. Remove the voltage cables.

2. Remove the clamp sensors.

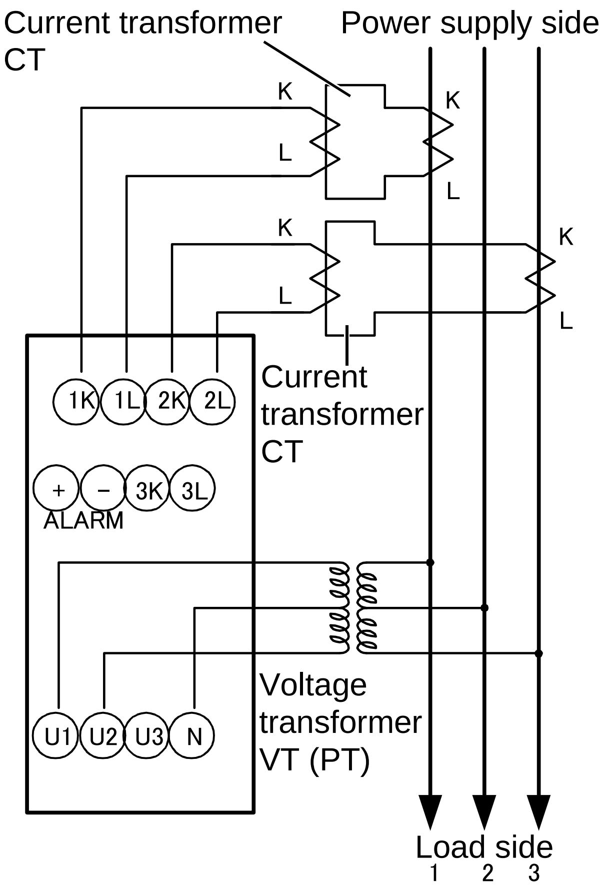
Connection diagram



Measurement of single-phase, 2-wire line

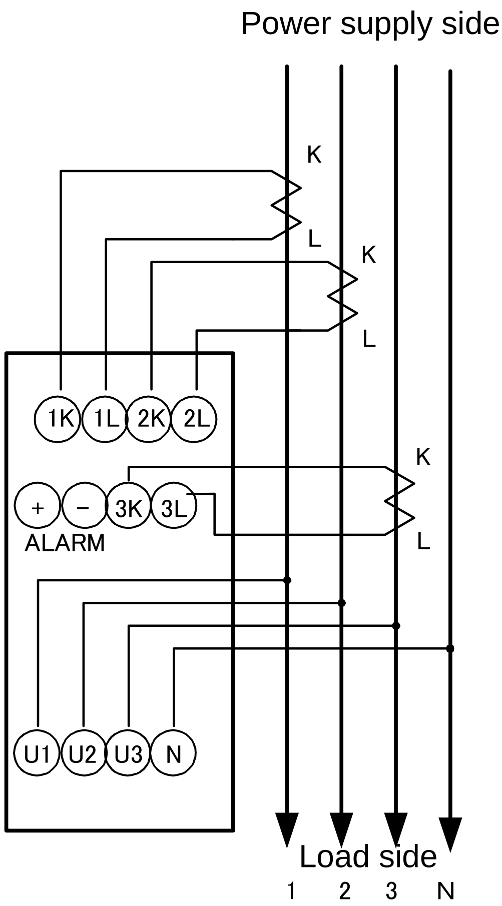


Measurement of singe-phase, 3-wire line or 3-phase, 3-wire line



INPUT : 1PHASE 3WIRE
3PHASE 3WIRE

Measurement of
singe-phase, 3-wire line
or
3-phase, 3-wire line
using CT and VT (PT)



INPUT : 3PHASE 4WIRE

Measurement of
3-phase, 4-wire line

9.4 Others

9.4.1 Alarm Output

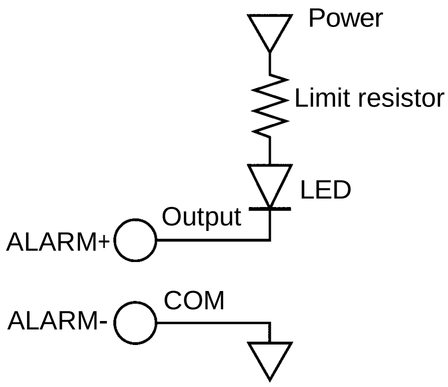
(1) Output Rating

WARNING

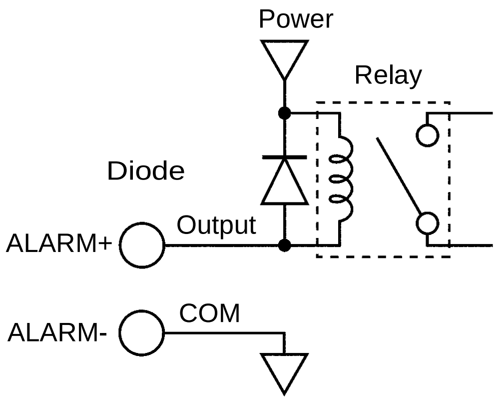
Ensure that the input does not exceed the maximum input voltage or current to avoid module damage, short-circuiting and electric shock resulting from heat building.

Output method	Open collector
Maximum input voltage / current	30 V, 20 mA max.
Signal logic	Enabled: ON Disabled: OFF

Circuit diagram



Connecting LED



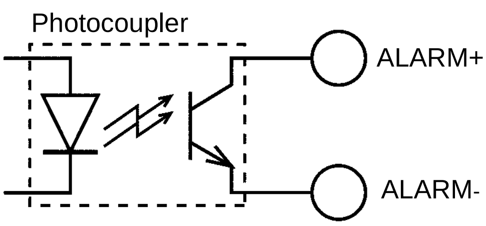
Connecting relay

NOTE

- When connecting a relay or LED lamp, ensure that the relay or lamp operates at up to 30 V and 20 mA. When connecting a relay, be sure to use a diode to absorb counter electromotive force.

(2) Target of Alarm Monitoring

One measurement item is judged whether high or low.

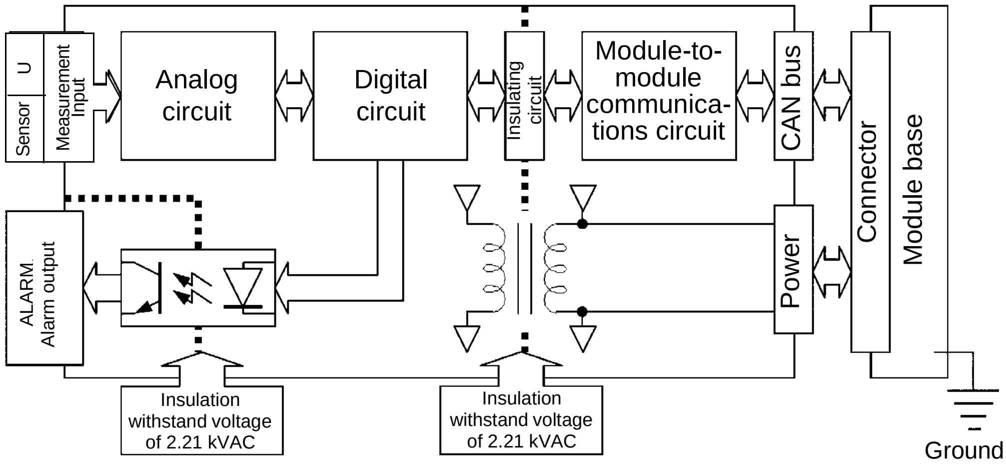


9.4.2 Insulation of Internal Circuit

DANGER

Insulation is not provided between the measurement input terminals or between the CLAMP SENSOR INPUT terminals and U INPUT terminals. Beware of electric shock and short-circuiting. Moreover, be sure to cover the measured line when live.

In the 2331-20, the input circuit and alarm output are insulated from the CAN bus as shown in the block diagram below. (Withstand voltage: 2.21 kVAC, 50/60 Hz, Response current: 5 mA, 1 minute)



9.5 Specifications

9.5.1 Basic Specifications

Condition of guaranteed accuracy

Condition of guaranteed accuracy	10-minute warming-up time, Sine wave input, Power factor =1, Common-mode voltage =0 V
Period of guaranteed accuracy	1 year
Effective measurement range	Voltage: 70%f.s. to 130%f.s. Current: 2%f.s. to 130%f.s.
Effective power	2%f.s. to 130%f.s.
The range of operating temperature and humidity for guaranteed accuracy	23°C±5°C (73°F±8.5°F), 80%RH or less The ranges above apply unless otherwise specified in each specification.
fundamental frequency range	45 to 66 Hz

Measurement items and accuracy specifications

Measurement lines	single-phase 2-wire line, single-phase 3-wire line, three-phase 3-wire line, three-phase 4-wire line
Measurement items	Voltage, current, active power, power factor, active energy within an interval, and frequency

Voltage / Current measurement

Measurement range	Voltage: U1,U2,U3 100 V,200 V (Switched using the SW.) Current: I1,I2,I3 1 A,5 A,50 A,100 A,200 A,500 A,1000 A (Depends on the clamp sensor used.)
Measurement accuracy	Voltage: ±1.0%f.s. Current: ±1.0%f.s. + Clamp sensor accuracy

Current range

Clamp Sensor and Its Current Range		2331-20 Current Range (Selectable using the PC application)
	1 A (100 mV/A)	1 A
9765	5 A (20 mV/A)	5 A
9695-02	50 A (10 mV/A)	5 A
		50 A
9695-03	100 A (1 mV/A)	100 A
9661-01	500 A (1 mV/A)	100 A
		500 A
	1000 A (0.5 mV/A)	200 A
		1000 A

Power range

Voltage /Wiring	Current	1.000 A	5.000 A	50.00 A	100.0 A	200.0 A	500.0 A	1.000 kA
100.0 V	1P2W	100.0 W	500.0 W	5.000 kW	10.00 kW	20.00 kW	50.00 kW	100.0 kW
	1P3W 3P3W	200.0 kW	1.000 kW	10.00 kW	20.00 kW	40.00 kW	100.0 kW	200.0 kW
	3P4W	300.0 W	1.500 kW	15.00 kW	30.00 kW	60.00 kW	150.0 kW	300.0 kW
200.0 V	1P2W	200.0 W	1.000 kW	10.00 kW	20.00 kW	40.00 kW	100.0 kW	200.0 kW
	1P3W 3P3W	400.0 W	2.000 kW	20.00 kW	40.00 kW	80.00 kW	200.0 kW	400.0 kW
	3P4W	600.0 W	3.000 kW	30.00 kW	60.00 kW	120.0 kW	300.0 kW	600.0 kW

- The range table lists the full scales of voltage and current measurement ranges.
- When the VT (PT) ratio and CT ratio are set, the ranges will be multiplied by (VT (PT) ratio × CT ratio).
- The number of digits of a measurement to display depends on the PC application used.

Active Power Measurement

Measurement range	Effective Power P Voltage range × Current range
Measurement accuracy	±1.5%f.s.+Clamp sensor accuracy
Polarity	Consumption: No sign Regeneration: "-"

Active Energy Measurement

Measurement range	Active energy within interval Wh + consumed component only
Totalization accuracy	±1.6% f.s. ± clamp sensor accuracy (Note that f.s. is voltage range × current range.)

Power Factor

Measurement range	Power factor PF 0 to 1
Measurement accuracy	±5%rdg. (At full-scale input with power factor of 1)

Frequency measurement

Measurement range	Frequency FREQ 40 Hz to 70 Hz
Measurement accuracy	±0.5%rdg. (When input is 70% to 130% f.s. of voltage range)
Object to be measured	Voltage U1

Operation Method for Totalization

Start of totalization	The PC application starts measurement.
End of totaliztion	The PC application ends measurement (depending on recording end conditions). For details, refer to specifications of the PC application.

Other Characteristics

Temperature	Within ±0.05 f.s./°C
Effect of common-mode voltage	Within±0.5%f.s. (Common-mode voltage 300 V, 50Hz/60Hz)
Actual time accuracy	±100 ppm (Reference value at temperature from 0 to 50°C (32 to 122°F) without using communications module)
Effect of electromagnetic field	Within ±2% f.s. (in field of 400 Vrms/m and 50/60Hz)
Zero suppression	Voltage : Less than 0.5% f.s. Current : Less than 0.5% f.s. (less than 0.9% f.s. when using the 9695-02 with 5A range selected) Power : When voltage or current is 0

9.5.2 Function Specifications

Execute the functions from the PC application via communications.

Monitoring function

This function outputs the current measured values (instantaneous values).

Measured value recording function

Measurements are recorded at a set recording interval.	
Real-time management	This is automatically set from the PC application at the start of recording.
Recording start	Immediate start/Reserved-time start
Recording end	Manual end/Reserved-time end
Operation when memory is full	Memory full stop /Endless ♦Set the condition before the start of recording.
Recording interval	1/2/5/10/15/20/30 sec., 1/2/5/10/15/20/30/60 min.
Recording mode	Instantaneous value MAX/MIN/AVE Instantaneous value + MAX/MIN/AVE Total 3 modes Set the mode before the start of recording. The types of values for recorded measurement items vary depending on the recording mode. Instantaneous value mode: instantaneous value MAX/MIN/AVE recording mode: maximum value, minimum value, and average value Instantaneous value + MAX/MIN/AVE recording mode: instantaneous value, maximum value, minimum value, and average value
Recorded data	One data set contains time, voltage, current, effective power, power factor, Active energy within an interval, frequency Instantaneous recording mode 1P2WU1, I1, P, PF, Wh+, FREQ 1P3W/3P3WU1, U2, I1, I2, P, PF, Wh+, FREQ 3P4WU1, U2, U3, I1, I2, I3, P, PF, Wh+, FREQ MAX/MIN/AVE recording mode 1P2WMaximum/Minimum/Average of U1, I1, P, PF, FREQ, Wh+ 1P3W/3P3WMaximum/Minimum/Average of U1, U2, I1, I2, P, PF, FREQ, Wh+ 3P4WMaximum/Minimum/Average of U1, U2, U3, I1, I2, I3, P, PF, FREQ,Wh+ Instantaneous value + MAX/MIN/AVE recording mode 1P2WInstantaneous value/Maximum/Minimum/Average of U1, I1, P, PF, FREQ, Wh+ 1P3W/3P3WInstantaneous value/Maximum/Minimum/Average ofU1, U2, I1, I2, P, PF, FREQ, Wh+ 3P4WInstantaneous value/Maximum/Minimum/Average ofU1, U2, U3, I1, I2, I3, P, PF, FREQ, Wh+ ♦Data is scaled if scaling is ON.

Power outage protection	After recovering from a power outage, the instrument automatically returns to the state held before the outage.

Alarm judgment and recording function

Alarm judgment is made at every sampling, and the history will be recorded in flash memory if the measured value recording function remains active.	
Judgment method	Criterion threshold can be set to either Hi or Lo. The instantaneous value at every sampling is judged (effective in any measurement mode.).
Recorded data	One data set contains time, generation/reversion, CH and judgment threshold.
Alarm output	Alarm output × 1 CH ♦Output is turned ON when an alarm (Hi or Lo) occurs. Whether to hold the alarm output can be selected. The reset switch or a command can be used to reset alarms.

9.5.3 General Specifications

Input method	U INPUT: Insulated input (Not insulated from current measurement circuit) CLAMP SENSOR INPUT: Input insulated by a clamp sensor
Input resistance (50/60 Hz)	U INPUT: 1.6 MΩ ± 10% (Difference input) CLAMP SENSOR INPUT: 200 kΩ ± 10%
Measurement method	Digital sampling
Internal memory	512 k bytes Flash memory
Backup	Recorded data (saved in flash memory) ♦Data loss for up to 2 minutes before and after a power outage may occur.
Clock function	The real time clock (year, month, day, hour, minute, and second) of the communications module is used.
LED display	Used for monitoring and warning
Communication interface	CAN bus
Maximum input voltage	U INPUT: 300 Vrms, 424.3 V peak ALARM: 30 VDC CLAMP SENSOR INPUT: 1.5 Vrms, 2.2 V peak value
Maximum rated voltage to earth	Voltage input (U INPUT) terminal 300 Vrms, 50/60 Hz
Alarm output	Open collector; 30 VDC, 20 mA max.
Rated supply voltage	+5 V±0.3 VDC
Maximum rated power	2.5 W
Dielectric strength	3.536 kVACBetween U INPUT terminals and Case (excluding terminal section) 2.210 kVAC Between U INPUT terminals and ALARM terminals, interface terminals CLAMP SENSOR INPUT terminals and ALARM terminals, Interface terminals (50/60 Hz, Response current 5 mA, one minutes)
Dimensions	Approx. 45.5W × 96H × 94.5D mm (1.79"W × 3.78"H × 3.72"D) (including cover, excluding projections)
Mass	Approx. 240 g (8.5 oz.) (including cover)

Option	9695-02 CLAMP ON SENSOR (50 Arms) 9695-03 CLAMP ON SENSOR (100 Arms) 9661-01 CLAMP ON SENSOR (500 Arms) 9765* CLAMP ON SENSOR (5 Arms) (See "When using Model 9765 " (p.168)) ♦All sensors are the voltage-output type. 9238 CLAMP SENSOR CABLE L9019-02 VOLTAGE CORD (Red/ Black) L9019-03 VOLTAGE CORD (Red/ Black/ Yellow) L9019-04 VOLTAGE CORD (Red/ Black/ Yellow/ Blue) * Not complied with the CE marking.
Operational ranges for temperature and humidity	0 to 50°C (32 to 122°F), 80%RH or less (with no condensation)
Temperature and humidity ranges for storage	-10 to 50°C (14 to 122°F), 80%RH or less (with no condensation)
Operating environment	Indoors, altitude up to 2000 m (6562-ft.)
Standards applying	Safety EN61010, Pollution Degree 2 Measurement Category III (anticipated transient overvoltage 4000 V) EMC EN61326 CLASS A

2332-20 POWER METER MODULE 10

10.1 Overview

10.1.1 Product Overview

The 2332-20 is a measurement module of the Hioki "Smart Site" (remote measurement system).
This module measures and records power at regular intervals.
And the voltage, current, active power, reactive power, power factor, active energy within an interval, and frequency are also can be measured.
The 2332-20 is used with the power supply module, communications module, and module base.

Number of measurement circuits	1P2W: 1 to 6 circuits 1P3W, 3P3W: 1 to 3 circuits
Voltage input	200 V range
Current Input	Clamp sensor

(Conceptual image)

NOTE Do not use this module as a wattmeter or watt-hour meter for business transactions.

10.1.2 Major Features

- **This is a clamp-type wattmeter used for a 70 to 260 VAC single-phase line to a 3-phase, 3-wire line.**
- **One module measures a common voltage on up to six single-phase/2-wire circuits, three single-phase/3-wire circuits, or three 3-phase/3-wire circuits.**
- **The recording interval is selectable from 1 second to 60 minutes.**
- **The maximum, minimum, and average measurements during the recording interval can be recorded (with sampling once a second).**
- **The module is equipped with an alarm assessment function**

Rough Estimate of Storable Data Quantity and Time

The amount of data that can be stored and duration of storage vary depending on the circuits to be measured, selected measurement end condition (memory full stop or endless), and recording mode. Use the table below as a guide.

Wiring	Measurement circuit	Reference page
1P2W	Six circuits	page 187
	Five circuits	page 187
	Four circuits	page 188
	Three circuits	page 188
	Two circuits	page 189
	One circuit	page 189
1P3W/3P3W	Three circuits	page 190
	Two circuits	page 190
	One circuit	page 191

NOTE

- When the alarm log is ON, the frequency of occurrence of alarms increases, and the recording period will be shortened.
- The measurement items to be recorded can be selected. For example, if half the number of measuring items are selected, the available storage time will be doubled.
- In MAX/MIN/AVE recording mode or instantaneous value + MAX/MIN/AVE recording mode, you can select measurement items. For example, the duration of storage is about 1.5 times longer when you select MAX/MIN in MAX/MIN/AVE mode, and 3 times longer when you only select MAX.
- The duration of storage under "endless" is the minimum duration of storage.

1P2W Measurement of six circuits

	Memory full stop			Endless		
	Instantaneous Value	MAX/MIN/AVE	Instantaneous value + MAX/MIN/AVE	Instantaneous Value	MAX/MIN/AVE	Instantaneous value + MAX/MIN/AVE
Quantity of storable data	3510	1410	1080	3042	1222	936
Recording interval						
1 sec.	50 min.	20 min.	15 min.	50 min.	20 min.	15 min.
2 sec.	1.5 hours	40 min.	30 min.	1.5 hours	40 min.	30 min.
5 sec.	4.5 hours	1.5 hours	1.5 hours	4 hours	1.5 hours	1 hour
10 sec.	9.5 hours	3.5 hours	3 hours	8 hours	3 hours	2.5 hours
15 sec.	14.5 hours	5.5 hours	4.5 hours	12.5 hours	5 hours	3.5 hours
20 sec.	19.5 hours	7.5 hours	6 hours	16.5 hours	6.5 hours	5 hours
30 sec.	1 day	11.5 hours	9 hours	1 day	10 hours	7.5 hours
1 min.	2 days	23.5 hours	18 hours	2 days	20 hours	15.5 hours
2 min.	4.5 days	1.5 days	1.5 days	4 days	1.5 days	1 day
5 min.	12 days	4.5 days	3.5 days	10.5 days	4 days	3 days
10 min.	24 days	9.5 days	7.5 days	21 days	8 days	6.5 days
15 min.	37 days	14.5 days	11 days	32 days	12.5 days	9.5 days
20 min.	49 days	19.5 days	15 days	42 days	16.5 days	13 days
30 min.	73 days	29 days	22.5 days	63 days	25 days	19.5 days
60 min.	146 days	59 days	45 days	127 days	51 days	39 days

1P2W Measurement of five circuits

	Memory full stop			Endless		
	Instantaneous Value	MAX/MIN/AVE	Instantaneous value + MAX/MIN/AVE	Instantaneous Value	MAX/MIN/AVE	Instantaneous value + MAX/MIN/AVE
Quantity of storable data	4095	1657	1275	3549	1436	1105
Recording interval						
1 sec.	1 hour	20 min.	20 min.	50 min.	20 min.	15 min.
2 sec.	2 hours	50 min.	40 min.	1.5 hours	40 min.	30 min.
5 sec.	5.5 hours	2 hours	1.5 hours	4.5 hours	1.5 hours	1.5 hours
10 sec.	11 hours	4.5 hours	3.5 hours	9.5 hours	3.5 hours	3 hours
15 sec.	17 hours	6.5 hours	5 hours	14.5 hours	5.5 hours	4.5 hours
20 sec.	22.5 hours	9 hours	7 hours	19.5 hours	7.5 hours	6 hours
30 sec.	1 day	13.5 hours	10.5 hours	1 day	11.5 hours	9 hours
1 min.	2.5 days	1 day	21 hours	2 days	23.5 hours	18 hours
2 min.	5.5 days	2 days	1.5 days	4.5 days	1.5 days	1.5 days
5 min.	14 days	5.5 days	4 days	12 days	4.5 days	3.5 days
10 min.	28 days	11.5 days	8.5 days	24.5 days	9.5 days	7.5 days
15 min.	43 days	17 days	13 days	37 days	14.5 days	11.5 days
20 min.	57 days	23 days	17.5 days	49 days	19.5 days	15 days
30 min.	85 days	35 days	26.5 days	74 days	29.5 days	23 days
60 min.	171 days	69 days	53 days	148 days	60 days	46 days

1P2W Measurement of four circuits

	Memory full stop			Endless		
	Instantaneous Value	MAX/MIN/AVE	Instantaneous value + MAX/MIN/AVE	Instantaneous Value	MAX/MIN/AVE	Instantaneous value + MAX/MIN/AVE
Quantity of storable data	4912	2010	1552	4257	1742	1345
Recording interval						
1 sec.	1 hour	30 min.	20 min.	1 hour	20 min.	20 min.
2 sec.	2.5 hours	1 hour	50 min.	2 hours	50 min.	40 min.
5 sec.	6.5 hours	2.5 hours	2 hours	5.5 hours	2 hours	1.5 hours
10 sec.	13.5 hours	5.5 hours	4 hours	11.5 hours	4.5 hours	3.5 hours
15 sec.	20 hours	8 hours	6 hours	17.5 hours	7 hours	5.5 hours
20 sec.	1 day	11 hours	8.5 hours	23.5 hours	9.5 hours	7 hours
30 sec.	1.5 days	16.5 hours	12.5 hours	1 day	14.5 hours	11 hours
1 min.	3 days	1 day	1 day	2.5 days	1 day	22 hours
2 min.	6.5 days	2.5 days	2 days	5.5 days	2 days	1.5 days
5 min.	17 days	6.5 days	5 days	14.5 days	6 days	4.5 days
10 min.	34 days	13.5 days	10.5 days	29.5 days	12 days	9 days
15 min.	51 days	20.5 days	16 days	44 days	18 days	14 days
20 min.	68 days	27.5 days	21.5 days	59 days	24 days	18 days
30 min.	102 days	42 days	32 days	89 days	36 days	28 days
60 min.	205 days	84 days	65 days	177 days	73 days	56 days

1P2W Measurement of three circuits

	Memory full stop			Endless		
	Instantaneous Value	MAX/MIN/AVE	Instantaneous value + MAX/MIN/AVE	Instantaneous Value	MAX/MIN/AVE	Instantaneous value + MAX/MIN/AVE
Quantity of storable data	6142	2557	1980	5323	2216	1716
Recording interval						
1 sec.	1.5 hours	40 min.	30 min.	1 hour	30 min.	20 min.
2 sec.	3 hours	1 hour	1 hour	2.5 hours	1 hour	50 min.
5 sec.	8.5 hours	3.5 hours	2.5 hours	7 hours	3 hours	2 hours
10 sec.	17 hours	7 hours	5.5 hours	14.5 hours	6 hours	4.5 hours
15 sec.	1 day	10.5 hours	8 hours	22 hours	9 hours	7 hours
20 sec.	1 day	14 hours	11 hours	1 day	12 hours	9.5 hours
30 sec.	2 days	21 hours	16.5 hours	1.5 days	18 hours	14 hours
1 min.	4 days	1.5 days	1 day	3.5 days	1.5 days	1 day
2 min.	8.5 days	3.5 days	2.5 days	7 days	3d ays	2 days
5 min.	21 days	8.5 days	6.5 days	18 days	7.5 days	5.5 days
10 min.	43 days	17.5 days	13.5 days	37 days	15 days	11.5 days
15 min.	64 days	26.5 days	20.5 days	55 days	23 days	17.5 days
20 min.	85 days	36 days	27.5 days	74 days	30.5 days	23.5 days
30 min.	128 days	53 days	41 days	111 days	46 days	36 days
60 min.	256 days	107 days	83 days	222 days	92 days	72 days

1P2W Measurement of two circuits

	Memory full stop			Endless		
	Instantaneous Value	MAX/MIN/AVE	Instantaneous value + MAX/MIN/AVE	Instantaneous Value	MAX/MIN/AVE	Instantaneous value + MAX/MIN/AVE
Quantity of storable data	8190	3510	2730	7098	3042	2366
Recording interval						
1 sec.	2 hours	50 min.	40 min.	1.5 hours	50 min.	30 min.
2 sec.	4.5 hours	1.5 hours	1.5 hours	3.5 hours	1.5 hours	1 hour
5 sec.	11 hours	4.5 hours	3.5 hours	9.5 hours	4 hours	3 hours
10 sec.	22.5 hours	9.5 hours	7.5 hours	19.5 hours	8 hours	6.5 hours
15 sec.	1 day	14.5 hours	11 hours	1 day	12.5 hours	9.5 hours
20 sec.	1.5 days	19.5 hours	15 hours	1.5 days	16.5 hours	13 hours
30 sec.	2.5 days	1 day	22.5 hours	2 days	1 day	19.5 hours
1 min.	5.5 days	2 days	1.5 days	4.5 days	2 days	1.5 days
2 min.	11 days	4.5 days	3.5 days	9.5 days	4 days	3 days
5 min.	28 days	12 days	9 days	24.5 days	10.5 days	8 days
10 min.	57 days	24 days	18.5 days	49 days	21 days	16 days
15 min.	85 days	37 days	28 days	74 days	32 days	24.5 days
20 min.	114 days	49 days	38 days	99 days	42 days	33 days
30 min.	171 days	73 days	57 days	148 days	63 days	49 days
60 min.	341 days	146 days	114 days	296 days	127 days	99 days

1P2W Measurement of a circuit

	Memory full stop			Endless		
	Instantaneous Value	MAX/MIN/AVE	Instantaneous value + MAX/MIN/AVE	Instantaneous Value	MAX/MIN/AVE	Instantaneous value + MAX/MIN/AVE
Quantity of storable data	12285	5580	4387	10647	4836	3802
Recording interval						
1 sec.	3 hours	1.5 hours	1 hour	2.5 hours	1 hour	1 hour
2 sec.	6.5 hours	3 hours	2 hours	5.5 hours	2.5 hours	2 hours
5 sec.	17 hours	7.5 hours	6 hours	14.5 hours	6.5 hours	5 hours
10 sec.	1 day	15.5 hours	12 hours	1 day	13 hours	10.5 hours
15 sec.	2 days	23 hours	18 hours	1.5 days	20 hours	15.5 hours
20 sec.	2.5 days	1 day	1 day	2 days	1 day	21 hours
30 sec.	4 days	1.5 days	1.5 days	3.5 days	1.5 days	1 day
1 min.	8.5 days	3.5 days	3 days	7 days	3 days	2.5 hours
2 min.	17 days	7.5 days	6 days	14.5 days	6.5 days	5 days
5 min.	43 days	19 days	15 days	37 days	16.5 days	13 days
10 min.	85 days	39 days	30 days	74 days	34 days	26 days
15 min.	128 days	58 days	46 days	111 days	50 days	40 days
20 min.	171 days	78 days	61 days	148 days	67 days	53 days
30 min.	256 days	116 days	91 days	222 days	101 days	79 days
60 min.	512 days	233 days	183 days	444 days	202 days	158 days

1P3W/ 3P3W Measurement of three circuits

	Memory full stop			Endless		
	Instantaneous Value	MAX/MIN/AVE	Instantaneous value + MAX/MIN/AVE	Instantaneous Value	MAX/MIN/AVE	Instantaneous value + MAX/MIN/AVE
Quantity of storable data	5115	2047	1575	4433	1774	1365
Recording interval						
1 sec.	1 hour	30 min.	20 min.	1 hour	20 min.	20 min.
2 sec.	2.5 hours	1 hour	50 min.	2 hours	50 min.	40 min.
5 sec.	7 hours	2.5 hours	2 hours	6 hours	2 hours	1.5 hours
10 sec.	14 hours	5.5 hours	4 hours	12 hours	4.5 hours	3.5 hours
15 sec.	21 hours	8.5 hours	6.5 hours	18 hours	7 hours	5.5 hours
20 sec.	1 day	11 hours	8.5 hours	1 day	9.5 hours	7.5 hours
30 sec.	1.5 days	17 hours	13 hours	1.5 days	14.5 hours	11 hours
1 min.	3.5 days	1 day	1 day	3 days	1 day	22.5 hours
2 min.	7 days	2.5 days	2 days	6 days	2 days	1.5 days
5 min.	17.5 days	7 days	5 days	15 days	6 days	4.5 days
10 min.	36 days	14 days	10.5 days	30.5 days	12 days	9 days
15 min.	53 days	21 days	16 days	46 days	18 days	14 days
20 min.	71 days	28 days	21.5 days	62 days	24.5 days	18.5 days
30 min.	107 days	43 days	33 days	92 days	37 days	28 days
60 min.	213 days	85 days	66 days	185 days	74 days	57 days

1P3W/ 3P3W Measurement of two circuits

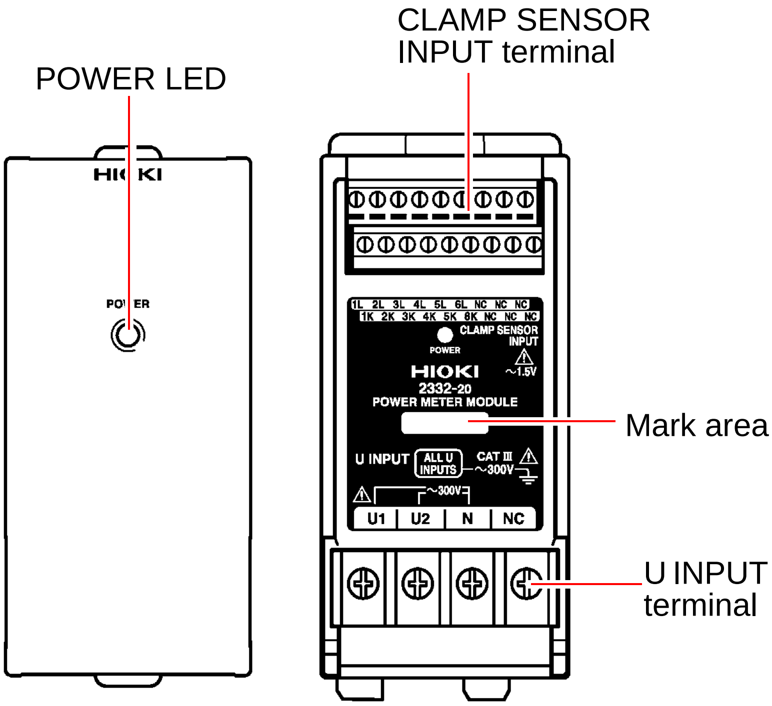
	Memory full stop			Endless		
	Instantaneous Value	MAX/MIN/AVE	Instantaneous value + MAX/MIN/AVE	Instantaneous Value	MAX/MIN/AVE	Instantaneous value + MAX/MIN/AVE
Quantity of storable data	6825	2790	2152	5915	2418	1865
Recording interval						
1 sec.	1.5 hours	40 min.	30 min.	1.5 hours	40 min.	30 min.
2 sec.	3.5 hours	1.5 hours	1 hour	3 hours	1 hour	1 hour
5 sec.	9 hours	3.5 hours	2.5 hours	8 hours	3 hours	2.5 hours
10 sec.	18.5 hours	7.5 hours	5.5 hours	16 hours	6.5 hours	5 hours
15 sec.	1 day	11.5 hours	8.5 hours	1 day	10 hours	7.5 hours
20 sec.	1.5 days	15.5 hours	11.5 hours	1 day	13 hours	10 hours
30 sec.	2 days	23 hours	17.5 hours	2 days	20 hours	15.5 hours
1 min.	4.5 days	1.5 days	1 day	4 days	1.5 days	1 day
2 min.	9 days	3.5 days	2.5 days	8 days	3 days	2.5 days
5 min.	23.5 days	9.5 days	7 days	20.5 days	8 days	6 days
10 min.	47 days	19 days	14.5 days	41 days	16.5 days	12.5 days
15 min.	71 days	29 days	22 days	62 days	25 days	19 days
20 min.	95 days	39 days	29.5 days	82 days	34 days	25.5 days
30 min.	142 days	58 days	45 days	123 days	50 days	39 days
60 min.	284 days	116 days	90 days	246 days	101 days	78 days

1P3W/ 3P3W Measurement of a circuit

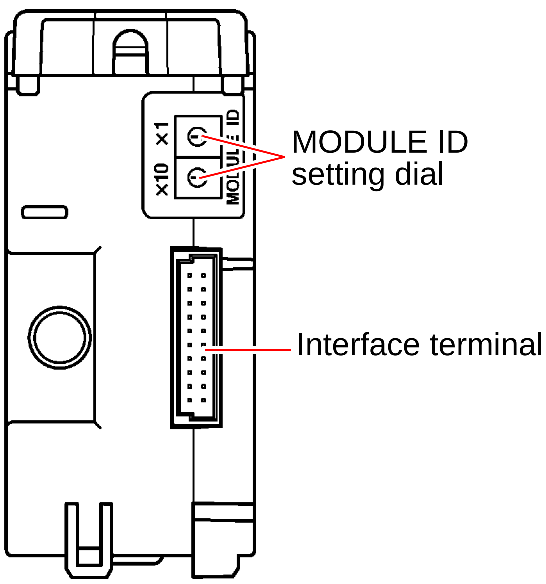
	Memory full stop			Endless		
	Instantaneous Value	MAX/MIN/AVE	Instantaneous value + MAX/MIN/AVE	Instantaneous Value	MAX/MIN/AVE	Instantaneous value + MAX/MIN/AVE
Quantity of storable data	10237	4387	3412	8872	3802	2957
Recording interval						
1 sec.	2.5 hours	1 hour	50 min.	2 hours	1 hour	40 min.
2 sec.	5.5 hours	2 hours	1.5 hours	4.5 hours	2 hours	1.5 hours
5 sec.	14 hours	6 hours	4.5 hours	12 hours	5 hours	4 hours
10 sec.	1 day	12 hours	9 hours	1 day	10.5 hours	8 hours
15 sec.	1.5 days	18 hours	14 hours	1.5 days	15.5 hours	12 hours
20 sec.	2 days	1 day	18.5 hours	2 days	21 hours	16 hours
30 sec.	3.5 days	1.5 days	1 day	3 days	1 day	1 day
1 min.	7 days	3 days	2 days	6 days	2.5 days	2 days
2 min.	14 days	6 days	4.5 days	12 days	5 days	4 days
5 min.	36 days	15 days	11.5 days	30.5 days	13 days	10 days
10 min.	71 days	30 days	23.5 days	62 days	26 days	20.5 days
15 min.	107 days	46 days	36 days	92 days	40 days	30.5 days
20 min.	142 days	61 days	47 days	123 days	53 days	41 days
30 min.	213 days	91 days	71 days	185 days	79 days	62 days
60 min.	427 days	183 days	142 days	370 days	158 days	123 days

10.1.3 Name and Function of the Parts

Front



Back



POWER LED	Goes on or flashes when power is supplied to the module. Remains on, flashes, or changes to another color according to the state of the module. **POWER LED indication** Monitoring and warning display Lit in green : Data being recorded. Flashing in green : Standing by. Lit in yellow : Alarm output. Flashing in yellow: one of the following*1 The voltage is outside the effective input range. The current is out of range. The active power is a negative value. Lit in red: Non-recoverable error occurred. *2 Flashing in red : Recoverable error occurred. *3
Mark area	Use this area to make a note of the object to measure or the module ID. Use an ink pen, since pencil lead may rub off.
CLAMP SENSOR INPUT terminal	Connect the output of clamp sensors to these terminals (for 6 channels).
U INPUT terminal	Connect voltages to be measured to these terminals.
MODULE ID setting dial	Use the dial to set the module's identification No.

