User's Manual

DA100
Data Acquisition Unit

DARWIN

IM DA100-01E

YOKOGAWA
Yokogawa Electric Corporation

IM DA100-01E
8th Edition

Foreword

Thank you for purchasing the YOKOGAWA DA100 Data Acquisition System (DA100/DS400/DS600).
This User's Manual contains useful information regarding the instrument's functions and operating procedures, as well as precautions that should be observed during use. To ensure proper use of the instrument, please read this manual thoroughly before operating it.
Keep the manual in a safe place for quick reference whenever a question arises.
The following manuals are provided with the instrument in addition to this manual.

Manual Name	Manual No.
DA100 Communication Interface	IMDA100-11E
Standard Software for DA100	IMDP10001-62E

Notes

- DARWIN is a system comprising a number of data-acquisition equipment components. In the course of system growth, new models, software, various input/output modules and optional features are added to the family to enhance the systems expandability and flexibility. You can check the versions of your equipment and software by referring to the style number (Sn) and release number (Rn) respectively which are shown on the nameplate of the main unit.
  When configuring a system, you must confirm that the style number of each component unit and software meets the following requirements:
  1 the style number of each input/output module must be the same as or lower than that of the main unit or subunit to which the module is connected.
  2 the release number of a dedicated software package must be the same or higher than the style number of the main unit or subunit where the package is installed and where it performs control.

  Any equipment/software not meeting these requirements might have incompatible areas with your system configuration.
  In this manual, equipment of style S8 is explained.
- The contents of this manual are subject to change without prior notice as a result of improvements in the instrument's performance and functions.
- Every effort has been made in the preparation of this manual to ensure the accuracy of its contents. However, should you have any questions or find any errors, please contact your nearest YOKOGAWA representative as listed on the back cover of this manual.
- Copying or reproduction of all or any part of the contents of this manual without YOKOGAWA's permission is strictly prohibited.

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6th Edition: November 1998
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8th Edition: October 2000

Disk No. RE02
8th Edition: October 2000 (YK)

About the Style Number

Products with style numbers S6, S7, and S9 are not sold.
The following functions are available for DC100 with style number S2:
• Computation function (including remote RRJC)
The following functions are available for DC100 with style number S3:
• RS-422-A/RS-485 communication module
The following functions are available for DC100 with style number S4:
• Pulse input module
• GP-IB module
The following functions are available for DC100 with style number S5:
• mA-input/power monitor/strain input module
• Extension module and extension base
• Report function
The following functions are available for DC100 with style number S8:
• Digital input module
• Ethernet module/RS-232-C module/RS-422-A/RS-485 module
• Measurement of active power and apparent power on ch3 to ch6 for power monitor module
The following functions are available for DC100 with style number S10:
• Retransmission module

Checking the Contents of the Package

Unpack the box and check the contents before operating the instrument. In case the wrong instrument or accessories have been delivered, or if some accessories are not present, or if they seem abnormal, contact the dealer from which you purchased them. Futhermore, please contact a Yokogawa representative to order any of parts as follows.

Main Unit DA100

Check that model and suffix code given on the name plate are according to your order.

Model and Suffix Codes

Model	Suffix Code	Description
DA100	.....	Main Unit DA100
Type	-1	Stand-alone model
	-2	Expandable model
	-B	DU100-11 (Input module) and DT300-21 (Communication module) are attached
	-C	DU100-21 (Input module) and DT300-21 (Communication module) are attached
	-D	DU100-31 (Input module) and DT300-21 (Communication module) are attached
Software	3	Software
Power Supply	-1	100-240VAC
	-2	12-28VDC
Power Cord	D	3-pin inlet w/UL, CSA cable (Part No. A1006WD)
	F	3-pin inlet w/VDE cable (Part No. A1004WD)
	R	3-pin inlet w/SAA cable (Part No. A1024WD)
	S	3-pin inlet w/BS cable (Part No. A1023WD)
	W	3-pin inlet with screw conversion terminal
	Y	No power cord, 2-pin round-type connector
Option	/M1	Optional math function (included remote RJC and event/action functions)
	/M3	Report fuction

NO. (Instrument Number), Style number (equipment) and Release number (software package)

Please quote these numbers when contacting the dealer.

Subunit DS400/DS600

Check that model and suffix code given on the name plate are according to your order.

Model and Suffix Codes

Model	Suffix Code	Description		
DS400	.....	4-module connection subunit		
DS600	.....	6-module connection subunit		
Type	00	always 00		
Power Supply	-1	100-240VAC		
	-2	12-28VDC		
Power Cord	D	3-pin inlet w/UL, CSA cable	S	3-pin inlet w/BS cable
	F	3-pin inlet w/VDE cable	W ...	3-pin inlet with screw conversion terminal
	R	3-pin inlet w/SAA cable	Y	No power cord, 2-pin round-type connector

NO. (Instrument Number) and Style number (equipment)

Please quote these numbers when contacting the dealer.

Input Modules

Check that model code given on the name plate is according to your order.

Model Codes

Model	Description
DU100-11	10-channel universal input module, screw type terminal
DU100-21	20-channel universal input module, screw type terminal
DU100-31	30-channel universal input module, screw type terminal
DU100-12	10-channel universal input module, clamp type terminal
DU100-22	20-channel universal input module, clamp type terminal
DU100-32	30-channel universal input module, clamp type terminal
DU200-11	10-channel DCV/TC/DI input module, screw type terminal
DU200-21	20-channel DCV/TC/DI input module, screw type terminal
DU200-31	30-channel DCV/TC/DI input module, screw type terminal
DU200-12	10-channel DCV/TC/DI input module, clamp type terminal
DU200-22	20-channel DCV/TC/DI input module, clamp type terminal
DU200-32	30-channel DCV/TC/DI input module, clamp type terminal
DU300-11	10-channel, mA-input module with screw terminals
DU300-12	10-channel, mA-input module with clamp terminals
DU400-12	Power monitor module for single-phase use
DU400-22	Power monitor module for three-phase use
DU500-12	10-channel, strain input module with 120-Ω bridge resistors
DU500-22	10-channel, strain input module with 350-Ω bridge resistors
DU500-32	10-channel, strain input module with NDIS terminals
DU600-11	10-channel, pulse input module with screw terminals
DU700-11	10-channel, digital input module with screw terminals

NO. (Instrument Number)

Please quote this instrument number when contacting the dealer.

I/O Terminal Modules

Check that model code given on the name plate is according to your order.

Model Codes

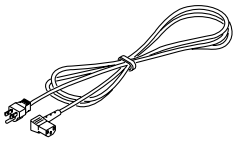
Model	Description
DT100-11	DI/DO module, screw type terminal
DT200-11	Alarm output module (4 transfer contacts), screw type terminal
DT200-21	Alarm output module (10 make contacts), screw type terminal
DT300-11	GP-IB module
DT300-21	RS-232C module, D-sub terminal
DT300-31	RS-422-A/RS-485 module
DT300-41	Ethernet module
DT500-11	1-5 V retransmission module, screw type terminal
DT500-21	4-20 mA retransmission module, screw type terminal

NO. (Instrument Number) and Style number (equipment)

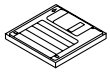
Please quote these numbers when contacting the dealer.

Standard Accessories

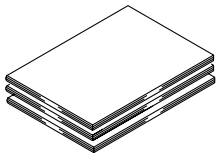
1 power cord (conform your order)



1 3.5" floppy disk

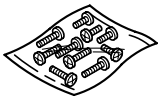


4 User's manuals
- **IM DA100-01E**
- **IM DA100-11E**
- **IM DP12013-61E**



1 clamp filter (Part No. A1179MN, when power supply code is -1)

M4 screws (for 1 unit) (4 to fasten the feet, 6 for panel installation)



DC power terminal connector (when power supply code is -2)

DA100-B, DA100-C, and DA100-D are appended to the following accessories in addition to the above-mentioned standard accessories by the customer of purchase.

Main Unit Type	Name	Model	Q'ty
DT100-B	10-channel universal input module	DU100-11	1
	RS-232-C module	DT300-21	1
	RS-232-C cable		1
DT100-C	20-channel universal input module	DU100-21	1
	RS-232-C module	DT300-21	1
	RS-232-C cable		1
DT100-D	30-channel universal input module	DU100-31	1
	RS-232-C module	DT300-21	1
	RS-232-C cable		1

Note

When DA100-B, DA100-C, and DA100-D are used while bought, the system need not be restructured. However, when the position where the module is installed is changed or another module is installed, it is necessary to restructure the system.

Optional Accessories

Name	Model	Description
Extender module	DV100-011	
Extender base	DV100-012	
Extension cable	DV200-000	Length: 0.5m
Extension cable	DV200-001	Length: 1m
Extension cable	DV200-002	Length: 2m
Extension cable	DV200-005	Length: 5m
Extension cable	DV200-010	Length: 10m
Extension cable	DV200-020	Length: 20m
Extension cable	DV200-050	Length: 50m
Extension cable	DV200-100	Length: 100m
Extension cable	DV200-200	Length: 200m
Extension cable	DV200-300	Length: 300m
Extension cable	DV200-400	Length: 400m
Extension cable	DV200-500	Length: 500m
Shunt resistance	DV300-011	10Ω, for screw
Shunt resistance	DV300-012	10Ω, for clamp
Shunt resistance	DV300-101	100Ω, for screw
Shunt resistance	DV300-102	100Ω, for clamp
Shunt resistance	DV300-251	250Ω, for screw
Shunt resistance	DV300-252	250Ω, for clamp
Rack mount kit	DV400-011	ANSI/EIA standard
Strain conversion cable	DV450-001	
Cable adapter	DV250-001	for expanding cables
AC adapter	DV500-001	2-pin inlet w/UL, CSA cable for DC100/DA100/ DS400/DS600
	DV500-002	2-pin inlet w/VDE cable for DC100/DA100/DS400/ DS600
	DV500-003	2-pin inlet w/SAA cable for DC100/DA100/DS400/ DS600
	DV500-004	2-pin inlet w/BS cable for DC100/DA100/DS400/ DS600

Software

Name	Model	Description
DAQ Software 32	DP120-13	Same as the standard accessory
DAQ Software 32 Plus	DP320-13	

Safety Precautions

This instrument is an IEC safety class I instrument (provided with terminal for protective grounding).
The following general safety precautions must be observed during all phases of operation, service and repair of this instrument. If this instrument is used in a manner not sepecified in this manual, the protection provided by this instrument may be impaired. Also, YOKOGAWA Electric Corporation assumes no liability for the customer's failure to comply with these requirements.

The following symbols are used on this instrument.


To avoid injury, death of personnel or damage to the instrument, the operator must refer to an explanation in the User's Manual or Service Manual.


Protective grounding terminal.


Alternating current.

ON(power).


OFF(power).

Make sure to comply with the following safety precautions. Not complying might result in injury, death of personnel or damage to the instrument.

WARNING

Power Supply
Ensure the source voltage matches the voltage of the power supply before turning ON the power.

Power Cable and Plug
To prevent an electric shock or fire, be sure to use the power cord supplied by YOKOGAWA. The main power plug must be plugged in an outlet with protective grounding terminal. Do not invalidate protection by using an extension cord without protective grounding.

Protective Grounding
Make sure to connect the protective grounding to prevent an electric shock before turning ON the power.

Necessity of Protective Grounding
Never cut off the internal or external protective grounding wire or disconnect the wiring of protective grounding terminal. Doing so poses a potential shock hazard.

Defect of Protective Grounding and Fuse
Do not operate the instrument when protective grounding or fuse might be defective.

Do not Operate in an Explosive Atmosphere
Do not operate the instrument in the presence of flammable liquids or vapors. Operation of any electrical instrument in such an environment constitutes a safety hazard.

Do not Remove any Covers
There are some areas with high voltages. Do not remove any cover if the power supply is connected. The cover should be removed by qualified personnel only.

External Connection
To ground securely, connect the protective grounding before connecting to measurement or control unit.

How to Use this Manual

This User's Manual consists of the following four chapters and an Index.

Chapter	Title	Description
Chapter 1	**System configuration**	Explains the position of the DA100 system within DARWIN, its configuration, functions, etc..
Chapter 2	**Installation and Wiring**	Explains how to install and wire the DA100.
Chapter 3	**Trouble-shooting and Maintenance**	Explains how to analyse troubles and what to do in case trouble occurs.
Chapter 4	**Specifications**	Explains basic output settings such as the output mode, type, frequency and voltage.
Index		Gives the index in alphabetical order.

Conventions Used in this Manual

Units

k ..... means "1000". Example: 100kHz
K ..... means "1024". Example: 128Kword

Used Characters

Alphanumerics enclosed in double quotation marks usually refer to characters and set values that appear on the screen and panel.

Note

The following symbol marks are used to attract the operator's attention.

Affixed to the DA100/DS400/DS600, indicating that for safety, the operator should refer to the appropriate User's Manual. For a list of the User's Manuals, refer to page 1.

WARNING Describes precautions that should be observed to prevent the danger of injury or death to the user.

CAUTION Describes precautions that should be observed to prevent damage to the DA100/DS400/DS600.

Note Provides information that is important for proper operation of the DA100/DS400/DS600.