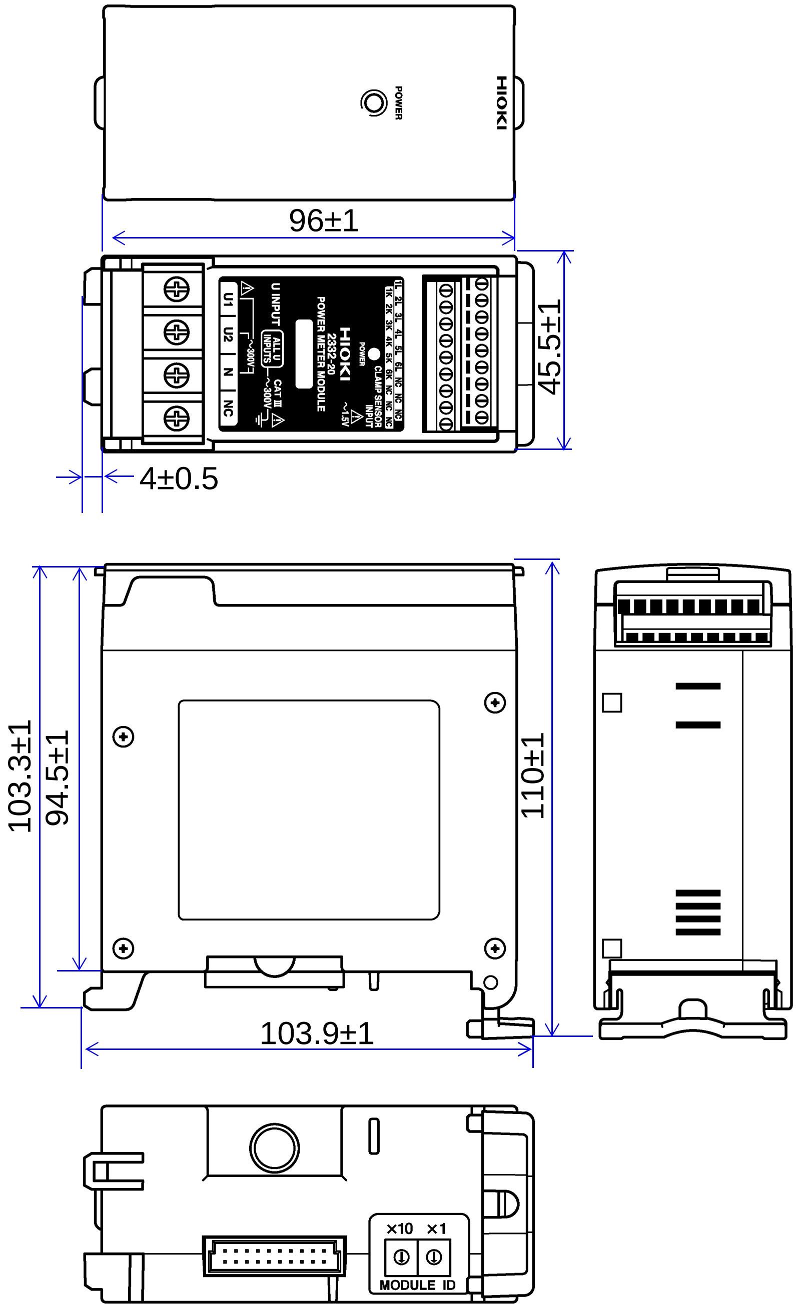
*1: You can select a POWER LED monitoring mode on the PC applications software. Use the current monitoring mode to only measure electric current (without voltage input). Otherwise, use voltage/current/power monitoring mode.

- Voltage/Current/Power Monitoring Mode
  The LED will start flashing in yellow when any of the following events occurs:
  Flashing in yellow indicates one of the following:
  The voltage is outside the effective input range.
  The current is out of range.
  The active power is a negative value.
- Current Monitoring Mode
  The LED will start flashing in yellow in case of the following event:
  The current is out of range.

*2: The module needs repair.
Contact your dealer or Hioki representative.

*3: The same module ID may be used by another module.

10.1.4 Dimension Diagrams



(Unit:mm)

10.1.5 Accessory and Option

Accessories

None

Option

9695-02 CLAMP ON SENSOR (50 Arms)
9695-03 CLAMP ON SENSOR (100 Arms)
9661-01 CLAMP ON SENSOR (500 Arms)
9765* CLAMP ON SENSOR (5 Arms, For CT secondary side)

9238 CLAMP SENSOR CABLE
L9019-02 VOLTAGE CORD (Red/ Black)
L9019-03 VOLTAGE CORD (Red/ Black/ Yellow)
* Not complied with the CE marking.

When using Model 9765

DANGER

- **To avoid short circuits and potentially life-threatening hazards, never attach the product to a circuit that operates at more than 30 VAC, or over bare conductors.**
- **This product should only be connected to the secondary side of a breaker, so the breaker can prevent an accident if a short circuit occurs. Connections should never be made to the primary side of a breaker, because unrestricted current flow could cause a serious accident if a short circuit occurs.**

10.2 Settings

10.2.1 Setting the Module ID

You can connect up to 63 measurement modules to one communications module.

Setting Procedure

Use the module ID setting dial to set the ID No. of the module to a number from 01 and to 63. (You cannot set a number other than the above.)

NOTE

- Ensure that the set ID is not used for any other module connected to the same communications module.
- The ID numbers of modules need not be consecutive.
- Setting the ID to 99, then turning on the power resets all internal settings to the defaults.
- The module ID and COM ID (communications module ID) are not related and can be set independently.

10.3 Preparations

DANGER

- **Note the following maximum input voltage.**
  U INPUT:AC300 Vrms, 424.3 V Peak
  CLAMP SENSOR INPUT: AC 1.5 Vrms, 2.2 V Peak
  ALARM:DC 30 V
  Attempting to measure voltage in excess of the maximum input could destroy the instrument and result in personal injury or death.
- **The maximum rated voltage between input terminals and ground is 300 VrmsAC. Attempting to measure voltages exceeding 300 VrmsAC. with respect to ground could damage the instrument and result in personal injury.**

CAUTION

- Do not connect to the instrument any current sensor other than the clamp sensor dedicated to the instrument.Other sensors could lead to instrument damage due to excessive input power.
- *Avoid dropping the clamp or subjecting it to other impact, since this could damage the mating surface of the core and adversely affect measurement.
- *If the mating surface of the core is soiled, wipe it gently with a soft cloth, since a soiled mating surface could affect measurement.
- *If the power supply produces noise, it is recommended to use a noise filter.
- *If the power supply line or signaling line is likely to induce surges during electrical storms, etc., insert a dedicated lightning arrester between each line and the installed device to protect the module.

10.3.1Installing the Module

(1) Installing the Module Base

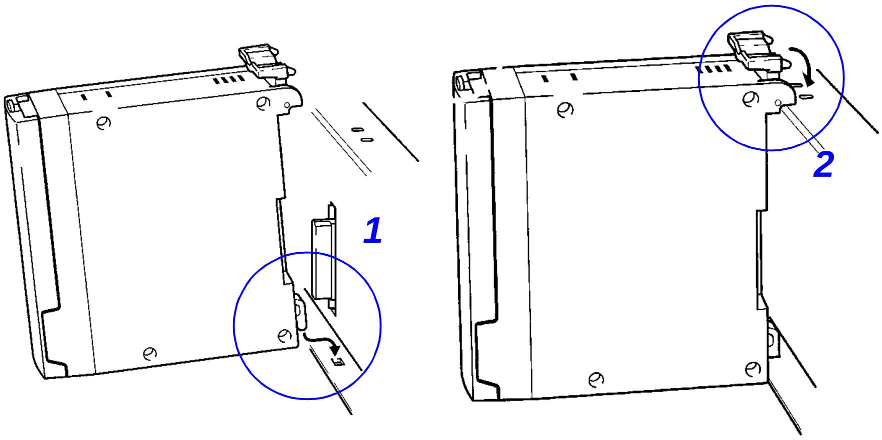
CAUTION

Do not mount the module base on the ceiling where it may fall off.

Fasten the module base to a DIN rail or the wall according to the procedure described in the **19 "2391-01, 2391-02, 2391-03 MODULE BASE"(P.305)** or **20 "2392-01/02 MODULE BASE"(P.319)** series MODULE BASE instruction manual.

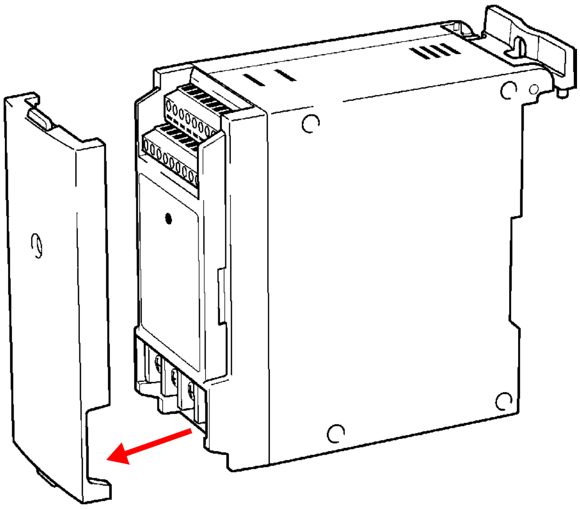
(2) Mounting a Module on the Module Base

Mount a module on the module base as shown below. Ensure that the lever clicks.



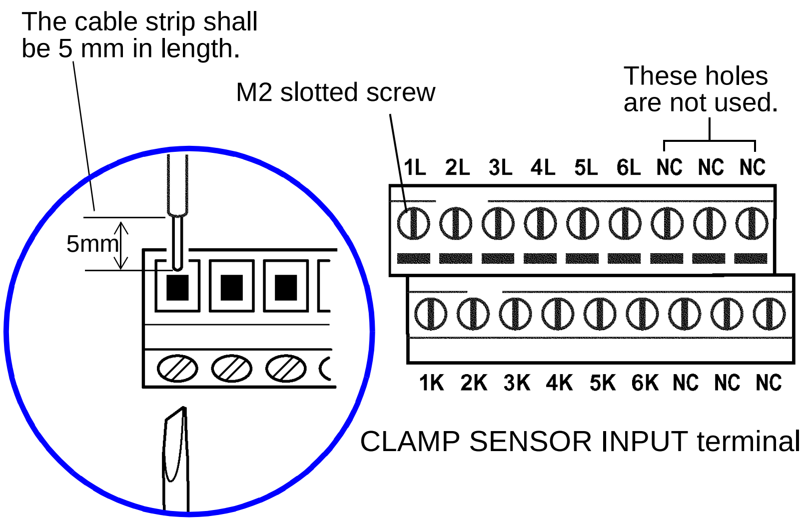
10.3.2 Connecting the Clamp Sensor to Module

1. Remove the cover from the module.



2. Use a flathead screwdriver to loosen the screw on the CLAMP SENSOR INPUT terminal.

3. Insert the cable of the clamp sensor into the square hole on the CLAMP SENSOR INPUT terminal, then tighten the screw (to a tightening torque of 0.25 N•m).



CLAMP SENSOR INPUT terminal

❖ **"Connection diagram"(P.203)**

Clamp Sensors

- 9695-02 (50 A)
- 9695-03 (100 A)
- 9661-01 (500 A)
- 9765 (5 A, For CT secondary side)

Cables

- The 9695-02/03 Clamp-on Sensors have a terminal-block structure.
- You can use various types of cables.

Cables (Recommended)

- 600 V vinyl-insulated 0.9 mm^2 cable or equivalent
- 300 V vinyl-insulated 0.75 mm^2 cable or equivalent

The cable strip shall be 5 mm in length.

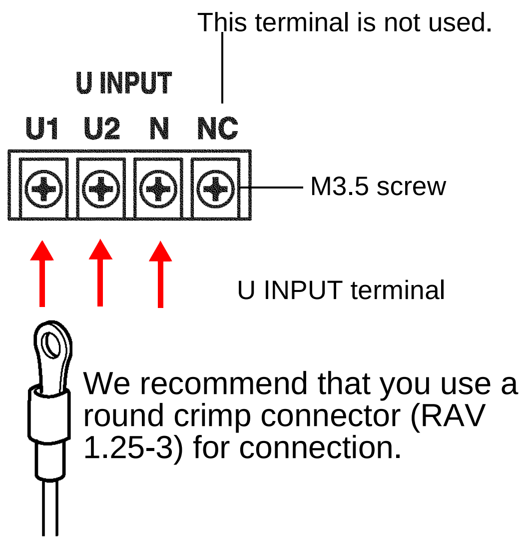
The 9238 CLAMP SENSOR CABLE (3 m) is optionally available.

NOTE

Note that measurement may be adversely affected by external noise or the electromagnetic environment when using cable longer than 3 meters.

10.3.3 Connecting the Voltage Cable to the Module

Connect voltage cables to the U INPUT terminals (at a tightening torque of 0.8 N•m).



❖ **"Connection diagram"(P.203)**

Cables (Recommended)

600 V vinyl-insulated 0.9 mm^2 cable or equivalent

10.3.4 Connecting to the Measured Line

DANGER

- **In order to prevent electric shock and short-circuit accidents, shut off the power to the line to be measured before connecting the clamp sensors and voltage cords.**
- **U INPUT terminals (U1 and U2) share the N terminal; inputs to these terminals are not insulated from each other. Be careful to avoid electric shock and short-circuiting.**
- **The CLAMP SENSOR INPUT terminals are not insulated from the U INPUT terminals. Be careful to avoid electric shock and short-circuiting when using the U INPUT terminals.**
- **To avoid short circuits and potentially life-threatening hazards, never attach the clamp sensor to a circuit that operates at more than the maximum rated voltage, or over bare conductors.**
- **Clamp sensor should only be connected to the secondary side of a breaker, so the breaker can prevent an accident if a short circuit occurs. Connections should never be made to the primary side of a breaker, because unrestricted current flow could cause a serious accident if a short circuit occurs.**
- **If the secondary circuit is opened while electricity is being sent through the CT, very high and dangerous voltage may be generated at the secondary side terminal.**
- **Be sure to cover the measured line when live to avoid electric shock and short-circuiting.**

DANGER

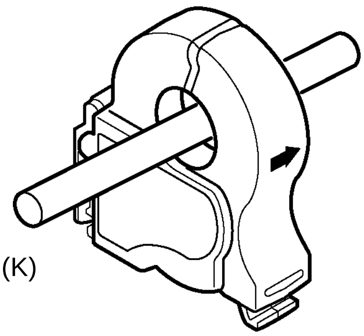
When the clamp sensor is opened, do not allow the metal part of the clamp to touch any exposed metal, or to short between two lines, and do not use over bare conductors.

CAUTION

- Avoid stepping on or pinching cables, which could damage the cable insulation.
- Do not input voltage or current to the U INPUT terminals and CLAMP SENSOR INPUT terminals when module power is OFF. This will avoid damaging the module.

Connect the sensors and cables to the measured line according to the connection diagram.

1. Connect the clamp sensors to the line.
2. Connect the voltage cables to the line.



❖ **See the "Connection diagram"(P.203) and refer to the instruction manual for the clamp sensor being used.**

NOTE

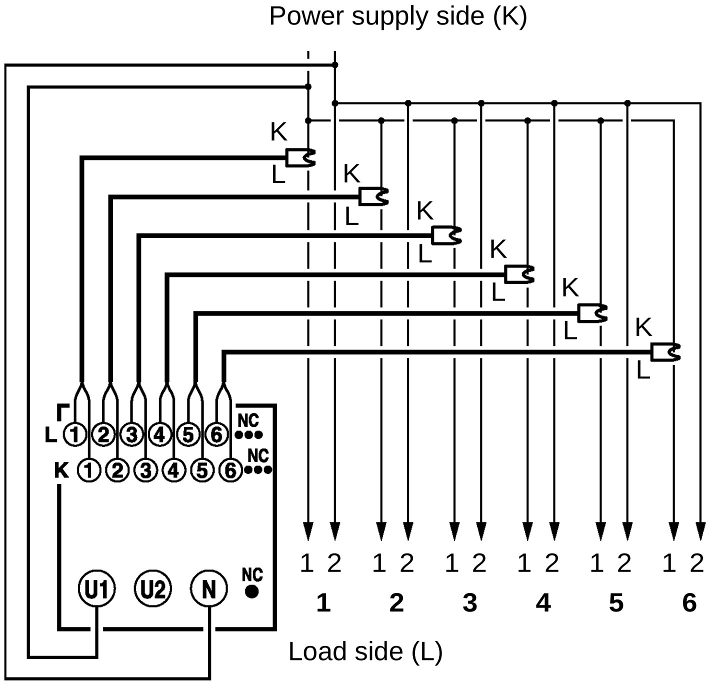
- Ensure that the measured line is correctly set and connection correctly made to ensure accurate measurement.
- If a range exceeding three times the one set at the CLAMP SENSOR INPUT terminal is entered, values measured through other channels may be affected. Do not exceed the stated range.
- Clamp the cladding of the wire by placing the clamp with the arrow on it facing the load side.
- One module measures a common voltage from single-phase/2-wire lines to 3-phase/3-wire lines (up to six single-phase/2-wire circuits, three single-phase/3-wire circuits, or three 3-phase/3-wire circuits).
- When measuring a 3-phase line, be sure to align the phase sequence of the measured line with the order of measurement channels of the module.

Completing Measurement

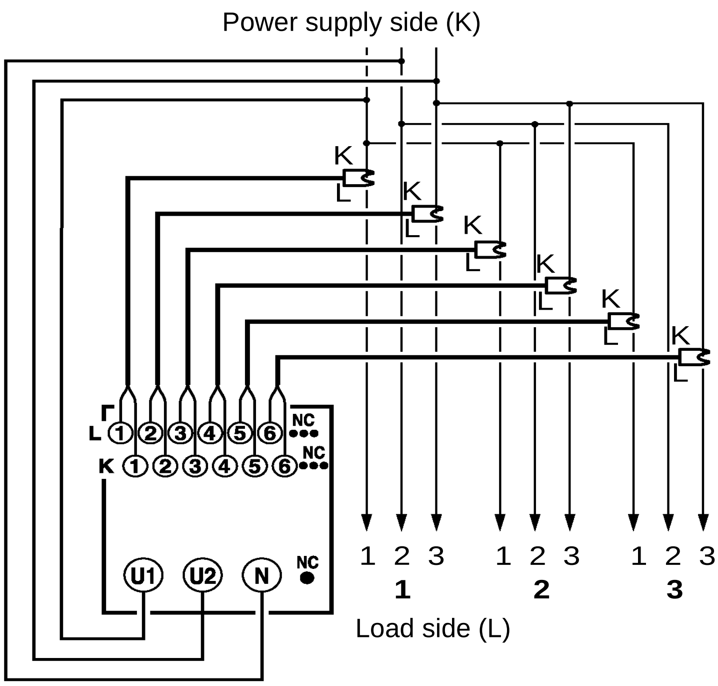
1. Remove the voltage cables.
2. Remove the clamp sensors.

Connection diagram

Single-phase, 2-wire line (1P2W)

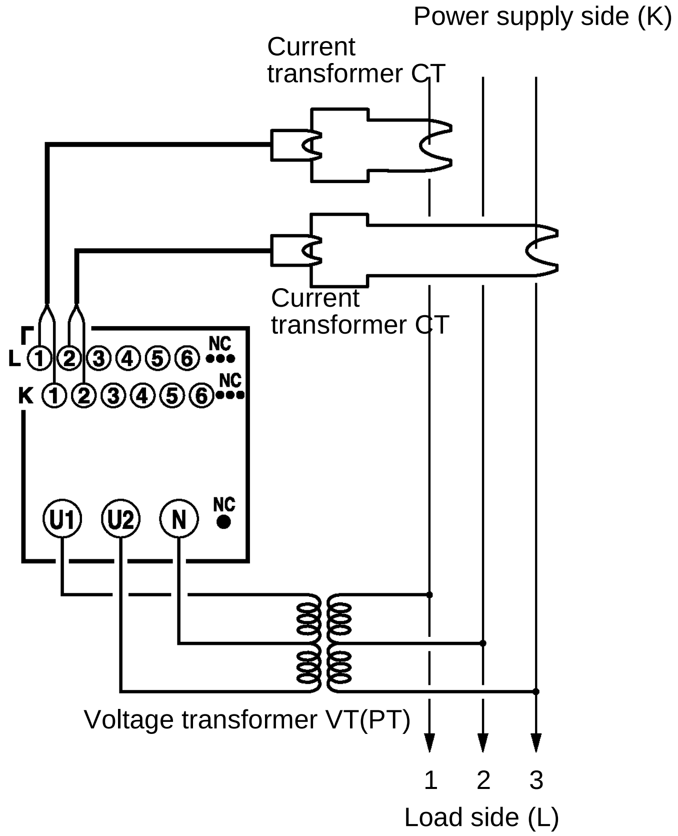


Singe-phase, 3-wire line (1P3W)
3-phase, 3-wire line (3P3W)



Singe-phase, 3-wire line (1P3W)
3-phase, 3-wire line (3P3W)

Using CT and VT (PT) for Single Circuit Measurement



10.4 Others

10.4.1 Alarm Assessment

You can select a measurement item and set the threshold for Hi/Lo assessment.

Measurement item

- Voltage
- Current
- Active power
- Reactive power
- Power factor
- Active energy within an interval
- Frequency

If measurement exceeds the threshold, the POWER LED will light in yellow.

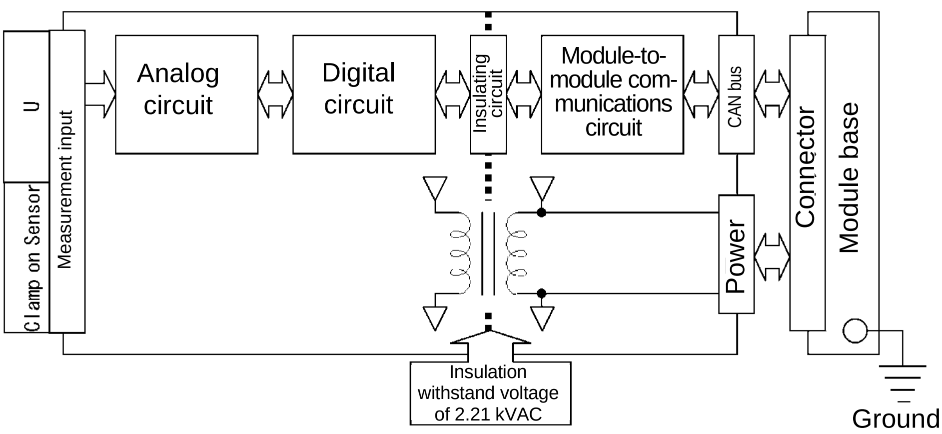
External I/O control is available when using the 2341-20 INPUT MODULE and 2342-20 OUTPUT MODULE.

10.4.2 Insulation of Internal Circuit

CAUTION

Insulation is not provided between the measurement input terminals or between the CLAMP SENSOR INPUT terminals and U INPUT terminals. Beware of electric shock and short- circuiting. Moreover, be sure to cover the measured line when live.

In the 2332-20, the input circuit are insulated from the CAN bus as shown in the block diagram below. (Withstand voltage: 2.21 kVAC, 50/60 Hz, Response current: 5 mA, 1 minute)



10.5 Specifications

10.5.1 Basic Specifications

Condition of guaranteed accuracy

Condition of guaranteed accuracy	10-minute warming-up time, Sine wave input, Power factor =1, Common-mode voltage =0 V
Temperature and humidity for guaranteed accuracy	23±5°C(73±9°F), 80%RH or less The ranges above apply unless otherwise specified in each specification.
Guaranteed accuracy period	1 year
Effective measurement range	Voltage: 35%f.s. to 130%f.s. Current: 2%f.s. to 130%f.s. Effective power: 2%f.s. to 130%f.s.
Fundamental frequency range	45 to 66Hz

Measurement items and accuracy specifications

Measurement lines	Single-phase 2-wire line (1 to 6 circuits) Single-phase 3-wire line (1 to 3 circuits) Three-phase 3-wire line (1 to 3 circuits) Measurement circuits are at a common voltage.
Measurement items	Voltage, current, active power, reactive power, power factor, active energy within an interval, and frequency

Measurement item	Single-phase 3-wire line (1 to 6 circuits)	Single-phase 3-wire line, three-phase 3-wire line (1 to 3 circuits)
Voltage	U1	U1, U2
Current	I1, I2, I3, I4, I5, I6	I1, I2, I3, I4, I5, I6
Active power	P1, P2, P3, P4, P5, P6	P1, P2, P3
Reactive power	Q1, Q2, Q3, Q4, Q5, Q6	Q1, Q2, Q3
Power factor	PF1, PF2, PF3, PF4, PF5, PF6	PF1, PF2, PF3
Active energy within an interval	WP+1, WP+2, WP+3, WP+4, WP+5, WP+6	WP+1, WP+2, WP+3
Frequency	FREQ	FREQ

Voltage / Current measurement

Measurement range	Voltage (U1, U2): 200 V Current:(I1,I2,I3, I4, I5, I6) 1A,5A,50A,100A,200A,500A,1000A (Depends on the clamp sensor used.) Current range is set for every two channels. (I1, I2)/ (I3, I4)/ (I5, I6) The VT (PT) ratio cannot be set separately for U1 and U2. The CT ratio is set for every two channels. (I1, I2)/ (I3, I4)/ (I5, I6)
Measurement accuracy	Voltage: ±1.0%f.s. Current: ±1.0%f.s. + Clamp sensor accuracy

Current range

Clamp Sensor and Its Current Range		2331-20Current Range (Selectable using the PC application)
	1 A (100 mV/A)	1 A
9765	5 A (20 mV/A)	5 A
9695-02	50 A (10 mV/A)	5 A
		50 A
9695-03	100 A (1 mV/A)	100 A
9661-01	500 A (1 mV/A)	100 A
		500 A
	1000 A (0.5 mV/A)	200 A
		1000 A

Power range unit: [W]

Current Volrage/Wiring		1.000A	5.000A	50.00A	100.0A	200.0A	500.0A	1.000k A
200.0 V	1P2W	200.0	1.000 k	10.00 k	20.00 k	40.00 k	100.0 k	200.0 k
	1P3W 3P3W	400.0	2.000 k	20.00 k	40.00 k	80.00 k	200.0 k	400.0 k

- The range table lists the full scales of voltage and current measurement ranges.
- When the VT (PT) ratio and CT ratio are set, the ranges will be multiplied by (VT (PT) ratio × CT ratio).
- The number of digits of a measurement to display depends on the PC application used.

Active Power Measurement

Measurement range	Effective Power P Voltage range × Current range (see power range table, page 207)
Measurement accuracy	±1.5%f.s.+Clamp sensor accuracy
Polarity	Consumption: No sign Regeneration: "-"

Reactive Power Measurement

Measurement range	Effective Power Q Voltage range × Current range (see power range table, page 207)
Measurement accuracy	±5%f.s.+Clamp sensor accuracy
Polarity	No sign

Active Energy Measurement

Measurement range	Active energy within interval WP + consumed component only
Totalization accuracy	±1.6% f.s. ± clamp sensor accuracy (Note that f.s. is voltage range × current range.)

Power Factor

Measurement range	Power factor PF 0 to 1 (f.s. = 1)
Measurement accuracy	±5%rdg. (At full-scale input of voltage/current with power factor of 1 to 0.5)

Frequency measurement

Measurement range	Frequency FREQ 40 to 70 Hz

Measurement accuracy	±0.5%rdg. (When input is 35% to 130% f.s. of voltage range)
Object to be measured	Voltage U1

Operation Method for Totalization

Start of totalization	The PC application starts measurement.
End of totaliztion	The PC application ends measurement (depending on recording end conditions). For details, refer to specifications of the PC application.

Other Characteristics

Temperature	Within ±0.05 f.s./°C
Effect of common-mode voltage	Within ±0.5%f.s. (Common-mode voltage 300 V, 50Hz/60Hz)
Actual time accuracy	±100 ppm (Reference value at temperature from 0 to 50°C without using communications module)
Effect of electromagnetic field	Within ±2.5% f.s. (in field of AC400 Arms/m and 50/60Hz)
Zero suppression	Voltage: Less than 0.5% f.s. Current: Less than 0.5% f.s (less than 0.9% f.s. when using the 9695-02 with 5A range selected) Active power: When voltage or current is 0

10.5.2 Function Specifications

Execute the functions from the PC application via communications.

Monitoring function

This function outputs the current measured values (instantaneous values).

Measured value recording function

Measurements are recorded at a set recording interval.	
Real-time management	This is automatically set from the PC application at the start of recording.
Recording start	Immediate start/Reserved-time start
Recording end	Manual end/Reserved-time end
Operation when memory is full	Memory full stop /Endless ♦Set the condition before the start of recording.
Recording method	Interval recording (Total number of pulse are recorded at a set recording interval.)
Recorded data	One data set contains time, voltage, current, effective power, reactive power, power factor, active energy within an interval, frequency

Recording item	Single-phase 3-wire line (1 to 6 circuits)	Single-phase 3-wire line, three-phase 3-wire line (1 to 3 circuits)
Voltage	U1	U1, U2
Current	I1, I2, I3, I4, I5, I6	I1, I2, I3, I4, I5, I6
Active power	P1, P2, P3, P4, P5, P6	P1, P2, P3
Reactive power	Q1, Q2, Q3, Q4, Q5, Q6	Q1, Q2, Q3
Power factor	PF1, PF2, PF3, PF4, PF5, PF6	PF1, PF2, PF3
Active energy within an interval	WP+1, WP+2, WP+3, WP+4, WP+5, WP+6	WP+1, WP+2, WP+3
Frequency	FREQ	FREQ

♦Data is scaled if scaling is ON

Recording mode	Instantaneous value MAX/MIN/AVE Instantaneous value + MAX/MIN/AVE Total 3 modes Set the mode before the start of recording. The types of values for recorded measurement items vary depending on the recording mode. Instantaneous value mode: instantaneous value MAX/MIN/AVE recording mode: maximum value, minimum value, and average value Instantaneous value + MAX/MIN/AVE recording mode: instantaneous value, maximum value, minimum value, and average value
Recording end condition	Memory full stop /Endless ♦Set the condition before the start of recording.
Recording interval	1/2/5/10/15/20/30 sec., 1/2/5/10/15/20/30/60 min.
Power Outage Protection	After recovering from a power outage, the instrument automatically returns to the state held before the outage.

Alarm judgment and recording function

Alarm judgment is made at every sampling, and the history will be recorded in flash memory if the measured value recording function remains active.	
Judgment method	Criterion threshold can be set to either Hi or Lo. The instantaneous value at every sampling is judged (effective in any measurement mode.).
Recorded data	One data set contains time, generation/reversion, CH and judgment threshold.
Alarm output	No output ♦Output is turned ON when an alarm (Hi or Lo) occurs. Whether to hold the alarm output can be selected. The reset switch or a command can be used to reset alarms.

10.5.3 General Specifications

Input method	U INPUT: Insulated input (Not insulated from current measurement circuit) CLAMP SENSOR INPUT: Input insulated by a clamp sensor
Input resistance (50/60 Hz)	U INPUT: 3.62 MΩ ± 10% (Difference input) CLAMP SENSOR INPUT: 200 kΩ ± 10%
Measurement method	Digital sampling
Internal memory	512 KB Flash memory
Backup	Recorded data (saved in flash memory) Data loss for up to 2 minutes before and after a power outage may occur.
Clock function	The real time clock (year, month, day, hour, minute, and second) of the communications module is used.
Communication interface	CAN bus
Maximum input voltage	U INPUT: 300 Vrms, 424.3 V peak CLAMP SENSOR INPUT: 1.5 Vrms, 2.2 V peak value
Maximum rated voltage to earth	Voltage input (U INPUT) terminal 300 Vrms, 50/60 Hz
Rated supply voltage	+5V±0.3VDC
Maximum rated power	2.5 W

LED display	Used for monitoring and warning Lit in green: Data being recorded. Flashing in green: Standing by. Lit in yellow: Alarm output. Flashing in yellow: one of the following*1 The voltage is outside the effective measurement range. The current is out of range. The active power is a negative value. Lit in red: Non-recoverable error occurred. *2 Flashing in red: Recoverable error occurred.*3 *1: You can select a POWER LED monitoring mode on the PC applications software. Use the current monitoring mode to only measure electric current (without voltage input). Otherwise, use voltage/current/power monitoring mode. Voltage/Current/Power Monitoring Mode The LED will start flashing in yellow when any of the following events occurs: Flashing in yellow indicates one of the following: The voltage is outside the effective input range. The current is out of range. The active power is a negative value. Current Monitoring Mode The LED will start flashing in yellow in case of the following event: The current is out of range. *2: The module needs repair. Contact your dealer or Hioki representative. *3: The same module ID may be used by another module.
Dielectric strength	3.536 kVAC Between U INPUT terminal and Case (excluding terminal section) 2.210 kVAC Between U INPUT terminal and interface terminal CLAMP SENSOR INPUT terminal and Interface terminal (50/60 Hz, response current 5 mA, one minutes
Dimensions	Approx. 45.5W × 96H × 94.5D mm (1.79"W × 3.78"H × 3.72"D) (including cover, sans protrusions)
Mass	Approx. 250 g (8.8 oz.) (including cover)
Option	9695-02 CLAMP ON SENSOR (50 Arms) 9695-03 CLAMP ON SENSOR (100 Arms) 9661-01 CLAMP ON SENSOR (500 Arms) 9765* CLAMP ON SENSOR (5 Arms) (See "When using Model 9765 " (p.195)) All sensors are the voltage-output type. 9238 CLAMP SENSOR CABLE L9019-02 VOLTAGE CORD (Red/ Black) L9019-03 VOLTAGE CORD (Red/ Black/ Yellow) * Not complied with the CE marking.
Operating temperature and humidity	0 to 50°C (32 to 122°F), 80%RH or less (with no condensation)
Storage temperature and humidity	-10 to 50°C (14 to 122°F), 80%RH or less (with no condensation)
Operating environment	Indoors, altitude up to 2000 m (6562-ft.)
Applicable standards	Safety EN61010, Pollution degree 2 Measurement Category III, (anticipated transient overvoltage 4000 V) EMC EN61326 Class A

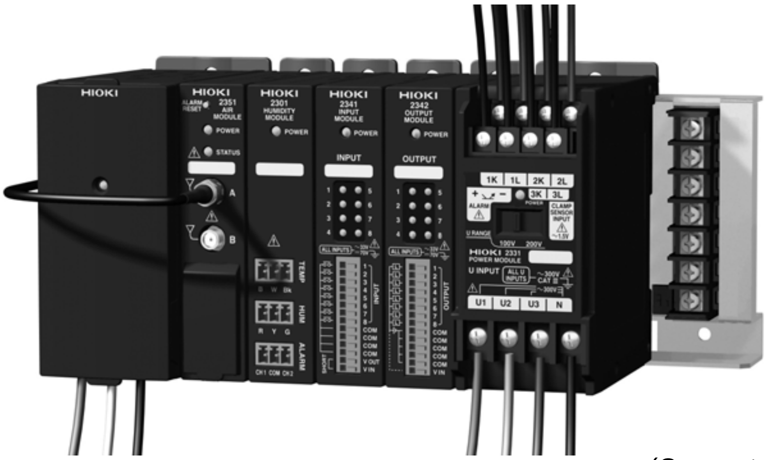
2341-20 INPUT MODULE 11

11.1 Overview

11.1.1 Product Overview

The 2341-20 is a logic signal input module for the Hioki Smart Site (remote measurement system). The module monitors contact or voltage signals from external devices second by second. If the module detects any changes in status, it writes the data to a log held in memory.
The logic state of the input signal can also be recorded at the specified interval.
It is used with a power supply module, a communications module, and a module base.

Number of input channels	8 channels
Input signal	contact signal/voltage signal (active Low)



(Conceptual image)

11.1.2 Major Features

- **The module records changes in the status of input signals along with time information (30,000 records).**
- **The recording interval is selectable from 1 second to 60 minutes.**

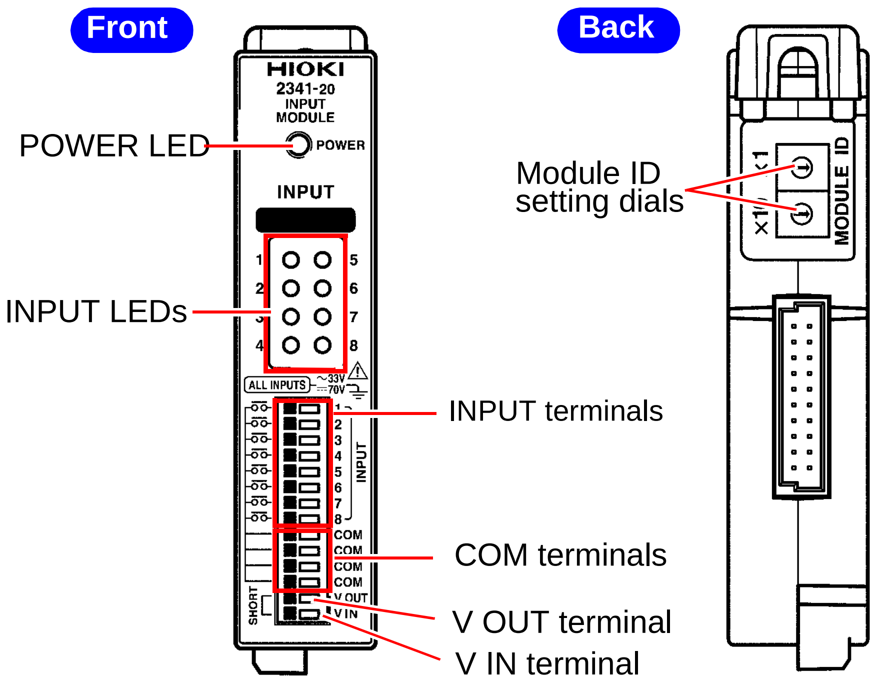
- **A reference voltage can be input to set a High level criterion voltage for input signals between 4.5 and 30 VDC.**

11.1.3 Name and Function of the Parts

CAUTION

To avoid damage to the internal and connected circuitry, observe the following precautions:

- Limit the input voltage to the INPUT terminal to below the input voltage of the V IN terminal.
- V IN may appear at the INPUT terminal. Set V IN to a value lower than the rated value of the circuit to be connected to the INPUT terminal.



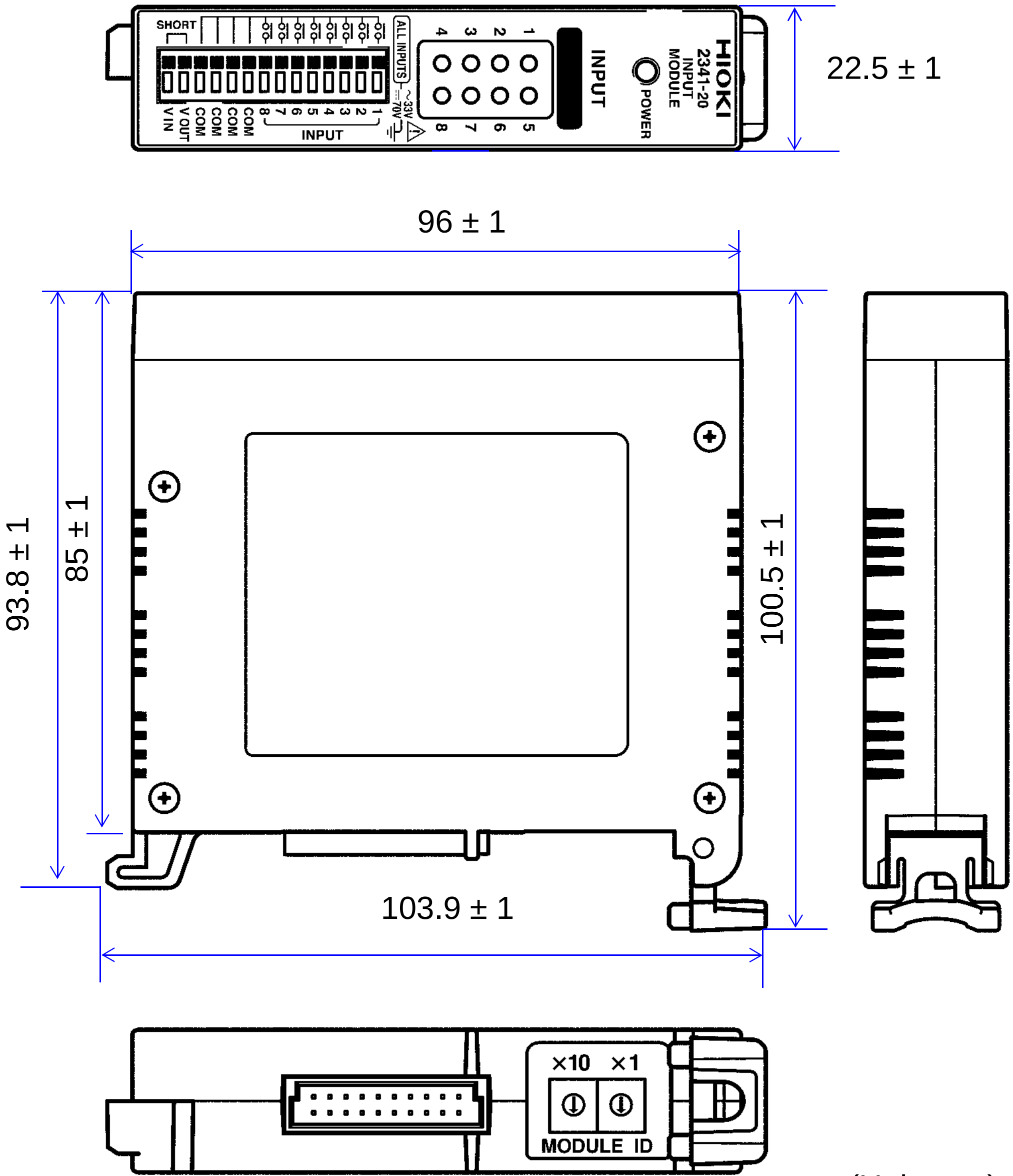
POWER LED	Goes on or flashes when power is supplied to the module. Remains on, flashes, or changes to another color according to the state of the module. **POWER LED indication** Lit in green : Data being recorded. Flashing in green : Standing by. Lit in red : Non-recoverable error occurred. *1 Flashing in red : Recoverable error occurred. *2
INPUT LED	Indicates the status of the input signal. Lights up in green when the contact signal is ON or the voltage signal is at LOW level.

INPUT terminals	Connect input signals to these terminals. Up to 8-channel contact signals or voltage signals (active Low) can be detected. Contact signals and voltage signals may be mixed on these terminals. Criterion threshold Contact signal: ON : 500 Ω or less, OFF : 500 kΩ or higher Voltage signal: LOW : 0 to 1.0 (V), HIGH : V IN - 1.0 to V IN (V)
COM terminals	This is a low-potential terminal shared by the INPUT, V IN and V OUT terminals.
V OUT terminal	Outputs a voltage (5 ± 0.5 VDC, 20 mA Max.) between V OUT and COM.
V IN terminal	The contact detection voltage and the High level value voltage for the voltage signal are input to this terminal (input range: 4.5 to 30 VDC). If the V IN terminal is short-circuited with V OUT, the threshold is set to approximately 5 VDC.
Module ID setting dials	Use the dial to set the module's identification No.

*1: The module needs repair. Contact your dealer or Hioki representative.

*2: The same module ID may be used by another module.

11.1.4 Dimension Diagrams



(Unit: mm)

11.1.5 Accessory and Option

Accessory

None

Option

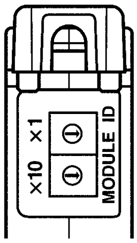
None

11.2 Settings

Setting the Module ID

You can connect up to 63 modules (measurement, input/output, and link) to one communications module.

Setting Procedure



Use the module ID setting dial to set the ID No. of the module to a number from 01 and to 63. (You cannot set a number other than the above.)

NOTE

- Ensure that the set ID is not used for any other module connected to the same communications module.
- The ID numbers of modules need not be consecutive.
- Setting the ID to 99, then turning on the power resets all internal settings to the defaults.
- The module ID and COM ID are not related and can be set independently.
- For COM ID, see the instruction manual for the communications module.

11.3 Preparations

11.3.1 Installing the Module

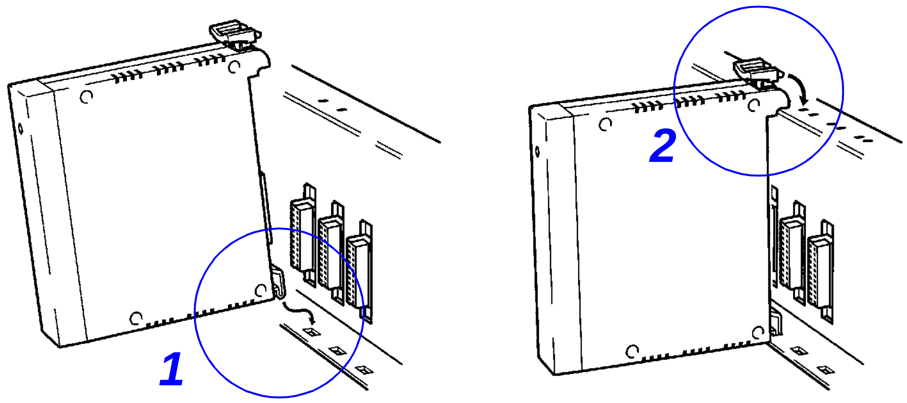
(1) Installing the Module Base

CAUTION Do not mount the module base on the ceiling where it may fall off.

Fasten the module base to a DIN rail or the wall according to the procedure described in the **19 "2391-01, 2391-02, 2391-03 MODULE BASE"(P.305)** or **20 "2392-01/02 MODULE BASE"(P.319)** series MODULE BASE instruction manual.

(2) Mounting a Module on the Module Base

Mount a module on the module base as shown below. Ensure that the lever clicks.



11.3.2 Connecting Input/Output Cables

CAUTION

The channels are not insulated from each other. Take care to avoid short circuits. When measuring two measurement points having a potential difference, equalize the ground level potential of the object to be measuredwith that of the module, or use another 2341-20 module. This prevents unreliable measurements.

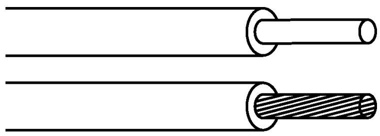
Recommended Cable

Single-wire : 0.32 to 0.65 mm
(Recommended: 0.65 mm)

Stranded-wire : 0.08 to 0.32 mm^2
Strand diameter: 0.125 or more
(Recommended: 0.32 mm^2
Strand diameter: 0.18 or more)

AWG : 22 to 28
(Recommended: AWG22)

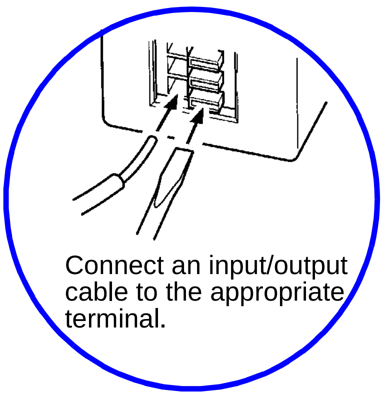
Cable strip length : 9 to 10 mm



(1) Connecting the Input/Output Terminal block

WARNING

The maximum input voltage is INPUT ≦ V IN ≦ +30 V. Ensure that the input does not exceed the maximum input voltage to avoid instrument damage, short-circuiting and electric shock resulting from heat building.



1. Hold down the button of the terminal using a flat-blade screwdriver or similar tool.
2. While holding down the button, insert an input/output cable into the lead connection hole.
3. Release the button to lock the cable.

NOTE

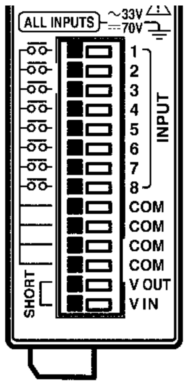
Make sure the cable length does not exceed 30 m (98 feet). If the cable is longer than 30 m, measurement may be affected by external noise or other electromagnetic environment.

(2) The Location of the Input/Output Cable

CAUTION

Follow the instructions below to avoid damaging internal and connected circuits.

- Make sure the input voltage to the INPUT terminal does not exceed the input voltage to the V IN terminal.
- V IN (VDC) may appear at the INPUT terminals. Make sure that the V IN does not exceed rating of the circuit connected to the INPUT terminal.
- Take care regarding the polarities of the INPUT terminal and V IN terminal.



Terminal	Function
INPUT terminal (Input)	Logic signal input (Between INPUT1 to 8 and COM)
V OUT terminal (5 VDC output)	Connected to V IN Set V IN = 5 VDC.
V IN terminal (Input)	Sets contact detection voltage/ High level voltage for voltage signal. (Between V IN and COM)

NOTE

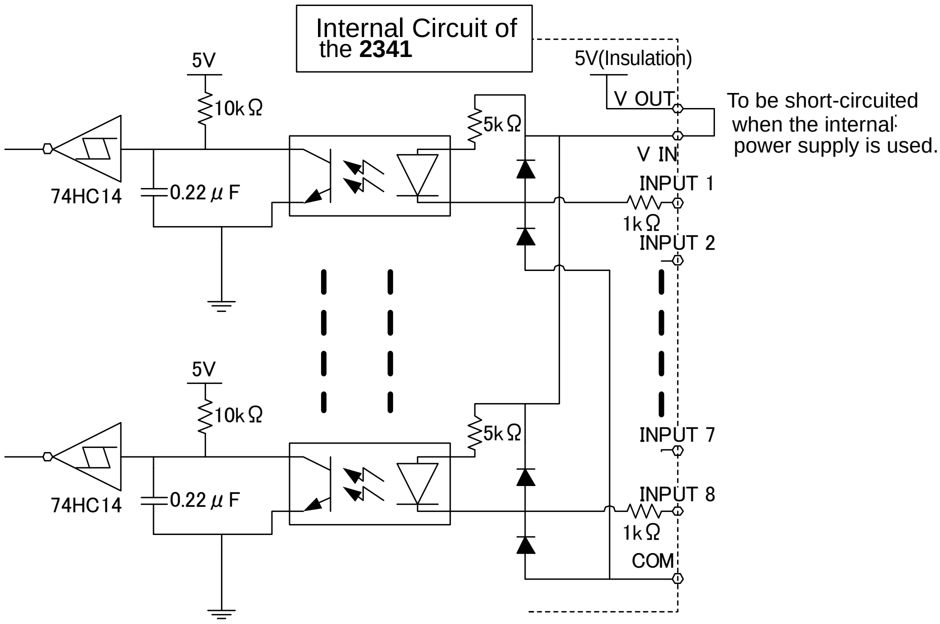
To detect signals, make sure a voltage is applied to the V IN terminal from the V OUT terminal or from an external source.

❖ **11.4.2 "Examples of Connections According to Type of Device Coupled"(P.220)**

11.4 Others

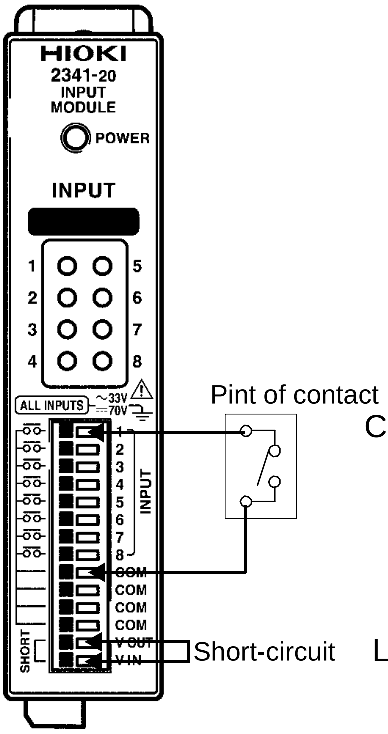
11.4.1 Internal Circuit

The diagram below shows the internal circuit of an input/output terminal. Use the diagram as a guide for terminal connections.



11.4.2 Examples of Connections According to Type of Device Coupled

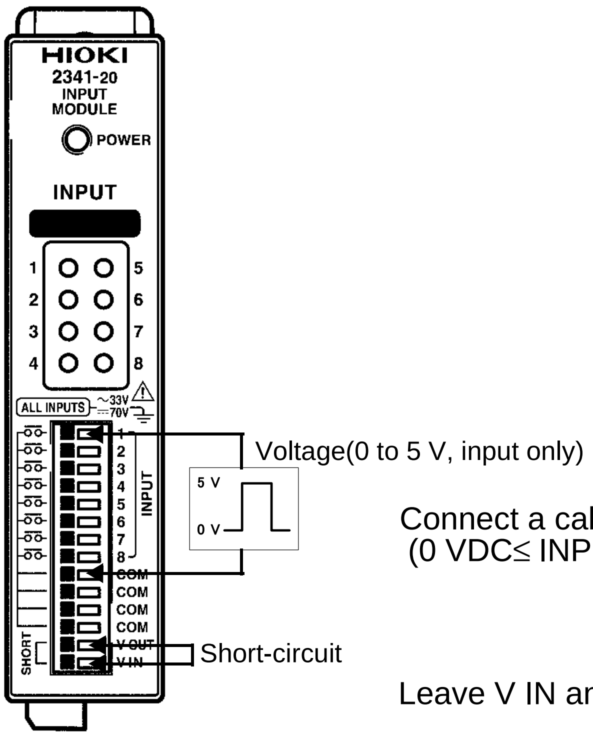
(1) Contact Output Devices (Relays, Etc.)



Connect a cable between INPUT and COM.

Leave V IN and V OUT short-circuited.

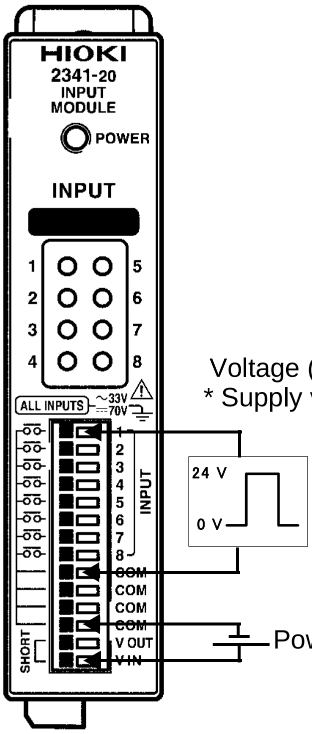
(2) Voltage Output Devices (When High Level Is +4 to 5 V)



Connect a cable between INPUT and COM.
(0 VDC≤ INPUT ≤ +5 V)

Leave V IN and V OUT short-circuited.

(3) Voltage Output Devices (When High Level Needs to Be Set)



Voltage (Example of 0-24 V input)
* Supply voltage to be made equal to the input High level.

Connect a cable between INPUT and COM.
(0 VDC≤ INPUT ≤ V IN)

Power (24 V)

Apply a High-Level judgment voltage in a range from +4.5 to +30 V across V IN and COM

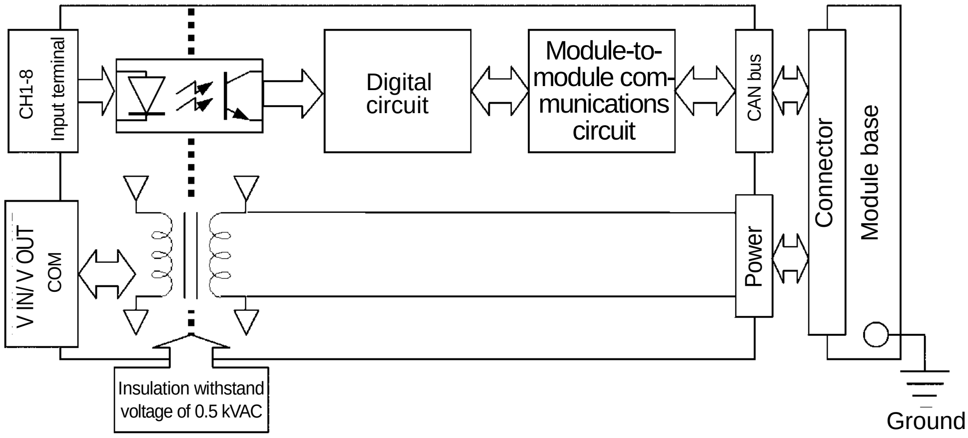
Reference:
The voltage range for level judgment is as follows:
H: V IN -1.0 to V IN (V)
L: 0 to +1.0

11.4.3 Insulation of Internal Circuit

CAUTION

The channels in the measurement input section are not insulated from each other. When connecting signals different in potential to these terminals, use an additional module, or insulate the signals externally, then connect to the terminals. This will prevent errors and module malfunctions.

In the instrument, the input circuit is insulated from the CAN bus as shown in the block diagram below. (Withstand voltage: 0.5 kVAC, 50/60 Hz,
Response current: 5 mA, 1 minute)



11.5 Specifications

11.5.1 Basic Specifications

Operation	Receives contact signals from an external device and monitors the status of the signals.
Number of inputs	8 channels
Input signal	Contact/Voltage input (Photocoupler insulation)
Signal level	High: V IN - 1.0 to V IN (V) Low: 0 V to 1.0 V
Contact detection level	ON: Resistance of 500 Ω or less OFF: Resistance of 500 kΩ or more
Internal insulation power supply	5 ± 0.5 VDC, 20 mA Max. Between V OUT and COM.
External input power supply	4.5 to 30 VDC Between V IN and COM
Input status indication	Contact ON, LOW level
Input terminal	Terminal block
Low-pass filter	Time constant of 2.2 ms
Sampling	Once per second

11.5.2 Function Specifications

Execute the functions from the PC application via communications.

Monitoring function

This function outputs the current status of the output terminal (hereinafter called "measured value").

Measured value recording function

Measurements are recorded at a set recording interval.	
Real-time management	This is automatically set from the PC application at the start of recording.
Recording start	Immediate start/Reserved-time start
Recording end	Manual end/Reserved-time end
Operation when memory is full	Memory full stop /Endless ♦Set the condition before the start of recording.
Recording interval	1/2/5/10/15/20/30 sec., 1/2/5/10/15/20/30/60 min.
Recording mode	Instantaneous value
Recorded data	One data set contains time and measured values (for the 8 channels.).
Recording capacity	512 k bytes Flash memory
Quantity of recorded data	Instantaneous value recording mode: 30,000 data × 8 CH
Power outage protection	After recovering from a power outage, the instrument automatically returns to the state held before the outage.

Alarm judgment and recording function

At every sampling, the function makes alarm judgment as to whether the input is active or not, and records the change history in flash memory if the measured value recording function of the system is active.	
Judgment method	Active Hi/Lo (Active ON/OFF) can be set selectively. Judges instantaneous values at every sampling.
Recording method	Instantaneous value (A log event is recorded only when the recording is started or stopped, or when changes in status are detected.)
Recorded data	One data set contains time, event, measured values of all channels (Judgment).

11.5.3 General Specifications

Clock accuracy	±100 ppm (Reference value at temperature from 0 to 50°C (32 to 122°F) without the communications module)
Backup	Recorded data (saved in flash memory) * Data loss for up to 2 minutes before and after a power outage may occur.
Communication interface	CAN bus (500 kps)
Maximum rated voltage to earth	33 Vrms, 70 VDC (Sum with input voltage)
Rated supply voltage	5 ± 0.25 VDC
Maximum rated power	1.4 W
Dielectric strength	500 VAC Between input terminal and CAN bus (50/60 Hz, Response current 5 mA, one minutes
Dimensions	Approx. 22.5W × 96H × 85D mm (0.89"W × 3.78"H × 3.35"D) (excluding projections)
Mass	Approx. 120 g (4.2 oz.)
Operating temperature and humidity	0 to 50°C (32 to 122°F), 80%RH or less (with no condensation)
Storage temperature and humidity	-10 to 50°C (14 to 122°F), 80%RH or less (with no condensation)
Operating environment	Indoors, altitude up to 2000 m (6562-ft.)
Standards applying	Safety EN61010 Pollution degree 2 EMC EN61326 Class A

2342-20 OUTPUT MODULE 12

12.1 Overview

12.1.1 Product Overview

The 2342-20 is a control signal output module for the Hioki Smart Site (remote measurement system). The module outputs control signals, monitors commands from the host, and records data on measurement modules and input modules connected to this communications module. If the module detects any changes in status, It writes this data to a log held in memory. Further, if a change occurs in the judgment result, this history will be recorded in the module.
It is used with a power supply module, a communications module, and a module base.

Number of output channels	8 channels
Output signal	Open collector output

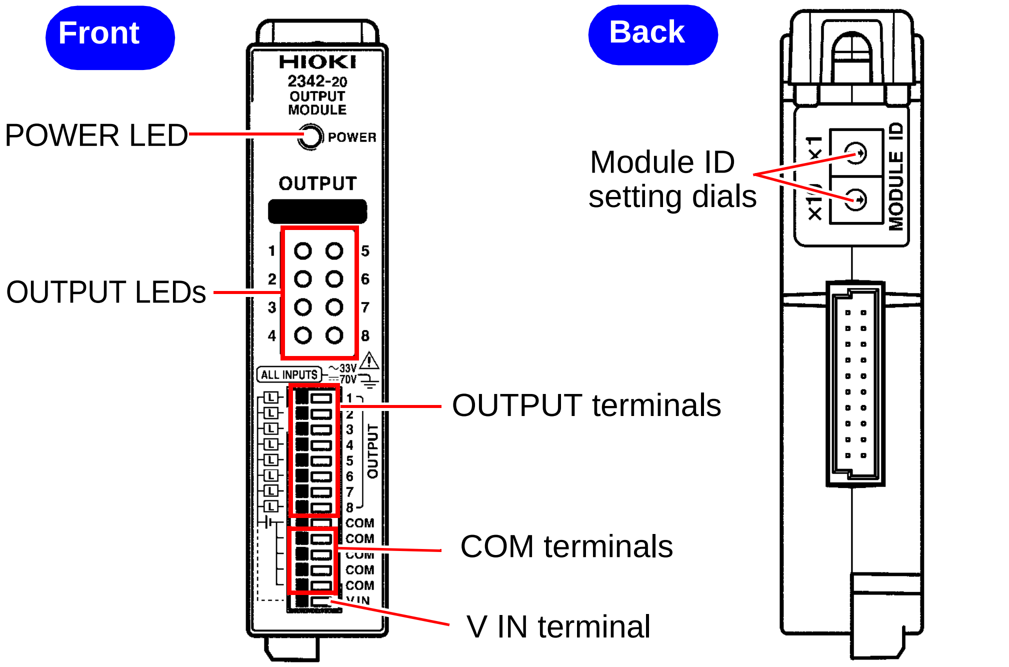
(Conceptual image)

12.1.2 Major Features

- **The module records changes in the status of output signals along with time information (30,000 records).**
- **The instrument is provided with a function to control the output signal from a personal computer and a function to monitor, judge and output the values measured by the measuring module. Either of these functions can be selected.**

- **The instrument includes a "Logic output function" that performs logic operations (AND, OR) on the input to each channel and outputs the results during the monitoring and judgment of the input module.**
- **The module has a filter function that outputs the judgment result, which is held for a certain period of time.**
- **The module has a channel-linking function that groups several channels and prioritizes their output.**

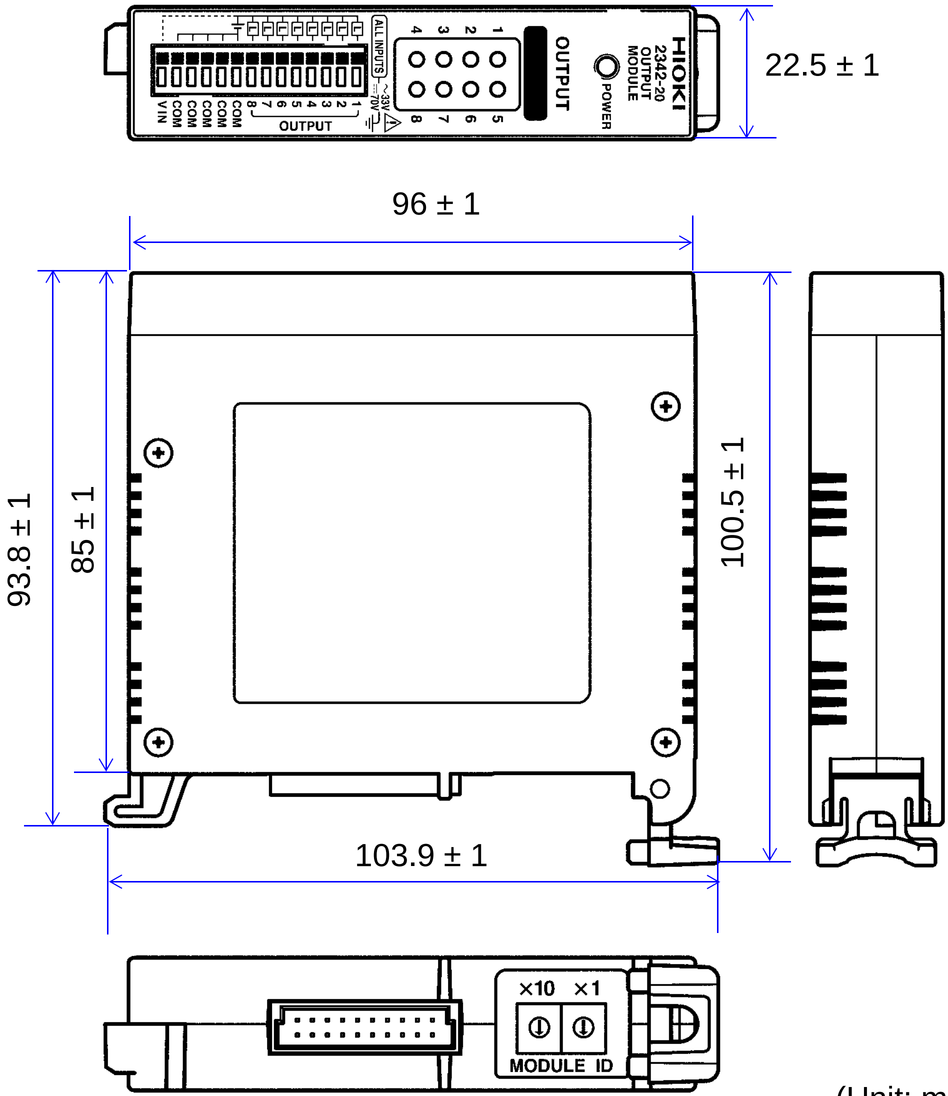
12.1.3 Name and Function of the Parts



POWER LED	Goes on or flashes when power is supplied to the module. Remains on, flashes, or changes to another color according to the state of the module. **POWER LED indication** Lit in green : Data being recorded. Flashing in green : Standing by. Flashing in yellow: Setting error *1 Lit in red : Non-recoverable error occurred. *2 Flashing in red : Recoverable error occurred. *3
OUTPUT LEDs	Lights up in green when the output transistor is ON (open collector output).
COUTPUT terminals	These are the output signal terminals (open collector output). Up to 8 output channels are available.
COM terminals	Connect a DC voltage signal or DC current signal to this terminal (channel 2).
V IN terminal	Connect the power supply for the relay drive circuit to this terminal (with protective diode, Input range: 30 VDC max.). *4
Module ID setting dials	Use the dial to set the module's identification No.

*1: No module has an ID registered as a module to be monitored.
*2: The module needs repair. Contact your dealer or Hioki representative.
*3: The same module ID may be used by another module.
*4: When using the V IN terminal, make sure the input voltages to the OUTPUT terminals do not exceed the input voltage to the V IN terminal.
If you do not use the V IN terminal, these channels may be connected to power supplies with different voltage levels.

12.1.4 Dimension Diagrams



(Unit: mm)

12.1.5 Accessory and Option

Accessories
None

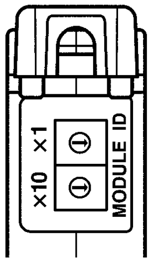
Option
None

12.2 Settings

Setting the Module ID

You can connect up to 63 modules (measurement, input/output, and link) to one communications module.

Setting Procedure



Use the module ID setting dial to set the ID No. of the module to a number from 01 and to 63. (You cannot set a number other than the above.)

NOTE

- Ensure that the set ID is not used for any other module connected to the same communications module.
- The ID numbers of modules need not be consecutive.
- Setting the ID to 99, then turning on the power resets all internal settings to the defaults.
- For COM ID, see the instruction manual for the communications module.

12.3 Preparations

12.3.1 Installing the Module

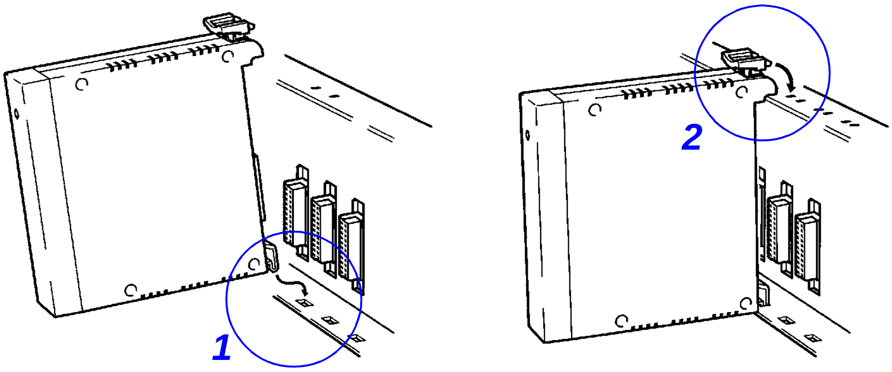
(1) Installing the Module Base

CAUTION Do not mount the module base on the ceiling where it may fall off.

Fasten the module base to a DIN rail or the wall according to the procedure described in the **19 "2391-01, 2391-02, 2391-03 MODULE BASE"(P.305)** or **20 "2392-01/02 MODULE BASE"(P.319)** series MODULE BASE instruction manual.

(2) Mounting a Module on the Module Base

Mount a module on the module base as shown below. Ensure that the lever clicks.

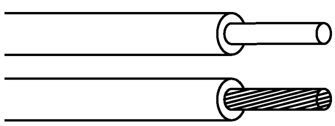


12.3.2 Connecting Input/Output Cables

CAUTION The channels are not insulated from each other. Take care to avoid short circuits. A short-circuit may result in errors or module malfunctions.

Recommended Cable

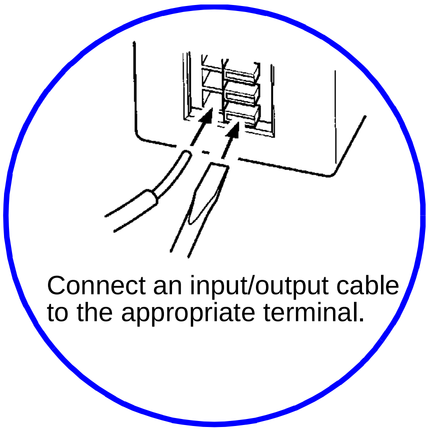
Single-wire : 0.32 to 0.65 mm (Recommended: 0.65 mm)
Stranded-wire : 0.08 to 0.32 mm^2 Strand diameter: 0.125 or more (Recommended: 0.32 mm^2 Strand diameter: 0.18 or more)
AWG : 22 to 28 (Recommended: AWG22)
Cable strip length: 9 to 10 mm



(1) Connecting the Input/Output Terminal block

WARNING

The maximum input voltage and current is 30 VDC, 250 mA/ 1 channel. Ensure that the input does not exceed the maximum input voltage to avoid instrument damage, short-circuiting and electric shock resulting from heat building.


Connect an input/output cable to the appropriate terminal.

1. Hold down the button of the terminal using a flat-blade screwdriver or similar tool.
2. While holding down the button, insert an input/output cable into the lead connection hole.
3. Release the button to lock the cable.

NOTE

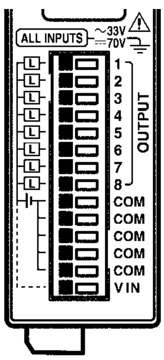
Make sure the cable length does not exceed 30 m (98 feet). If the cable is longer than 30 m, measurement may be affected by external noise or other electromagnetic environment.

(2) The Location of the Input/Output Cable

CAUTION

Follow the instructions below to avoid damaging internal and connected circuits.

- Make sure the input voltage to the OUTPUT terminal does not exceed the input voltage to the V IN terminal.
- Take care regarding the polarities of the OUTPUT terminal and V IN terminal.



Terminal	Function
OUTPUT terminal (Output)	Open collector output (Between OUTPUT1 to 8 and COM)
V IN terminal (Input)	Input of power supply for the relay drive circuit (Between V IN and COM, 30 VDC Max., with protective diode)

12.4 Others

12.4.1 Output Circuit

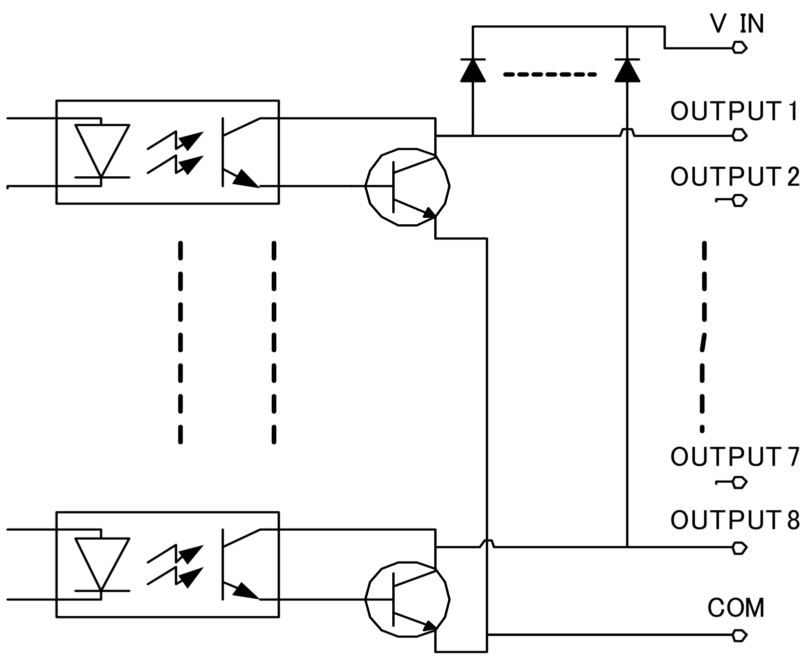
(1) Output Rating

WARNING **Ensure that the input does not exceed the maximum input voltage or current to avoid instrument damage, short-circuiting and electric shock resulting from heat building.**

Output Method	Open collector
Maximum input voltage/current	30 V, input current of 250 mA/ 1 channel

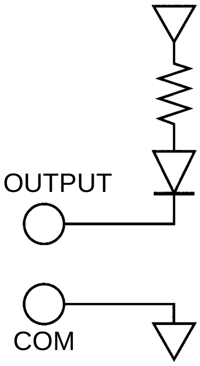
(2) Internal Circuit

The output circuit is configured as shown below.

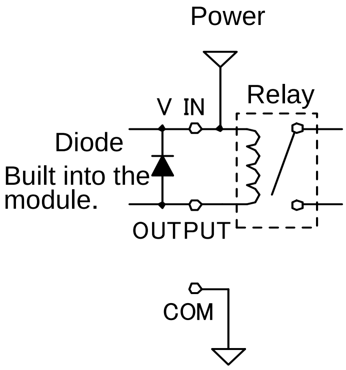


NOTE The output transistor works as a switch between signal output and ground in the module. When output becomes enabled, the switch is turned on and current flows from the output signal to COM in the module. Therefore, a relay or LED lamp can be connected directly to the output terminal (page 232).

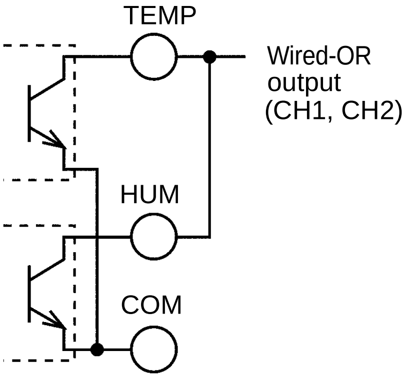
Circuit diagram



Connecting LED



Connecting relay



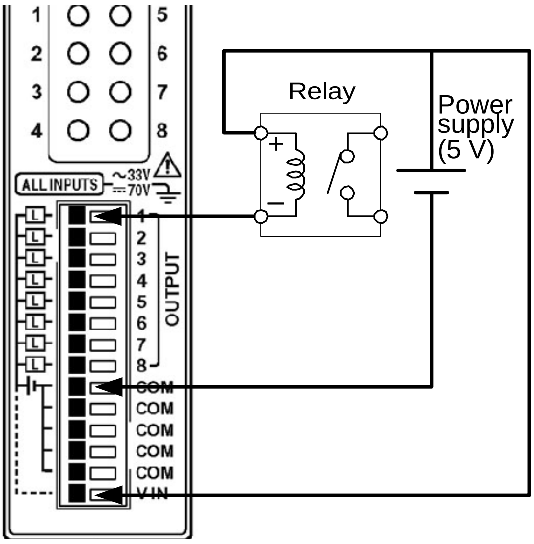
Using on Wired-OR Logic

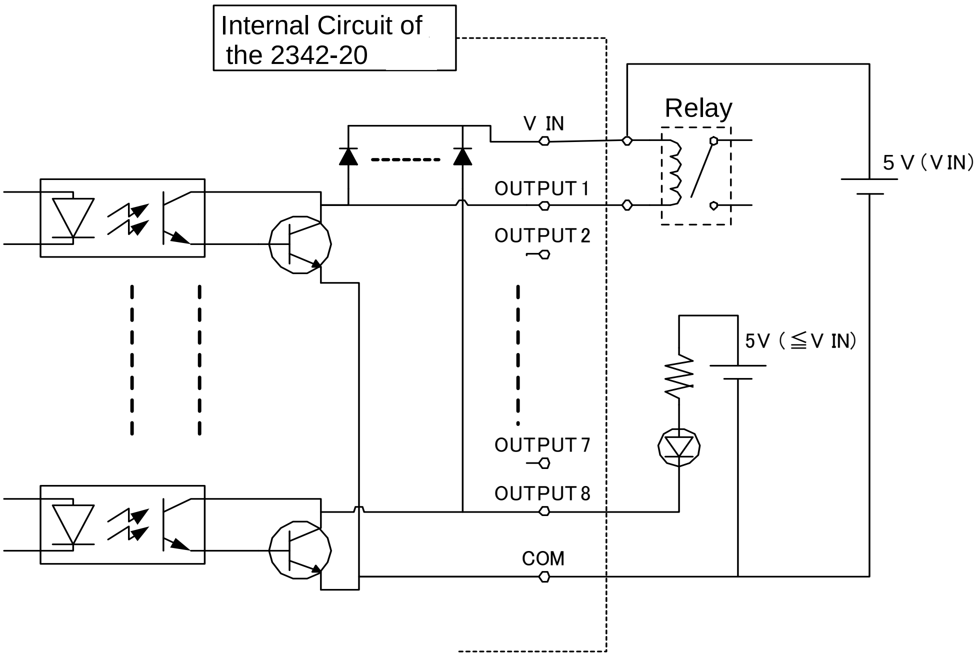
NOTE

- The LED lamps and relays connected to this module must operate at currents lower than 30 V and 250 mA (When using V IN with relay is 100 mV.). The module is equipped with a built-in diode to absorb counter-electromotive force if a relay is connected.
  (Electric specification of protective diode for drive a relay built into this module: Average rectification rated current Io=100 [mA], Reverse rated Voltage V_R=80 [V])
- The open collector output operates on wired OR logic, choosing channels from CH1 to CH8 and connecting them to each other. If an alarm is issued on one of the channels, an alarm signal is issued.