Contents

1.1 About DARWIN

Created from a completely new concept that is based on modular architecture, the group of next generation's data acquisition systems is called **DARWIN (Data Acquistion and Recording Windows)**.

Today many data acquisition networks are increasingly being linked together. More than ever before, large volume, high speed, accurate, easy-to-use communication functions are essential in many disciplines.

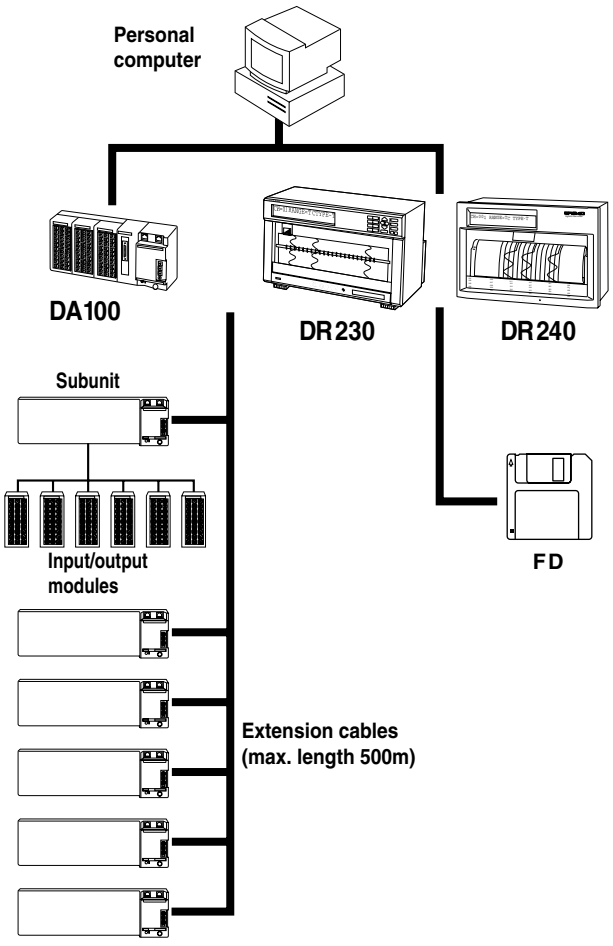
In a world of measurement and control where the number of measurement points has increased sharply, the ability to acquire information from a large number of points easily and economically is crucial. Interfacing to a personal computer allows simplified utilization of the information while improving quality and efficiency.

DARWIN is based on a unique, new concept to meet these needs. The art of measurement is revolutionized by **DARWIN** which integrates functions of conventional recording and data logging.

Most existing data acquisition equipment has been the all-in-one type in which the measurement section and display/recording section are contained in one box. While this simplifies operation on the one hand, it is difficult to adapt to changes in the measurement environment and also makes expansion difficult.

DARWIN uses a data acquisition engine and remote I/O modules which are completely separate from each other. It is an entirely new product line which quickly and flexibly copes with various restrictive conditions and changes in specifications.

Supported by a personal computer, a whole line-up can be created starting whith the data acquisitions system DA100 which performs data logging. For example, using a printer as the output device, the equipment becomes a hybrid recorder (DR series).



1.2 DA100's System Configuration

The DA100 is a data acquisition unit which allows data logging on a personal computer of small scale, 10-ch data logging up to 300-ch, multi-point measurements.
Measurement data can be analyzed in real-time on the PC, as the DA100 can be controlled using communication interface.
There are two types of DA100, the DA100 stand-alone type, and the DA100 expandable type.

DA100 Stand-alone type

Being suitable for small scale data logging between 10 and 40ch, the light-weight main unit allows an easy and quick setting up.

DA100 Expandable type

The expandable type consists of one main unit and by connecting up to six subunits (DA400/DS600), the number of measurement points can be expanded to a maximum of 300ch. Using dedicated twisted-pair cables between each unit, it is possible to connect up to 500 meters. Since even measurement objects scattered over a wide area can be wired fast and with a minimum of wiring, a flexible, extensive measurement system can be configured.
The input modules to be connected to the DA100 or DA400/DS600 are in units of 10ch and can be selected from the following, in order to match your measurement conditions.

- Universal Input Module and DCV/TC/DI Input Module

  Temperature, DC voltage, and contact signals can be measured, but cannot be connected to a system's main unit.
- mA-input Module

  This module can directly measure DC currents ranging from -20 mA to 20 mA since it contains shunt resistors. It cannot be connected to a system's main unit.
- Power Monitor Module

  This module can measure the effective voltage, effective current, active power, reactive power, apparent power, frequency, power factor and phase angle for an AC voltage or AC current input. It is available in either a single-phase or three-phase model. This module cannot be connected to a system's main unit.
- Strain Input Module

  This module can measure strain. It is available in either a model with built-in 120- or 350- Ω bridge resistors or a model with NDIS terminals where bridge resistors are connected externally. The module cannot be connected to a system's main unit.
- Pulse input module (to be released soon)

  When inputting a TTL signal or contact signal from a revolution counter or flow meter, the number of pulses can be counted, computation can be carried out, etc..
- Digital Input Module

  This module can measured contact signal, but cannot be connected to a system's main unit.
- Communication module

  For transfer of setting parameters and measurement data by communication interface.
- Alarm output module

  Outputs alarm signals as contact signals.
- DI/DO module

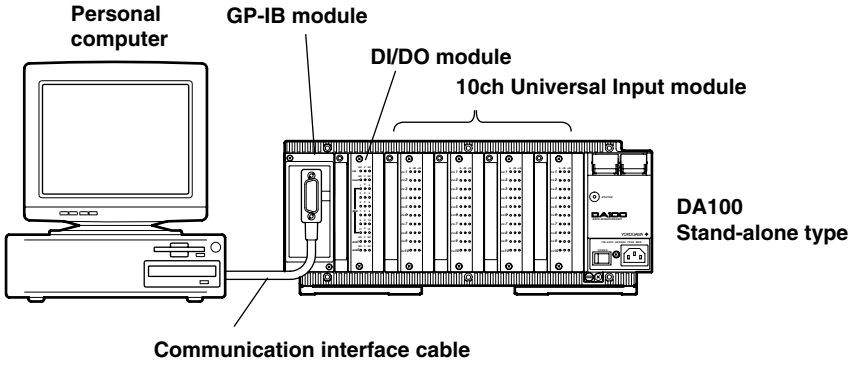
  Allows output of a signal in case of alarm or failure.
- Retransmission module

  This module deals with data that are measured or computed by the product, or set by a personal computer via a communication interface. The modules convert them to 1-5 V analog voltage or 4-20 mA analog current signals for output. The module cannot be connected to the expanable model's main unit.
- Extender module

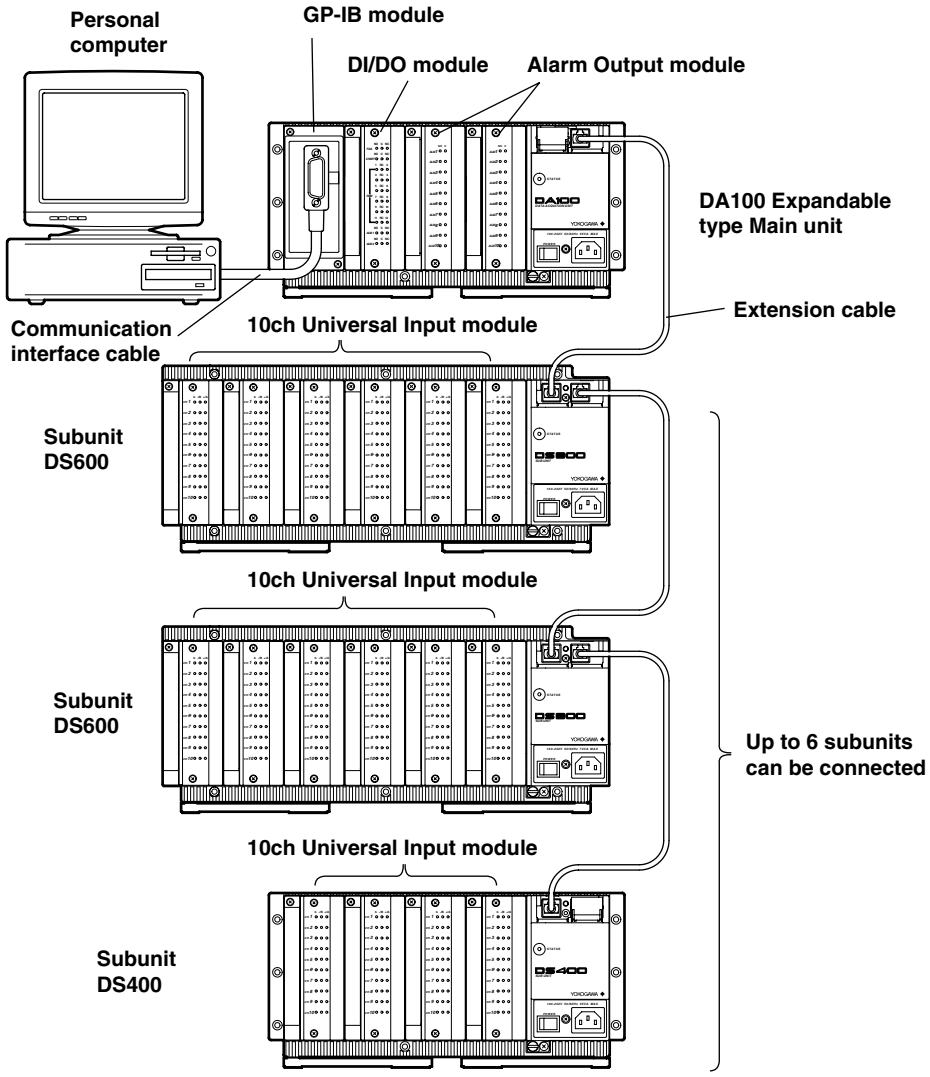
  To provide power supply to far away input modules.

Connection example

Stand-alone type

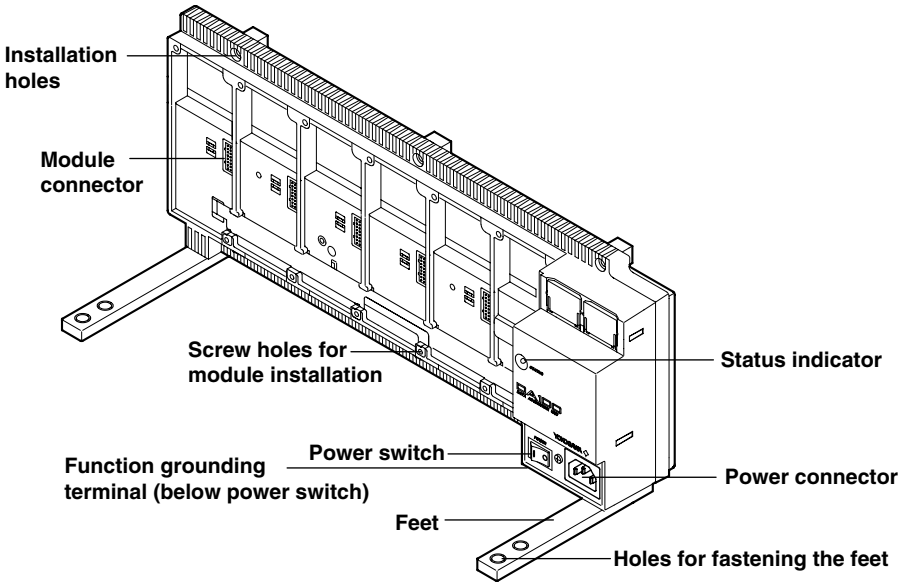


Expandable type

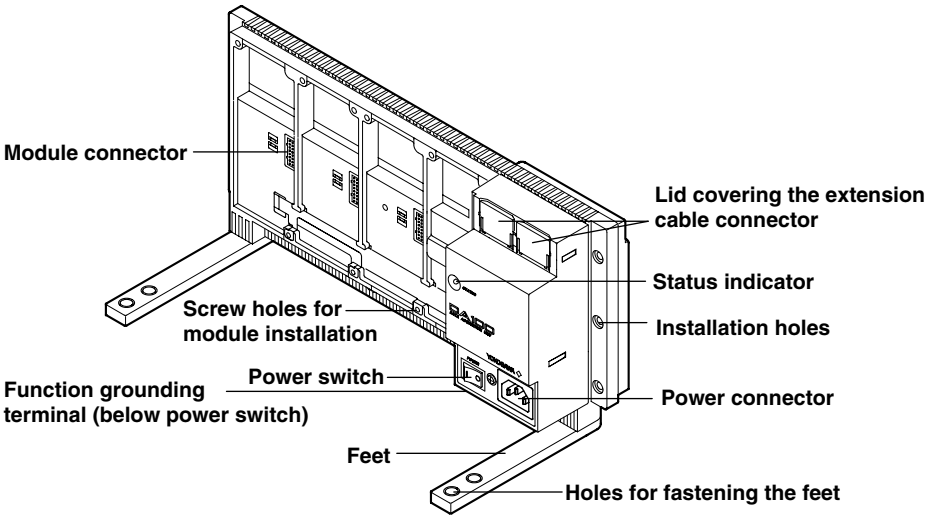


1.3 Name and Function of Each Part

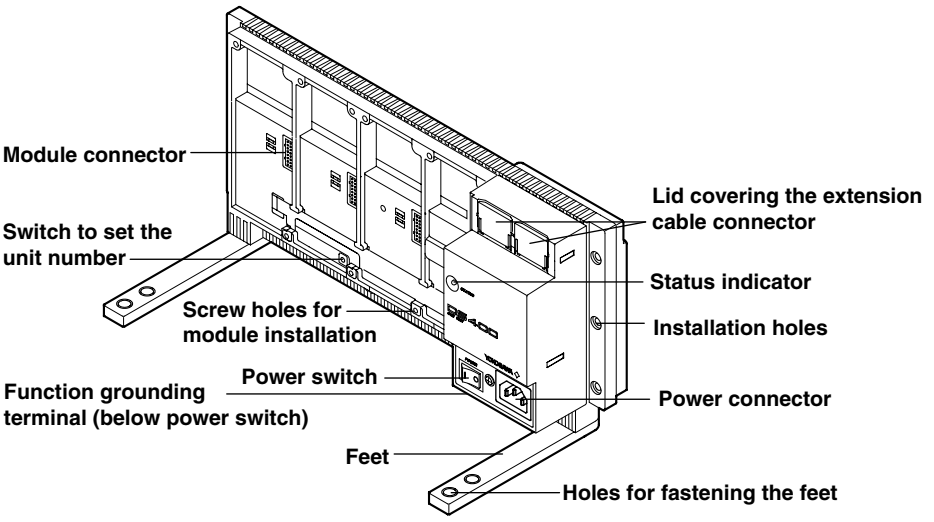
DA100 Stand-alone type (DA100-1)