12.4.2 Examples of Connections According to Type of Device Coupled

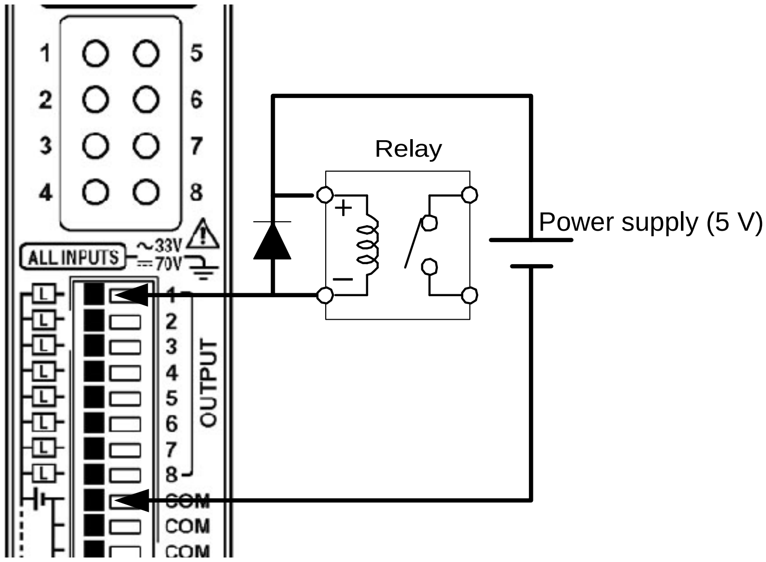
(1) To drive a relay (When using V IN)

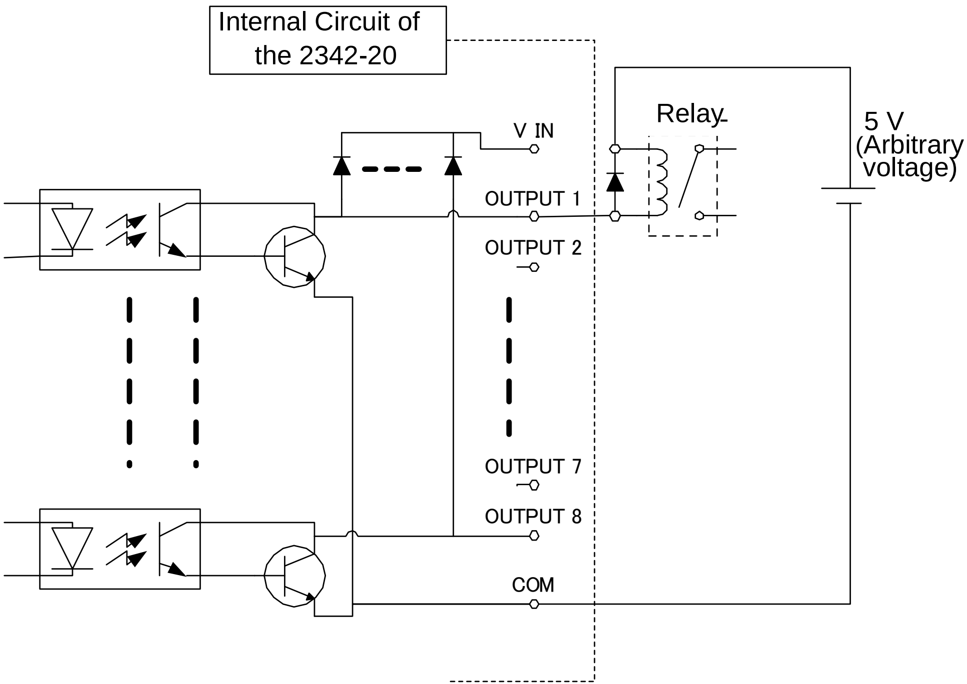




NOTE A built-in diode of the instrument prevents a counter electromotive force. (The maximum input current is 100 mA/channel.)
Set the OUTPUT terminal to the range of input voltage ≤ V IN ≤ +30 V.

(2) To drive a relay (When not using V IN)

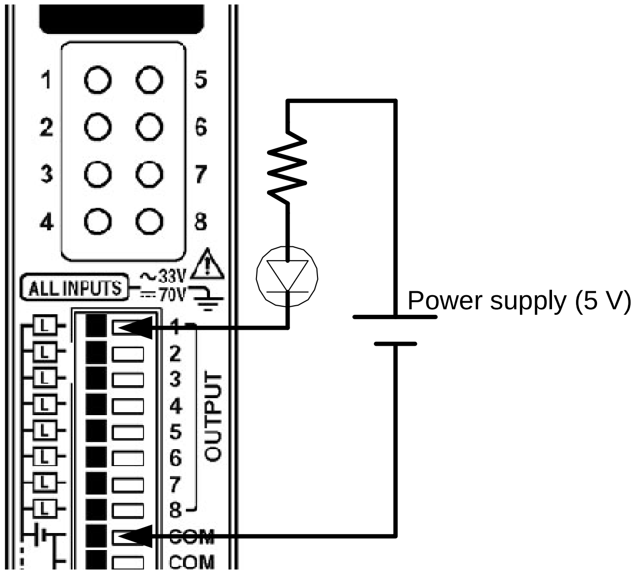


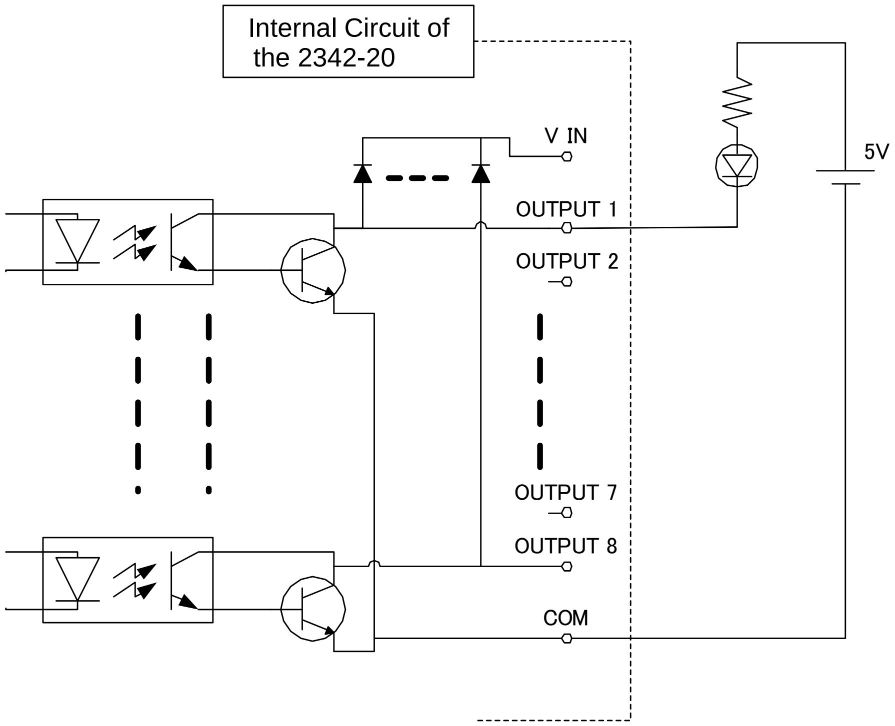


NOTE

An add-on diode is required due to the presence of the counter electromotive force of the relay.
The OUTPUT terminal can be set to a different input voltage value for each channel.
(Maximum input voltage/current are 30 VDC and 250 mA/ 1 channel.)

(3) To light an LED (5 V drive)



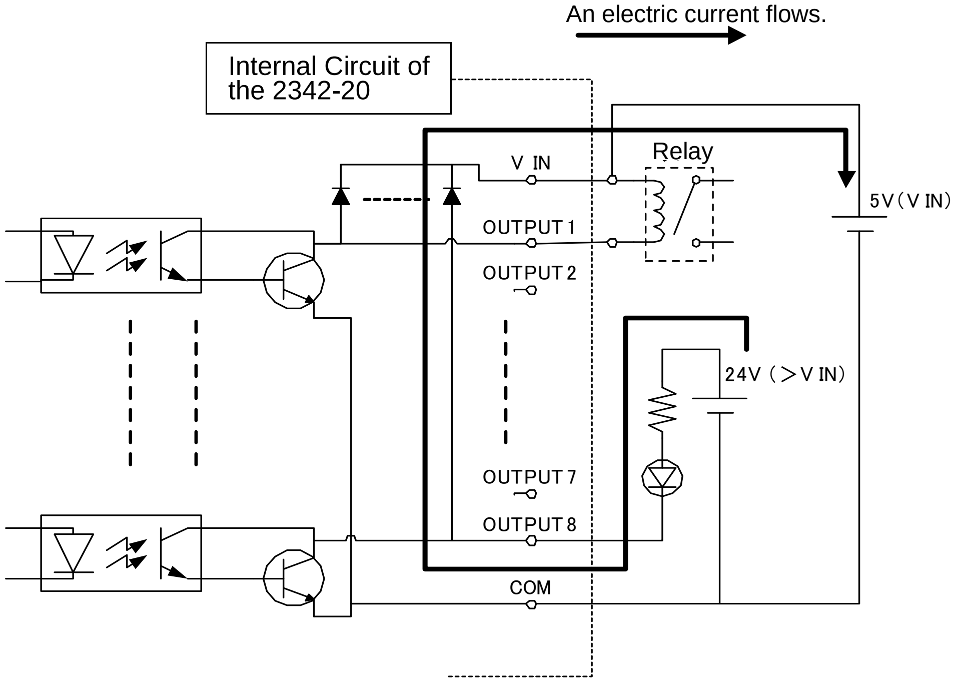


NOTE

Use a current-limiting resistor.
(The maximum input current is 250 mA/channel.)

(4) Incorrect usage of V IN terminal

Take care not to reverse the polarities of the terminals.



NOTE

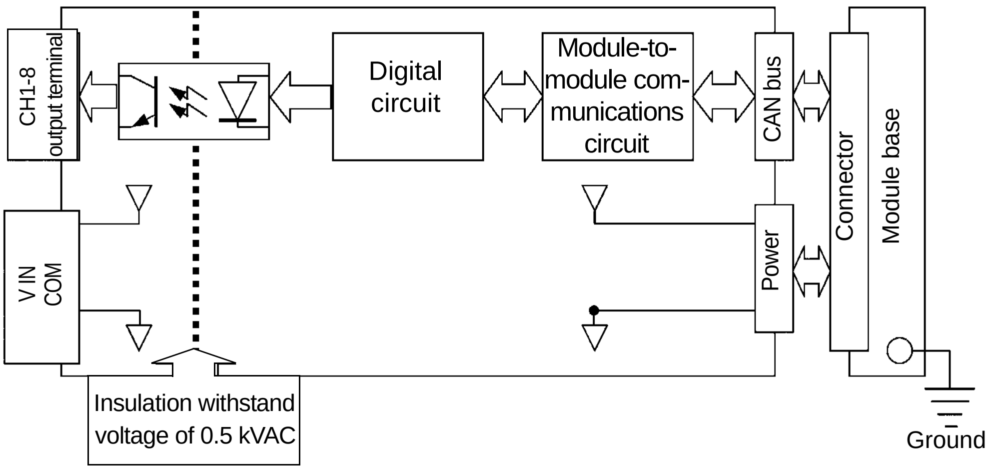
Set the OUTPUT terminal to the range of input voltage ≤ V IN ≤ +30 V.
Improper use of the V IN terminal may result in the flow of an electric current as shown above, generating heat and potentially damaging internal and connected circuits.

12.4.3 Insulation of Internal Circuit

CAUTION

The output terminals are not insulated from each other. When connecting signals with different potentials to these terminals, use an additional module, or insulate the signals externally before connecting them to the terminals. This will prevent errors and module malfunctions.

In the instrument, the input circuit and output are insulated from the CAN bus as shown in the block diagram below. (Withstand voltage: 0.5 kVAC, 50/60 Hz, Response current: 5 mA, 1 minute)



12.5 Specifications

12.5.1 Basic Specifications

Operation	Outputs control signals based on commands from the host or measurement module data.
Number of outputs	8 channels
Output signal	Open collector output (photocoupler insulation)
Internal insulation power supply	N/A
External input power supply	Between V IN and COM 30 VDC Max.
Maximum sink current	250 mA/ 1 channel
Maximum input voltage	30 VDC
Output status indication	Green LED lights up when output transistor is ON (each channel).
Output terminal	Terminal block

12.5.2 Function Specifications

Execute the functions from the PC application via communications.

Monitoring function

This function outputs the current status of the output terminal (hereinafter called "measured value").

Alarm judgment and recording function

At every sampling, the function makes alarm judgment as to whether the input is active or not, and records the change history in flash memory if the measured value recording function of the system is active.	
Judgment method	Active Hi/Lo (Active ON/OFF) can be set selectively. Judges instantaneous values at every sampling.
Recording mode	Instantaneous value recording (A log event is recorded only when the recording is started or stopped, or when changes in status are detected.)
Recorded data	One data set contains time, event, measured values of all channels (Judgment values).
Real-time management	This is automatically set from the PC application at the start of recording.
Recording start	Immediate start/Reserved-time start
Recording end	Manual end/Reserved-time end
Operation when memory is full	Memory full stop /Endless ♦Set the condition before the start of recording.
Recording capacity	512 k bytes Flash memory
Quantity of recorded data	Instantaneous value recording mode: 30,000 data × 8 CH
Power outage protection	After recovering from a power outage, the instrument automatically returns to the state held before the outage.

12.5.3 Each Channel Output Function

Host Command

Output state	Held * Released via the reset switch or by a command.

Module Monitoring

Sampling	Once/second
Threshold	High and low limits may be set.
Logic output function	Outputs the result of Boolean logic calculations for the channels of an 8-channel input module. * Selects "Logic output function" or "module measurement judgment function" (for each channel).
Judgment parameter	The instantaneous value is determined each second.
Output hold	Selects Hold or Not Hold. Released via the reset switch or by a command.
Filter function	If the judgment results during the specified time are the same, the result is output.

Output Relating Function

Related channel	The channels do not issue output while the high-priority channel is doing likewise.

12.5.4 General Specifications

Clock accuracy	±100 ppm (Reference value at temperature from 0 to 50°C (32 to 122°F) without the communications module)
Backup	Recorded data (saved in flash memory) * Data loss for up to 2 minutes before and after a power outage may occur.
Communication interface	CAN bus (500 kps)
Maximum rated voltage to earth	33 Vrms, 70 VDC (Sum with input voltage)
Maximum rated voltage to earth	5 ± 0.25 VDC
Maximum rated power	1.4 W
Dielectric strength	500 VAC Between output terminal and CAN bus (50/60 Hz, Response current 5 mA, one minutes
Dimensions	Approx. 22.5W × 96H × 85D mm (0.89"W × 3.78"H × 3.35"D) (excluding projections)
Mass	Approx. 120 g (4.2 oz.)
Operating temperature and humidity	0 to 50°C (32 to 122°F), 80%RH or less (with no condensation)
Storage temperature and humidity	-10 to 50°C (14 to 122°F), 80%RH or less (with no condensation)
Operating environment	Indoors, altitude up to 2000 m (6562-ft.)
Standards applying	Safety EN61010 Pollution degree 2 EMC EN61326 Class A

2343-20 RS LINK MODULE 13

13.1 Overview

13.1.1 Product Overview

The 2343-20 is a measurement module for the Hioki "Smart Site" (remote measurement system). The module transmits commands to the device connected to the RS-232C terminal at regular intervals and stores the returned values from the device in memory.
It is used with a power supply module, a communications module, and a module base.

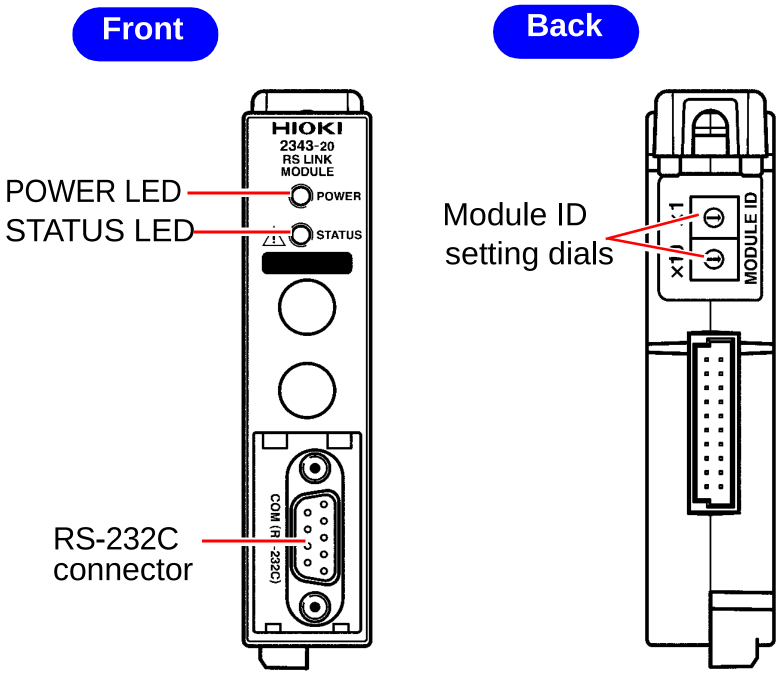
Standard connectable RS-232C device	3331, 3332, MELSEC
Number of connectable devices	1 unit

(Conceptual image)

13.1.2 Major Features

- **The recording interval can be set between 1 second and 60 minutes.**
- **Devices with RS-232C terminals can be connected to this module and incorporated into the Hioki remote measurement system.**

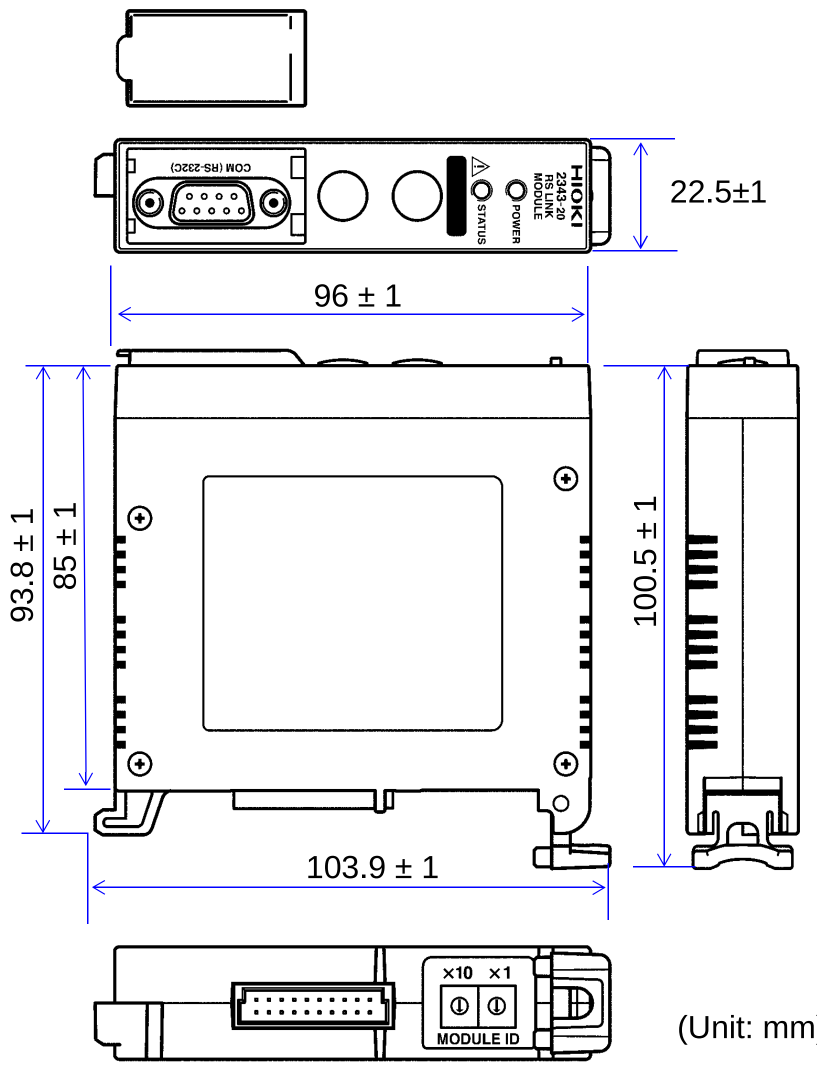
13.1.3 Name and Function of the Parts



POWER LED	Goes on or flashes when power is supplied to the module. Remains on, flashes, or changes to another color according to the state of the module. **POWER LED indication** Lit in green : Data being recorded. Flashing in green : Standing by. Flashing in yellow:RS232C communications down Lit in red : Non-recoverable error occurred. *1 Flashing in red : Recoverable error occurred. *2
STATUS LED	Stays ON, begins flashing or changes color depending on the operating status of the module. Lit in green : Communicating via RS-232C.
RS-232Cconnector	Connect an RS-232C cable (optional) to this terminal.
Module ID setting dial	Use the dial to set the module's identification No.

*1: The module needs repair. Contact your dealer or Hioki representative.
*2: The same module ID may be used by another module.

13.1.4 Dimension Diagrams



(Unit: mm)

13.1.5 Accessory and Option

Accessories

None

Option

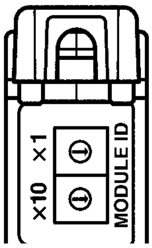
9612 RS-232C CABLE
9637 RS-232C CABLE

13.2 Settings

13.2.1 Setting the Module ID

You can connect up to 63 modules (measurement, input/output, and link) to one communications module.

Setting Procedure



Use the module ID setting dial to set the ID No. of the module to a number from 01 and to 63. (You cannot set a number other than the above.)

NOTE

- Ensure that the set ID is not used for any other module connected to the same communications module.
- The ID numbers of modules need not be consecutive.
- Setting the ID to 99, then turning on the power resets all internal settings to the defaults.
- The module ID and COM ID are not related and can be set independently.
- For COM ID, see the instruction manual for the communications module.

13.3 Preparations

13.3.1 Installing the Module

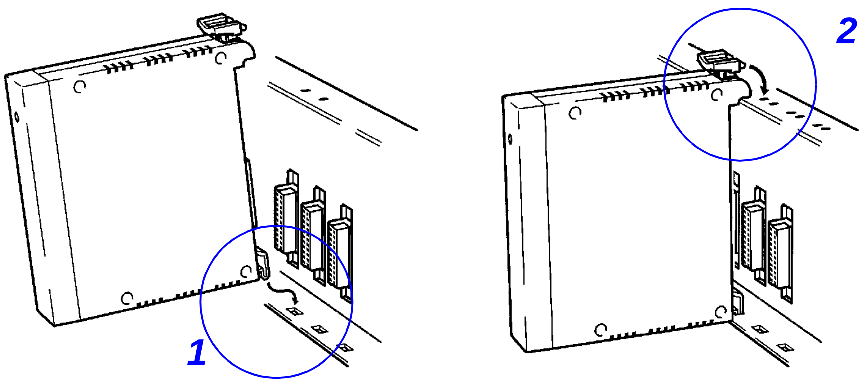
(1) Installing the Module Base

CAUTION Do not mount the module base on the ceiling where it may fall off.

Fasten the module base to a DIN rail or the wall according to the procedure described in the **19 "2391-01, 2391-02, 2391-03 MODULE BASE"(P.305)** or **20 "2392-01/02 MODULE BASE"(P.319)** series MODULE BASE instruction manual.

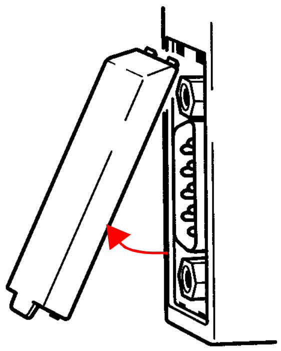
(2) Mounting a Module on the Module Base

Mount a module on the module base as shown below. Ensure that the lever clicks.



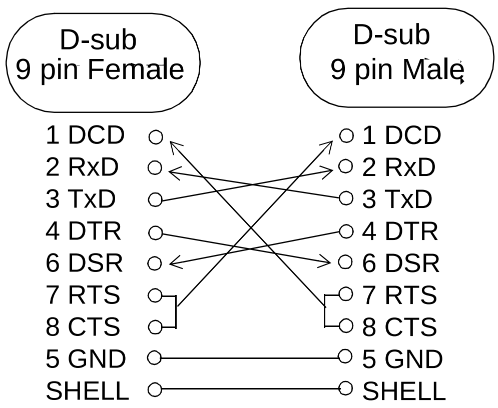
13.3.2 Connecting RS-232C Cable to the Module

1. Remove the cover from the RS-232C terminal on this module.
2. Connect the RS-232C cable to the module.
3. Connect the RS-232C cable to the external device.



Compatible Cables

- The 9637 RS-232C CABLE (1.8 m/ 5.9 feet)
- When using a commercially available cable, use one with the following wiring configuration:



NOTE When connecting with the 3168, use the 9612 RS-232C cable.

13.4 Specifications

13.4.1 Basic Specifications

Operations	Communicates with an external RS-232C device and obtains the status of or controls the device.
External communications interface	RS-232C Connector : D-SUB 9-pin Transmission rate : 2400/4800/9600/19200/38400/57600 bps Parity : None/Odd/Even Bit length : 7 bits/ 8 bits Stop bit : 1 bit/ 2 bits Handshake : None
Internal communications interface	CAN (for communications with the communications module at a rate of 500 kbps)
Standard connectable device	3331, 3332, 3193 (On special order), MELSEC

13.4.2 Function Specifications

Execute the functions from the PC application via communications.

Monitoring function

This function outputs the current status of the output terminal (hereinafter called "measured value").

Measured value recording function

This function sends commands to external RS devices at every preset recording interval, and records the values returned (measured values).	
Command value format	ASCII/Binary format, selectable ♦ When setting an arbitrary device
Return value format	ASCII/(Comma/character-delimited)/Binary (Fixed length), selectable ♦ When setting an arbitrary device
Real-time management	This is automatically set from the PC application at the start of recording.
Recording start	Immediate start/Reserved-time start
Recording end	Manual end/Reserved-time end
Operation when memory is full	Memory full stop /Endless ♦Set the condition before the start of recording.
Recording interval	1/2/5/10/15/20/30 sec., 1/2/5/10/15/20/30/60 min.
Recording mode	• Instantaneous value • MAX/MIN/AVE • Instantaneous value + MAX/MIN/AVE Total 3 modes ♦Set the mode before the start of recording.
Recorded data	One data set: Time + value returned from an external device.
Quantity of recorded data	It depends ondconnectable device.
Recording capacity	512 k bytes Flash memory
Power outage protection	After recovering from a power outage, the instrument automatically returns to the state held before the outage.

Alarm judgment and recording function

At every sampling, the function makes alarm judgment as to whether the input is active or not, and records the change history in flash memory if the measured value recording function of the system is active.	
Judgment method	Active Hi/Lo (Active ON/OFF) can be set selectively. Judges instantaneous values at every sampling.
Recording date	One data set contains time, generation/reversion, CH and judgment threshold.
Alarm output	Alarm output × 1 CH ♦Output is turned ON when an alarm (Hi or Lo) occurs. Whether to hold the alarm output can be selected. The reset switch or a command can be used to reset alarms.

13.4.3 General Specifications

Clock accuracy	±100 ppm (Reference value at temperature from 0 to 50°C (32 to 122°F) without the communications module)
Backup	Recorded data (saved in flash memory) * Data loss for up to 2 minutes before and after a power outage may occur.
Rated supply voltage	5 ± 0.3 VDC
Maximum rated power	1.4 W
Dimensions	Approx. 22.5W × 96H × 85D mm (0.89"W × 3.78"H × 3.35"D) (excluding projections)
Mass	Approx. 150 g (5.3 oz.)
Options	9637 RS-232C CABLE 9612 RS-232C CABLE
Operating temperature and humidity	0 to 50°C (32 to 122°F), 80%RH or less (with no condensation)
Storage temperature and humidity	-10 to 50°C (14 to 122°F), 80%RH or less (with no condensation)
Operating environment	Indoors, altitude up to 2000 m (6562-ft.)
Standards applying	Safety EN61010 Pollution degree 2 EMC EN61326 Class A

2351 AIR MODULE 2352-20 WIRE MODULE 14

14.1 Overview

In this manual, the 2351-20 and 2351-21 are indicated as 2351, except when the full model number is specified.

14.1.1 Product Overview

- The 2351 and 2352-20 are the communications module of Hioki "Smart Site" (remote measurement system).
- The 2351 and 2352-20 are used with the power supply module, measurement module, and module base.
- This module links the measurement modules with a PC, server, and communications infrastructure, and transfers data.
- The transmission speed is 51.9 kbps for wireless communications and 57.6 kbps for RS-232C communications.

Number of communications modules connectable to one master station	Up to 88 units (2351)
Number of measurement modules connectable to one wireless module	Up to 63 units (2351, 2352-20)

(Conceptual image)

Conformity for regulations on wireless communication.
2351-20 can be used in the EU and Korea only.

Contains already Notified and Certified Transmitter
Module:
R&TTE: NB No.; 0682 Registration No.; E812974O-CC
MIC: Type ID; LARN8-IO2F2402/2479TR0.006F1D783
Certification No.; FUT-FRH-SD07TB
Date of Cirtification; 01(Month) 11(Date) 2006(Year)
Model No. of Equipment;FRH-SD07TB
Manufacturer/Applicant; FUTABA CORPORATION, Japan

2351-21 can be used in the U.S.A. and Canada only.

Contains FCC ID: AZP-FRH-SD07TU
IC: 5829A-235121

Operation is subject to the following two conditions:
(1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of this device.

The following notices are for Canada only:
This device has been designed to operate with an antenna having a maximum gain of 2.14 dB.
Antenna having a higher gain is strictly prohibited per regulations of Industry Canada. The Required antenna impedance is 50 ohms.
To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (EIRP) is not more than that required for successful communication.
The installer of this radio equipment must ensure that the antenna is located or pointed such that it does not emit RF field in excess of Health Canada limits for the general population; consult Safety Code 6, obtainable from Health Canada's website www.hc-sc.gc.ca/rpb.

14.1.2 Major Features

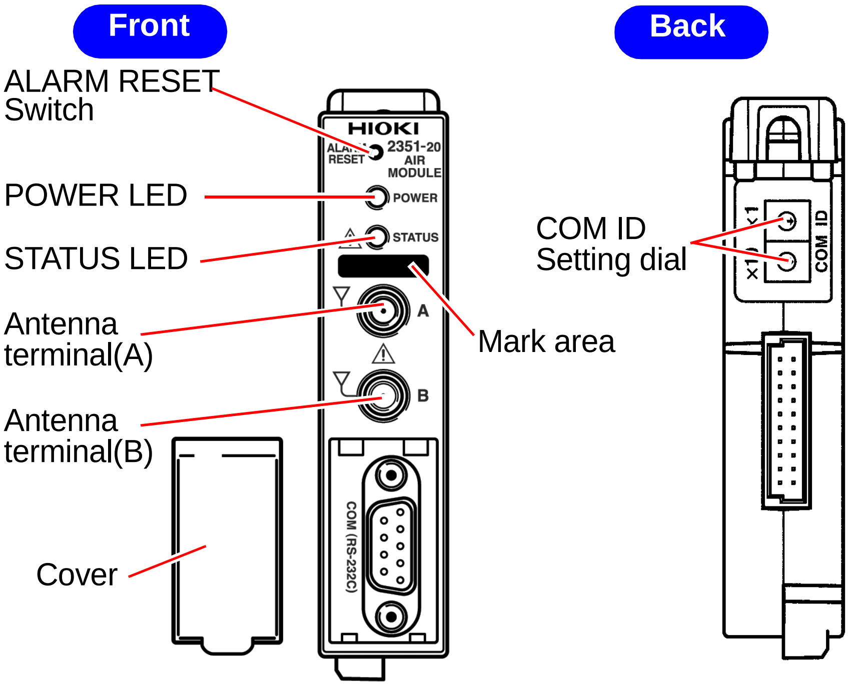
2351 AIR MODULE

- This communications module employs SS wireless technology, which is one feature of this system. It requires no communications cables, which reduces cost and installation time, and simplifies configuration of a measurement system.
- The module has two antenna terminals and supports diversity reception. (Only one terminal is used for sending.)
- When used in combination with the 2353 LAN Module, the instrument can be connected to a LAN.

2352-20 WIRE MODULE

- This communications module sends and receives data via the RS-232C.
- This module is designed to be incorporated into the customer's equipment or used for a small system consisting of one 2300 Module.

14.1.3 Name and Function of the Parts



The figure shows the 2351-20.

POWER LED	Goes on or flashes when power is supplied to the module. Remains on, flashes, or changes to another color according to the state of the module. **POWER LED indication** Lit in green : Operating normally Lit in yellow : Alarm output. Lit in red : Non-recoverable error occurred.*1 Flashing in red : Recoverable error occurred. *2
STATUS LED	Remains on, flashes, or changes to another color according to the state of the module. STATUS LED indication Lit in green :Communicating
Mark area	Use this area to make a note of the object to measure or the COM ID. Use an ink pen, since pencil lead may rub off.
RS-232C terminal	Connect the RS-232C cable to this terminal. Use the 9637 RS-232C CABLE (option).
Antenna terminal (A) (2351 only)	Connect the sending/receiving antenna to this terminal. Antenna terminal (B) has no transmission function. When using only one antenna, connect it to this terminal.
Antenna terminal (B) (2351 only)	This terminal is for the receiving antenna only. To perform diversity reception, connect the receiving antenna to this terminal.
ALARM RESET switch	This switch cancels alarm output. Hold down the switch for at least one second to cancel the alarm.
COM ID setting dial	Use the dial to set the module's identification No.

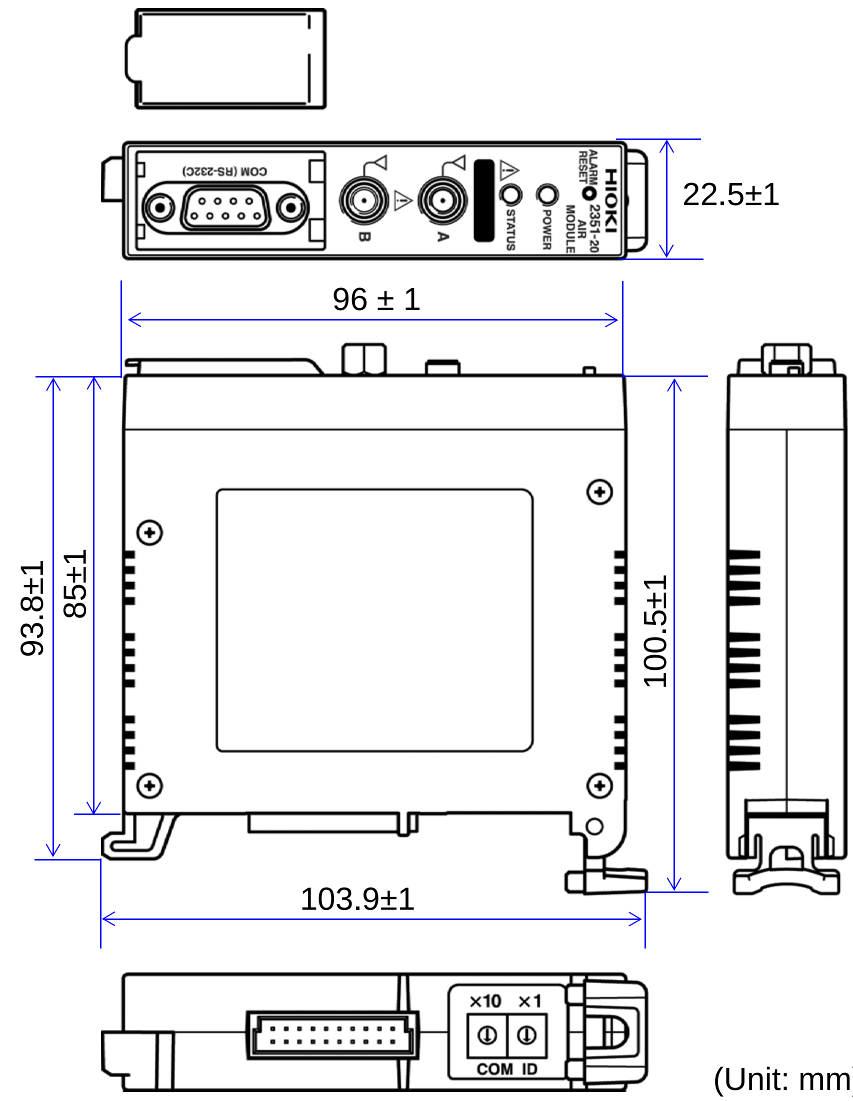
*1: The module needs repair. Contact your vendor (agent) or nearest Hioki office.

*2: The cause of an error may be the connection of two or more communication modules. If a wireless module and LAN module are to be used, set the COM ID of the LAN module to "00."

NOTE

- Antenna terminal (B) is for receiving only and has no transmission function.

14.1.4 Dimension Diagrams



(Unit: mm)

14.1.5 Accessory and Option

Accessories

None

Option

9760 ANTENNA (With antenna base)*
9760-01 ANTENNA (Weatherproof with antenna base)*
9760-02 ANTENNA (Pencil-shaped with L-angle)*
9760-03 ANTENNA (Patch type, Single reception, With antenna base)
9760-04 ANTENNA (Patch type, Diversity reception, With antenna base)
9761 ANTENNA CABLE (1 m)*
9761-01 ANTENNA CABLE (2 m)*
9761-02 ANTENNA CABLE (5 m)*
9637 RS-232C CABLE

*For 2351 only

14.2 Settings

14.2.1 Setting the COM ID

You can connect up to 89 communications modules to a PC or server.

Setting Procedure

Use the COM ID setting dial to set the ID No. of the module from 01 to 89. (You cannot set it to a number other than indicated above.)

NOTE

- When the instrument is connected to a server or PC through a LAN, if to be used as the master wireless unit, set COM ID of the 2353-20 LAN module to "00."

❖ **15.2.1 "Setting the COM ID"(P.266)**

- Ensure that the set ID is not used by any other communications module on the system controlled by the same PC or server.
- The ID numbers of modules need not be consecutive.
- Setting the ID to 99, then turning on the power resets all internal settings to the defaults.
- The module ID and COM ID are not related and can be set independently.

14.3 Preparations

14.3.1 Installing the Module

(1) Installing the Module Base

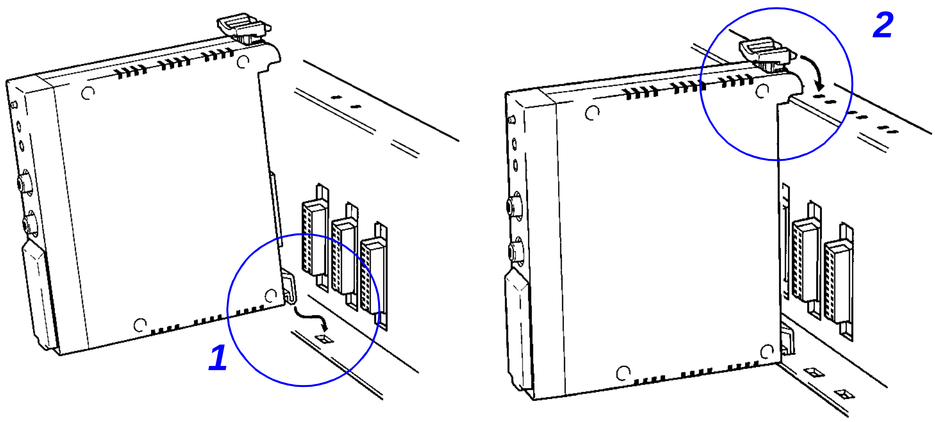
⚠CAUTION

Do not mount the module base on the ceiling where it may fall off.

Fasten the module base to a DIN rail or the wall according to the procedure described in the **19 "2391-01, 2391-02, 2391-03 MODULE BASE"(P.305)** or **20 "2392-01/02 MODULE BASE"(P.319)** series MODULE BASE instruction manual.

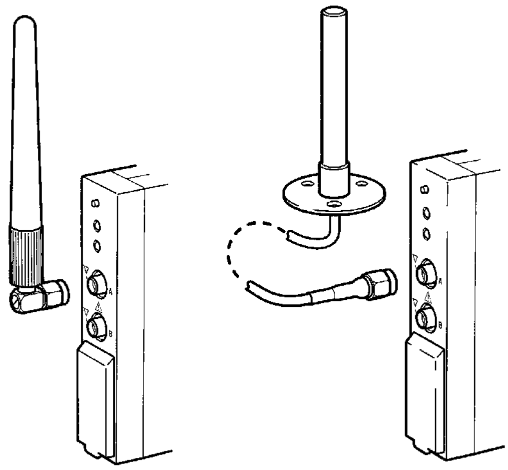
(2) Mounting a Module on the Module Base

Install this module next to the power module.
Insert the levers of the module into the module-mounting slots to mount the module as shown below. Ensure that the levers click into position.



14.3.2 Connecting Sending/Receiving Antenna to Module (2351 Only)

1. Insert the antenna into the module.
2. Tighten the SMA nut on the antenna side by hand.
3. Then use an 8-mm spanner to securely tighten the nut.



NOTE

- Antenna terminal (A) can transmit and receive signals. Use this terminal when using only one antenna for communications.
- Antenna terminal (B) is for receiving only and has no transmission function. To perform diversity reception, connect the receiving antenna to this terminal.

Compatible Antennas and Extension Cables:

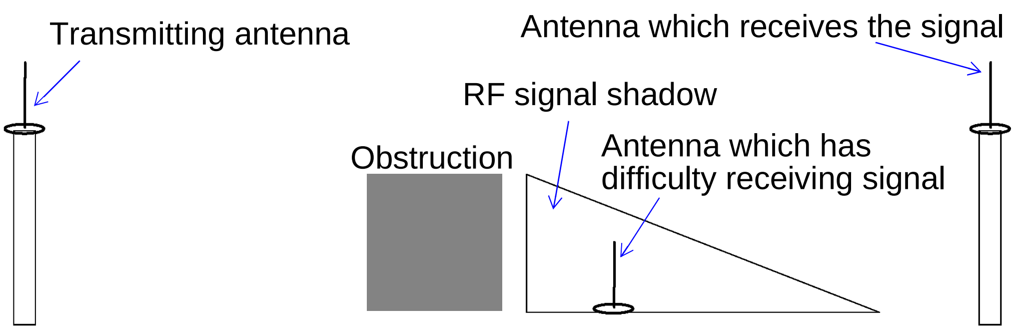
9760	ANTENNA (With antenna base)
9760-01	ANTENNA (Weatherproof with antenna base)
9760-02	ANTENNA (Pencil-shaped with L-angle)
9760-03	ANTENNA (Patch type, Single reception, With antenna base)
9760-04	ANTENNA (Patch type, Diversity reception, With antenna base)
9761	ANTENNA CABLE (1 m)
9761-01	ANTENNA CABLE (2 m)
9761-02	ANTENNA CABLE (5 m)

14.3.3 How to install the antennae

Antennae Placement

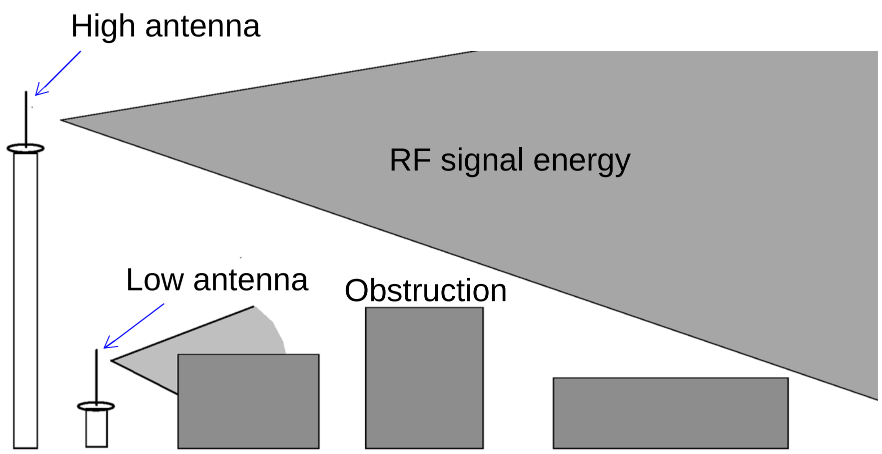
1. As much as possible, position and install the antennae so that there is clear a line of sight between them.

   Because the 2351 AIR MODULE communicates via high frequency radio waves, the direct signal path is strong, but any obstructions between the antennae have the characteristic of greatly reducing reception gain. Because of this, position and install the antennae so that there is a clear line of sight between them wherever possible. Especially when sending signals at distances of greater than 50m indoors or 100 m outdoors, position and install the antennae so that there is a clear line of sight between them.



2. Position the antennae high

   Bearing in mind the above, positioning the antennae high in the open air will eliminate interference from obstructions and the wave signals will travel more easily. Conversely, if the antennae height is too low (10 cm or so), the output signal will become weak.



Obstructions around the antennae

1. Do not place obstructions around the antennae.
   Any obstacles in the vicinity of the antennae, particularly those nearby and in the signal path, will interfere with communication and cause the wave signal not to travel.
   Metal causes the highest level of interference, followed by materials which contain moisture such as concrete, plasterboard and wood. Glass and plastic do not cause much interference.
   Apart from the issue of maintaining line-of-sight, such obstructions (especially metal) can change the character of the antenna itself and may create wave reflection problems, thereby influencing communication even if the obstructions are not in the direct signal path. Taking these points into consideration, be sure that all obstructions are at least 30 cm away from the antennae.
2. Separate the antennae from walls by at least 30 cm.
   If the antenna is near a wall, it will be subjected to reflection influence from the wall and communication conditions will worsen. However, when using a flat antenna, the back of the Other points of cautionantenna may be up against a wall.

Other points of caution

1. Do not bump or knock the antennae

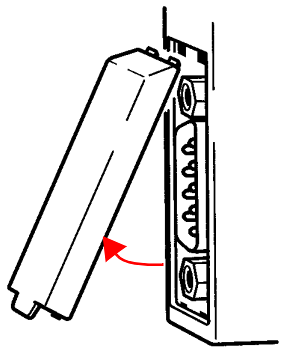
   The antennae are not designed to withstand impact. Therefore either place the antennae where they will not be struck by other objects, or take precautions to protect them.
   If subjected to powerful shock the antennae may be damaged. Even if there is no visible external damage, internal damage such as a broken wires can make communication impossible.
2. Antennae which can be used outdoors

   Some HIOKI antennae are intended for outdoor use and others are not. In the below chart, those products marked with "●" may be used outdoors, but those marked with "×" are encased in plastic or other non-metal materials which should be protected from rain and water. Additionally, although plastic is not metal it still influences the antennae characteristics and may slightly reduce the communications range.

Model	Name	Compatibility
9760	ANTENNA (With antenna base)	×
9760-01	ANTENNA (Weatherproof with antenna base)	●
9760-02	ANTENNA (Pencil-shaped with L-angle)	×
9760-03	ANTENNA (Patch type, Single reception, With antenna base)	●
9760-04	ANTENNA (Patch type, Diversity reception, With antenna base)	●

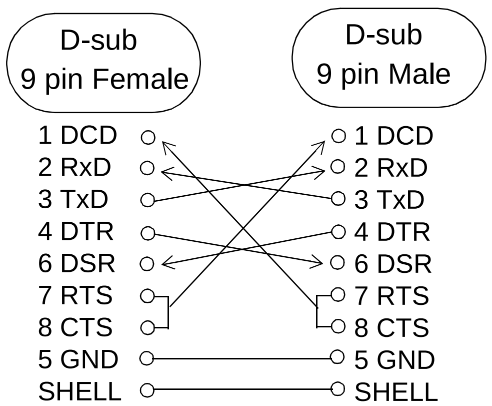
14.3.4 Connecting RS-232C Cable to Module

- Connect an RS-232C cable to the RS-232C terminal for communicating with a PC or server via RS-232C.
- Remove the cover from the RS-232C terminal and connect an RS-232C cable to it.



Compatible Cables

- The 9637 RS-232C CABLE (1.8 m) for PC/AT compatible PC
- When using a commercially available cable, use one with the following wiring configuration:



14.4 Specifications

14.4.1 Basic Specifications

Operation	Enables communications between a PC and the measurement modules when positioned between both. Also relays communications between wireless modules (2351 only).
External communications interface	SS wireless* (SMA connector for connecting antenna × 2, transmission speed of 51.9 kbps for diversity reception, Antenna power 5 mW or less. (2351 only)) RS-232C (D-sub 9-pin, used for setting parameters, transmission speed of 57.6 kbps)
Internal communications interface	CAN (Connecting communications modules to measurement modules, transmission speed of 500 kbps)

* Frequency Assignments

1.Frequency Band

The 2351 has 48 individual frequencies between 2426 MHz and 2473 MHz with 1 MHz separation in each frequency. One band consists of 24 frequencies in the 48 frequencies for select/ operate. See the table below for the exact frequency assignments.

2. Frequency Allocation

24 Frequency are assigned each frequency band (01,and 02) with 1 MHz separation. If 1 MHz adjacent frequency separation is utilized in a same area, the possibility of adjacent channel interference exists because the difference of reception signal level between the desired signal and undesired leakage from the adjacent channel.

Therefore, more than 2 MHz separation operation is recommended.

Frequency Table

Freq. No.	Freq. (MHz)	
	01 Band	02 Band*
0	2426	2450
1	2427	2451
2	2428	2452
3	2429	2453
4	2430	2454
5	2431	2455
6	2432	2456
7	2433	2457
8	2434	2458
9	2435	2459
10	2436	2460
11	2437	2461
12	2438	2462
13	2439	2463
14	2440	2464
15	2441	2465
16	2442	2466
17	2443	2467
18	2444	2468
19	2445	2469
20	2446	2470
21	2447	2471
22	2448	2472
23	2449	2473

*Both France and Spain are band limited, please use 02 Band for operation.

14.4.2 Function Specifications

Clock function	RTC is built in (year, month, day, hour, minute, and second). Corrects the internal clock of each measurement module at irregular intervals.
Alarm clear	Clears alarm output of a measurement module, controlled by key operation or communications.
Number of modules to connect	External communications: up to 89 units (Assign a COM ID to each communications module.) Internal communications: up to 63 units (Assign a MODULE ID to each measurement module.)

14.4.3 General Specifications

Clock accuracy	±30 ppm (Reference value at temperature from 0 to 50°C (32 to 122°F))
Backup	Clock (uses a lithium battery) ♦Battery life: approx. 5 years (Reference value at temperature 25°C (77°F)
Rated supply voltage	5 V±0.3 VDC
Maximum rated power	1.4 W
Dimensions	Approx. 22.5W × 96H × 85D mm (0.89"W × 3.78"H × 3.35"D) (excluding projections)
Mass	2351: Approx. 150 g (5.3 oz.) 2352-20: Approx. 125 g (4.4 oz.)
Options	9760 ANTENNA (With antenna base)* 9760-01 ANTENNA (Weatherproof with antenna base)* 9760-02 ANTENNA (Pencil-shaped with L-angle)* 9760-03 ANTENNA (Patch type, Single reception, With antenna base) 9760-04 ANTENNA (Patch type, Diversity reception, With antenna base) 9761 ANTENNA CABLE (1 m)* 9761-01 ANTENNA CABLE (2 m)* 9761-02 ANTENNA CABLE (5 m)* 9637 RS-232C CABLE (1.8 m) *For 2351 only
Operational ranges for temperature and humidity	0 to 50°C (32 to 122°F), 80%RH or less (with no condensation)
Temperature and humidity ranges for storage	-10 to 50°C (32 to 122°F), 80%RH or less (with no condensation)
Operating environment	Indoors, altitude up to 2000 m (6562-ft.)
Standards applying	Safety : EN61010 Pollution Degree 2 EMC : EN61326 CLASS A R&TTE*1 : EN300 440-2 (Registration No.: E812974O-CC) MIC*1 :Type ID:LARN8-IO2F2402/2479TRO.006F1D78 (Certification No.:FUT-FRH-SD07TB) FCC*2 : Part 15.247 (FCC IDENTIFIER: AZP-FRH-SD07TU) IC*2 : RSS210 (IC IDENTIFIER: 5829A-235121) *1: For 2351-20 only *2: For 2351-21 only

14.5 Disposing of the Instrument

Before Disposing of the Instrument

The instrument contains a lithium battery for memory backup.

WARNING

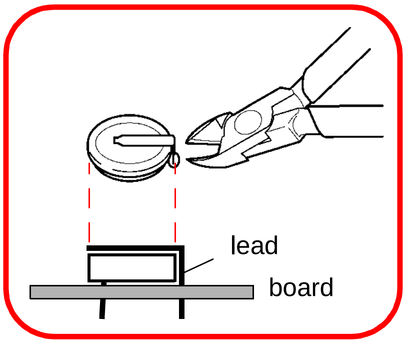
- **To avoid electric shock, turn off the power switch and disconnect the power cord and cables before removing the lithium battery.**
- **Battery may explode if mistreated. Do not short-circuit, recharge, disassemble or dispose of in fire.**

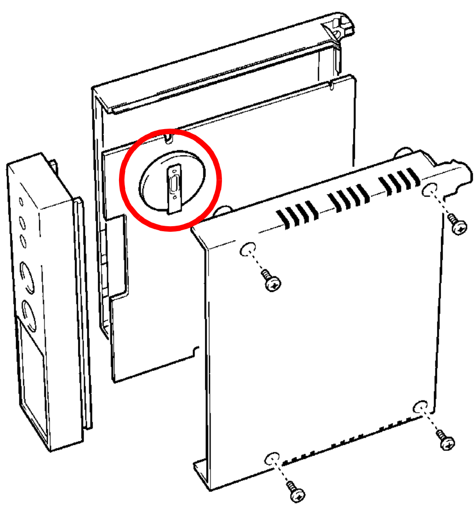
CAUTION

When disposing of this instrument, remove the lithium battery and dispose of battery and instrument in accordance with local regulations.

Required tools:
- One Phillips screwdriver
- One pair of wirecutters

1. Remove the 4 screws securing the lower case.
2. Use wirecutters to clip both leads of the button style lithium battery.





CALIFORNIA, USA ONLY
This product contains a CR Coin Lithium Battery which contains Perchlorate Material - special handling may apply.
See www.dtsc.ca.gov/hazardouswaste/perchlorate

2353-20 LAN MODULE 15

15.1 Overview

15.1.1 Product Overview

The 2301-20 is the communications module of Hioki "Smart Site" (remote measurement system).
This module is used with the power supply module, measurement module, and module base.
This module links the measurement modules with a PC, server, and communications infrastructure, and transfers data.
10BASE-T supports LAN communication.

Number of communications modules connectable to one server or a PC	Up to 89 units
Number of measurement modules connectable to one communications module	Up to 63 units

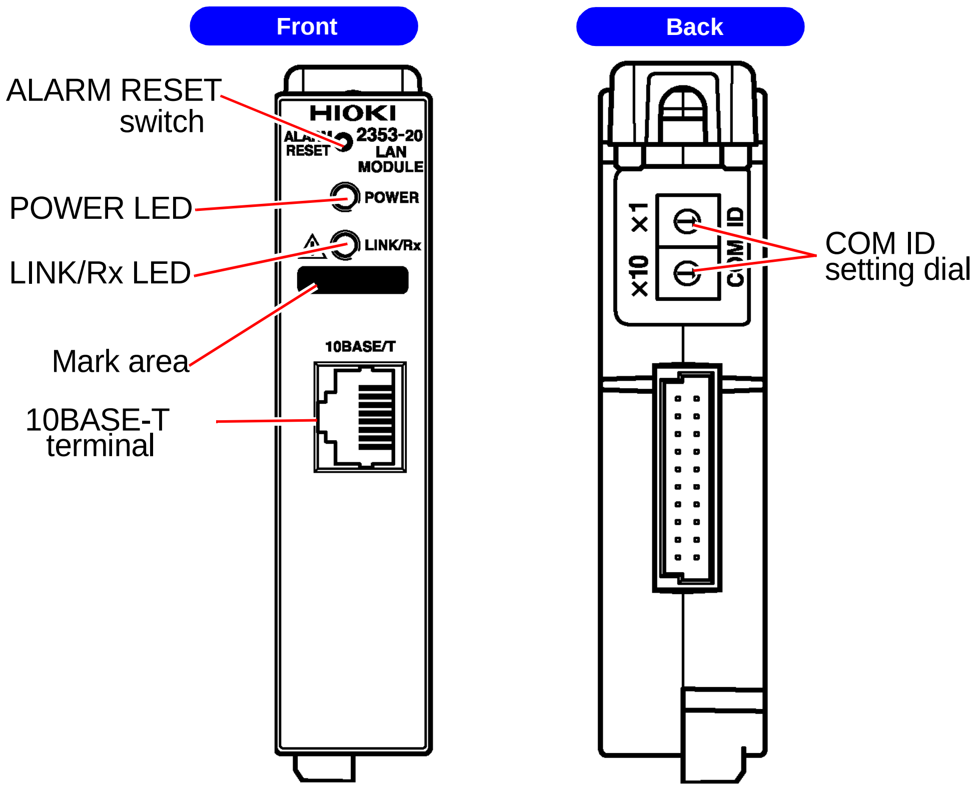
(Conceptual image)

15

15.1.2 Major Features

- **The communication interface supports 10BASE-T. The module lets you record data via LAN communication.**
- **When used as a set with this device, the master unit of a 2351 air module can be connected to a LAN.**

15.1.3 Name and Function of the Parts



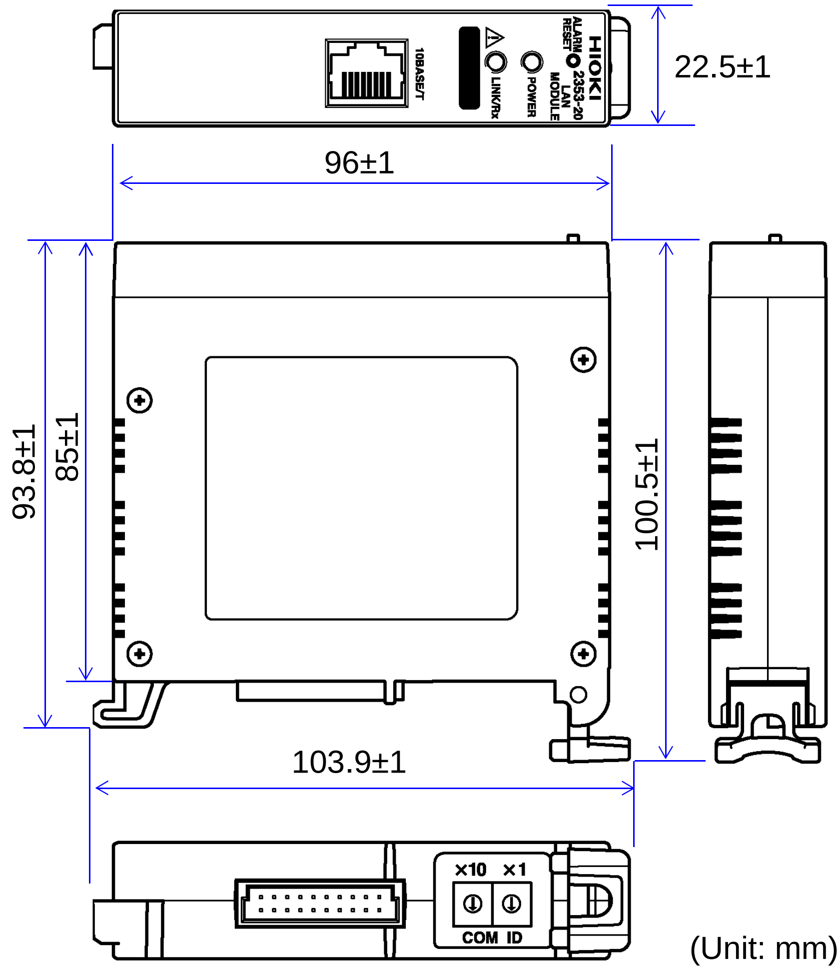
POWER LED	Goes on or flashes when power is supplied to the module. Remains on, flashes, or changes to another color according to the state of the module. **POWER LED indication** Lit in green : Operating normally Lit in yellow : Alarm output. Lit in red : Non-recoverable error occurred. *1 Flashing in red : Recoverable error occurred.*2
LINK/Rx LED	Remains on, flashes, or changes to another color according to the state of the module. Lit in green: Linking in progress. (The LAN cable is properly connected.) Flashing in yellow:Communicating
Mark area	Use this area to make a note of the object to measure or the com ID. Use an ink pen, since pencil lead may rub off.
10BASE-T terminal	The 9642 LAN cable connects the terminal and a PC.
ALARM RESET switch	This switch cancels alarm output. Hold down the switch for at least one second to cancel the alarm.
COM ID setting dial	Use the dial to set the module's identification No.

*1: The module needs repair. Contact your dealer or Hioki representative.

*2: The cause of an error may be the connection of two or more communication modules. If a wireless module and LAN module are to be used, set the COM ID of the LAN module to "00."

NOTE The LED starts flashing in yellow when power is turned on. If it does not stop flashing after 20 seconds, check the setting of the CAN termination switch on the 2391 or 2392 series MODULE BASE [**TERMINATION ON/OFF**]. (The switch should normally be set ON. When using the CAN bus, be sure to turn off the switch of the corresponding terminal No.) If the setting is not correct, turn off the power, then correct the setting. For details, see the **19 "2391-01, 2391-02, 2391-03 MODULE BASE"(P.305)** or **20 "2392-01/02 MODULE BASE"(P.319)** series MODULE BASE instruction manual.

15.1.4 Dimension Diagrams



(Unit: mm)

15.1.5 Accessory and Option

Accessories

None

Option

9642 LAN CABLE (Straight/cross conversion connector provided, 5 m)

15.2 Settings

15.2.1 Setting the COM ID

(1) 2351 AIR MODULE + 2353 LAN MODULE are used in combination

When the master wireless unit is connected to the server or PC through a LAN, the 2351 air module and 2353 LAN module are used in combination.
You can connect up to 89 communications modules to one server or a PC.
(A set of air modules + LAN module is counted as one unit.)

Setting Procedure

Set the ID numbers of the communication modules using the COM ID setting dial, as shown below:
(You cannot set a number other than the above.)

LAN modules	COM ID: 00
Air modules	COM ID: 01 to 89

(2) Use of the Instrument Solely with the 2353LAN Module

Connect the measuring module to a server or PC through a LAN.
You can connect up to 89 communications modules to one server unit or a PC.

Setting Procedure

Use the COM ID setting dial to set the ID No. of the module to a number from 01 and to 89. (You cannot set a number other than the above.)

NOTE

- Ensure that the set ID is not used by any other communications module on the system controlled by the same server or PC.
- The ID numbers of modules need not be consecutive.
- Setting the ID to 99, then turning on the power resets all internal settings to the defaults.
- Default communications settings are as follows:
  IP address 192.168.1.200
  Sub-net mask 255.255.255.0
- The module ID, COM ID, and IP address are not related and can be set independently.

15.3 Preparations

15.3.1 Installing the Module

(1) Installing the Module Base

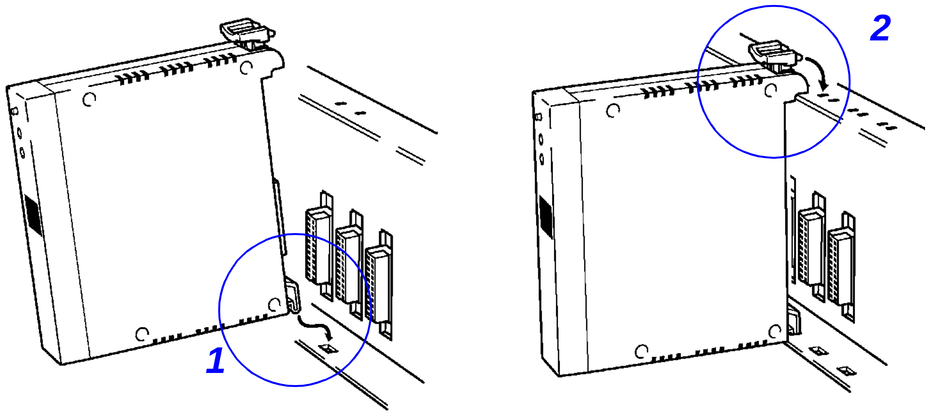
CAUTION

Do not mount the module base on the ceiling where it may fall off.

Fasten the module base to a DIN rail or the wall according to the procedure described in the **19 "2391-01, 2391-02, 2391-03 MODULE BASE"(P.305)** or **20 "2392-01/02 MODULE BASE"(P.319)** series MODULE BASE instruction manual.

(2) Mounting a Module on the Module Base

Insert the levers of the module into the module-mounting slots to mount the module as shown below. Ensure that the levers click into position.



15.3.2 Connecting the LAN Cable

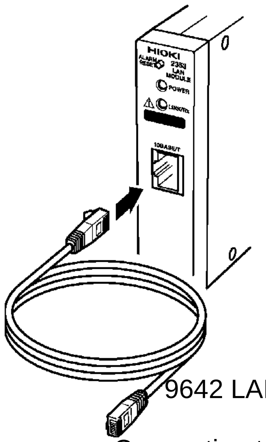
CAUTION

Before connecting this server to a hub or PC, make sure that said devices are powered off to prevent internal damage.

Connecting the 2353-20 to a Hub

(When using a 2353-20 module connected to a network)

Use the 9642 LAN CABLE (optional) to connect the 2353-20 to the hub.



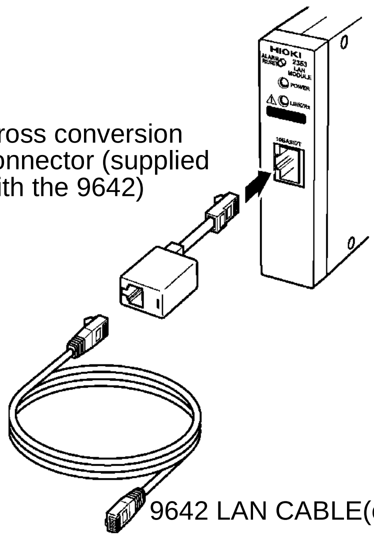
Connecting to a Hub

1. Turn off power of the system and hub.
2. Connect the 9642 LAN CABLE to 10BASE-T connectors of the 2353-20 and hub.

Connecting the 2353-20 to a PC

(To directly connect the 2353-20 to a PC)

Use the 9642 LAN CABLE (optional) to connect the 2353-20 to a PC.



Connecting to a PC

1. Turn off power of the system and PC.
2. Connect the 9642 LAN CABLE to the cross conversion connector supplied.
3. Connect the 9642 LAN CABLE to the 10BASE-T connector of the PC.
4. Connect the 9642 LAN CABLE to the 10BASE-T connector of the PC.

15.3.3 Setting the IP Address

The following software is required for setting the IP address.
For details, contacting your dealer or Hioki representative.

- 9768 Smart Site Utility Pro

Refer to the software manual for how to configure the IP address.

NOTE

Contact your network administrator for the setting value of the IP address.

15.4 Specifications

15.4.1 Basic Specifications

Operation	Enables communications (data acquisition, setting) between a PC and the measurement modules when positioned between both. When used in combination with the 2351 wireless module, this module functions as an RS-232C-LAN converter.
External communications interface	LAN IEEE802.3 Ethernet 10BASE-T Connector: RJ-45
Internal communications interface	CAN (Connecting LAN modules to measurement modules) transmission speed of 500 kbps

15.4.2 Function Specifications

Modbus Communication function	Data is output after receiving communication commands from Modbus/TCP-compatible external devices.
E-mail send function	Maximum number of e-mail addresses that can be saved: 20 (per one LAN module) Maximum number of e-mail address per transmission: 20 (per one channel) • Monitor the alarm condition of measurement module connected by CAN bus and in the event of any unusual events/restoration, a mail is delivered via the mail server. • A periodic notification of instantaneous value is sent by mail.
Clock function	RTC is built in (year, month, day, hour, minute, and second). Corrects the internal clock of each measurement module at irregular intervals.
Alarm clear	Clears alarm output of a measurement module, controlled by key operation or communications.
Number of modules to connect	External communications: up to 89 units (Assign a COM ID to each communications module.) Internal communications: up to 63 units (Assign a MODULE ID to each measurement module.)
Rotary SW	Setting for COM ID

15.4.3 General Specifications

Clock accuracy	±30 ppm (Reference value at temperature from 0 to 50°C)
Backup	Clock (uses a lithium battery) Battery life: approx. 5 years (Reference value at temperature 25°C (77°F)
Rated supply voltage	5 VDC±0.3 V
Maximum rated power	1.4 W
Dimensions	Approx.22.5W × 96H × 85D mm (0.89"W × 3.78"H × 3.35"D) (excluding projections)
Mass	Approx.120 g (4.2 oz.)
Option	9642 LAN CABLE (Straight/cross conversion connector provided, 5 m)
Operating temperature and humidity	0 to 50°C (32 to 122°F), 80%RH or less (non-condensating)
Storage temperature and humidity	-10 to 50°C (14 to 122°F), 80%RH or less (non-condensating)
Operating environment	Indoors, altitude up to 2000 m (6562-ft.)
Applicable standards	Safety EN61010, Pollution degree 2 EMC EN61326, Class A

15.5 Disposing of the Instrument

Before Disposing of the Instrument

The instrument contains a lithium battery for memory backup.

WARNING

- **To avoid electric shock, turn off the power switch and disconnect the power cord and cables before removing the lithium battery**
- **Battery may explode if mistreated. Do not short-circuit, recharge, disassemble or dispose of in fire.**

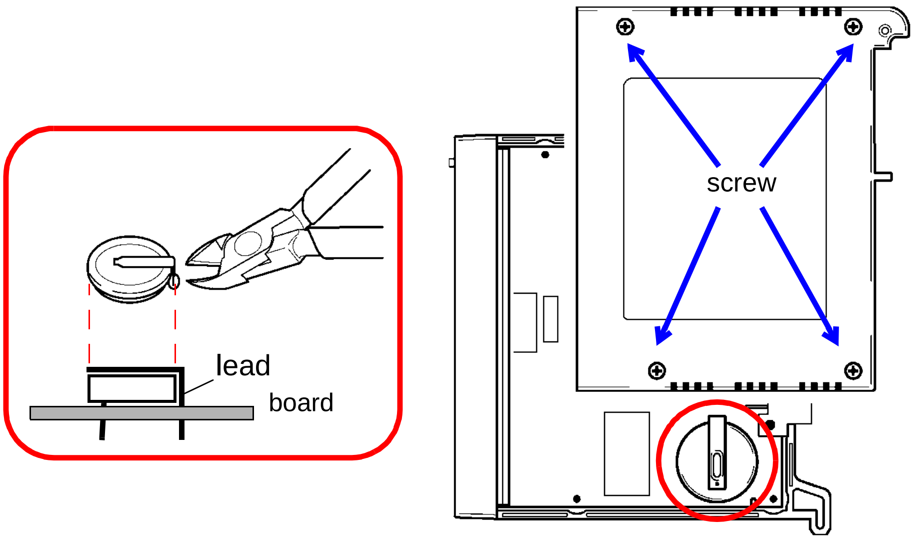
CAUTION

When disposing of this instrument, remove the lithium battery and dispose of battery and instrument in accordance with local regulations.

Required tools:
- One Phillips screwdriver
- One pair of wirecutters

1. Remove the 4 screws securing the lower case.

2. Use wire cutters to clip both leads of the button style lithium battery.



CALIFORNIA, USA ONLY
This product contains a CR Coin Lithium Battery which contains Perchlorate Material - special handling may apply.
See www.dtsc.ca.gov/hazardouswaste/perchlorate

2354-20 MEMORY MODULE

16

16.1 Overview

16.1.1 Product Overview

This is a communications module of the Hioki "Smart Site" (remote measurement system). This module can be used in conjunction with the power module, communications module and module base. This module is positioned between the PC, servers, communications infrastructure, and the measurement modules and is used to transfer and receive data.
LAN communications is compatible with 100 BASE-TX (or 10 BASE-T).
By inserting the optional CF card (9726, 9727, 9728 and 9729), data recorded by the measurement module can be saved. Important data can also be backed up in case of communication errors or when the computer has not been used for a long time.
* Recording cannot be carried out if the CF card is not inserted into this instrument.

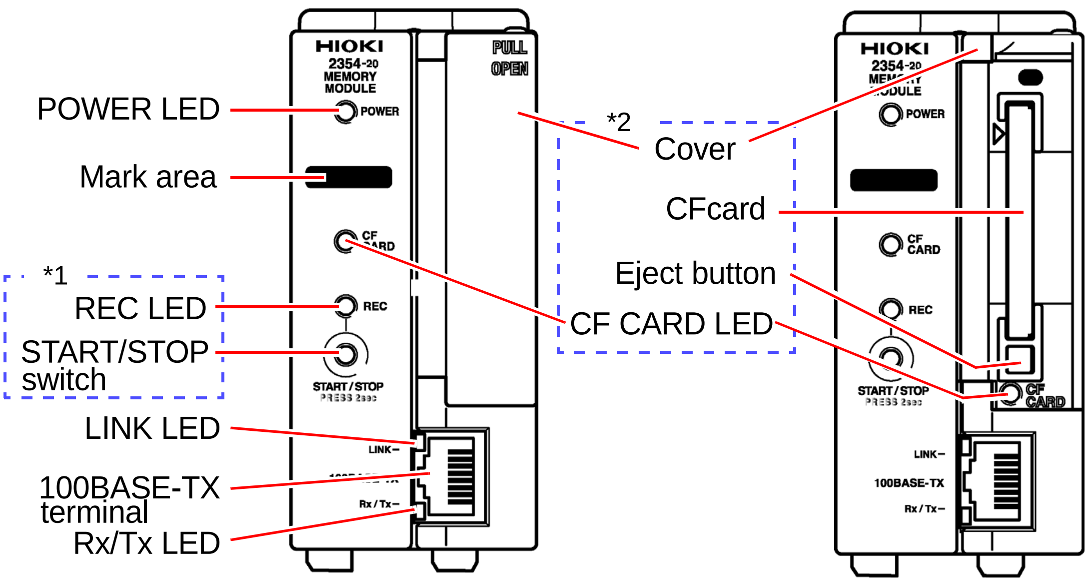
Number of communications modules connectable to one server or a PC	Up to 89 units
Number of measurement modules connectable to one communications module	Up to 63 units

16.1.2 Major Features

- **The communication interface supports 100BASE-TX (10BASE-T). The module lets you record data via LAN communication.**
- **Equipped with CF card slot to save recorded data regularly.**

16.1.3 Name and Function of the Parts

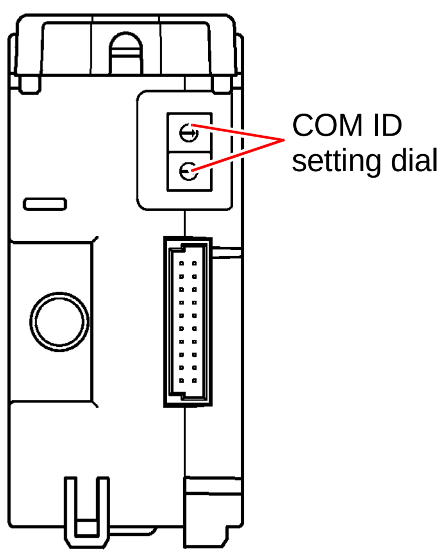
Front



When the cover is closed

When the cover is opened

Back



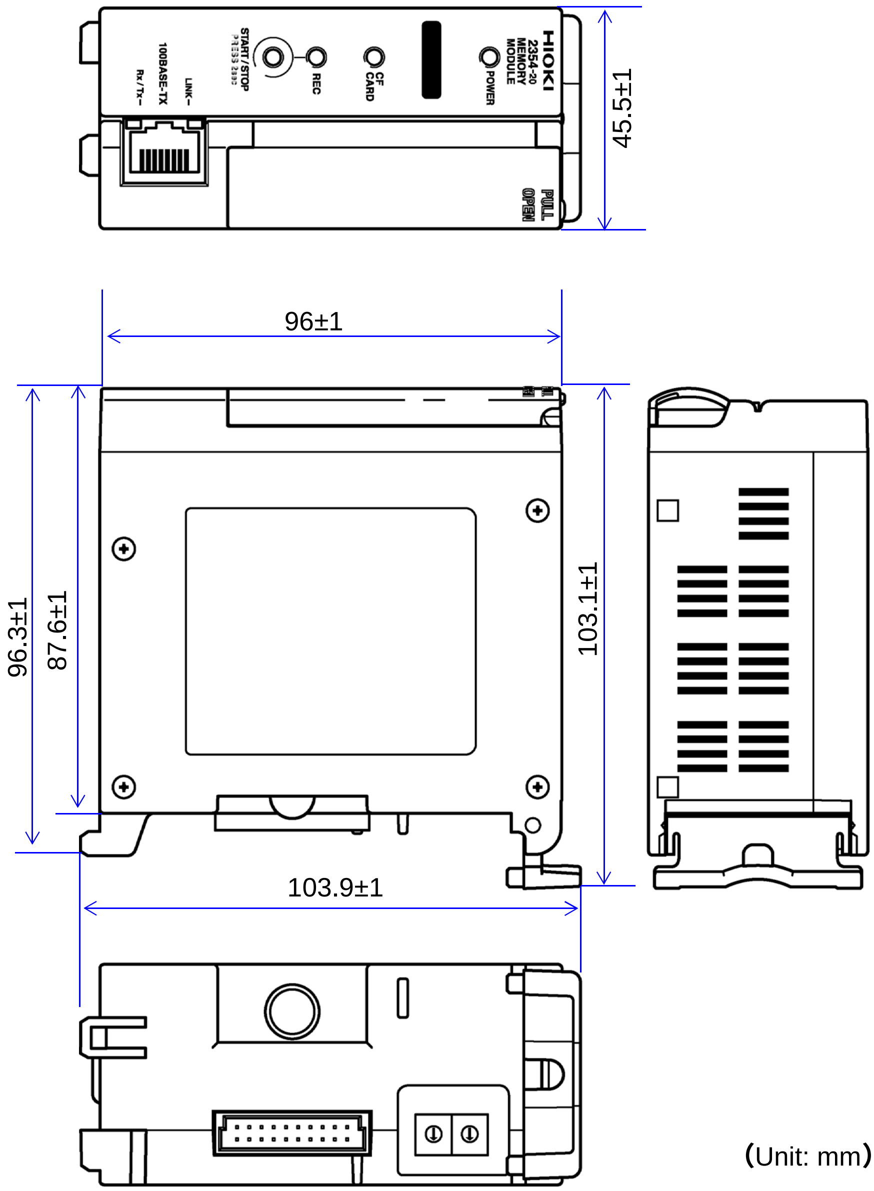
POWER LED	Goes on or flashes when power is supplied to the module. Remains on, flashes, or changes to another color according to the state of the module. Lit in green : Operating normally Lit in red : Non-recoverable error occurred.[*3] Flashing in red : Recoverable error occurred.[*4]
CF CARD LED	Colors of the lights, flashing lights vary depending on the condition of the CF card: *2
REC LED	Colors of the lights, flashing lights vary depending on the recording condition of the instrument: *1
START/STOP switch	Starting and ending the recording Recording will start when the button is pressed for more than 2 seconds during recording stop. Recording will stop when the button is pressed for more than 2 seconds during recording.
100BASE-TX terminal LINK LED Rx/Tx LED	The 9642 LAN cable connects the terminal and a PC. LED lights and flashes vary according to the conditions of the LAN connection and communications. LINK LED unlit : LAN cable is not connected properly or the PC is not switched on LINK LED lit in yellow : linking (LAN cable is connected properly) Rx/Tx LED flashing in green: Data transmission
Mark area	Use this area to make a note of the object to measure or the com ID. Use an ink pen, since pencil lead may rub off.
Cover	Open the cover and insert/ remove the CF card. Close the cover firmly after inserting the CF card.
CFcard slot	Slot for inserting the CF card. Slide the CF card all the way in.
Eject button	Press to eject the CF card.
COM ID setting dial	Use the dial to set the module's identification No.