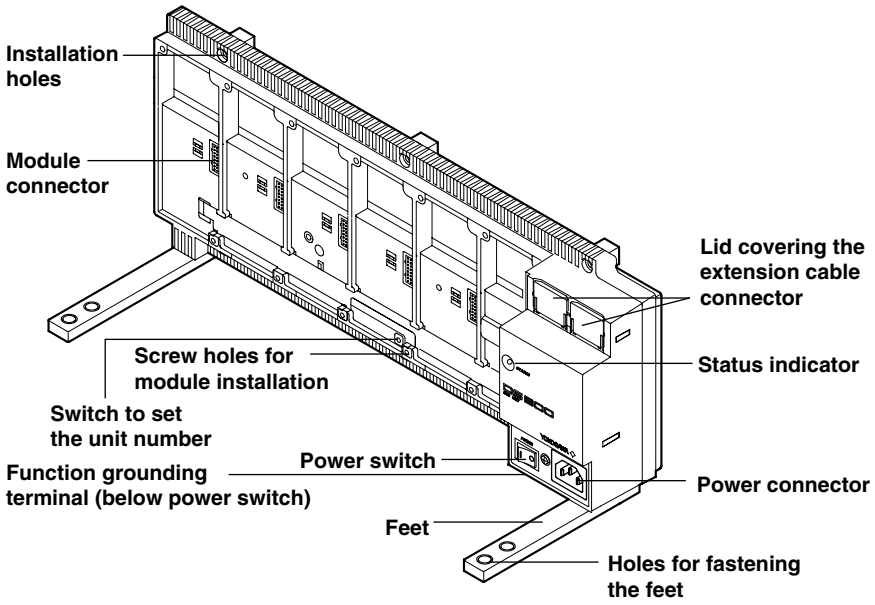
DA100 Expandable type (DA100-2)



Subunit DS400

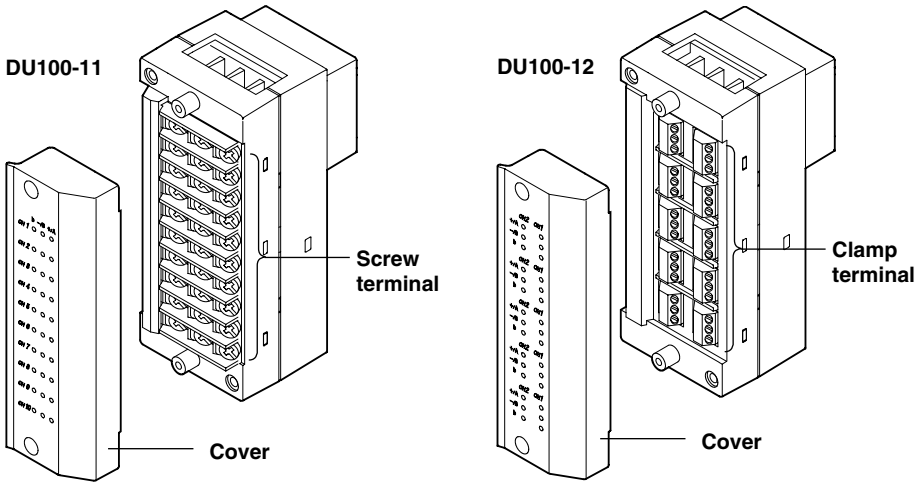


Subunit DS600



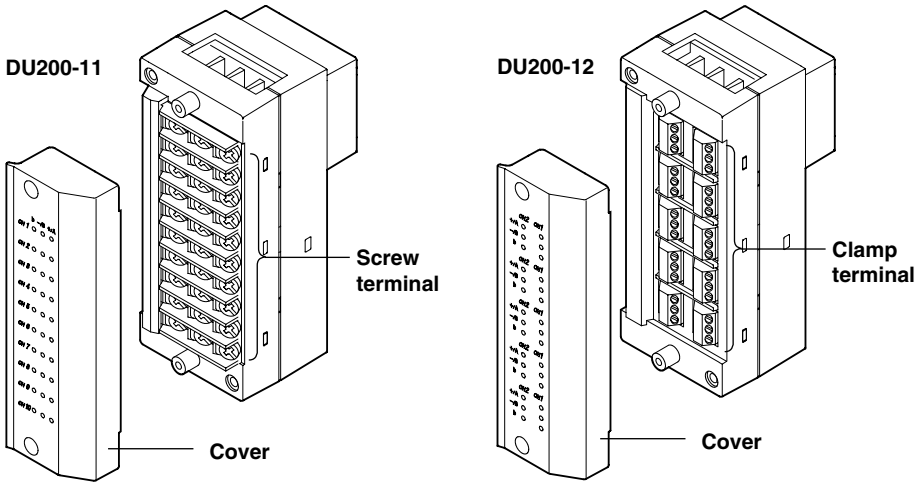
Input modules

10-ch Universal input module (DU100-11/DU100-12)



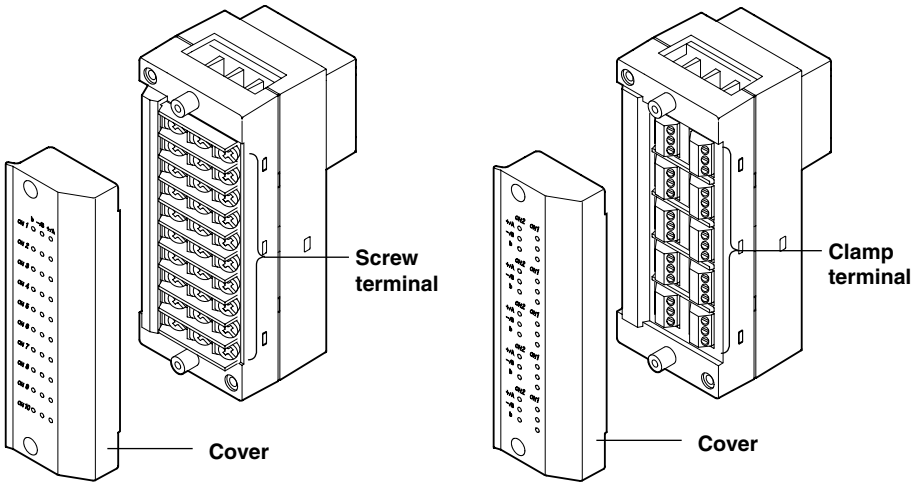
The 20-ch Universal input modules (DU100-21/DU100-22) and the 30-ch Universal input modules (DU100-31/DU100-31) are similar to the ones shown above.

10-ch DCV/TC/DI input module (DU200-11/DU200-12)

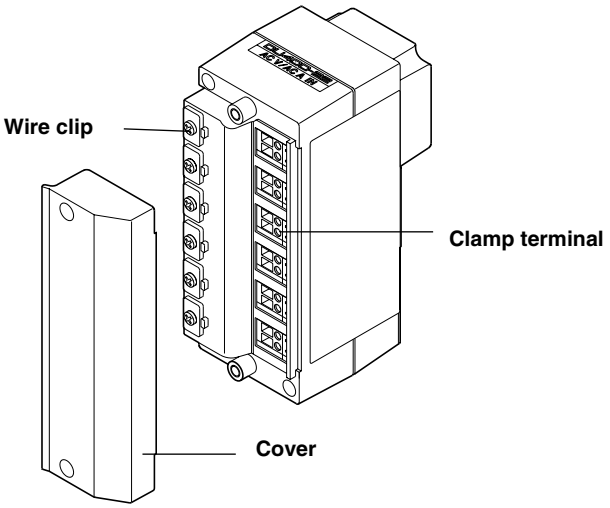


The 20-ch DCV/TC/DI input modules (DU200-21/DU200-22) and the 30-ch DCV/TC/DI input modules (DU200-31/DU200-31) are similar to the ones shown above.

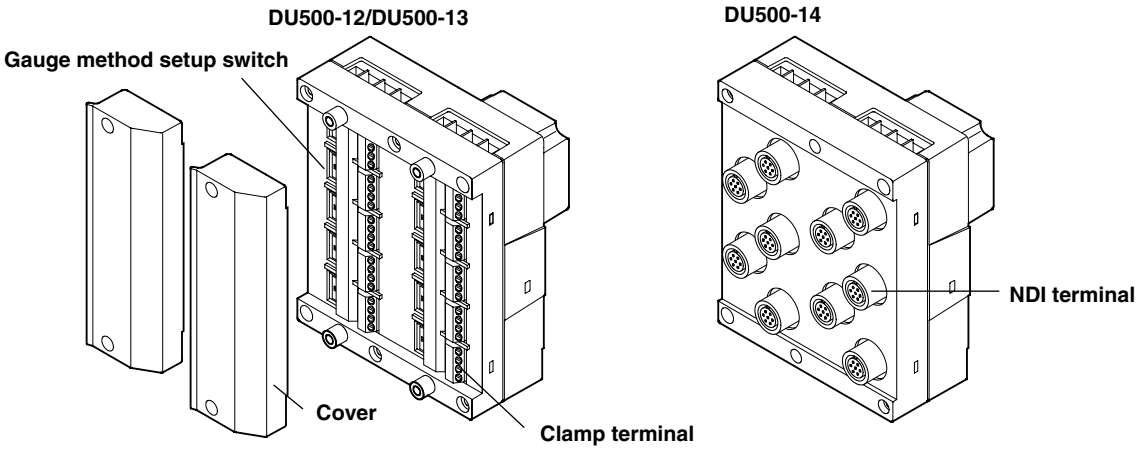
mA input module (DU300-11/DU300-12)



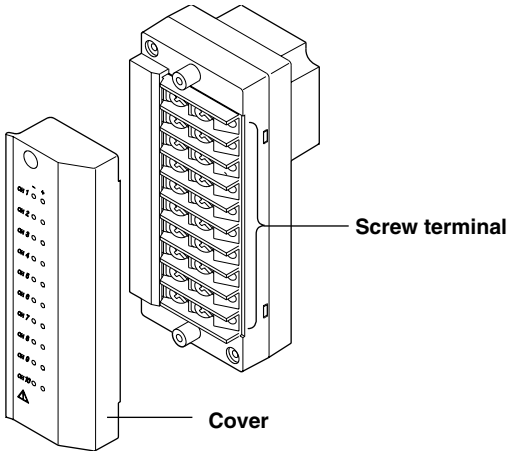
Power monitor module (DU400-12/22)



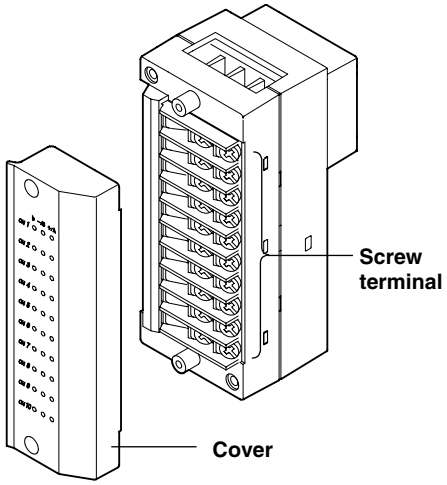
Strain input module (DU500-12/DU500-13/DU500-14)



Pulse input module (DU600-11)