*1 Refer to **16.4.2 "Recording operation"(P.283)** for recording indications and operational methods.
*2 Refer to **16.4.1 "For CF card"(P.280)** for CF card indications and operational methods.
*3 The module needs repair. Contact your dealer or Hioki representative.
*4 The cause of an error may be the connection of two or more communication modules.

NOTE

When power is switched or when the power is cut off, the POWER LED will flash in orange. When the orange light is flashing, do not operate the instrument. The instrument is preparing to start up or shut down. If the instrument is handled during this time, data saved in the CF card may be corrupted. In addition, if the yellow light still flashes 20 seconds after power has been turned on, check the end terminals of the module base's CAN switch (TERMINATION ON/OFF). Refer to **19 "2391-01, 2391-02, 2391-03 MODULE BASE"(P.305)** and **20 "2392-01/02 MODULE BASE"(P.319)** for details on end terminal switch.

16.1.4 Dimension Diagrams



(Unit: mm)

16.1.5 Accessory and Option

Accessories

Ferrite clamp 2

Option

9642 LAN CABLE (Straight/cross conversion connector provided, 5 m)
9726 PC CARD 128 M
9727 PC CARD 256 M
9728 PC CARD 512 M
9729 PC CARD 1 G

16.2 Settings

16.2.1 Setting the COM ID

Connect the measuring module to a server or PC through a LAN. You can connect up to 89 communications modules to one server unit or a PC.

Setting Procedure

Use the COM ID setting dial to set the ID No. of the module to a number from 01 and to 89. (You cannot set a number other than the above.)

NOTE

- Ensure that the set ID is not used by any other communications module on the system controlled by the same server or PC.
- The ID numbers of modules need not be consecutive.
- Setting the ID to 99, then turning on the power resets all internal settings to the defaults.
- Default communications settings are as follows:
  IP address192.168.1.200
  Sub-net mask255.255.255.0
- The module ID, COM ID, and IP address are not related and can be set independently.

16.3 Preparations

16.3.1 Installing the Module

(1) Installing the Module Base

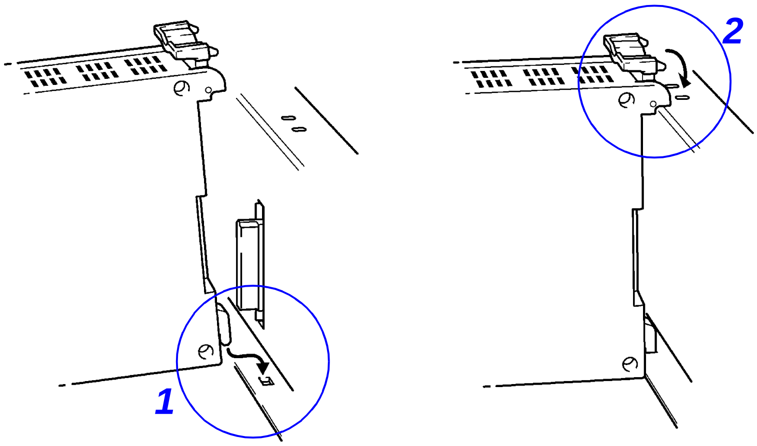
CAUTION

Do not mount the module base on the ceiling where it may fall off.

Fasten the module base to a DIN rail or the wall according to the procedure described in the **19 "2391-01, 2391-02, 2391-03 MODULE BASE"(P.305)** or **20 "2392-01/02 MODULE BASE"(P.319)** series MODULE BASE instruction manual.

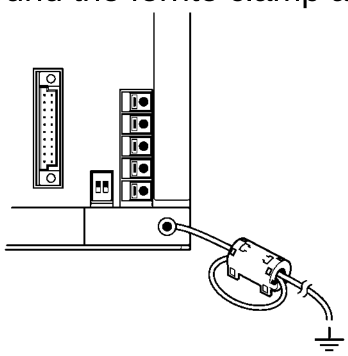
(2) Mounting a Module on the Module Base

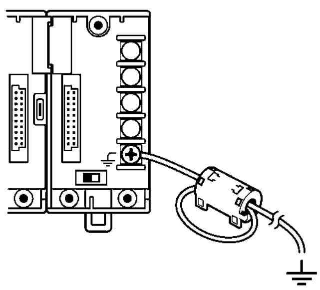
Attach it firmly to the module connection slot until you hear a click, as shown in the diagram.



(3) Attach the ferrite clamp to the functional earth wire.

When using a cable to earth the instrument from the functional earth terminal of the 2391 or 2392 module base, roll the cable around the ferrite clamp as shown in the diagram.


For 2391-01/02/03


For 2392-01/02

16.3.2 Connecting the LAN Cable

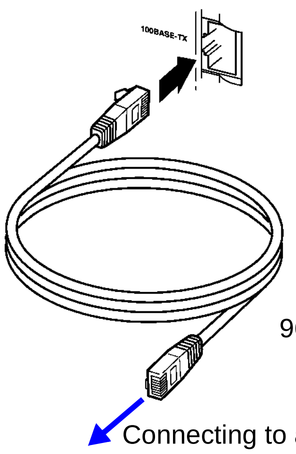
CAUTION

Before connecting this server to a hub or PC, make sure that said devices are powered off to prevent internal damage.

(1) Connecting the LAN Cable

Connecting the 2354-20 to a Hub
(When using a 2354-20 module connected to a network)

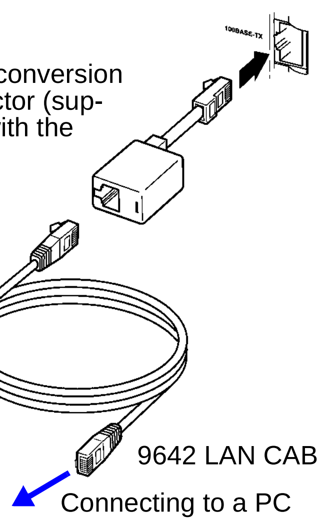
Use the 9642 LAN CABLE (optional) to connect the 2354-20 to the hub.



1. Turn off power of the system and hub.
2. Connect the 9642 LAN CABLE to 100BASE-TX (10BASE-T) connectors of the 2354-20 and hub.

Connecting the 2354-20 to a PC
(To directly connect the 2354-20 to a PC)

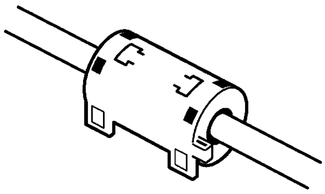
Use the 9642 LAN CABLE (optional) to connect the 2354-20 to the hub.



1. Turn off power of the system and PC.
2. Connect the 9642 LAN CABLE to the cross conversion connector supplied.
3. Connect the 9642 LAN CABLE to the 100BASE-TX connector of the PC.
4. Connect the 9642 LAN CABLE to the 100BASE-TX (10BASE-T) connector of the PC.

(2) Attach the LAN cable to the ferrite clamp.

Attach the LAN cable to the ferrite clamp as shown in the diagram.



16.4 Other

16.4.1 For CF card

Important

- This instrument cannot record without the CF card.
- Do not remove the CF card for more than 10 minutes during recording. This may cause damage to the recorded data. If the cover is left open for 2 or more hours, the system will automatically save the recorded data to prevent data damage even when the CF card is inserted, but not all the recorded data will be guaranteed. Please ensure that the cover is firmly closed.
  In addition, during automatic saving of recording data when the cover is open, do not attempt to remove the CF card as this will damage it. Close the cover before opening it to remove the card.
- Use only PC Cards sold by Hioki.
  Compatibility and performance are not guaranteed for PC cards made by other manufacturers. You may be unable to read from or save data to such cards.

Hioki options

9726 PC CARD 128 M
9727 PC CARD 256 M
9728 PC CARD 512 M
9729 PC CARD 1 G

(1) Operational situation

LED lights and flashes of the CF CARD LED vary according to the conditions of the card.

LED		CF card	Cover	Access	Others
State	Color				
Unlit	--	Removed	Open	Not allowed	--
Unlit		Inserted			
Unlit		Removed	Closed		
Lit	green	Inserted		No access	Normal
	yellow				Remaining capacity low
	red				No capacity
Flashing	green			Accessing	Normal
	yellow				Remaining capacity low
	red				No capacity
Rapid flashing	red			--	Other errors
Flashing	green		Open ⇒Closed	--	Unmount
Flashing	green		Open ⇒Closed	--	Mount

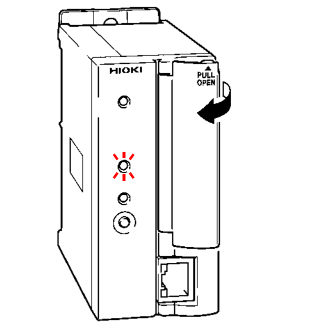
NOTE

Mounting, unmounting is automatically carried out when the cover is opened and closed. To do this, the CF card has to be safely inserted (or removed). When the CF card is removed immediately after opening the cover and while the green light is still flashing, it may be damaged. Do not attempt to remove the card when the green light is flashing.

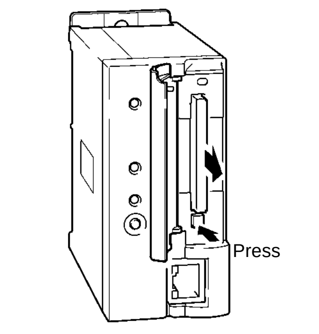
(2) Inserting and removing the CF card

Procedures

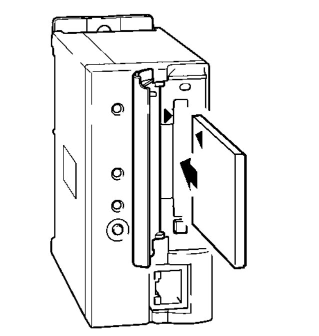
1. Open the cover
Open the cover as shown in the diagram if it is closed. CF CARD LED will start to flash in green.



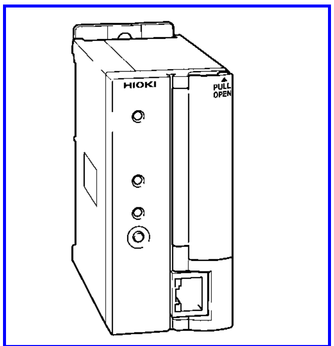
2. Take out the CF Card
Follow the diagram and carry out the following steps when the CF CARD LED is unlit.
When the eject button is pressed once, the card will be released. Press it back all the way one more time. When the card is not fully inserted, it will come undone again. Press the eject button firmly all the way to the end. Pick the CF card when it is released to remove it.



3. Inserting the CF card
Align the ▼ mark on the CF card with the ▼mark on the case and insert the card all the way in, as shown in the diagram. Do not mistake the front and back or direction of insertion and force the card into the case. This will damage the card or the instrument.



4. Close the cover
Close the cover until you can hear a click sound.
Once the cover is closed, a green light will flash (mounting) and turn green after a while. Do not force close the cover when the CF card or eject button is protruding from the instrument. Follow step 2 again.



NOTE

If the CF CARD LED does not flash green even after the cover is closed, confirm that the card is inserted properly and the cover is fully closed. In addition, if the green flashing light turns orange or red, this means the capacity in the CF card is not enough or that the card is spoilt. We recommend changing the card.

16.4.2 Recording operation

NOTE

This instrument cannot record without a CF card.
Refer to **16.4.1 "For CF card"(P.280)** for how to insert the CF card.
In addition, 9768 Smart Site Utility Pro software is necessary to operate this instrument.
For more details, please enquire from the shop you purchased the product or visit the nearest Hioki sales office.

With the 9768 Smart Site Utility Pro software, the instrument can start recording, view recorded data, stop recording and display the current measured value.
Refer to the instruction manual for 9768 Smart Site Utility Pro on how to use the software.

(1) Operational situation

Colors of lights and flashing lights of the REC LED vary according to the conditions of the recording operation.

LED		Recording operation	Others
Conditions	**Colors**		
Lit	green	Recording in operation	Normal operation
Flashing	green		Waiting for specified start time
Flashing	red		Error
Unlit	--	Recording stopping	--
Flashing	yellow	Recording in preparation	--
Lit	yellow	Recording aborted	--

NOTE

Recording preparation refers to the start of recording to the end of preparation, and to the end of recording to the end of processing. Do not operate the instrument during this period.

(2) Start/stop recording

This instrument can be operated by either of the following 2 procedures. Operation for each of the method is different and should be chosen according to the operational environment.
Refer to **"Chapter 6 Operations (2354-20)" of "**9768 Smart Site Utility Pro Instruction Manual" for details on how to operate the 9768.

Step 1 (online)

Setting method for the instrument	• Send setting from the 9768
Start/stop recording	• Start/stop recording from 9768 via telecommunications (refer to the following steps)
Record data	• 9768 data is regularly saved to the PC via telecommunications.
CF Card	• CF card is used as a backup memory for recorded data. • CF card automatically erases old data to free up capacity. • There is no need to exchange the CF card.
Using the recorded data	• Recorded data that was collected and saved by PC can be viewed with the 9768 Smart Site Viewer.

1. Inserting the CF card
   This instrument cannot record if the CF card is not inserted. Refer to **16.4.1 "For CF card"(P.280)** on how to insert the CF card.

2. Operating recording
   Use the 9768 to start recording, view recorded data or display current measurement values on the monitor.

Step 2 (offline)

Setting the instrument	• Save the setting file onto the CF card with the 9768 • When recording starts, the equipment is automatically set using the setting file saved on the CF card.
Start/stop recording	• Press the START/STOP switch (refer to the steps below)
Record data	• Data is regularly retrieved and saved by the CF card in the instrument. • Data can be removed from the CF card and read with a PC card reader. • Data can be downloaded by FTP to IE, etc. via LAN connection.
CF card	• Data is saved in the CF card. • CF card can be set to erase old data (stop or continue) to free up capacity. Continue is chosen, change the CF card regularly.
Using recorded data	• Data recorded in the CF card can be converted to the format for the 9768 and viewed with the 9768 Smart Site Viewer. • Data saved in different cards can be handled as one recorded data. • Text file saved in CF card can be viewed in Excel, etc.

1. Save the setting file to the CF card
   Save the setting file to the CF card by using the 9768.

2. Insert the CF card
   Insert the CF card with the saved setting file (1.).
   Refer to **16.4.1 "For CF card"(P.280)** on how to insert the CF card.

3. Start recording
   When the REC LED starts to flash in orange, press the START/STOP switch for approximately 2 seconds. When the recording preparation is over, the REC LED light will turn green to indicate the start of recording.

4. Exchange the CF card
   When the CF CARD LED turns orange or red, it means that the card does not have enough capacity. Exchange a new CF card when the CF card's capacity is full.

5. Stop recording
   When the REC LED starts to flash yellow, press the START/STOP switch for approximately 2 seconds. When recording has stopped, the REC LED light will go off, indicating the end of recording.

6. Using recorded data
   Data saved in the CF card can be converted to the format for 9768 and viewed with a Smart Site Viewer via a PC card reader.

NOTE

- If recording does not start even when the procedures stated above are followed (error occurs when recording with the 9768 module tries to start, or when the yellow flashing light does not appear even when the START/STOP switch is pressed), confirm that the CF card has been properly inserted and that the cover has been firmly shut. Refer to **16.4.1 "For CF card"(P.280)** on how to insert the CF card.
- When the instrument is offline, pressing the START/STOP switch after changing the CF card will terminate recording. Do not press the START/STOP switch after changing the card.

16.4.3 Setting the IP Address

The following software is required for setting the IP address.
For details, contacting your dealer or Hioki representative.

- 9768 Smart Site Utility Pro

Refer to the software manual for how to configure the IP address.

NOTE

Contact your network administrator for the setting value of the IP address.

16.5 Specifications

16.5.1 Basic Specifications

Operation	Data of measurement module connected by CAN bus at the start of recording, is consecutively saved in the CF card, based on recording interval and recording mode set. Data saved in the CF card, is sent to the PC through either LAN communications facilitated by the 9768 Smart Site Utility Pro, or file movement through the CF cards.
External memory	CF Card slot (50 pin 1 slot, for Type I) Card type: Flash ATA card (up to 1GB) Data format: MS-DOS Useable card: HIOKI 9726 (128MB), 9727 (256MB), 9728 (512MB), 9729 (1GB)
External communications interface	LAN (IEEE802.3 Ethernet 100BASE-TX, connector; RJ-45) Compatible protocol: FTP (server), SMTP, Modbus TCP (TCP/IP), reserved protocol (TCP/IP), SMTP-Auth *FTP (server) function retrieves data file inside the CF card
Internal communications interface	CAN bus (Model 2354-20 - connection to measurement module clusters communications speed 500 kbps)
Shutdown control	An electric double layer condenser is used to terminate the CF card in the event of a power cut off.

16.5.2 Function Specifications

LED/SW	LED: POWER, CF CARD, REC, LAN connector LED (LINK Rx/Tx) SW: START/STOP
CF cover	CF cover, when the cover is open, CF is inaccessible.
Modbus Communication function	Data is output after receiving communication commands from Modbus/TCP-compatible external devices.
E-mail send function	Number of monitored channels: up to 80CH Registered addresses: up to 20 (for 1 Memory module) Sent Mail addresses: up to 20 (for 1 CH) • Monitor the alarm condition of measurement module connected by CAN bus and in the event of any unusual events/restoration, a mail is delivered via the mail server. • A periodic notification of instantaneous value is sent by mail.
Clock function	RTC is built in (year, month, day, hour, minute, and second). Corrects the internal clock of each measurement module at irregular intervals.
Alarm clear	Clears alarm output of a measurement module, controlled by or communications.
Number of modules to connect	External communications: up to 89 units (Assign a COM ID to each communications module.) Internal communications: up to 63 units (Assign a MODULE ID to each measurement module.)
Rotary SW	Setting for COM ID
FTP client function	A recorded data file (CSV) is automatically transferred once per day.
SNTP client function	The designated NTP server (time server) can adjust the time once per day.

16.5.3 Data recorded Specifications

Recorded data	Depends on recording mode of each measurement module
Data collection method	Regular collection by in-built memory of each measurement (module saved in CF card)
Recording interval	1sec to 1 hour (depends on the recording interval of each measurement module)
Saving format	Binary or text (CSV)
Operational method	Files created by 9768 Smart Site Utility Pro are saved in CF and when the START SW button is pressed, recording will start after the setting is sent to the measurement module.
Data backup	Backed up by CF When the CF card is not inserted, data is saved in the respective measurement modules. When the CF card is inserted into the instrument, data saved in the different measurement modules will be re-saved in the CF card. * Each measurement module can collect up to 10 minutes of data.

16.5.4 General Specifications

Start up time	20 seconds maximum (time from switch is turned on to time required for all functions to start operating)
Clock accuracy	±30 ppm (Reference value at temperature from 0 to 50°C)
Dimensions	Approx. 45.5W × 96H × 88D mm (1.79"W × 3.78"H × 3.46"D) (excluding projections)
Mass	Approx. 300 g (10.6oz.)
Backup (Clock)	Uses a lithium battery Battery life: approx. 5 years (Reference value at temperature 25°C (77°F))
Rated supply voltage	5 VDC±0.3 V
Maximum rated power	3 W
Operating environment	Altitude up to 2000 m (6562-ft.), Indoors
Operating temperature and humidity	0 to 50°C (32 to 122°F), 80%RH or less (non-condensating)
Storage temperature and humidity	-10 to 50°C (14 to 122°F), 80%RH or less (non-condensating)
Accessory	Ferrite clamp.. 2
Option	9642 LAN CABLE 9726 PC CARD 128M 9727 PC CARD 256M 9728 PC CARD 512M 9729 PC CARD 1G
Applicable standards	Safety EN61010, Pollution degree 2 EMC EN61326 Class A

16.6 Disposing of the Instrument

Before Disposing of the Instrument

The instrument contains a lithium battery for memory backup.

WARNING

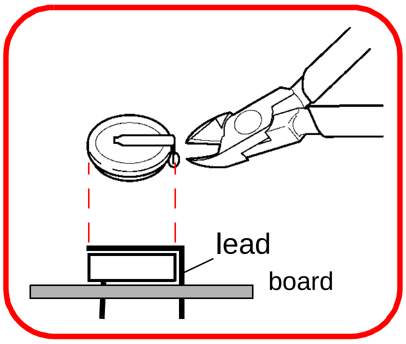
- **To avoid electric shock, turn off the power switch and disconnect the power cord and cables before removing the lithium battery**
- **Battery may explode if mistreated. Do not short-circuit, recharge, disassemble or dispose of in fire.**

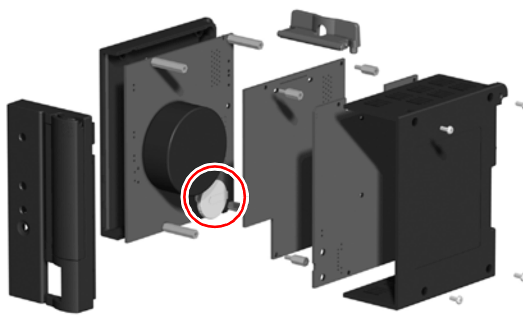
CAUTION

When disposing of this instrument, remove the lithium battery and dispose of battery and instrument in accordance with local regulations.

Required tools:
- One Phillips screwdriver
- One pair of wirecutters

1. Remove the 4 screws securing the lower case.
2. Use wire cutters to clip both leads of the button style lithium battery.





CALIFORNIA, USA ONLY
This product contains a CR Coin Lithium Battery which contains Perchlorate Material - special handling may apply.
See www.dtsc.ca.gov/hazardouswaste/perchlorate

2361-20 AC POWER MODULE 17

17.1 Overview

17.1.1 Product Overview

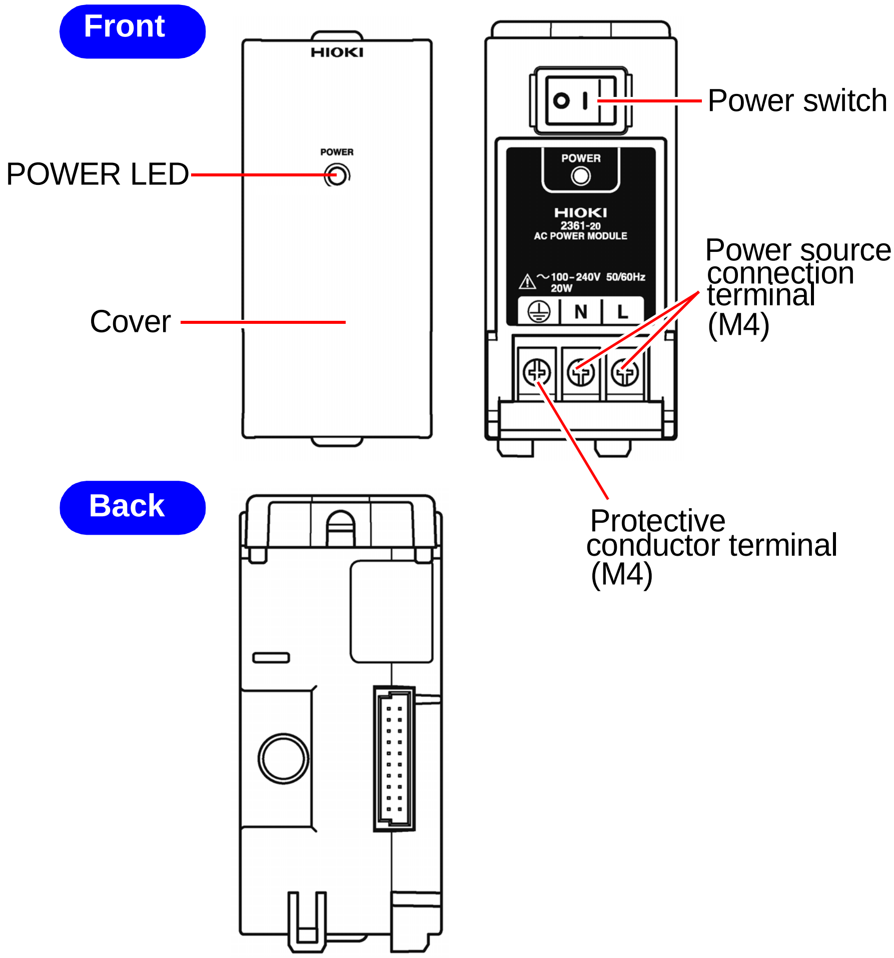
- The 2361-20 is a power module of the Hioki "Smart Site" (remote measurement system).
- The 2361-20 is used with the communications module, measurement module, and module base.
- The power supply module supplies power to one communications module and 10 measurement modules (or five power meter modules)

(Conceptual image)

17.1.2 Major Features

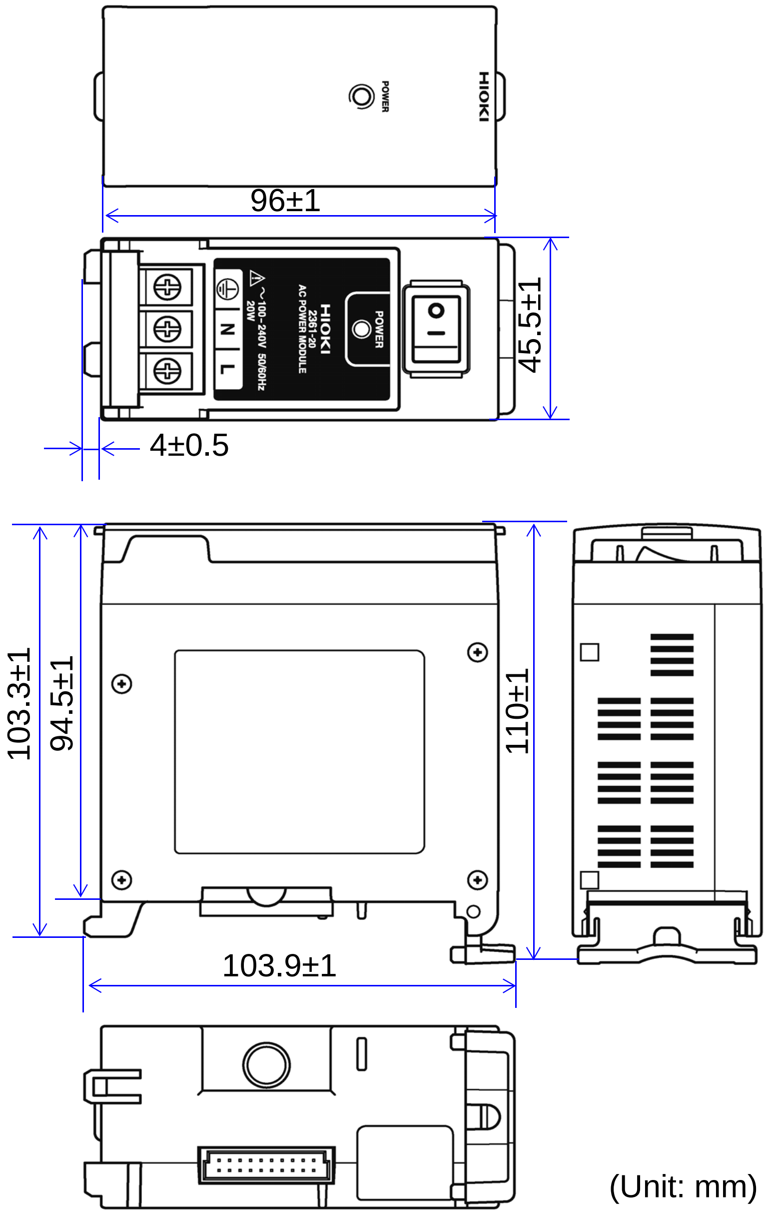
The module supplies the rated supply voltage, ranging from 100 to 240 VAC (50/60 Hz), without any manual switching.

17.1.3 Name and Function of the Parts



Power switch	Turns power ON/OFF. ❙ side : Power ON, ❍side: Power OFF
POWER LED	Remains green while the module is in operation. **POWER LED indication** Lit in green: Power ON
Power source connection terminal N (-), L (+)	Connect the power cord.
Protective conductor terminal	This is an protective earthing terminal. Be sure to ground the terminal.

17.1.4 Dimension Diagrams



(Unit: mm)

17.1.5 Accessory and Option

Accessories

Ferrite clamp 1

Option

9239-20 POWER CORD (for USA, with round crimp connector)
9239-21 POWER CORD (for CE, with round crimp connector)

17.2 Preparations

17.2.1 Installing the Module

(1) Installing the Module Base

CAUTION

Do not mount the module base on the ceiling where it may fall off.

Fasten the module base to a DIN rail or the wall according to the procedure described in the **19 "2391-01, 2391-02, 2391-03 MODULE BASE"(P.305)** or **20 "2392-01/02 MODULE BASE"(P.319)** series MODULE BASE instruction manual.

(2) Mounting a Module on the Module Base

WARNING

We make every effort to ensure the quality of this system. However, should the system emit a strange odor or smoke, turn off power immediately.
Moreover, to ensure that you can turn power off easily, do not lay cables in front of this module.

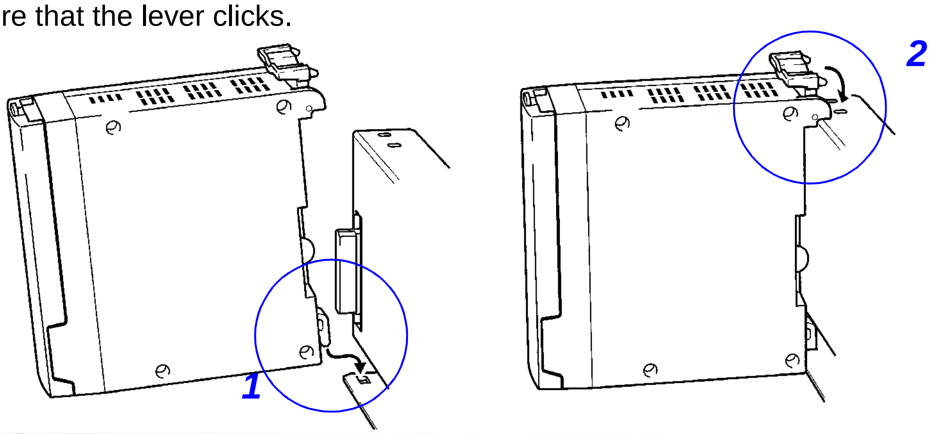
CAUTION

This module does not support parallel operation. Mount only one power supply module on a module base. Mounting two or more modules on a module base may damage the modules.

NOTE

Mount the module in the slots for the power supply module on the module base.

Mount a module on the module base as shown below.
Ensure that the lever clicks.



17.2.2 Connecting Power Cable

DANGER

- **This device should only be connected to the secondary side of a breaker, so the breaker can prevent an accident if a short circuit occurs.**
- **Connections should never be made to the primary side of a breaker, because unrestricted current flow could cause a serious accident if a short circuit occurs.**
- **Ensure that the 9239 series POWER CORD is not plugged into an AC outlet when connecting it to the module. This will prevent electric shock and short-circuiting.**
- **Ensure that the power switch of the module is OFF when connecting the power cable to the power line. If the switch is ON sparks may be generated and ignite a battery, organic solvent, or any other nearby volatile substance.**
- **Be sure to put the cover on the 2361-20 when the power line is live to avoid electric shock and short-circulating.**
- **Be sure to connect the earthing terminal to ground to avoid electric shock. Connect the earthing terminal to ground before connecting any other cable.**

WARNING

- **Before turning the device on, make sure the supply voltage matches that indicated on the its power connector. Connection to an improper supply voltage may damage the device and present an electrical hazard.**

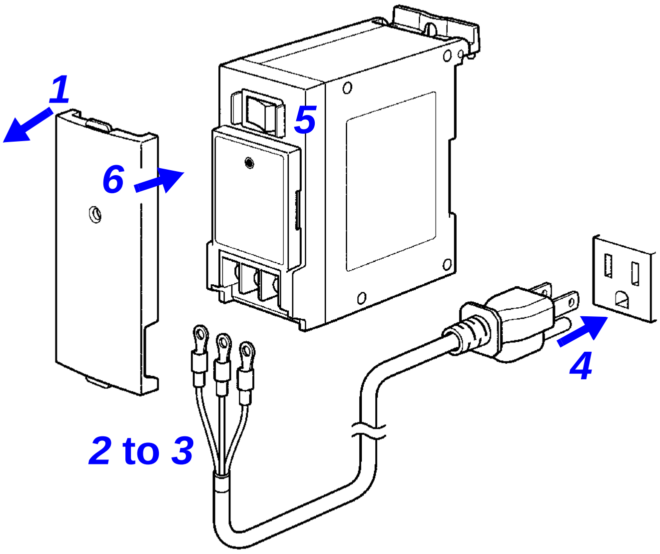
NOTE

The functions of this system may be interfered by external noise or an electromagnetic environment when connecting a cable more than 3 meters long.

1. Remove the cover.
2. Select a power cable of sufficient current-carrying capacity and withstand voltage, considering the power consumption and supply voltage.
   Power consumption: 20 W (50 VA)
   Available from 100 to 240 VAC (50/60 Hz) without manual switching

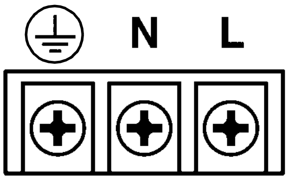
   Example:
   300 V vinyl cabtire cable
   3-core, 0.75 mm^2 (AWG18) or more
   The 9239 series POWER CORD (with round crimp connector) is optionally available.

17

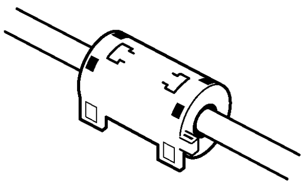


3. Connect the cable leads as shown below (at tightening torque of 0.8 N•m).
We recommend that you use M4 round crimp connectors.

Example: RAV 1.25 - 4
When using the optional 9239-20 POWER CORD, connect leads E, N, and L in this order from the left, while referring to the marker tubes.



4. Connect the power cable to the power source (AC outlet or panel-board).
In case of external noise,
mount the ferrite core supplied as an accessory as shown below.



5. Turn on the POWER switch (push it to the "I" side).

6. Secure the cover back in place.

⚠CAUTION

When the power cord is plugged into the power source (power outlet, distribution board, etc.), the terminal block of the instrument bears live power. Take care not to touch it when attaching/removing the cover, or on other occasions, as electric shock or short-circuit may result.

17.3 Specifications

17.3.1 Basic Specifications

Operation	Supplies power to measurement/communications modules.
Rated output voltage	5.0 VDC
Maximum output current	2.4 A
Maximum output power	12.0 VA
Output voltage accuracy	±5.0% (Within operating temperature and humidity ranges)

17.3.2 Function Specifications

Overcurrent protection	Min. 105% (Output current limiting and automatic reset)
Overvoltage protection	Min. 110% (Zener diode clamp)
Input surge current	Up to 20 A at 100 VAC or 40 A at 200 VAC
Parallel operation	Not available

17.3.3 General Specifications

Communication inter-face	Not available
Input terminal	Terminal block (Front panel)
Output terminal	Internal bus connector
Power switch	ON/OFF of output voltage
Rated supply voltage	100 to 240 VAC (50/60 Hz) (Voltage fluctuations of ±10% from the rated supply voltage are taken into account.)
Maximum rated power	20 W
Dielectric strength	3.0 kVAC (Between Input L, N and output) Response current 20 mA 2.0 kVAC (Between Input L, N and FG) Response current 20 mA
Fuse	2.5 A Built-in time-lag fuse (on the live side)
Dimensions	Approx. 45.5W × 96H × 94.5D mm (1.79"W × 3.78"H × 3.72"D) (Including cover, excluding projections)
Mass	Approx. 275 g (9.7 oz.) (Including cover)
Accessories	Ferrite clamp..1
Options	9239-20 POWER CORD (for USA, with round crimp connector) 9239-21 POWER CORD (for CE, with round crimp connector)
Operating temperature and humidity	0 to 50°C (32 to 122°F), 80%RH or less (non-condensating)

Storage temperature and humidity	-10 to 50°C (14 to 122°F), 80%RH or less (non-condensating)
Operating environment	Indoors, altitude up to 2000 m (6562-ft.)
Applicable standards	Safety EN61010 Pollution degree 2 EMC EN61326 CLASS A EN61000-3-2 EN61000-3-3

2362-20 DC POWER MODULE 18

18.1 Overview

18.1.1 Product Overview

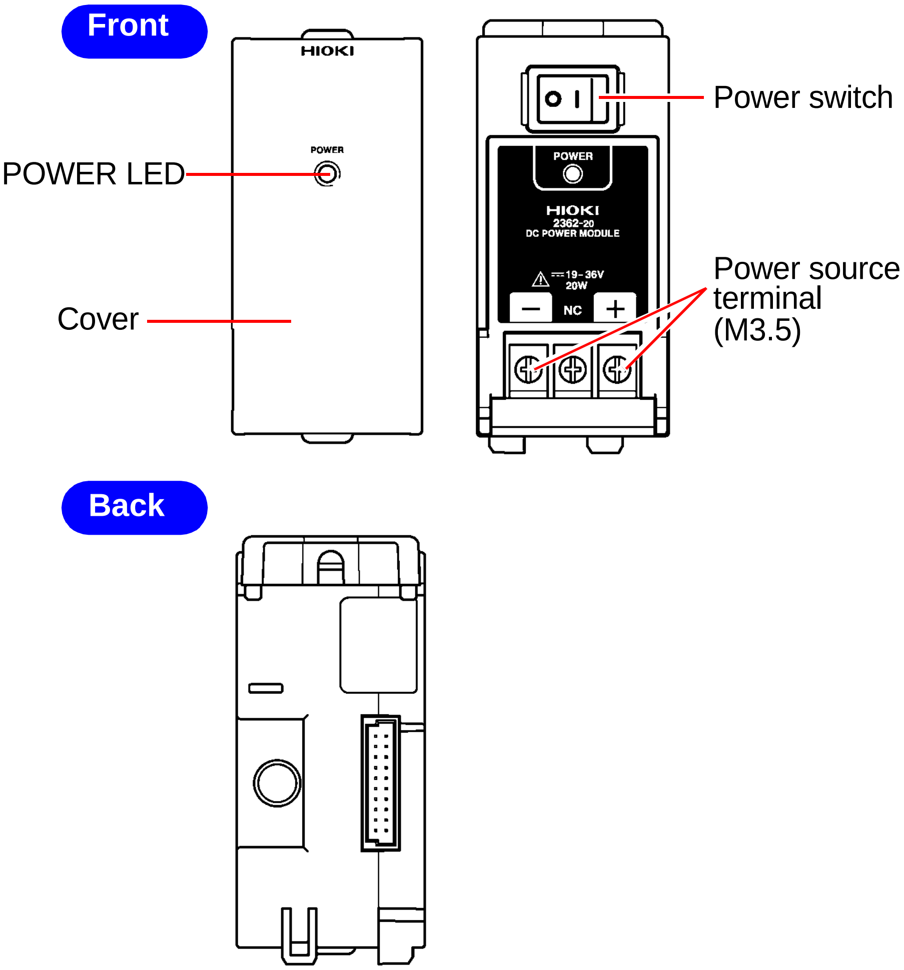
- The 2362-20 is a power module of the Hioki "Smart Site" (remote measurement system).
- The 2362-20 is used with the communications module, measurement module, and module base.
- The power supply module supplies power to one communications module and 10 measurement modules (or five power meter modules)

(Conceptual image)

18.1.2 Major Features

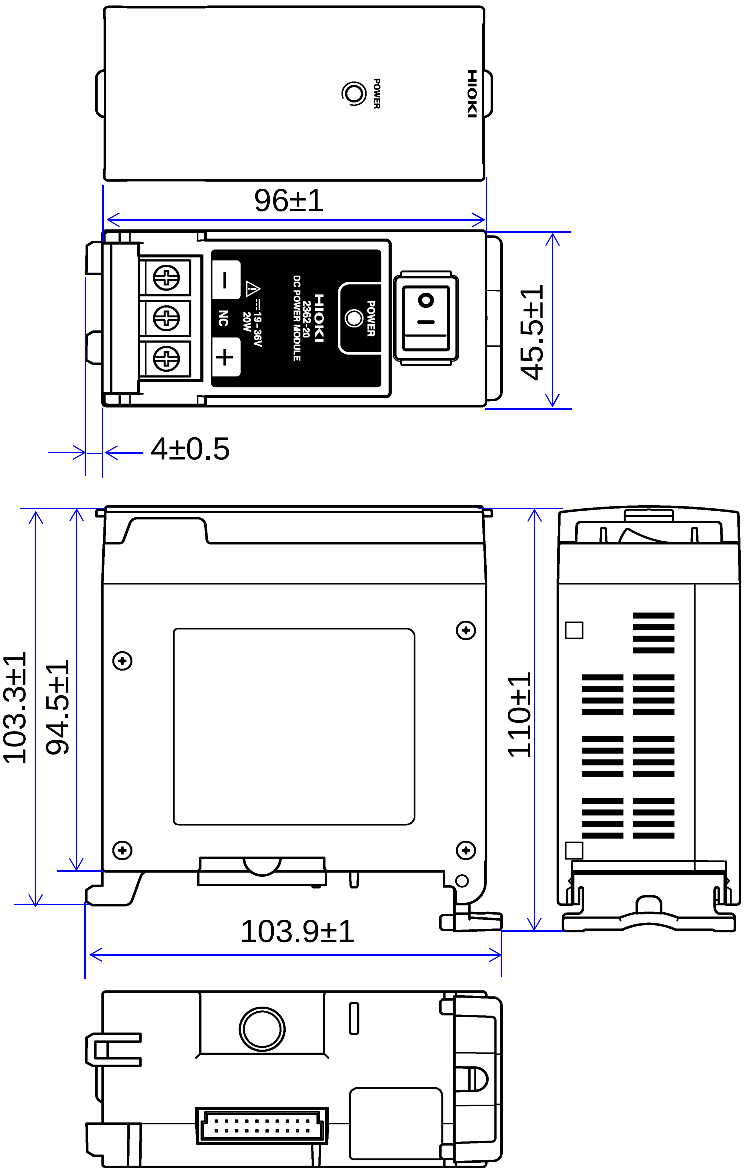
◆ **The module supplies the rated supply voltage ranging from 19 to 36 VDC.**

18.1.3 Name and Function of the Parts



Power switch	Turns power ON/OFF. ❙ side : Power ON ○side: Power OFF
POWER LED	Remains green while the module is in operation. POWER LED indication Lit in green: Power ON
Power source terminal	Connect the power cord. The terminal connectors are for "-," "NC" (non-connection), and "+" from the left.