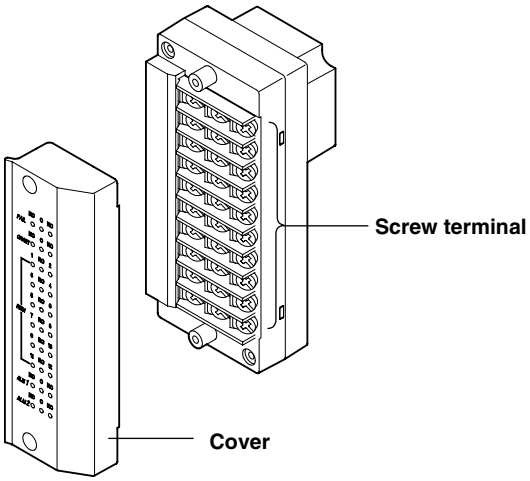


Digital input module (DU700-11)

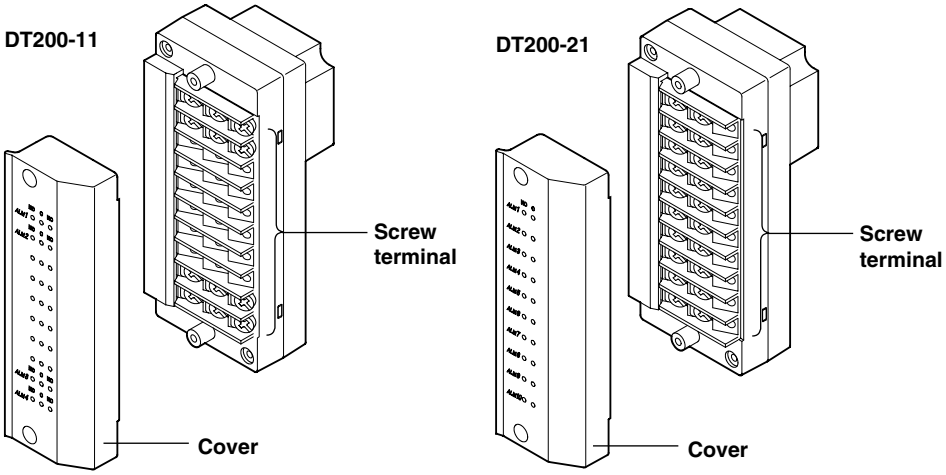


I/O Terminal Modules

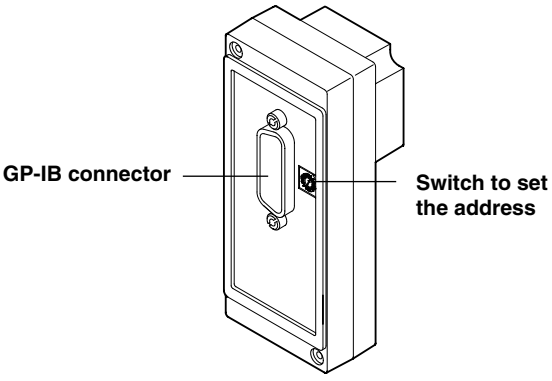
DI/DO module (DT100-11)



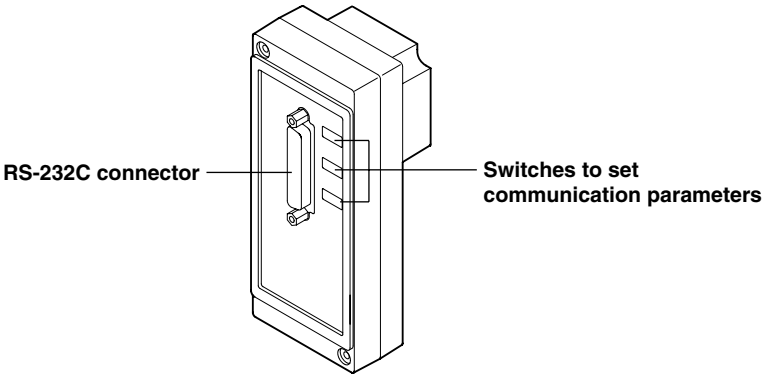
Alarm output module (DT200-11/DT200-21)



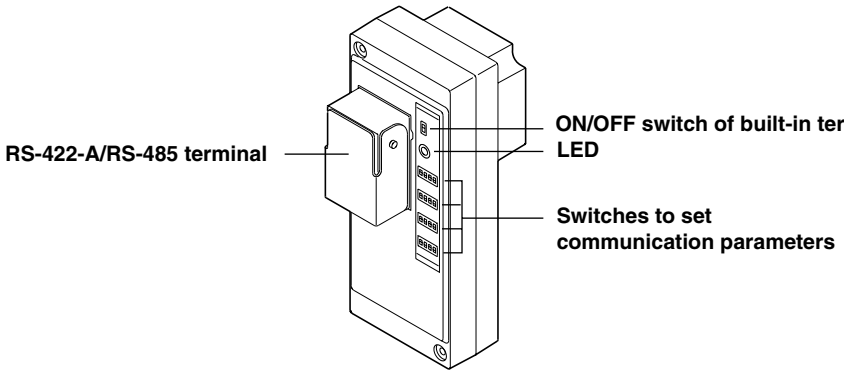
GP-IB module (DT300-11)



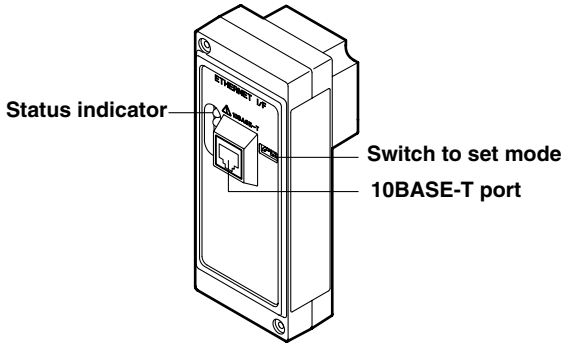
RS-232C module (DT300-21)



RS-422-A/RS-485 module (DT300-31)

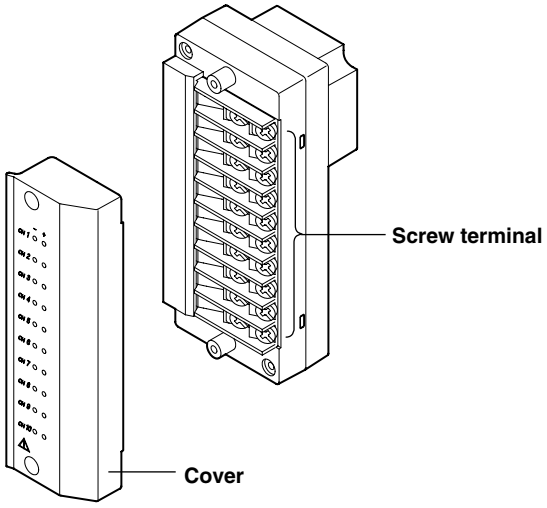


Ethernet module (DT300-41)

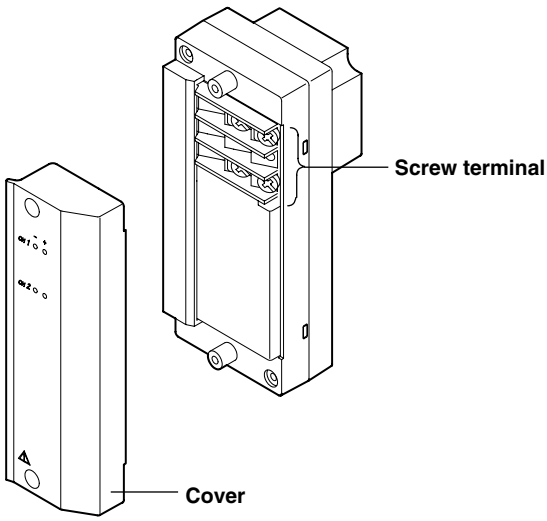


Retransmission Module

1-5 V Retransmission module (DT500-11)

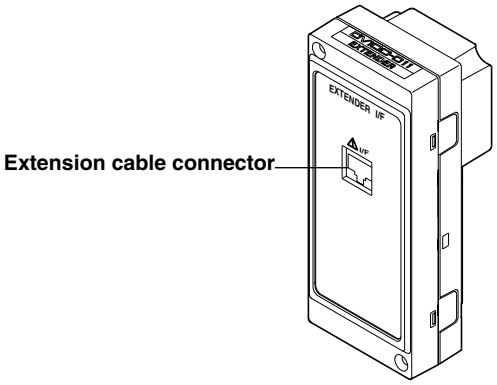


4-20 mA Retransmission module (DT500-21)

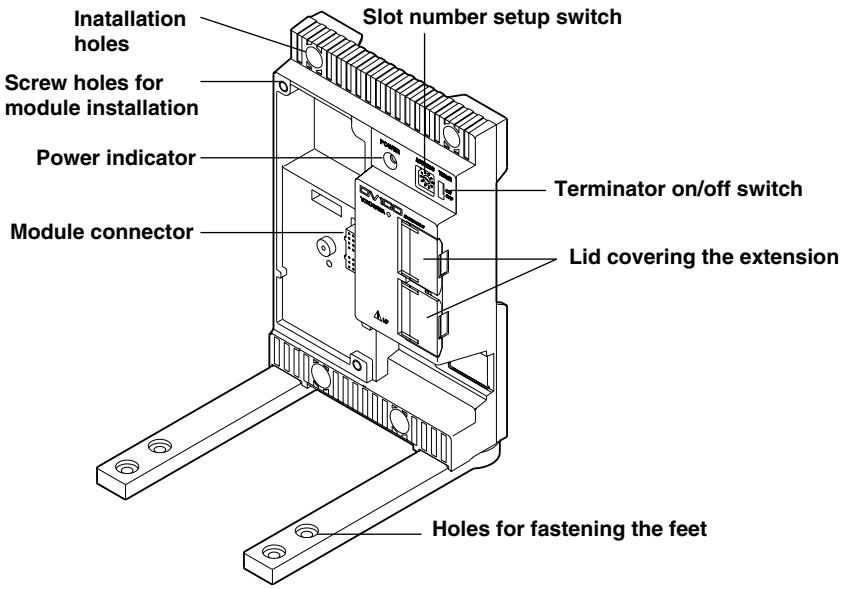


Extender Module/Extender Base

Extender Module (DV100-011)



Extender Base (DV100-012)



1.4 Supportive Software for the DA100 System

DAQ Software 32 (standard accessory)

This software comprises functions such as setting of measurement conditions, diagnosis, calibration and simple data collection.
The following three OS environments are supported.

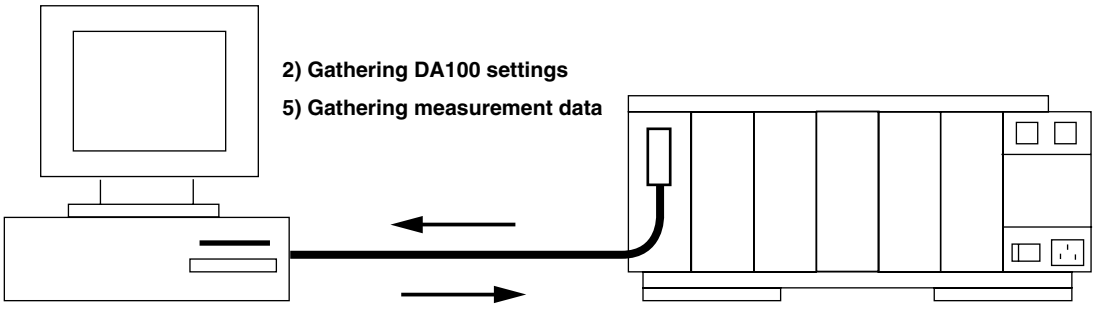
- Windows 95
- Windows 98
- Windows NT 4.0

1) Defining the environment

3) Executing DA100 settings

6) Storing the measurement data externally using the data logging software

7) Displaying the data, and converting it to text-data, Excel format or Lotus 1-2-3 format.



Note

- When using the DA100 for the first time, make sure to verify using the software's diagnosis program that the DA100 can be properly controlled by the personal computer. This can also be done by communication interface.
- Make sure that the total number of following setting changes, including calibrations and restructuring,does not surpass 100000.
  Measurement range
  Measurement interval
  A/D integration time
  Filter

DAQ Software 32 Plus (special order)

Allows the collecting of measurement data over a long period. The following OS environment is supported.

- Windows 95
- Windows 98
- Windows NT 4.0

2.1 General Precautions for Installation

Safety Precautions

Read the safety precautions

Make sure to have read the safety precautions described on pages 6 and 7 before using the instrument for the first time.

Do not remove any covers from the instrument

For internal inspection or adjustment, contact your sales representative or nearest service center. Addresses may be found on the back cover of this manual.

In case of malfunctioning

Never continue to use the instrument if there are any symptoms of malfunctioning such as unusual sounds, smell or smoke coming from the instrument. Immediately turn OFF the power and unplug the power cord. When using an adapter for direct wiring to the power supply, immediately turn OFF the power supply. Also disconnect the power to the equipment under measurement. Contact your sales representative or nearest service center. Addresses may be found on the back cover of this manual.

Power cord

Nothing should be placed on the power cord; it should also be kept away from any heat sources. When unplugging the power cord from the outlet, never pull the cord itself. Always hold the plug and pull it. If the power cord is damaged, contact your dealer for replacement. Refer to page 2 for the part number when placing an order.

General Handling Precautions

Never place anything on top of the instrument

Never place another instrument or any objects containing water on top of the instrument. Otherwise a failure may occur.