18.1.4 Dimension Diagrams



(Unit: mm)

18.1.5 Accessory and Option

Accessories

Ferrite clamp 1

Option

None

18.2 Preparations

18.2.1 Installing the Module

(1) Installing the Module Base

CAUTION

Do not mount the module base on the ceiling where it may fall off.

Fasten the module base to a DIN rail or the wall according to the procedure described in the **19 "2391-01, 2391-02, 2391-03 MODULE BASE"(P.305)** or **20 "2392-01/02 MODULE BASE"(P.319)** series MODULE BASE instruction manual.

(2) Mounting a Module on the Module Base

WARNING

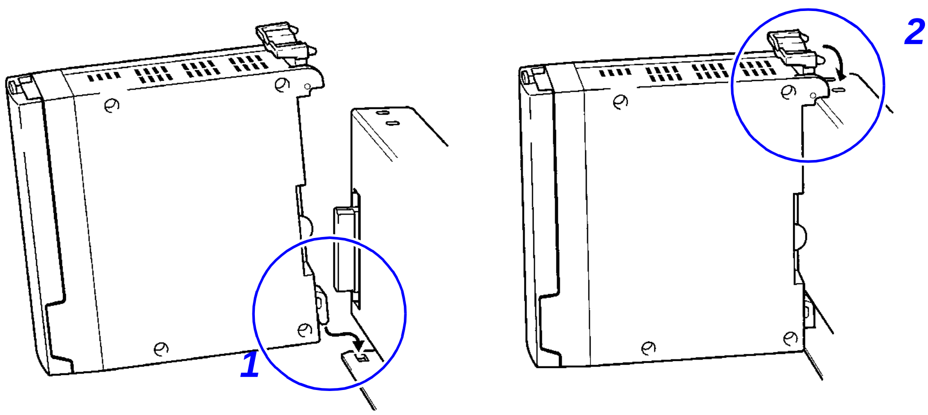
We make every effort to ensure the quality of this system. However, should the system emit a strange odor or smoke, turn off power immediately.
Moreover, to ensure that you can turn power off easily, do not lay cables in front of this module.

CAUTION

This module does not support parallel operation. Mount only one power supply module on a module base. Mounting two or more modules on a module base may damage the modules.

NOTE

Mount the module in the slots for the power supply module on the left edge of the module base.



18.2.2 Connecting Power Cable

WARNING

- **Before turning the instrument on, make sure the supply voltage matches that indicated on the its power connector. Connection to an improper supply voltage may damage the instrument and present an electrical hazard.**
- **Ensure that the power switch of the module is OFF when connecting the power cable to the module. If the switch is ON when you connect the power cable, sparks may be generated and ignite a battery, organic solvent, or any other nearby volatile substance.**
- **Ensure that the cable is not live when connecting it. This will prevent short-circuiting.**
- **Ensure that the power switch of the module is OFF when connecting the power cable to the power line. If the switch is ON sparks may be generated and ignite a battery, organic solvent, or any other nearby volatile substance.**

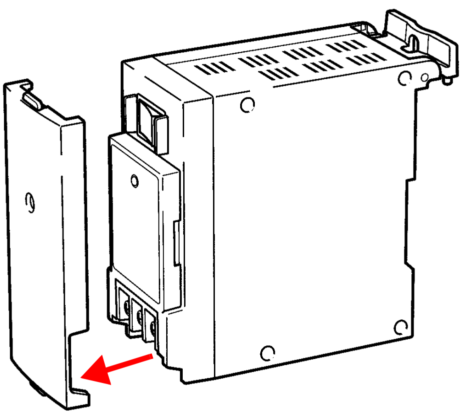
CAUTION

Be careful to avoid connecting voltage improperly, as the internal circuit may be destroyed.

NOTE

The functions of this system may be interfered by external noise or an electromagnetic environment when connecting a cable more than 3 meters long.

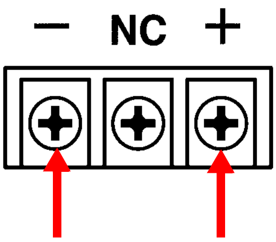
1. Remove the cover



2. Select a power cable of sufficient current-carrying capacity and withstand voltage, considering the power consumption and supply voltage.
Power consumption: 20 VA (20 W)
Available from 19 to 36 VDC.

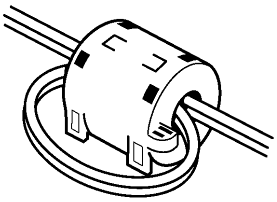
Example:
300 V vinyl cabtire cable
2-core, 0.75 mm^2 (AWG18) or more

3. Connect the cable leads as shown below (at tightening torque of 0.8 N•m).
We recommend that you use M3.5 round crimp connectors.
Example:RAV 1.25-3.5



4. Connect the power cable to the power source.

When using the module as a CE-mark compliant product, mount the ferrite core supplied as an accessory (as shown below).



5. Turn on the POWER switch (push it to the "I" side).

6. Secure the cover back in place.

18.3 Specifications

18.3.1 Basic Specifications

Operation	Supplies power to measurement/communications modules.
Rated output voltage	5.0 VDC
Maximum output current	2.4 A
Maximum output power	12.0 VA
Output voltage accuracy	±5.0% (Within operating temperature and humidity ranges)

18.3.2 Function Specifications

Overcurrent protection	Min. 105% (Constant current/constant voltage pendent and automatic rest)
Overvoltage protection	110 to 140% (Output shutdown and manual reset)
Input surge current	80 A max at 36 VDC.
Parallel operation	Not available

18.3.3 General Specifications

Communication interface	Not available
Input terminal	Terminal block (Front panel)
Output terminal	Internal bus connector
Power switch	ON/OFF of output voltage
Rated supply voltage	19 to 36 VDC
Maximum rated power	20 W
Dielectric strength	0.5 kVAC (Between input and output) Response current 5 mA
Fuse	The polyswitch is built in (on the + side with trip current of 3.7A).
Dimensions	Approx. 45.5W × 96H × 94.5D mm (1.79"W × 3.78"H × 3.72"D) (Including cover, excluding projections)
Mass	Approx. 250 g (8.8 oz.) (Including cover)
Accessories	Ferrite clamp..1
Operating temperature and humidity	0 to 50°C (32 to 122°F), 80%RH or less (non-condensating)
Storage temperature and humidity	-10 to 50°C (14 to 122°F), 80%RH or less (non-condensating)
Operating environment	Indoors, altitude up to 2000 m (6562-ft.)
Applicable standards	Safety EN610101 Pollution degree 2 EMC EN61326 CLASS A

2391-01, 2391-02, 2391-03 MODULE BASE 19

19.1 Overview

19.1.1 Product Overview

- The 2391-01, 2391-02, 2391-03 MODULE BASE is a module base of Hioki "Smart Site" (remote measurement system).
- It houses the communications module, measurement module, and power supply module.
- The module base has module-to-module communications and power supply functions.

Number of Connectable Modules

Model	2361-20, 2362-20 Power Module	Number of connectable slots (for Communications Module/ Measurement Module)
2391-01*1	1 unit	1 slot
2391-02	1 unit	6 slot
2391-03	1 unit	11 slot

Number of required slots for connection

	Communications Module		Measurement Module		
Model	2351-20, 2352-20, 2353-20	2354-20*2	2301-20 to 2305-20, 2341-20 to 2343-20	2321-20	2331-20, 2332-20
Required slots for connection	1 slot	2 slot	1 slot	3 slot	2 slot

*1: Module base for relay and master station.
*2: The 2354-20 cannot be connected to the 2391-01.

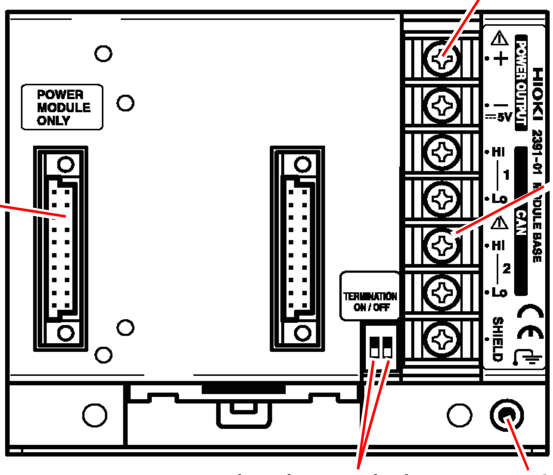
(Conceptual image)

19.1.2 Major Features

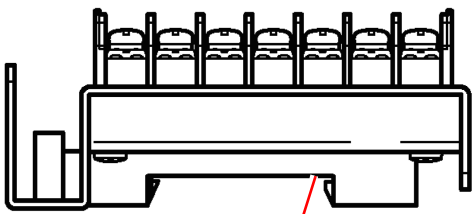
- **The internal buses can be connected using the CAN terminals and up to 63 measurement modules can be connected to one communications module. Please note that each module base must have a power supply module (all models 2391-01 to 2391-03).**

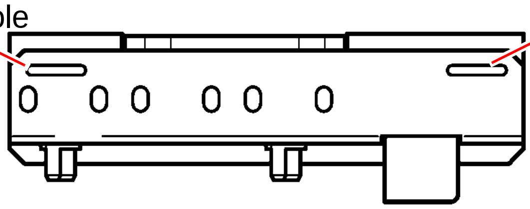
19.1.3 Name and Function of the Parts

Front



Back





The figure shows the 2391-01.

Power supply output terminal	Supplies power to the auxiliary equipment.
CAN terminals (connector for Internal bus connection)	Used to extend the internal bus. Connect terminal 1 to the module base near the communications module (upstream); connect terminal 2 to the module base far from the communications module (downstream). Use the communications cable for the CAN bus (CAN cable). Also be sure to connect the shielded wire.
CAN termination switch (TERMINATION ON/OFF)	Usually leave this switch ON. When using a CAN terminal, turn off the switch of the number corresponding to the terminal used to turn it off. ❖ **19.2.3 "Connecting the CAN Cable"(P.315)**
Functional earthing terminal	This is a functional earthing terminal. Be sure to ground this terminal.
DIN connector for module connection	These connectors are used to mount the power supply, communications, and measurement modules on the module base. Connect the power module, communications module, measurement module from the left in this order.
Connector for DIN rail fixing	This connector is used for mounting the module base on a DIN rail (35 mm wide).
Wall mounting hole	Used to mount the module base on a wall.

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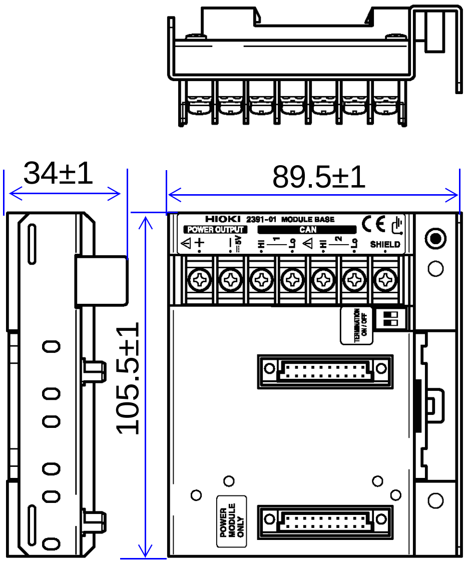
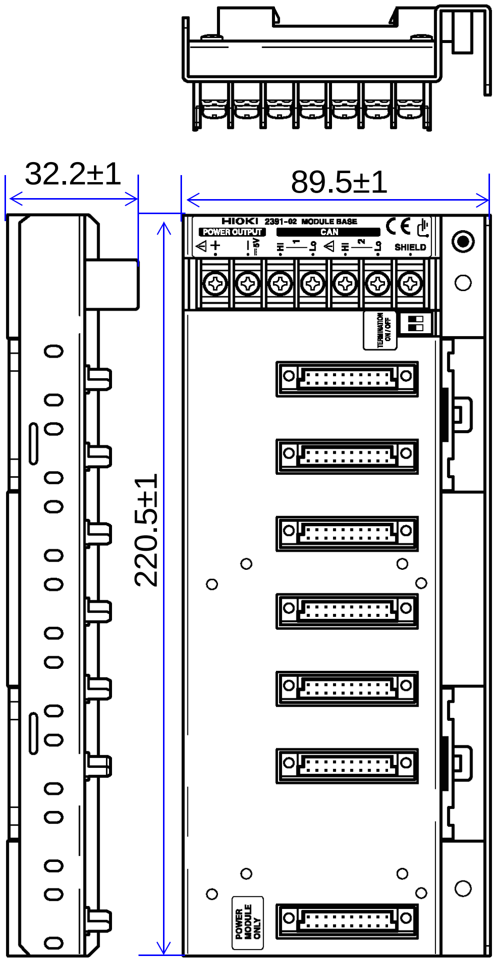
19.1.4 Dimension Diagrams

2391-01



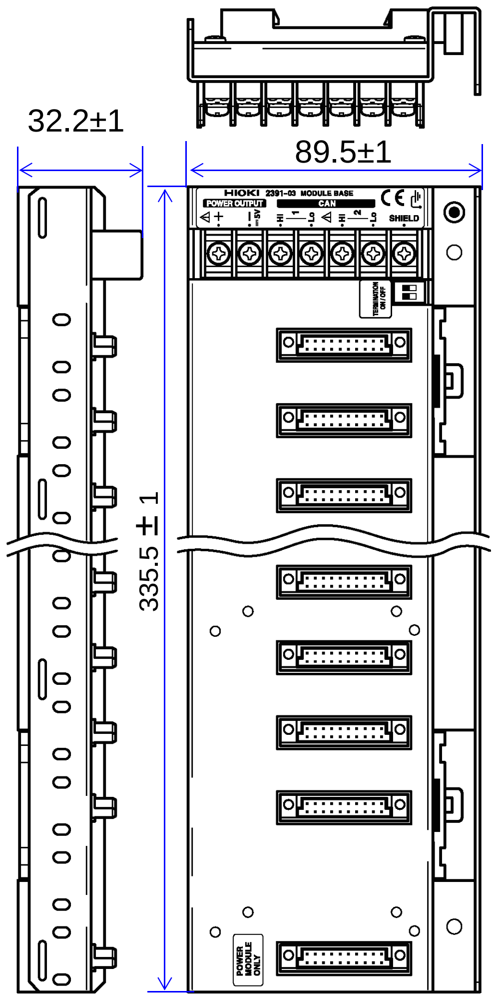
(Unit: mm)

2391-02



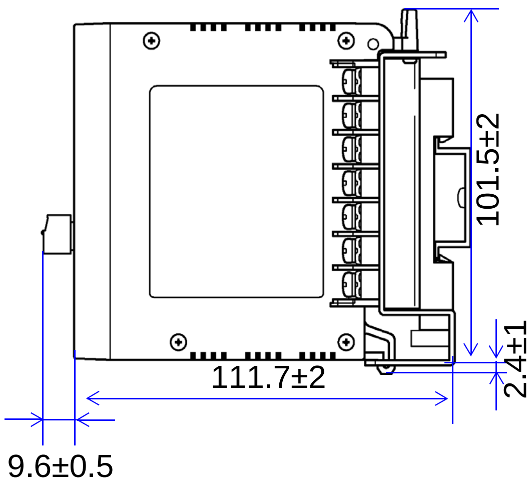
(Unit: mm)

2391-03



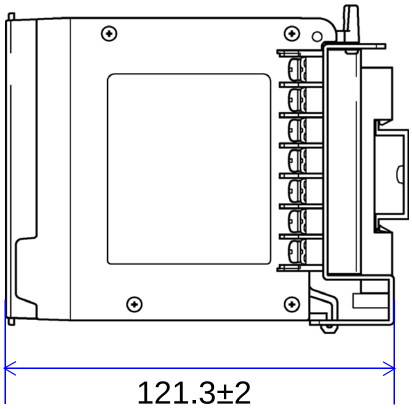
(Unit: mm)

2301 to 2305



(Unit: mm)

2331, 2361, 2362



(Unit: mm)

19.1.5 Accessory and Option

Accessories

Wall-mounting fixture (Supplied with 2391-01 and 2391-02) 1
Wall-mounting fixture (Supplied with 2391-03)............................2

Option

None

19.2 Preparations

19.2.1 Installing the Module

(1) Installing the Module Base

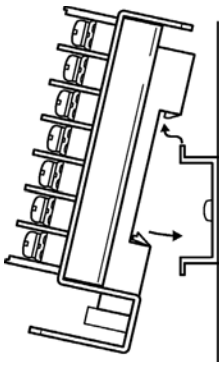
CAUTION

- Do not mount the module base on the ceiling where it may fall off.
- The module base shall be fastened using the proper means. If the module base slides right and left due to tolerances of the DIN rail dimensions, modules may fall off, wires may be short-circuited, or circuits broken.

Fasten the module base securely using either method below.

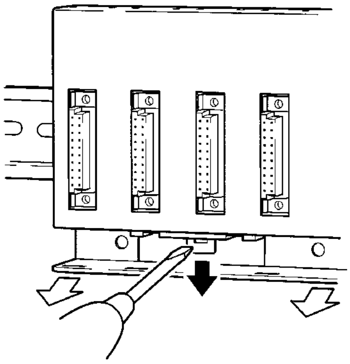
Mounting the Module Base on a DIN Rail

Use the DIN rail mount connector on the rear of the base to mount the module base on a DIN rail (35 mm wide).
The side of the module base with square holes is the bottom.
Hang the top hook of the DIN rail mount connector on the DIN rail, then push down the bottom of the server.



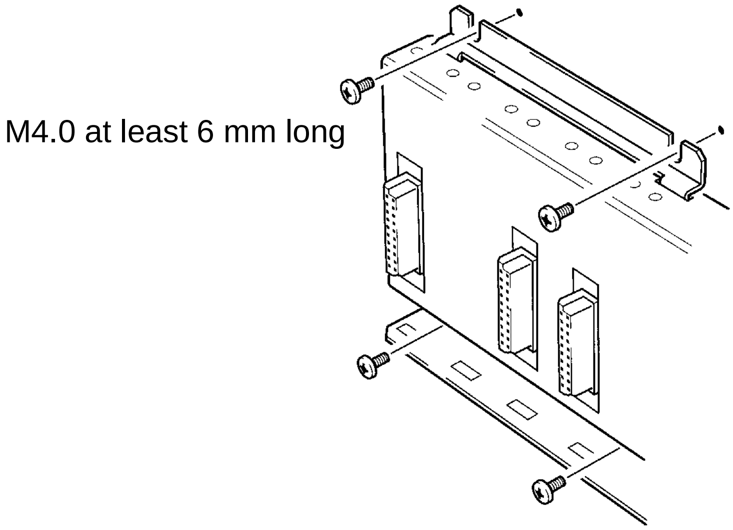
Removing the Module Base

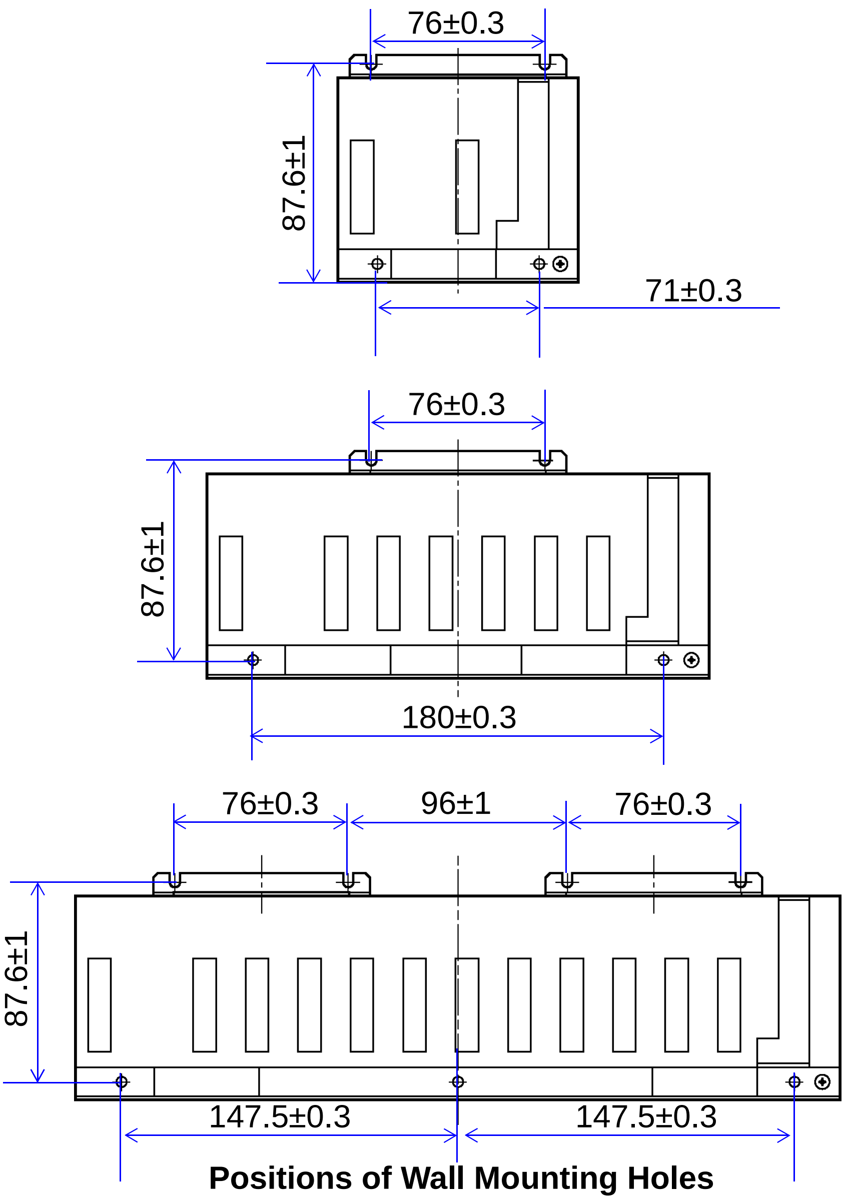
Remove the module base from the DIN rail, while using a flat blade screwdriver to push down the orange lever at the bottom of the connector.
Use the module base for screwdriver leverage.



Mounting the Module Base on a Wall

Mount the module base on a wall by using the wall mounting holes. Ensure that the wall is sufficiently strong. Insert and tighten the screws where shown below.





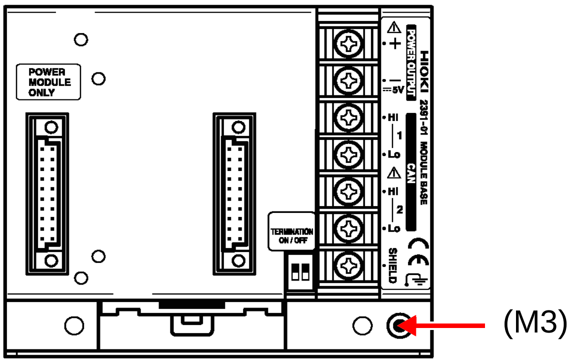
(Unit: mm)

Positions of Wall Mounting Holes

(2) Connecting the Functional Earthing Terminal

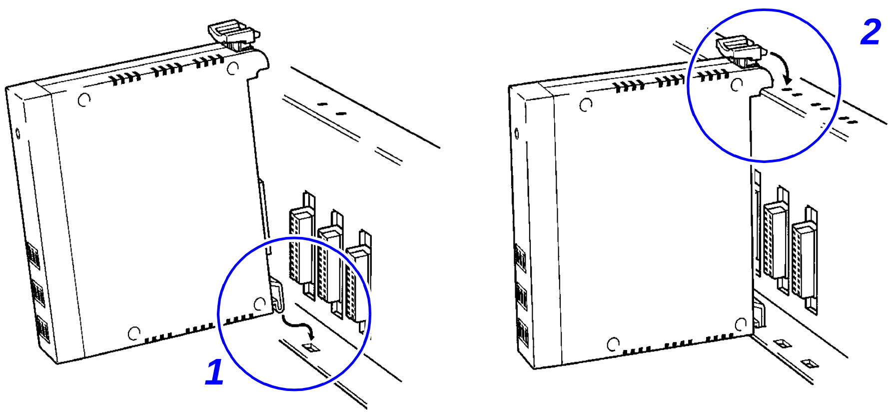
Ground the functional earthing terminal.
We recommend that you use a cable with a conductor cross section of 0.75 mm^2 or more and a round solderless terminal (tightening torque: 0.5 Nom).

Example:
RAV1.25-3



(3) Mounting a Module on the Module Base

Connect a module to the connector of the module base as shown below. Ensure that the levers make a clicking sound.



19.2.2 Connecting Power Supply Output Cord (2391-01 only)

⚠WARNING

- **Before turning the instrument on, make sure the supply voltage matches that indicated on the its power connector. Connection to an improper supply voltage may damage the instrument and present an electrical hazard.**
- **Ensure that module base power is OFF when connecting the power supply output cable. If the switch is ON when connecting the power cable, sparks may be generated and ignite a battery, organic solvent, or any other nearby volatile substance.**
- **Ensure that the cable is not live when connecting it. This will prevent short-circuiting.**
- **Ensure that the power switch of the module is OFF when connecting the power cable to the power line. If the switch is ON sparks may be generated and ignite a battery, organic solvent, or any other nearby volatile substance.**

⚠CAUTION

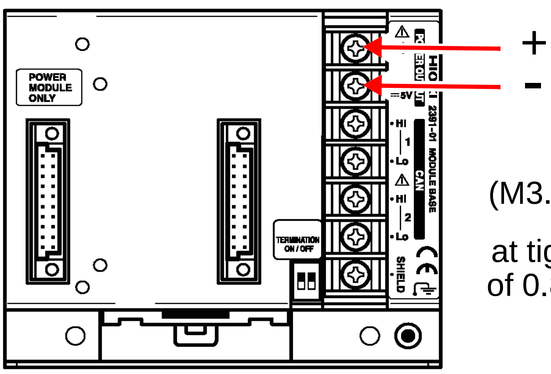
- Be careful to avoid connecting voltage improperly, as the internal circuitry may be destroyed.
- Ensure that the cable is not live when connecting it. This will prevent short-circuiting.

NOTE

A cable more than 3 meters long may be affected by external noise or the electromagnetic environment, and instruments may malfunction due to a drop in supply voltage.

To supply power (5 VDC) to the auxiliary equipment, use the power supply output cable to connect the power supply output terminal to the equipment.

❖ 19.1.3 Name and Function of the Parts



(M3.5)

at tightening torque of 0.8 N•m

For the power supply output cable, use a cable with a conductor cross section of 0.75 mm^2 (AWG18) or more and length of up to 1 meter.

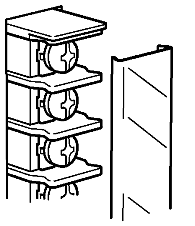
Example:

UL1007 AWG18/AWG16 (equivalent to 0.75 mm^2/1.25 mm^2) or equivalent
300V vinyl-cabtire cable

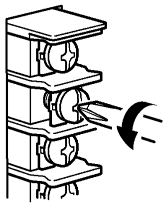
VCTF 2-core, 1.0 mm^2 or more
The cable length shall not exceed 1 meter.

19.2.3 Connecting the CAN Cable

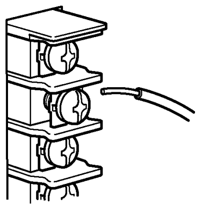
You can extend the internal bus by connecting a CAN cable to the CAN terminal.



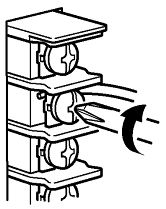
1. Open the terminal cover.



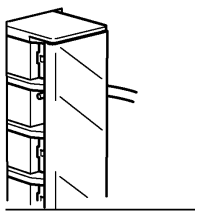
2. Use a plus screwdriver or similar tool to loosen the terminal.



3. Insert a lead into the terminal.



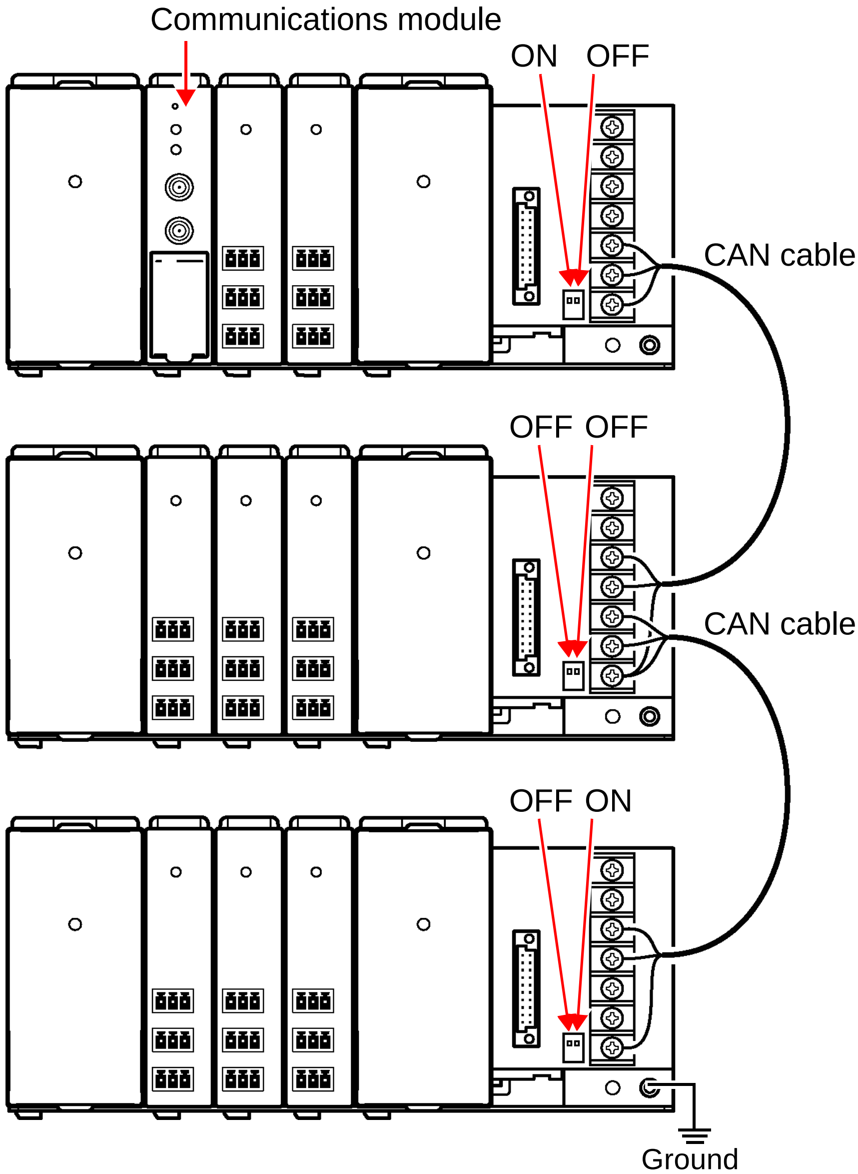
4. Use a plus screwdriver or similar tool to rishten the terminal, and fix a lead.



5. Install the cover to the terminal.
6. Turn OFF the termination switch of the number corresponding to the CAN terminal used to turn it off.

NOTE

- Ensure length of all cables do not exceed 100 m.
- Connect terminal 1 to the module base near the communications module (upstream); connect terminal 2 to the module base far from the communications module (downstream).



Only the CAN termination switch located on either side (a total of two) should be turned on. After all connections have been completed, check to make sure that the resistance between Hi and Lo is approx. 60 Ω.

NOTE

- When electric potential occurs between the functional earth terminals in the module base, CAN communications may not operate smoothly. When this happens, connect the shield wires of the CAN cable to the respective module bases and only 1 earth wire to earth, as shown in the diagram.

19.3 Specifications

19.3.1 Basic Specifications

Basic functions	Sends signals and supply power to remote measurement system modules connected thereto via the built-in internal bus (CAN bus). Also supplies power to the auxiliary equipment (2391-01 only).

2391-01

Number of module connection connectors	3 connectors (All connectors are used for a power supply module and communications module.)
Interface	• DIN connector for module connection 20 pin × 3 • Connector for internal bus extension, Power supply termina 7 terminals × 1

2391-02

Number of module connection connectors	8 connectors (3 connectors are used for a power supply module and communications module.)
Interface	• DIN connector for module connection 20 pin × 8 • Connector for internal bus extension, Power supply termina 7 terminals × 1

2391-03

Number of module connection connectors	13 connectors (3 connectors are used for a power supply module and communications module.)
Interface	• DIN connector for module connection 20 pin × 13 • Connector for internal bus extension, Power supply terminal 7 terminals × 1

19.3.2 Function Specifications

Internal bus termination	Terminates the internal bus with a termination switch.

19.3.3 General Specifications

Rated supply voltage	DC5 V
Maximum supplying power	15 W
Dielectric strength	0.5 kVAC (Between frame GND and internal bus) Response current 5 mA
Dimensions	2391-01: Approx. 105.5W × 89.5H × 26.5D mm (4.15"W × 3.52"H × 1.04"D) 2391-02: Approx. 220.5W × 89.5H × 26.5D mm (8.68"W × 3.52"H × 1.04"D) 2391-03: Approx. 335.5W × 89.5H × 26.5D mm (13.21"W× 3.52"H × 1.04"D) (excluding projections)
Mass	2391-01: Approx. 165 g (5.8 oz.) 2391-02: Approx. 315 g (11.1 oz.) 2391-03: Approx. 460 g (16.2 oz.)
Accessories	Wall-mounting fixture (Supplied with 2391-01 and 2391-02)............................1 Wall-mounting fixture (Supplied with 2391-03)..2
Operating temperature and humidity	0 to 50°C (32 to 122°F), 80%RH or less (non-condensating)
Storage temperature and humidity	-10 to 50°C (14 to 122°F), 80%RH or less (non-condensating)
Operating environment	Indoors, altitude up to 2000 m (6562-ft.)
Applicable standards	Safety EN61010 Pollution degree II EMC EN61326 CLASS A

2392-01/02 MODULE BASE 20

20.1 Overview

20.1.1 Product Overview

The 2392-01/02 is a module base for the Hioki "Smart Site" (remote measurement system). It houses a communications module, a measurement module, and a power supply module. The module base has a module-to-module communications function and an independent power supply.

Number of Connectable Modules

	Power supply module	Communications module		Each module		
Model No.	2361-20, 2362-20	2351-20, 2351-21, 2352-20, and 2353-20	2354-20	2301-20 to 2343-20	2321-20	2331-10, 2332-20
2392-01	1 unit	--				
2392-02	--	1 unit	1 unit	2 unit	1 unit*	1 unit

*The 2321-20 is necessary to connect 2 modules of the 2392.

(Conceptual image)

20

20.1.2 Major Features

- **The 2392-01 is a base for the power supply module only. The module has CAN terminals for internal bus connections*.**

- **The 2392-02 is a base for communications, measurement, and input/output modules. Power is supplied from the 2392-01.**
- **The internal buses can be connected using CAN terminals. Up to 63 measurement modules can be connected to a single communications module.**

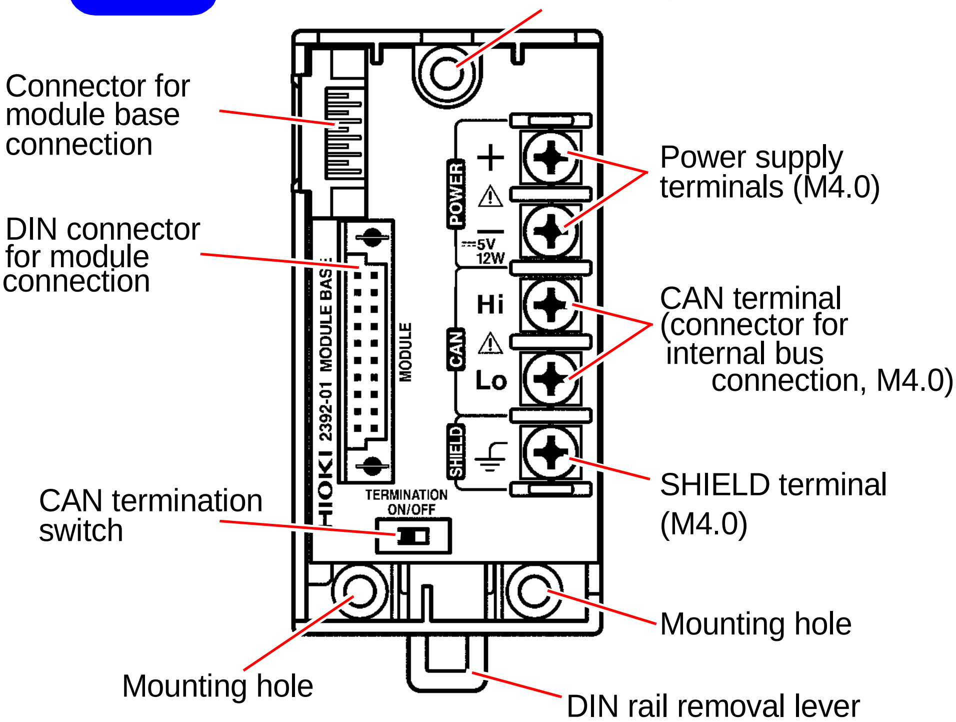
NOTE

CAN cables should not be extended beyond 100 m (328 feet). Due to the capacity of the power supply module, the number of the 2392-02 MODULE BASEs connected to the 2392-01 is limited to five.