When moving the instrument

First disconnect the power of the equipment under measurement and disconnect the signal and interface cables. Then turn the power of this instrument OFF and unplug the power cord.

Ventilation openings

Do not block the ventilation openings in order not to rise the internal temperature.

Electrically charged objects

Don't bring electrically charged objects near the input terminals. The internal circuitry might be damaged.

Cleaning

When cleaning the case or any other part of the instrument, first remove the power cord from the consent (and in case of direct connection, disconnect the power lines). Do not use volatile chemicals since this might result in dis-coloring etc. Always use a dry, soft cloth for cleaning.

When not using the instrument for a long time

When the instrument is not being used for an extensive period of time, unplug the power cord from the outlet (when using an adapter for direct wiring to the power supply, disconnect the power cord from the outlet).

2.2 How to Install the DA100

Installation Conditions

The instrument must be installed in a location where the following conditions are met.

· Ambient temperature: 0 to 50 °C
However, in case you mount the subunits DS400/DS600 directly to a panel, or mount them in a rack, it is possible to use them in a range of –10 to 60 °C.

WARNING

- When the environmental temperature is 50°C or more, the temperature of the rear panel may rise to more than 70°C. Thus, touching the rear panel under these circumstances has the danger of sustaining burns.
- To prevent a fire, always use the instrument in a vertical position, and do not block the upper side of the modules (a space of at least 3cm is necessary).

· Ambient humidity: 20 to 80%RH for –10 to 40 °C, 10 to 50%RH for 40 to 50 °C, 5 to 30%RH for 50 to 60 °C (However, no condensation should be present.)
· Installation location: Room
· Installation height: Altitude up to 2,000 m

Note

Internal condensation may occur if the instrument is moved to another place where both the ambient temperature and humidity are higher, or if the temperature changes rapidly. In case of thermocouple input, this might result in erroneous measurements. In those cases, allow the instrument to achieve equilibrium with to its new environment for at least one hour before starting operation.

Never install the instrument in any of the following locations:

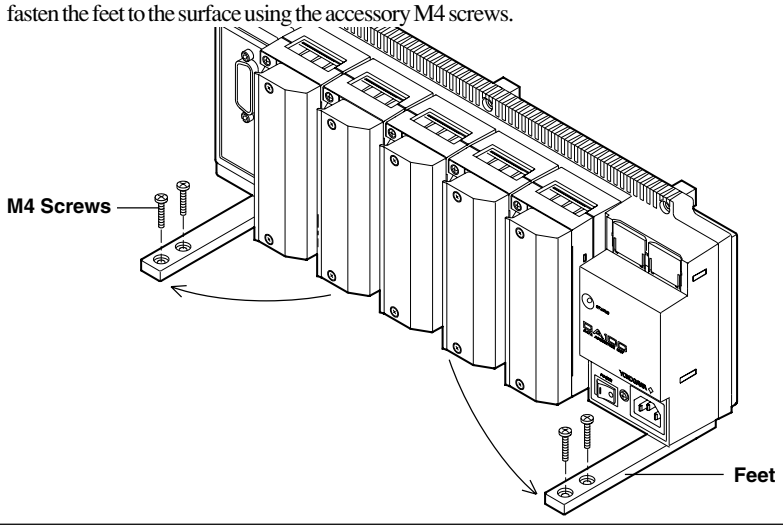
· in direct sunlight or near heat sources;
· where an excessive amount of soot, steam, dust or corrosive gases are present;
· near strong magnetic field sources;
· near high voltage equipment or power lines;
· where the level of mechanical vibrations is high;
· in an unstable place.

Installation Method

The data acquisition unit DA100 and the subunit DS400/DS600 can be installed on the floor, directly to a panel, or can be mounted in a rack. Units equipped with screw type terminals should only be used in panel installations.

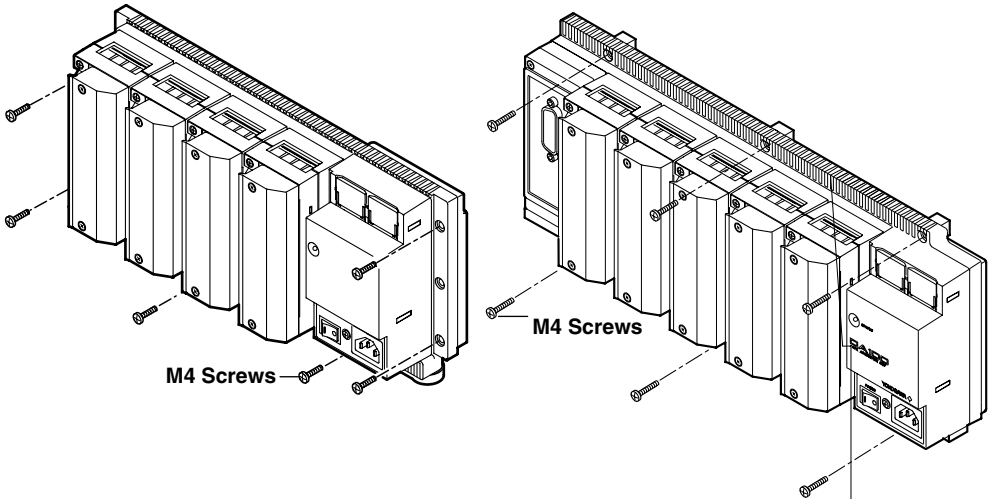
Floor installation

Swing the feet which are located under the unit to the front as shown in the figure below, and place the unit vertically. When there might a possibility of the unit tumbling over after wiring, fasten the feet to the surface using the accessory M4 screws.



Panel installation

Install the unit by fastening the accessory 6 screws (length : 16mm) as shown in the figure below.

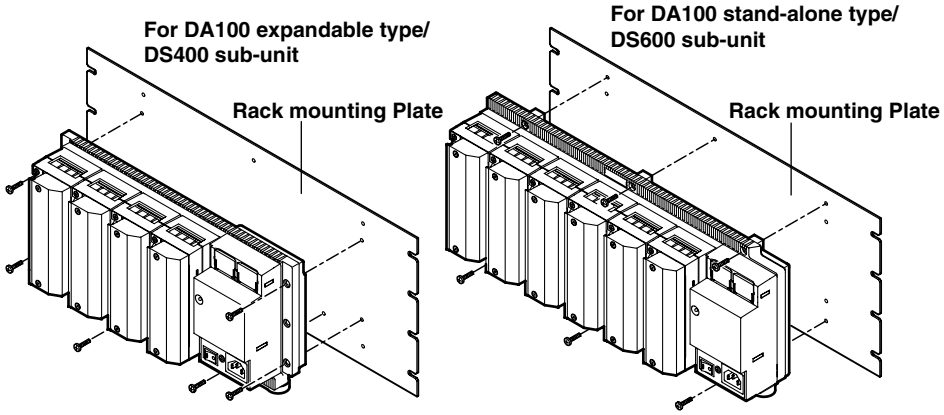


Rack mounting

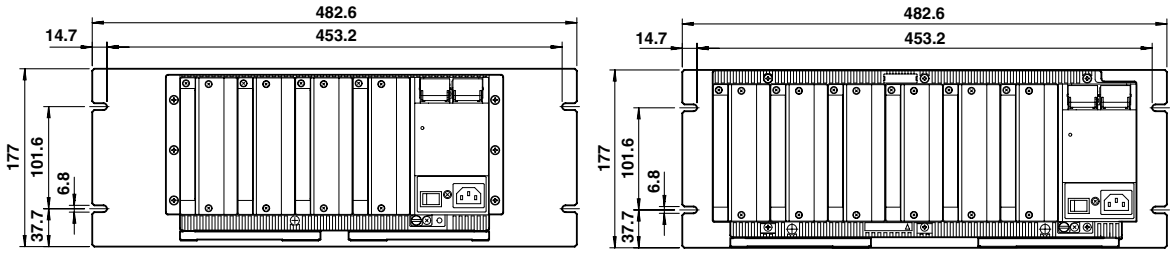
The following metal fittings can be purchased for rack mounting. For installation, refer to the instruction manual which comes with the rack mount fittings.

Name	Part No.	Description
Rack mount fittings	DV400-011	ANSI/EIA standard

The following figure shows how and where to fasten the unit to the rackmounting plate.



Dimensions



2.3 How to Connect the Input/Output Modules

WARNING

When connecting the Input/Output modules, make sure to turn OFF the power to the DA100/DS400/DS600 to prevent an electric shock or damage to the instrument.

Setting the Unit Number of each Subunit (only for the DA100 Expandable type)

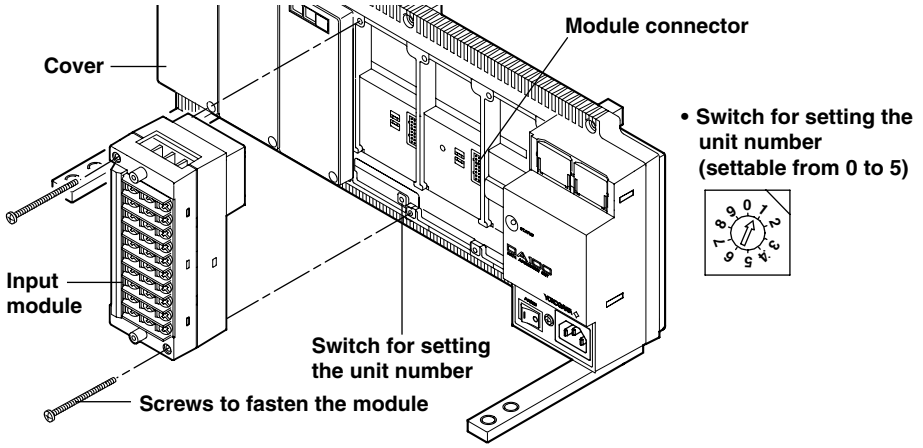
When connecting subunits to the DA100 Expandable type, it is necessary to assign a distinctive unit-number to each subunit. This number can be selected from 0 to 5 (the setting 6 and up will not be recognized) and is set, as shown in the figure below, by a setting switch (rotary dipswitch).

Note

When you connect an input module at the location of the setting switch, the switch can not be operated anymore. Therefore, make sure you set the switch before connecting any input module there. It is convenient for confirming unit numbers to write each unit number setting on a dented part located on the top of DS600 subunit or on the left side of DS400 subunit.

Connecting Method

1 Verify that the power to the DA100/DS400/DS600 has been turned OFF.
2 Remove the cover of the location where the module will be connected. Do not remove any cover of locations where no module will be connected.
3 Hold the input unit so that the male part of the connector at the back side of the input unit matches the female part of the receiving connector. Then connect the unit.
4 Fasten the input unit by fastening the two accessory M3 screws.



Modules Which Can be Used

In case of the DA100 Stand-alone type

Input module, alarm output module, DI/DO module, extender module, communication interface module, and retransmission module.

Number of modules that can be connected: 6 (of which at least one must be a communication interface module)

DI/DO module: not more than one

Input module: max. four (up to 40 channels)

Input module + alarm output module + DI/DO module + retransmission module: max. five

In case of the DA100 Expandable type

Not more than one DI/DO module can be connected to all units.

- Main unit

Alarm output module, DI/DO module, and communication interface module.

(Note: The input module and retransmission module cannot be connected.)

Number of modules that can be connected: 4 (of which at least one must be a communication interface module)

DI/DO module: not more than one

Alarm output module + DI/DO module: max. three

- Subunit DS400/DS600

Input module, alarm output module, DI/DO module, extender module, and retransmission module.

Number of modules that can be connected: 4 for DS400, 6 for DS600 (up to 300)

DS400: Input module + alarm output module + DI/DO module + retransmission module: max. four

DS600: Input module + alarm output module + DI/DO module + retransmission module: max. six

Note

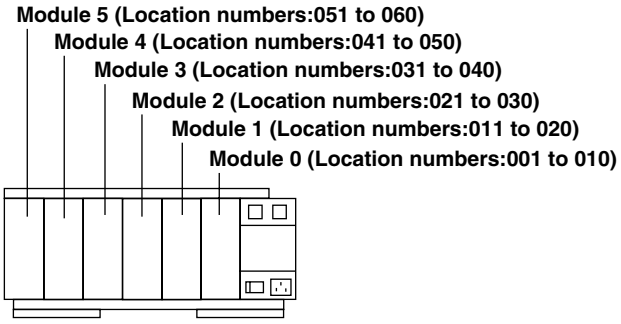
- No alarm output module or DI/DO module can be connected to the right side of an input module, since the rise in temperature would hinder the measurement accuracy.
- When mounting universal and power modules, or DCV/TC/DI and power modules together, keep the two modules apart at a distance equal to the width of at least two slots. Failure to observe this precaution may result in the measuring accuracy falling outside the guaranteed range.
- No retransmission module can be connected to the right side of universal input module, DCV/TC/DI module, since the rise in temperature would hinder the measurement accuracy.
- Verify the type of module by the seal on the top side.

Location and Location Number (Channel Number, Alarm Output Number, DI/DO Number)

The location numbers correspond to channel numbers for locations where the input module is connected, to alarm output numbers for locations where the alarm output module is connected, and to DI/DO numbers for locations where the DI/DO module is connected.

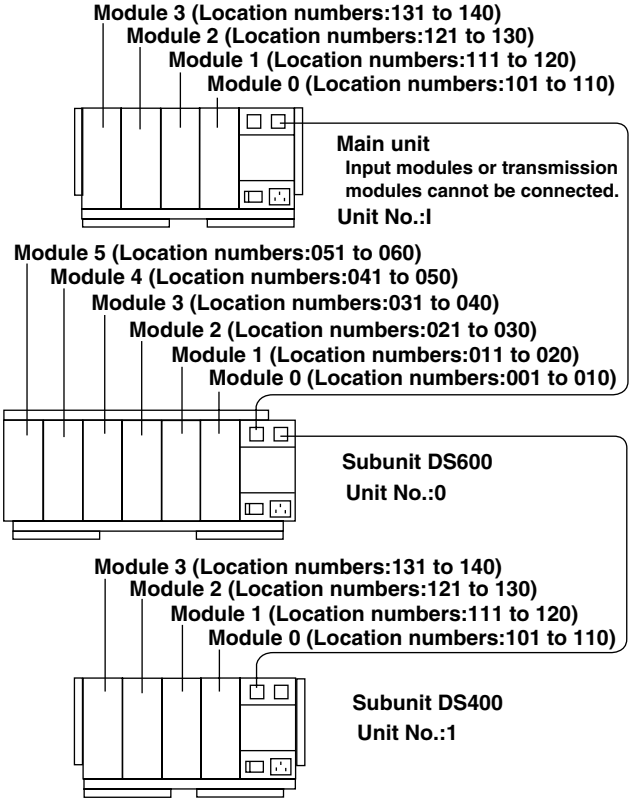
In case of the DA100 Stand-alone type

The location numbers correspond to the location of each module as shown in the figure below.



In case of the DA100 Expandable type

The unit number (refer to the previous page, the number of the main unit is fixed at "I") and location numbers correspond to the location of each module as shown in the figure below.



2.4 Connecting the Interface Cables

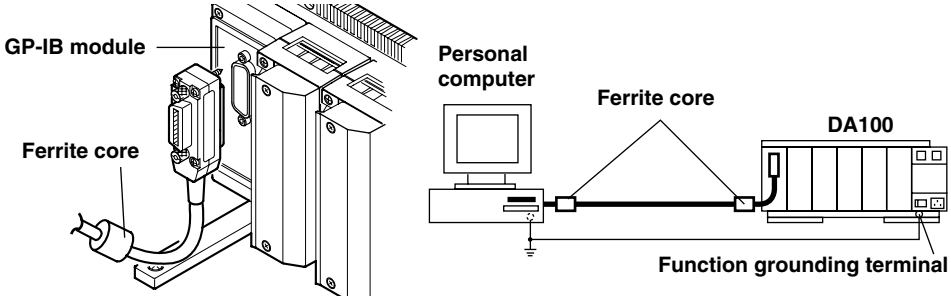
This section describes the connection between the communication module of the data acquisition unit DA100 and a personal computer using a communication interface.

GP-IB

The GP-IB connector of the GP-IB communication module is a 24-pin connector of IEEE St'd 488-1978. Only use cables that conform to IEEE St'd 488-1978 as a communication cable.

Connection Procedure

Connect the cable as shown in the figure below.



CAUTION

When (dis)connecting the GP-IB cable, turn OFF the power of both the personal computer and the data acquisition unit DA100. If the power is not turned OFF, malfunctions may occur and the internal circuitry may be damaged.

• When connecting the cable, take note of the following.

· Tighten the screws which fasten the GP-IB connector firmly.

· To eliminate noise, we recommend to apply two ferrite cores (as shown above) at both ends of the cable (e.g. ZCAT 3035-1330 from TDK). Use a shielded interface cable and ground equipment together at one point.

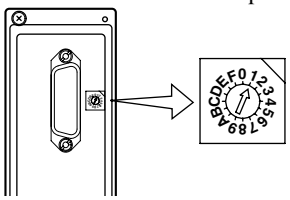
· Although more than one equipment can be connected to a GP-IB system, only one communication module can be connected to a single personal computer. To prevent trouble when using the accessory software, we recommend not to connect any other equipment with this DA100 system.

· In case several equipment are connected (although this situation is not recommended), make sure that to each a different address is assigned.

· Use only cables of 2m or less for connections between equipment.

How to Assign an Address

The address can be assigned easily by turning the rotary dipswitch as shown in the figure below. Any address can be set from "0" to "15"; the characters "A" to "F" on the dipswitch correspond to the address "10" to "15" respectively.



Set-up of the Personal Computer (when using the DAQ software 32 accessory)

1 A GP-IB board should be installed in the personal computer. Only the following GP-IB boards (made by National Instruments Co.) are supported.
AT-GPIB

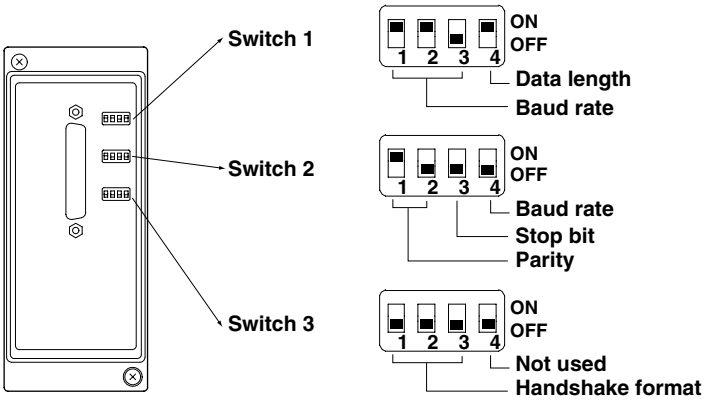
2 Install the accessory software for the GP-IB board (from National Instruments). The device driver must be registered as CONFIG.SYS [device=(drive:directory)GPIB.COM].

- Do not rename the device. A renamed device will not be recognized any longer.
- This software supports only the control of board gpib0. Be aware of this when you are working in multiple GP-IB board environment.
- After installation, verify using the accessory diagnosis software program that no errors have occurred.

RS-232C

Communication Settings

Communication parameters are set using the three switches located on the RS-232C modules.



Switch 1 and No.4 of Switch 2

Baudrate	dipswitch	No.1	No.2	No.3	No.4 (switch 2)
150		OFF	OFF	OFF	OFF
300		OFF	OFF	ON	OFF
600		OFF	ON	OFF	OFF
1200		OFF	ON	ON	OFF
2400		ON	OFF	OFF	OFF
4800		ON	OFF	ON	OFF
9600		ON	ON	OFF	OFF ←initial value
19200		ON	ON	ON	OFF
38400		OFF	OFF	OFF	ON

Data length	dipswitch	No.4
7		OFF
8		ON ←initial value

Switch 2

Parity	dipswitch	No.1	No.2
NONE		OFF	OFF
ODD		OFF	ON
EVEN		ON	OFF ←initial value

Stop bit	dipswitch	No.3
1		OFF ←initial value
2		ON

Switch 3

Handshake format	dipswitch	No.1	No.2	No.3
no handshake		OFF	OFF	OFF ←initial value
XON-DTR*		OFF	OFF	ON
XON-RTS*		OFF	ON	OFF
CTS-DTR		OFF	ON	ON
CTS-RTS		ON	OFF	OFF

* When the baud rate is set to 38400, there is no handshaking.

Note

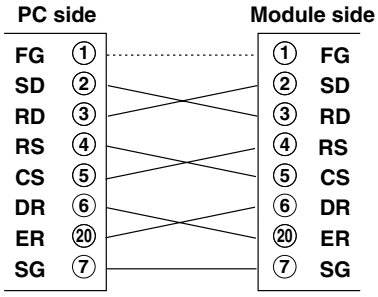
When you are using the accessory software or DAQ software 32 Plus, the settings should be as follows: baud rate 2400 to 38400bps, data length: 8 bit, parity: ODD, stop bit: 1, handshake format: CTS-RTS.

Connecting the RS-232C cable

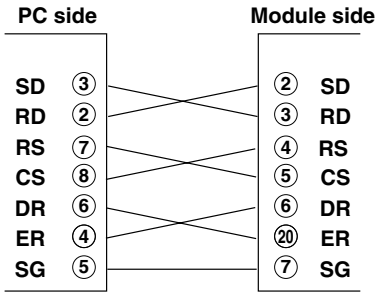
Connect the connector of the RS-232C communication module to a personal computer as follows. The figures below show cases when hardware handshake is carried out. For other connections, refer to the DA100 Communication Interface User's Manual (IM DA100-11E).

• In case of IBM compatible DOS machine

D-Sub 25 pin



D-Sub 9-pin

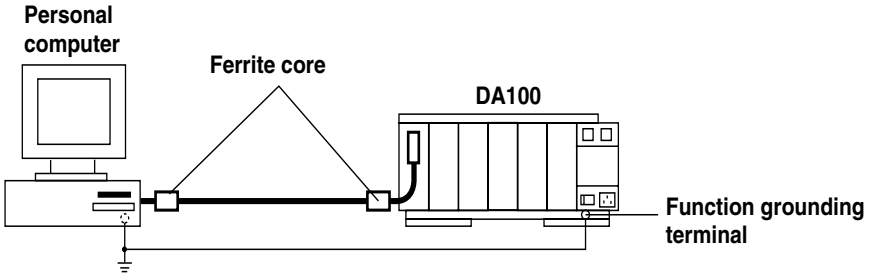


CAUTION

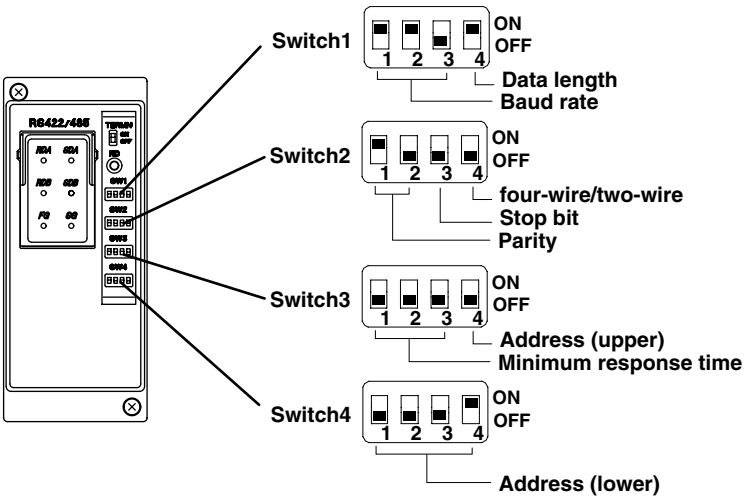
When (dis)connecting the RS-232C cable, turn OFF the power of both the personal computer and the data acquisition unit DA100. If the power is not turned OFF, malfunctions may occur and the internal circuitry may be damaged.

Note

To eliminate noise, we recommend to apply ferrite cores to both ends of the interface cable (e.g. ZCAT3035-1330 from TDK). If the noise persists, apply more ferrite cores. Use shielded interface cables and ground equipment together at one point.



RS-422-A/RS-485



Baud rate (No.1 to 3 of Switch1)

Baud rate	No.1	No.2	No.3	
300	OFF	OFF	ON	
600	OFF	ON	OFF	
1200	OFF	ON	ON	
2400	ON	OFF	OFF	
4800	ON	OFF	ON	
9600	ON	ON	OFF	←Default Setting
19200	ON	ON	ON	
38400	OFF	OFF	OFF	

Data length (No.4 of Switch1)

Data length	No.4	
7	OFF	
8	ON	←Default Setting

Parity (No.1 to 2 of Switch2)

Parity	No.1	No.2	
None	OFF	OFF	
ODD	OFF	ON	
EVEN	ON	OFF	←Default Setting

Stop bit (No.3 of Switch2)

Stop bit	No.3	
1	OFF	←Default Setting
2	ON	

Switch between four-wire/two-wire systems (No.4 of Switch2)

four-wire/two-wire	No.4	
four-wire	OFF	←Default Setting
two-wire	ON	

Minimum response time (No.1 to 3 of Switch3)

Minimum response time	No.1	No.2	No.3	
0ms	OFF	OFF	OFF	←Default
Setting				
10ms	OFF	OFF	ON	
20ms	OFF	ON	OFF	
50ms	OFF	ON	ON	
100ms	ON	OFF	OFF	

Address (No.4 of Switch3 and No.1 to 4 of Switch4)