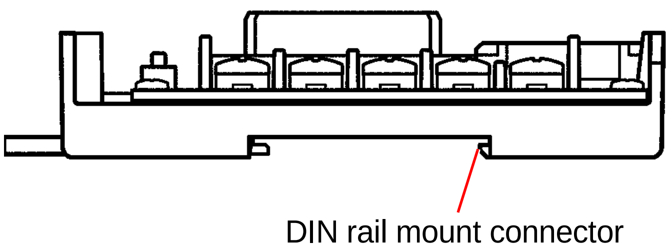
20.1.3 Name and Function of the Parts

2392-01

Front



\Back

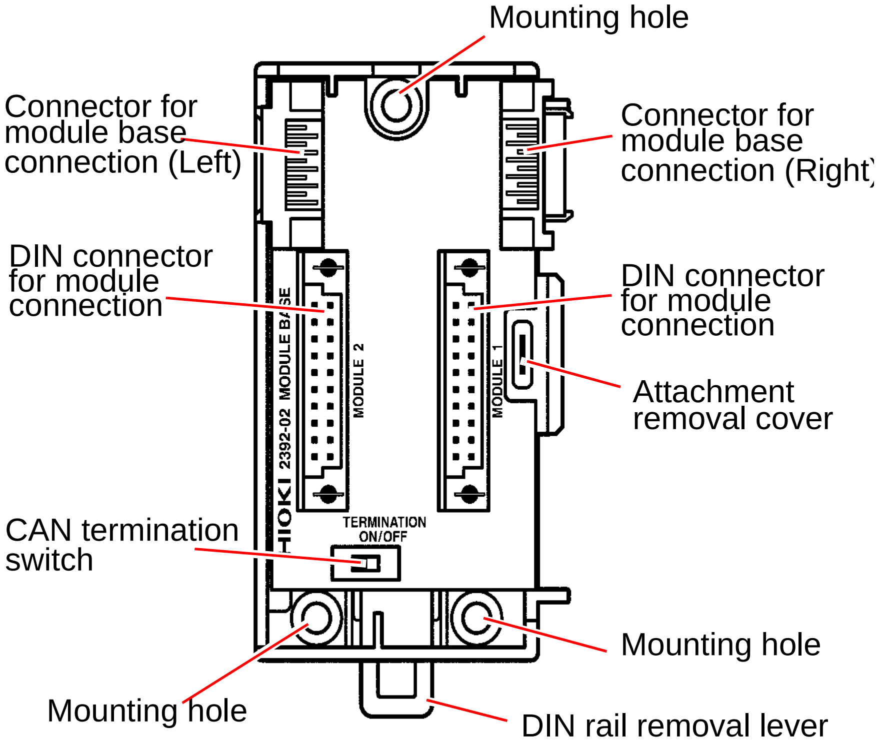


CAUTION Do not supply power to the power terminal from an external source. Doing so may damage the module base or the internal circuits of modules.

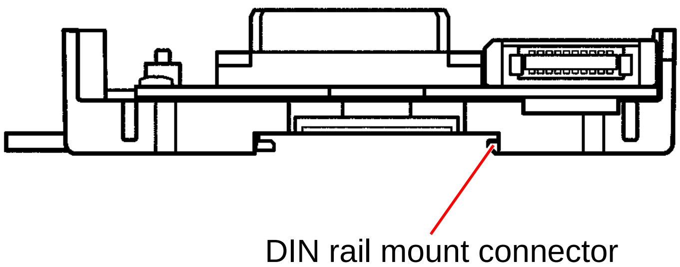
Connector for module base connection	Connect the 2392-02 to this connector.
DIN connector for module connection	This connector is used to connect a power supply module to the module base.
CAN termination switch (Termination ON/OFF)	Turned on/off according to the module base configuration and whether or not CAN cables are employed. ❖ **20.2.3 "Connecting the CAN Cable"(P.329)**
Mounting hole	Used to mount the module base to the wall.
Power supply terminals (M4.0)	Used to supply power to the auxiliary equipment. (supply capacity: 5 V, 12 W).
CAN terminals (connector for internal bus connection, M4.0)	Used to extend the internal bus. Use the communications cable for the CAN bus (CAN cable). Be sure to connect the shielding wire.
SHIELD terminal	This is a functional ground terminal. Be sure to ground this terminal. Connect the shielding wire for the CAN cable to this terminal.
DIN rail removal lever	Used to dismount this module base from a DIN rail.
DIN rail mount connector	This connector is used to mount the module base on a DIN rail (35 mm/1.38" wide).

2392-02

Front



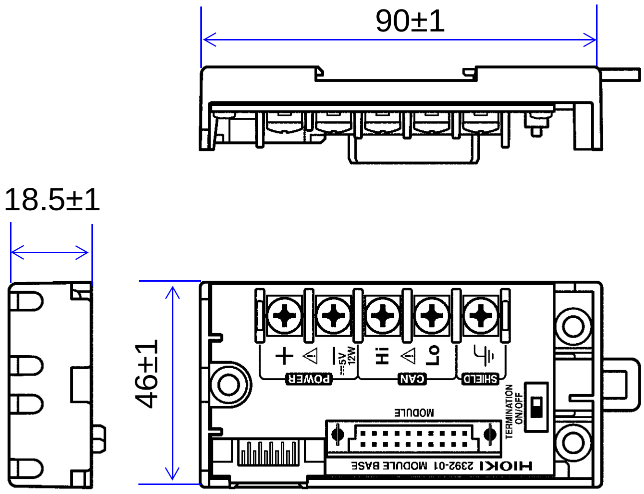
Back



CAN termination switch (Termination ON/OFF)	When transporting (moving) the instrument or an apparatus incorporating the instrument, take appropriate measures to prevent the instrument protruding (by taping the front, for example). ❖ **20.2.3 "Connecting the CAN Cable"(P.329)**
Connector for module base connection	Left : Connect the 2392-02 to this connector. Right : Connect the 2392-01 or the 2392-02 to this connector.
DIN connector for module connection	These connectors are used to mount the communications, and measurement modules on the module base.
Mounting hole	Used to mount the module base on a wall.
DIN rail removal lever	Used to dismount this module base from a DIN rail.
DIN rail mount connector	This connector is used for mounting the module base on a DIN rail (35 mm/1.38" wide).
Attachment removal cover	Used to remove the 2392 sets.

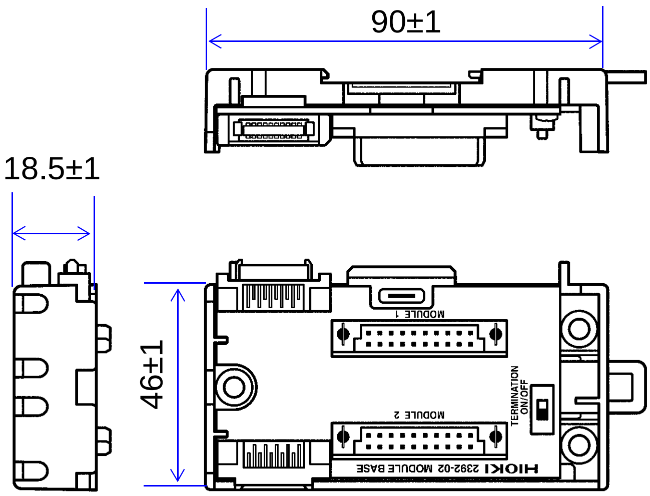
20.1.4 Dimension Diagrams

2392-01



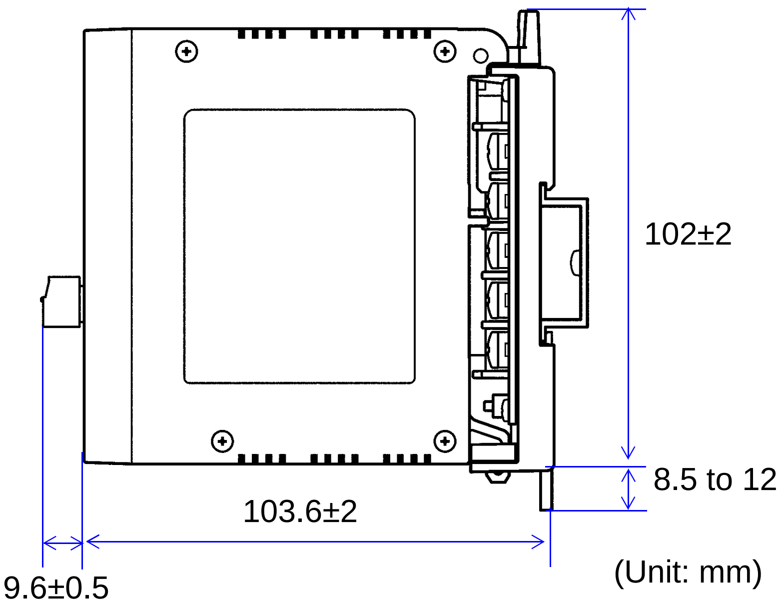
(Unit: mm)

2392-02

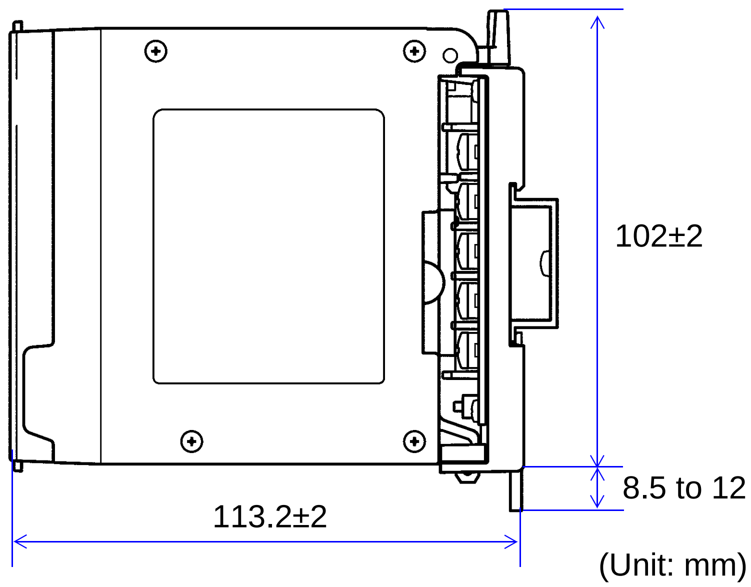


(Unit: mm)

2301 to 2305(Common to 2392-01 and -02)



2331, 2361, 2362(Common to 2392-01 and -02)



20.1.5 Accessory and Option

Accessories
None

Option
None

20.2 Preparations

20.2.1 Installing the Module

(1) Connecting Module Bases

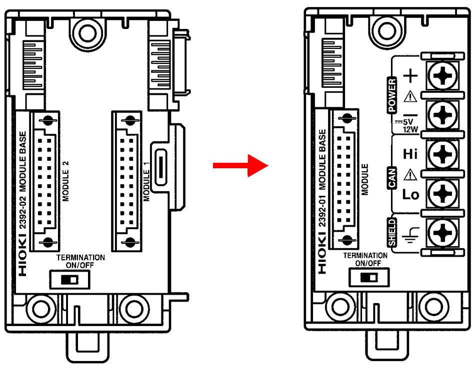
When using several 2392 MODULE BASE series connect them by the procedure given below.

1. Place the 2392-02 on the left and the 2392-01 on the right.

2. Press the module bases together to connect their connectors for the module bases. Make sure the connectors are connected securely.

3. When using 3 or more module bases, connect the second 2392-02 to the left of the first 2392-02 in the same way.

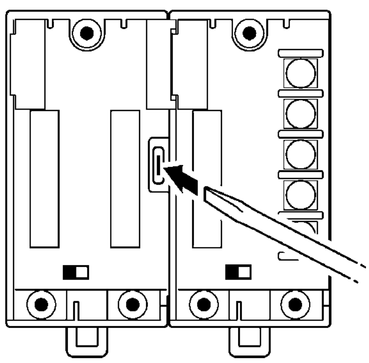
4. Pull on the module bases to confirm that they are securely connected.



NOTE When using the 2392 MODULE BASE series, one unit of the 2392-01 must always be used.

Disconnecting Module Bases

Remove the sets from each other by removing the removal cover with a minus screwdriver.



(2) Installing the Module Base

CAUTION

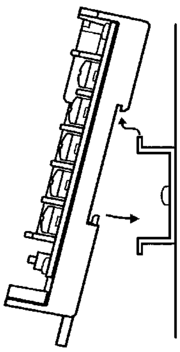
- Do not mount the module base on the ceiling where it may fall off.
- The module base shall be fastened using the proper means.
  If the module base slides right and left due to tolerances of the DIN rail dimensions, modules may fall off, wires may be short-circuited, or circuits broken.

Fasten the module base securely using either method below.

Mounting the Module Base on a DIN Rail

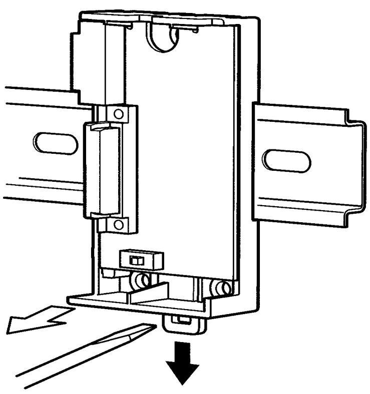
Use the DIN rail mount connector on the rear of the base to mount the module base on a DIN rail (35 mm/1.38" wide).

1. Pull down the DIN rail mount lever.
2. Hang the top hook of the DIN rail mount connector on the DIN rail and push in the bottom of the module.
3. Push up the DIN rail mount lever until it clicks into place.



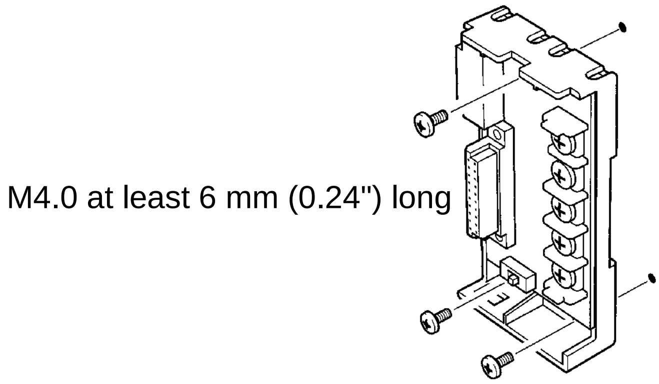
Dismounting the Module Base from the DIN Rail

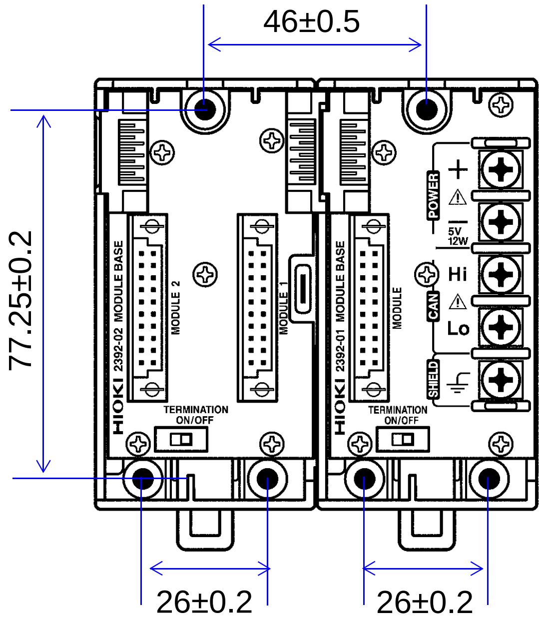
Pull down the DIN rail dismount lever using a flat blade screwdriver and remove the module base from the DIN rail. Use the module as the fulcrum for the screwdriver.



Dismounting the Module Base from the DIN Rail

Pull down the DIN rail dismount lever using a flat blade screwdriver and remove the module base from the DIN rail. Use the module as the fulcrum for the screwdriver.



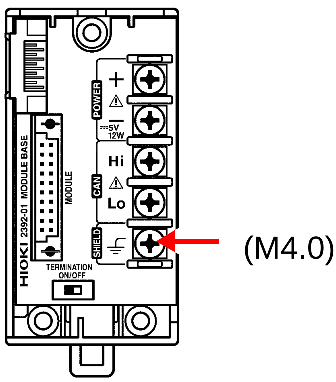


(Unit: mm)

Positions of Wall Mounting Holes

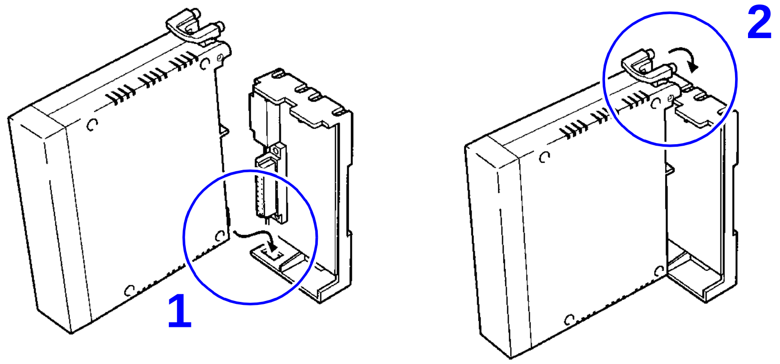
(3) Connecting the Functional Earthing Terminal

Ground the functional earthing terminal.
We recommend that you use a cable with a conductor cross section of 0.75 mm^2 (AWG18) or more and a round solderless terminal (tightening torque: 1.2 N·m).
Example: RAV1.25-4, BT1.25-F4



(4) Mounting a Module on the Module Base

Connect a module to the connector of the module base as shown below. Ensure that the levers make a clicking sound.



20.2.2 Connecting Power Supply Output Cord (2392-01 only)

CAUTION

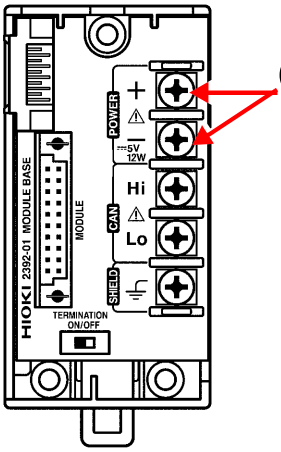
- **Before turning the instrument on, make sure the supply voltage matches that indicated on the its power connector.**
- **Be careful to avoid connecting voltage improperly, as the internal circuitry may be destroyed.**
- **Ensure that the cable is not live when connecting it. This will prevent short-circuiting.**
- **Ensure that module base power is OFF when connecting the power supply output cable. If the switch is ON when connecting the power cable, sparks may be generated and ignite a battery, organic solvent, or any other nearby volatile substance.**

NOTE

- A cable more than 1 meter (3.28 feet) long may be affected by external noise or the electromagnetic environment, and instruments may malfunction due to a drop in supply voltage.
- When the 2392-01 supplies power to the auxiliary equipment, only one 2392-02 base is connectable to the 2392-01.)

To supply power (5 VDC, 12 W) to the auxiliary equipment, use the power supply output cable to connect the power supply output terminal to the equipment.

❖ **20.1.3 "Name and Function of the Parts"(P.320)**



For the power supply output cable, use a cable with a conductor cross section of 1.0 mm^2 or more and length of up to 1 meter (3.28 feet).

Example:

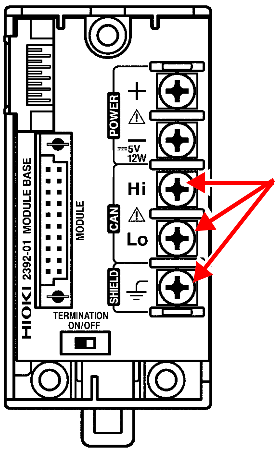
UL1007 AWG18/AWG16 (equivalent to 0.75 mm^2/1.25 mm^2) or equivalent

300 V vinyl-cabtire cable 2-core, 1.0 mm^2 or more
The cable length shall not exceed 1 meter.

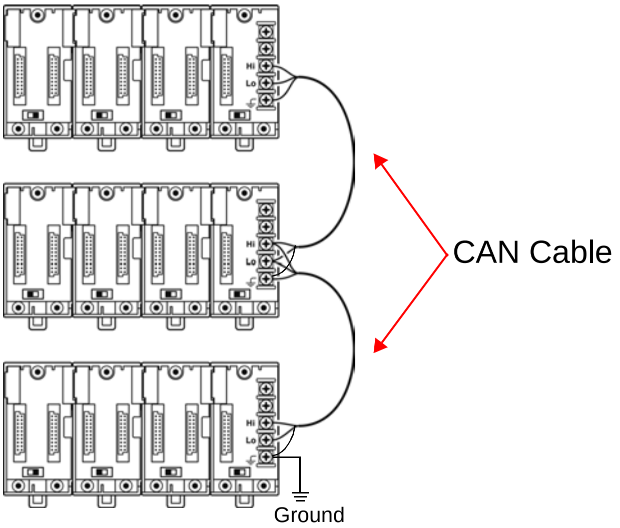
We recommend using a round solderless terminal for the connection.
Example:
RAV1.25-4, BT1.25-F4

20.2.3 Connecting the CAN Cable

Extending the internal bus by connecting CAN cables to the CAN terminals allows up to 63 measurement modules to be connected to a single communications module.



Use a CAN cable that complies with ISO 11898.



Connect Hi to Hi and Lo to Lo of the module bases.
Only the CAN termination switch located on either side (a total of two) should be turned on. After all connections have been completed, check to make sure that the resistance between Hi and Lo is approx. 60 Ω.

NOTE

- Ensure length of all cables do not exceed 100 m (328 feet).
- When electric potential occurs between the functional earth terminals in the module base, CAN communications may not operate smoothly. When this happens, connect the shield wires of the CAN cable to the respective module bases and only 1 earth wire to earth, as shown in the diagram.

20.3 Specifications

20.3.1 Basic Specifications

Basic functions	Sends signals and supply power to remote measurement system modules connected thereto via the built-in internal bus (CAN bus). Also supplies power to the auxiliary equipment (2392-01 only).

2392-01

Number of module connection connectors	1 connector (All connectors are used for a power supply module.)
Interface	Connector for internal bus extension 3 terminals × 1 Hi Lo Shield Power supply terminal 2 terminals × 1 VCC GND Connector for module base connection (For connection with the 2392-02)

2392-02

Number of module connection connectors	2 connectors
Interface	Connector for module base connection (left, For connection with the 2392-02) Connector for module base connection (right, For connection with the 2392-01/02)

20.3.2 Function Specifications

Internal bus termination	Terminates the internal bus with a termination switch.

20.3.3 General Specifications

Dimensions	2391-01: Approx. 46W × 90H × 18.5D mm 2392-02: Approx. 46W × 90H × 18.5D mm (1.81"W × 3.54"H × 0.73"D) (excluding projections)
Mass	2392-01: Approx. 50 g (1.8 oz.) 2392-02: Approx. 45 g (1.6 oz.)
Operating temperature and humidity	0 to 50°C (32 to 122°F), 80%RH or less (with no condensation)
Storage temperature and humidity	-10 to 50°C (14 to 122°F), 80%RH or less (with no condensation)
Operating environment	Indoors, altitude up to 2000 m (6562-ft.)
Standards applying	Safety EN61010 Pollution degree 2 EMC EN61326 Class A

Maintenance and Service 21

21.1 Cleaning

To clean the instrument, wipe it gently with a soft cloth moistened with water or mild detergent. Never use solvents such as benzene, alcohol, acetone, ether, ketones, thinners or gasoline, as they can deform and discolor the case.

21.2 Servicing

⚠CAUTION

Never modify the instrument. Only Hioki service engineers should disassemble or repair the instrument. Failure to observe these precautions may result in fire, electric shock, or injury.

- If the instrument seems to be malfunctioning, confirm that the cables are not open circuited before contacting your dealer or Hioki representative.
- When sending the instrument for repair, remove the batteries and pack carefully to prevent damage in transit. Include cushioning material so the instrument cannot move within the package. Be sure to include details of the problem. Hioki cannot be responsible for damage that occurs during shipment.
- When transporting (moving) the instrument or an apparatus incorporating the instrument, take appropriate measures to prevent the instrument protruding (by taping the front, for example).
- The instrument contains a built-in backup lithium battery, which offers a service life of about five years. If the date and time deviate substantially when the instrument is switched on, it is the time to replace that battery. Contact your dealer or Hioki representative.

HIOKI

DECLARATION OF CONFORMITY

Manufacturer's Name:	HIOKI E.E. CORPORATION
Manufacturer's Address:	81 Koizumi, Ueda, Nagano 386-1192, Japan
Product Name:	HUMIDITY MODULE
Model Number:	2301-20
Option:	9764-50 HUMIDITY SENSOR

The above mentioned products comform to the following product specifications:

Safety: EN61010-1:2001

EMC: EN61326-1:2006
Class A equipment
Equipment intended for use in industrial location

Supplementary Information:

The product herewith complies with the requirements of the EMC Directive 2004/108/EC, but is not applicable to the Low Voltage Directive 2006/95/EC.

HIOKI E.E. CORPORATION

20 November 2008

Atsushi Mizuno

Atsushi Mizuno

Director of Quality Assurance

2301A999-02

HIOKI

DECLARATION OF CONFORMITY

Manufacturer's Name:	HIOKI E.E. CORPORATION
Manufacturer's Address:	81 Koizumi, Ueda, Nagano 386-1192, Japan
Product Name:	Pt MODULE
Model Number:	2302-20

The above mentioned product comforms to the following product specifications:

Safety:	EN61010-1:2001
EMC:	EN61326-1:2006 Class A equipment Equipment intended for use in industrial location

Supplementary Information:

The product herewith complies with the requirements of the EMC Directive 2004/108/EC, but is not applicable to the Low Voltage Directive 2006/95/EC.

HIOKI E.E. CORPORATION

20 November 2008

Atsushi Mizuno

Atsushi Mizuno

Director of Quality Assurance

2302A999-02

HIOKI

DECLARATION OF CONFORMITY

Manufacturer's Name:	HIOKI E.E. CORPORATION
Manufacturer's Address:	81 Koizumi, Ueda, Nagano 386-1192, Japan
Product Name:	TC MODULE
Model Number:	2303-20

The above mentioned product comforms to the following product specifications:

Safety:	EN61010-1:2001
EMC:	EN61326-1:2006 Class A equipment Equipment intended for use in industrial location

Supplementary Information:

The product herewith complies with the requirements of the EMC Directive 2004/108/EC, but is not applicable to the Low Voltage Directive 2006/95/EC.

HIOKI E.E. CORPORATION

20 November 2008

Atsushi Mizuno

Atsushi Mizuno

Director of Quality Assurance

2303A999-02

HIOKI

DECLARATION OF CONFORMITY

Manufacturer's Name:	HIOKI E.E. CORPORATION
Manufacturer's Address:	81 Koizumi, Ueda, Nagano 386-1192, Japan
Product Name:	PULSE MODULE
Model Number:	2304-21

The above mentioned product comforms to the following product specifications:

Safety:	EN61010-1:2001
EMC:	EN61326-1:2006 Class A equipment Equipment intended for use in industrial location

Supplementary Information:

The product herewith complies with the requirements of the EMC Directive 2004/108/EC, but is not applicable to the Low Voltage Directive 2006/95/EC.

HIOKI E.E. CORPORATION

20 November 2008

Atsushi Mizuno

Atsushi Mizuno

Director of Quality Assurance

2304B999-02

HIOKI

DECLARATION OF CONFORMITY

Manufacturer's Name:	HIOKI E.E. CORPORATION
Manufacturer's Address:	81 Koizumi, Ueda, Nagano 386-1192, Japan
Product Name:	INSTRUMENTATION MODULE
Model Number:	2305-20

The above mentioned product comforms to the following product specifications:

Safety:	EN61010-1:2001
EMC:	EN61326-1:2006 Class A equipment Equipment intended for use in industrial location

Supplementary Information:

The product herewith complies with the requirements of the EMC Directive 2004/108/EC, but is not applicable to the Low Voltage Directive 2006/95/EC.

HIOKI E.E. CORPORATION

20 November 2008

Atsushi Mizuno

Atsushi Mizuno

Director of Quality Assurance

2305A999-02

HIOKI

DECLARATION OF CONFORMITY

Manufacturer's Name:	HIOKI E.E. CORPORATION
Manufacturer's Address:	81 Koizumi, Ueda, Nagano 386-1192, Japan
Product Name:	MULTIFUNCTION MODULE
Model Number:	2306-20

The above mentioned product comforms to the following product specifications:

Safety: EN61010-1:2001

EMC: EN61326-1:2006
Class A equipment
Equipment intended for use in industrial location

Supplementary Information:

The product herewith complies with the requirements of the EMC Directive 2004/108/EC, but is not applicable to the Low Voltage Directive 2006/95/EC.

HIOKI E.E. CORPORATION

20 November 2008

Atsushi Mizuno

Atsushi Mizuno

Director of Quality Assurance

2306A999-01

HIOKI

DECLARATION OF CONFORMITY

Manufacturer's Name:	HIOKI E.E. CORPORATION
Manufacturer's Address:	81 Koizumi, Ueda, Nagano 386-1192, Japan
Product Name:	WAVEFORM MODULE
Model Number:	2321-20

The above mentioned product conforms to the following product specifications:

Safety:	EN61010-1:2001
EMC:	EN61326-1:2006 Class A equipment Equipment intended for use in industrial location

Supplementary Information:

The product herewith complies with the requirements of the EMC Directive 2004/108/EC, but is not applicable to the Low Voltage Directive 2006/95/EC.

HIOKI E.E. CORPORATION

20 November 2008

Atsushi Mizuno

Atsushi Mizuno

Director of Quality Assurance

2321A999-01

HIOKI

DECLARATION OF CONFORMITY

Manufacturer's Name:	HIOKI E.E. CORPORATION
Manufacturer's Address:	81 Koizumi, Ueda, Nagano 386-1192, Japan
Product Name:	POWER METER MODULE
Model Number:	2331-20
Options:	L9019-02 VOLTAGE CORD L9019-03 VOLTAGE CORD L9019-04 VOLTAGE CORD

The above mentioned products comform to the following product specifications:

Safety:	EN61010-1:2001
	EN61010-031:2002+A1:2008
EMC:	EN61326-1:2006 Class A equipment Equipment intended for use in industrial location

Supplementary Information:

The products herewith comply with the requirements of the Low Voltage Directive 2006/95/EC and the EMC Directive 2004/108/EC.

HIOKI E.E. CORPORATION

26 October 2010

Atsushi Mizuno

Atsushi Mizuno

Director of Quality Assurance

2331A999-04

HIOKI

DECLARATION OF CONFORMITY

Manufacturer's Name:	HIOKI E.E. CORPORATION
Manufacturer's Address:	81 Koizumi, Ueda, Nagano 386-1192, Japan
Product Name:	POWER METER MODULE
Model Number:	2332-20
Options:	L9019-02 VOLTAGE CORD L9019-03 VOLTAGE CORD

The above mentioned products conform to the following product specifications:

Safety:	EN61010-1:2001 EN61010-031:2002+A1:2008
EMC:	EN61326-1:2006 Class A equipment Equipment intended for use in industrial location

Supplementary Information:

The products herewith comply with the requirements of the Low Voltage Directive 2006/95/EC and the EMC Directive 2004/108/EC.

HIOKI E.E. CORPORATION

26 October 2010

Atsushi Mizuno

Director of Quality Assurance

2332A999-04

HIOKI

DECLARATION OF CONFORMITY

Manufacturer's Name:	HIOKI E.E. CORPORATION
Manufacturer's Address:	81 Koizumi, Ueda, Nagano 386-1192, Japan
Product Name:	INPUT MODULE
Model Number:	2341-20

The above mentioned product comforms to the following product specifications:

Safety:	EN61010-1:2001
EMC:	EN61326-1:2006 Class A equipment Equipment intended for use in industrial location

Supplementary Information:

The product herewith complies with the requirements of the EMC Directive 2004/108/EC, but is not applicable to the Low Voltage Directive 2006/95/EC.

HIOKI E.E. CORPORATION

20 November 2008

Atsushi Mizuno

Atsushi Mizuno

Director of Quality Assurance

2341A999-02

HIOKI

DECLARATION OF CONFORMITY

Manufacturer's Name:	HIOKI E.E. CORPORATION
Manufacturer's Address:	81 Koizumi, Ueda, Nagano 386-1192, Japan
Product Name:	OUTPUT MODULE
Model Number:	2342-20

The above mentioned product comforms to the following product specifications:

Safety:	EN61010-1:2001
EMC:	EN61326-1:2006 Class A equipment Equipment intended for use in industrial location

Supplementary Information:

The product herewith complies with the requirements of the EMC Directive 2004/108/EC, but is not applicable to the Low Voltage Directive 2006/95/EC.

HIOKI E.E. CORPORATION

Atsushi Mizuno

20 November 2008

Atsushi Mizuno

Director of Quality Assurance

2342A999-02

HIOKI

DECLARATION OF CONFORMITY

Manufacturer's Name:	HIOKI E.E. CORPORATION
Manufacturer's Address:	81 Koizumi, Ueda, Nagano 386-1192, Japan
Product Name:	RS LINK MODULE
Model Number:	2343-20

The above mentioned products comform to the following product specifications:

Safety:	EN61010-1:2001
EMC:	EN61326-1:2006 Class A equipment Equipment intended for use in industrial location

Supplementary Information:

The product herewith complies with the requirements of the EMC Directive 2004/108/EC, but is not applicable to the Low Voltage Directive 2006/95/EC.

HIOKI E.E. CORPORATION

20 November 2008

Atsushi Mizuno

Atsushi Mizuno

Director of Quality Assurance

2343A999-02

HIOKI

DECLARATION OF CONFORMITY

Manufacturer's Name:	HIOKI E.E. CORPORATION
Manufacturer's Address:	81 Koizumi, Ueda, Nagano 386-1192, Japan
Product Name:	AIR MODULE
Model Number:	2351-20
Options:	9760 ANTENNA 9760-01 ANTENNA 9760-02 ANTENNA 9761 ANTENNA CABLE 9761-01 ANTENNA CABLE 9761-02 ANTENNA CABLE

The above mentioned products conform to the following product specifications:

Safety:	EN61010-1:2001
EMC:	EN61326-1:2006 Class A equipment Equipment intended for use in industrial location
R&TTE:	EN300 440-2 V1.3.1:2009

Supplementary Information:

The products herewith comply with the requirements of the R&TTE Directive 1999/5/EC.

HIOKI E.E. CORPORATION

28 February 2010

Atsushi Mizuno

Atsushi Mizuno

Director of Quality Assurance

2351A999-05

HIOKI

DECLARATION OF CONFORMITY

Manufacturer's Name:	HIOKI E.E. CORPORATION
Manufacturer's Address:	81 Koizumi, Ueda, Nagano 386-1192, Japan
Product Name:	WIRE MODULE
Model Number:	2352-20

The above mentioned products comform to the following product specifications:

Safety:	EN61010-1:2001
EMC:	EN61326-1:2006 Class A equipment Equipment intended for use in industrial location

Supplementary Information:

The product herewith complies with the requirements of the EMC Directive 2004/108/EC, but is not applicable to the Low Voltage Directive 2006/95/EC.

HIOKI E.E. CORPORATION

20 November 2008

Atsushi Mizuno

Atsushi Mizuno

Director of Quality Assurance

2352A999-02

HIOKI

DECLARATION OF CONFORMITY

Manufacturer's Name:	HIOKI E.E. CORPORATION
Manufacturer's Address:	81 Koizumi, Ueda, Nagano 386-1192, Japan
Product Name:	LAN MODULE
Model Number:	2353-20

The above mentioned products conform to the following product specifications:

Safety:	EN61010-1:2001
EMC:	EN61326-1:2006 Class A equipment Equipment intended for use in industrial location

Supplementary Information:

The product herewith complies with the requirements of the EMC Directive 2004/108/EC, but is not applicable to the Low Voltage Directive 2006/95/EC.

HIOKI E.E. CORPORATION

20 November 2008

Atsushi Mizuno

Atsushi Mizuno

Director of Quality Assurance

2353A999-02

HIOKI

DECLARATION OF CONFORMITY

Manufacturer's Name:	HIOKI E.E. CORPORATION
Manufacturer's Address:	81 Koizumi, Ueda, Nagano 386-1192, Japan
Product Name:	MEMORY MODULE
Model Number:	2354-20

The above mentioned product conforms to the following product specifications:

Safety:	EN61010-1:2001
EMC:	EN61326-1:2006 Class A equipment Equipment intended for use in industrial location

Supplementary Information:

The product herewith complies with the requirements of the EMC Directive 2004/108/EC, but is not applicable to the Low Voltage Directive 2006/95/EC.

HIOKI E.E. CORPORATION

20 November 2008

Atsushi Mizuno

Atsushi Mizuno

Director of Quality Assurance

2354A999-01

HIOKI

DECLARATION OF CONFORMITY

Manufacturer's Name:	HIOKI E.E. CORPORATION
Manufacturer's Address:	81 Koizumi, Ueda, Nagano 386-1192, Japan
Product Name:	AC POWER MODULE
Model Number:	2361-20
Option:	9239-20 POWER CORD

The above mentioned products conform to the following product specifications:

Safety: EN61010-1:2001

EMC: EN61326-1:2006
Class A equipment
Equipment intended for use in industrial location
EN61000-3-2:2006
EN61000-3-3:1995+A1:2001+A2:2005

Supplementary Information:

The products herewith comply with the requirements of the Low Voltage Directive 2006/95/EC and the EMC Directive 2004/108/EC.

HIOKI E.E. CORPORATION

12 November 2008

Atsushi Mizuno

Atsushi Mizuno

Director of Quality Assurance

2361A999-04

HIOKI

DECLARATION OF CONFORMITY

Manufacturer's Name: HIOKI E.E. CORPORATION

Manufacturer's Address: 81 Koizumi, Ueda, Nagano 386-1192, Japan

Product Name: DC POWER MODULE

Model Number: 2362-20

The above mentioned product comforms to the following product specifications:

Safety: EN61010-1:2001

EMC: EN61326:1997+A1:1998+A2:2001+A3:2003
Class A equipment
Equipment intended for use in industrial location

Supplementary Information:

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC.

HIOKI E.E. CORPORATION

6 April 2006

T. Yoshiike

Tatsuyoshi Yoshiike

President

2362A999-01

HIOKI

DECLARATION OF CONFORMITY

Manufacturer's Name:	HIOKI E.E. CORPORATION
Manufacturer's Address:	81 Koizumi, Ueda, Nagano 386-1192, Japan
Product Name:	MODULE BASE
Model Number:	2391-01, 2391-02, 2391-03 2392-01, 2392-02

The above mentioned products comform to the following product specifications:

Safety:	EN61010-1:2001
EMC:	EN61326-1:2006 Class A equipment Equipment intended for use in industrial location

Supplementary Information:

The product herewith complies with the requirements of the EMC Directive 2004/108/EC, but is not applicable to the Low Voltage Directive 2006/95/EC.

HIOKI E.E. CORPORATION

20 November 2008

Atsushi Mizuno

Atsushi Mizuno

Director of Quality Assurance

2391A999-02

HIOKI

HIOKI E. E. CORPORATION

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Technical Support Section

- All reasonable care has been taken in the production of this manual, but if you find any points which are unclear or in error, please contact your supplier or the International Sales and Marketing Department at Hioki headquarters.
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