Address	No.4(Switch3)	No.1(Switch4)	No.2(Switch4)	No.3(Switch4)	No.4(Switch4)	
1	OFF	OFF	OFF	OFF	ON	←Default Setting
2	OFF	OFF	OFF	ON	OFF	
3	OFF	OFF	OFF	ON	ON	
4	OFF	OFF	ON	OFF	OFF	
5	OFF	OFF	ON	OFF	ON	
6	OFF	OFF	ON	ON	OFF	
7	OFF	OFF	ON	ON	ON	
8	OFF	ON	OFF	OFF	OFF	
9	OFF	ON	OFF	OFF	ON	
10	OFF	ON	OFF	ON	OFF	
11	OFF	ON	OFF	ON	ON	
12	OFF	ON	ON	OFF	OFF	
13	OFF	ON	ON	OFF	ON	
14	OFF	ON	ON	ON	OFF	
15	OFF	ON	ON	ON	ON	
16	ON	OFF	OFF	OFF	OFF	
17	ON	OFF	OFF	OFF	ON	
18	ON	OFF	OFF	ON	OFF	
19	ON	OFF	OFF	ON	ON	
20	ON	OFF	ON	OFF	OFF	
21	ON	OFF	ON	OFF	ON	
22	ON	OFF	ON	ON	OFF	
23	ON	OFF	ON	ON	ON	
24	ON	ON	OFF	OFF	OFF	
25	ON	ON	OFF	OFF	ON	
26	ON	ON	OFF	ON	OFF	
27	ON	ON	OFF	ON	ON	
28	ON	ON	ON	OFF	OFF	
29	ON	ON	ON	OFF	ON	
30	ON	ON	ON	ON	OFF	
31	ON	ON	ON	ON	ON	

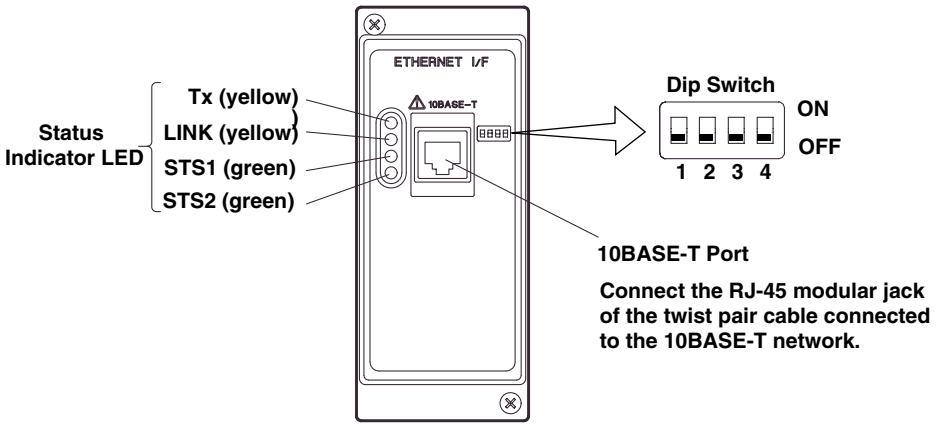
Connecting the RS-422-A/RS-285

For details on connectin the RS-422-A/RS-485 connector of the RS-422-A/RS-485 communication interface module to a personal computer, see IM DA100-11E, "DA100 Communication Interface User's Manual."

CAUTION

When (dis) connecting the RS-422-A/RS-485 cable, turn OFF the power of both the personal computer and the instrument. If the power is not turned OFF, malfunctions may occur and the internal circuitry may be damaged.

Ethernet



You can select the following three modes by setting the dip switch.

Configuration mode: A mode in which the IP address, subnet mask, and default gateway are set for theDA100.

Test mode: A mode in which the condition of the physical connection is tested.

Communication mode: A mode in which the DA100 is connected to the network to carry out communication. Use this mode to read in the DA100 measurement data with the personal computer.

In addition, you can turn ON/OFF the Keepalive function.

Mode Setting

Mode	Switch 1	Switch 2	
Configuration mode	ON	OFF	
Test mode	OFF	ON	
Communication mode	OFF	OFF	←Default Setting

Do not set both dip switches, 1 and 2, to ON.

Keepalive Setting

Keepalive	Switch 3	
Enable	ON	←Default Setting
Disable	OFF	

Keepalive is a function supported by TCP. It sends packets at constant time intervals and automatically disconnects when there is no corresponding response. This instrument sends packets at 30-second time intervals. If a response is not received, it sends 4 more packets at one-second intervals. If a response is still not received, the connection is dropped.

Have dip switch 4 turned OFF.

2.5 Connecting the Extension Cables (only for use with the expandable type DA100)

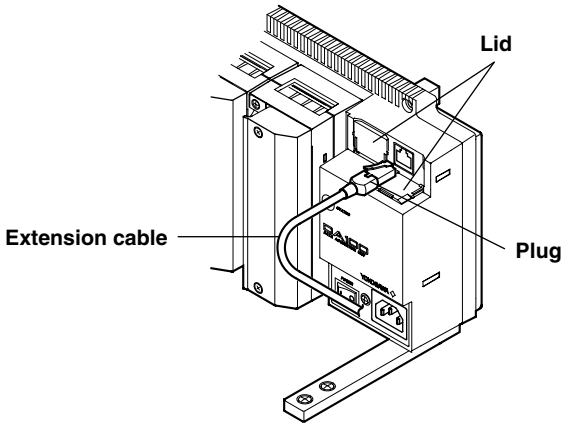
Extension Cables

Any of the following extension cables can be used for connections between the DA100 main unit and subunits or for connections between subunits.

Name	Model	Description
Extension cable	DV200-000	Length: 0.5m
Extension cable	DV200-001	Length: 1m
Extension cable	DV200-002	Length: 2m
Extension cable	DV200-005	Length: 5m
Extension cable	DV200-010	Length: 10m
Extension cable	DV200-020	Length: 20m
Extension cable	DV200-050	Length: 50m
Extension cable	DV200-100	Length: 100m
Extension cable	DV200-200	Length: 200m
Extension cable	DV200-300	Length: 300m
Extension cable	DV200-400	Length: 400m
Extension cable	DV200-500	Length: 500m

Connecting Procedure

Open the lid that covers the connector and insert the plug of the extension cable in the connector until you hear a click. Since both connectors are identical, it makes no difference which connector you use. Furthermore, since both plugs of the cable are identical, you may use either end.
When pulling the plug from the connector, gently press the peg of the plug and pull it forward.



Points to Note when Using the Extension Cables

- The maximum rated temperature is 60 °C;
- Never disconnect the extension cable from the connector by pulling the cable, since this might damage the signal cable. Always hold the plug.
- When wiring the extension cable through a cable duct, or metal pipe or such, protect the peg on top of the plug by covering it with tape.
- Fasten the cables in such a way that no force is being applied to connector or plug.
- To prevent the wire from snapping, etc. do no apply a pulling force of 70N or more. Furthermore, do not bend the cable in a radius of 3 centimeters or less.
- For wiring conditions, refer to 2.9 Countering Noise.

Note

When several sub-units are connected, and the power is turned off of one of them, the other connected sub-units which are further away from the main unit will not be recognized anymore.

2.6 Connecting the Signal Lines

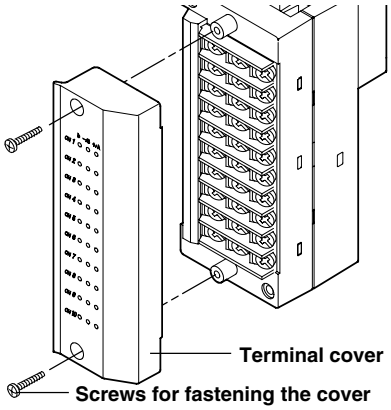
WARNING

- To prevent electric shock, always make sure that the power supply is turned OFF before connecting .
- When 30 VAC or 60 VDC and more is applied to the output terminal of the alarm output module or the output terminal of the DI/DO module, use double-insulated wires(withstand voltage performance: more than 2300 VAC) for those wires which apply 30 VAC or 60 VDC and more. All other wires can be basic-insulated(withstand voltage performance: more than 1350 VAC). Furthermore, use “crimp-on” lugs (for 4-mm screws) with insulation sleeves for connecting to the screw terminal. Make sure that the crimp-on tool must be one specified by the crimp-on lugs manufacture, and that the crimp-on lugs and tool must be matched to the wire size. To prevent from electric shock, do not touch the terminal after wiring and make sure to re-apply the cover.

CAUTION

- Do not apply an input voltage exceeding the following levels to each terminal of the module. Otherwise, the internal circuits may be damaged.
  Universal, DCV/TC/DI and digital input modules
  Allowable input voltage:
  2 V DC range or less, RTD, TC and DI (CONT): ±10 V DC
  6 to 50 V DC range, DI (LEVEL): ±60 V DC
  Max. common mode noise voltage: 250 VAC rms (50/60 Hz)
  mA input module
  5 VDC
  Strain input module
  Don’t input voltage to the terminal
  Pluse input module
  5 VDC
  Digital input of DI/DO module
  –2 VDC to 7 VDC
- The contact capacity of the alarm module and the digital out of the DI/DO module is as follows:
  250 VDC/0.1 A (with a resistor load), 250 VAC/2 A (with a resistor load), 30 VDC/2 A (with a resisitor load)
- The overvoltage category of each input module is CAT II (IEC 1010-1).

1 Verify that the power switch of the DA100/DS400/DS600 has been turned OFF.
2 Remove the terminal cover. (the figure below shows DU100-11.)



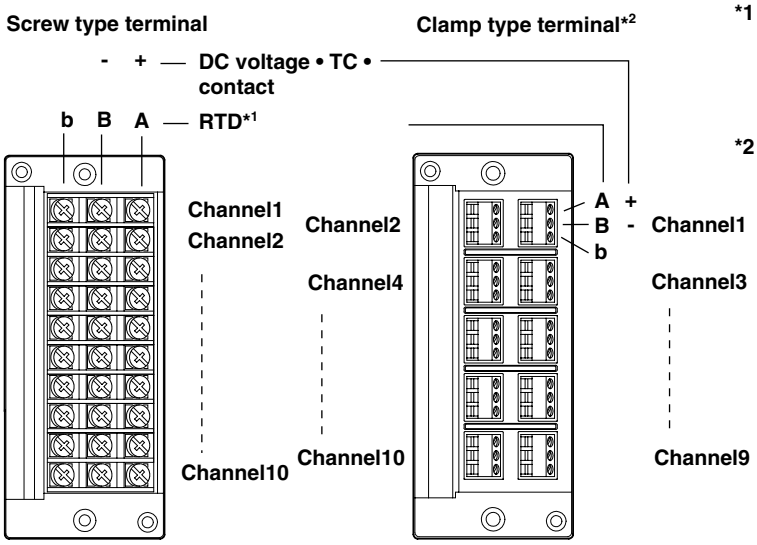
3 Fasten the signal wires to the terminals as shown in the figure below.
4 Re-apply the terminal cover and fasten the screws.

Note

- Make sure that the equipment connected to the signal in-/output conforms IEC (CSA) 950 or IEC (CSA) 1010. Also, make sure to use cables conform IEC (CSA) standards.
- In case you are using an internal RJC in case of thermocouple input, the following considerations are necessary to stabilize the temperature at the terminals. Always make sure to re-apply the terminal cover; The thermal capacity of the wiring should be small (cross sectional area of less than 0.5mm^2); Minimize outside temperature fluctuations as much as possible.
- To prevent noise, make sure to ground each unit at the grounding function terminal (below the power switch) together at one point.
- Refrain from wiring the input signals parallel. However, if you do, then the following considerations are necessary. Ground all equipment at the same point; Do not turn the power of other equipment ON/OFF during operation; Do not use the burnout function.
- If communication is disrupted while outputting the value of the communication input channel from the retransmission module, the retransmission module holds the value that was output immediately before the disruption occurred.
- After the power is turned ON or the retransmission or input channel settings are changed, it may take apporoximately twice teh measurement interval (amount of time needed to make two measurements) for the value of the retransmission to be stabilized.
- When a computation error or a burnout occurs, the output voltage or current will be the “+OVER” level or the “-OVER” level depending on the Set Up mode settings.
- The maximum time that takes to search out a burnout by using the universal input module or the DCV/TC/DI input module is 2.5 seconds. The values being output during this period from the transmission output module are unstable if a burnout occurs.

Wiring Input Signal Lines (to Universal and DCV/TC/DI input modules)

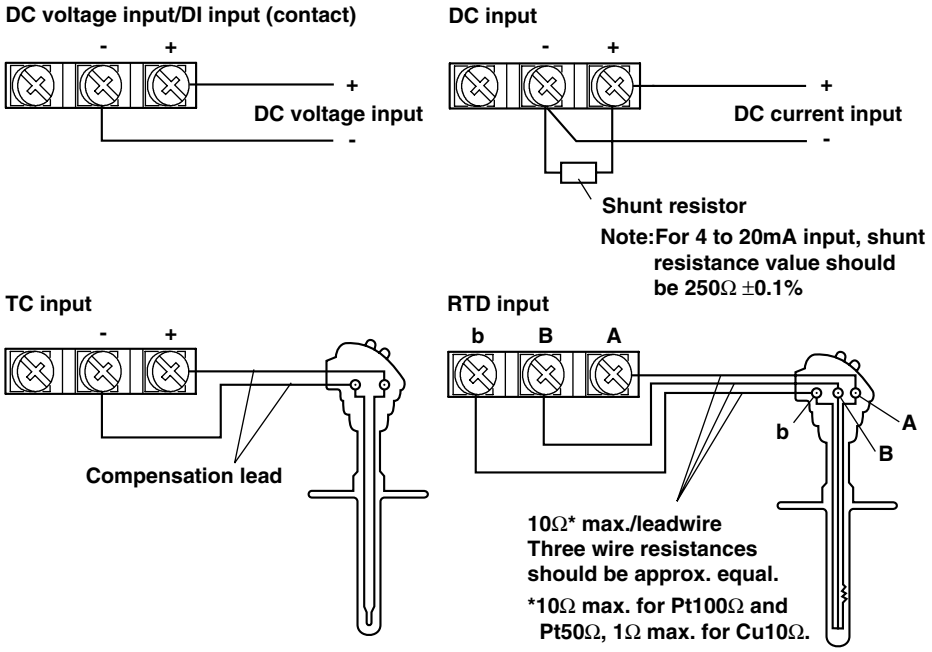
Terminals



*1 There are no RTD input terminals on the DCV/TC/DI input module and digital input module.

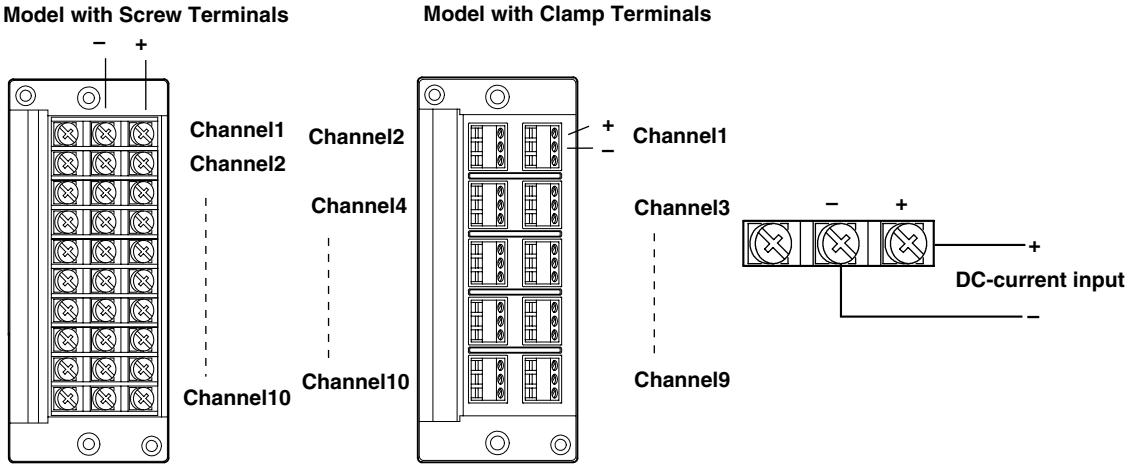
*2 There is no clamp type terminal for digital input module.

Wiring Diagram



Wiring DC-current Input Signal Lines (mA-input Module)

Diagrams of Terminal Block and Wiring

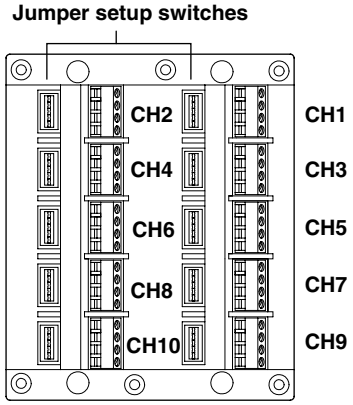


Wiring Strain Input Signal Lines (to Strain Input Module)

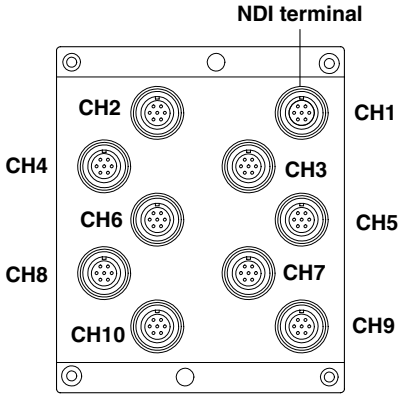
Please apply the optional DV450-001 strain conversion cable when using a bridge box or strain gage without sensor line.

Wiring Diagrams

Model with Built-in Bridge

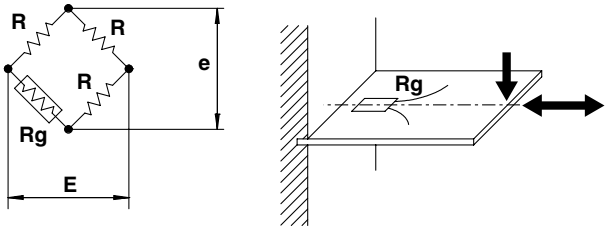


ResistorsModel with External Bridge Resistors



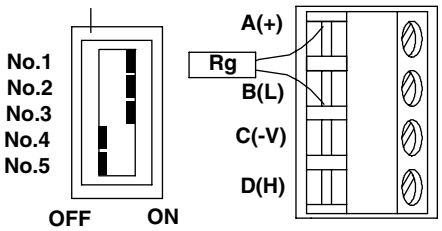
Wiring Diagrams

- **Single-gauge method**



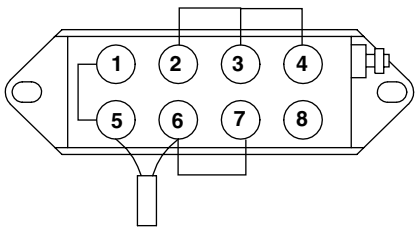
R = fixed resistor
r = resistance of leadwire
Rg = resistance of strain gauge
e = output voltage developed across bridge
E = voltage imposed across bridge

DU500-12/DU500-13
Jumper setup switch

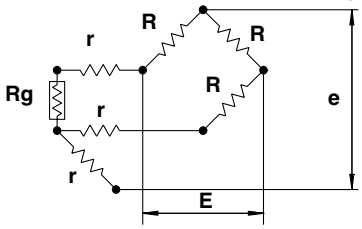


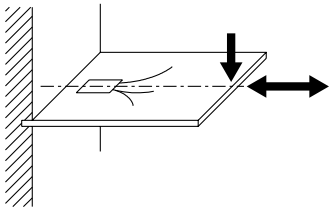
No.1	No.2	No.3	No.4	No.5
ON	ON	ON	OFF	OFF

DU500-14



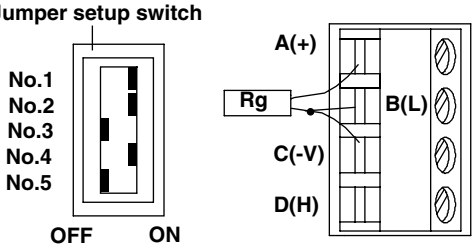
• **Single-gauge three-wire method**





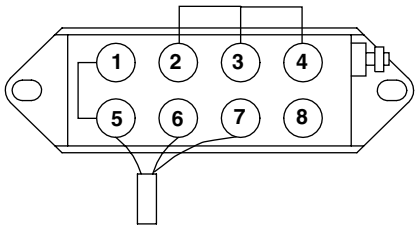
R = fixed resistor
r = resistance of leadwire
Rg = resistance of strain gauge
e = output voltage developed across bridge
E = voltage imposed across bridge

DU500-12/DU500-13
Jumper setup switch

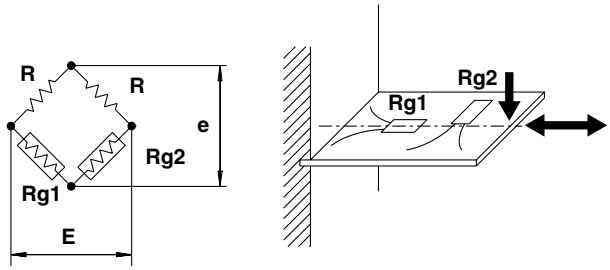


No.1	No.2	No.3	No.4	No.5
ON	ON	OFF	ON	OFF

DU500-14

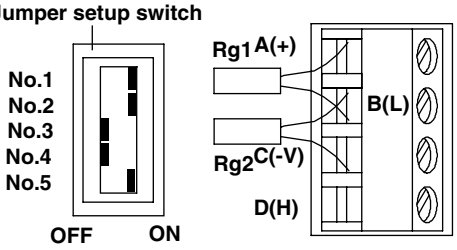


• **Adjacent-side two-gauge method**



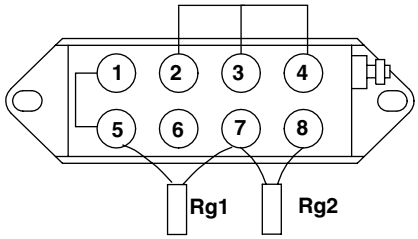
R = fixed resistor
r = resistance of leadwire
Rg = resistance of strain gauge
e = output voltage developed across bridge
E = voltage imposed across bridge

DU500-12/DU500-13
Jumper setup switch

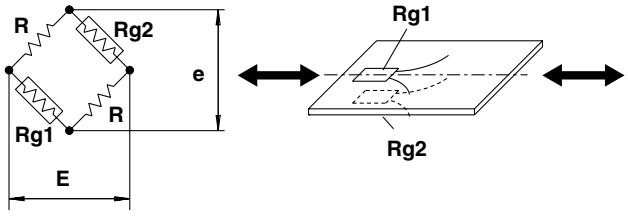


No.1	No.2	No.3	No.4	No.5
ON	ON	OFF	OFF	ON

DU500-14

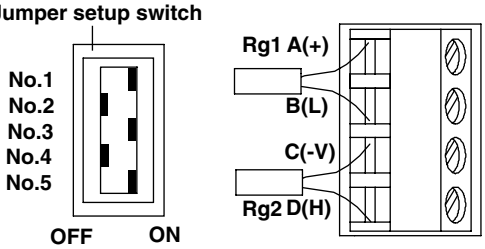


• **Opposed-side two-gauge method**



R = fixed resistor
r = resistance of leadwire
Rg = resistance of strain gauge
e = output voltage developed across bridge
E = voltage imposed across bridge

DU500-12/DU500-13
Jumper setup switch

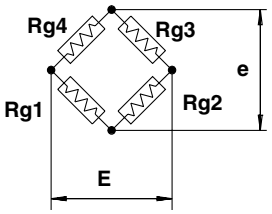


No.1	No.2	No.3	No.4	No.5
ON	OFF	ON	OFF	ON

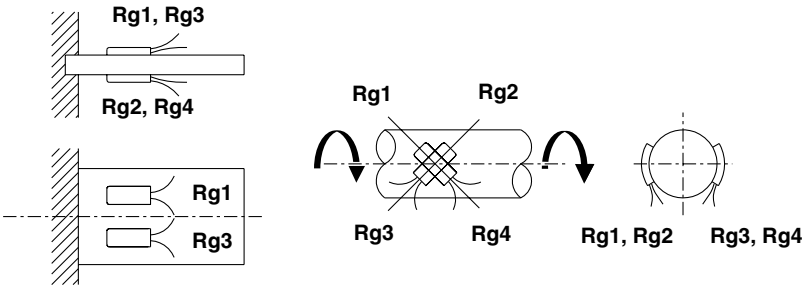
DU500-14

The 319300 bridge box does not support the opposed-side two gauge method.

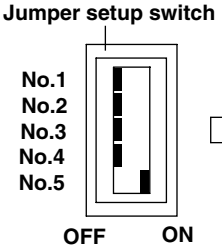
• **Four-gauge method**

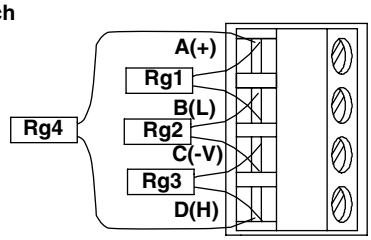


R = fixed resistor
r = resistance of leadwire
Rg = resistance of strain gauge
e = output voltage developed across bridge
E = voltage imposed across bridge

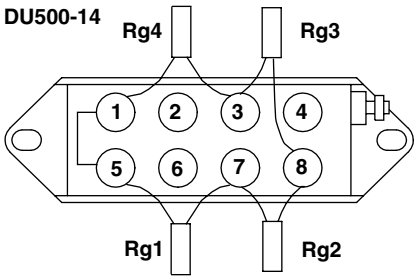


DU500-12/DU500-13
Jumper setup switch





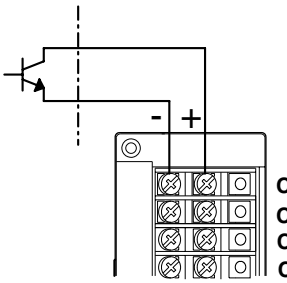
DU500-14



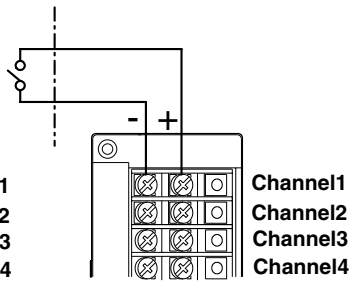
No.1	No.2	No.3	No.4	No.5
OFF	OFF	OFF	OFF	ON

Wiring Pulse Input Signal Lines (to Pulse Input Module)

Open collector
TTL open collector



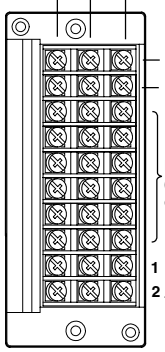
Contact



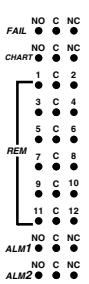
Wiring Alarm Output SIgnal Lines (to DI/DO and Alarm output modules)

Terminals

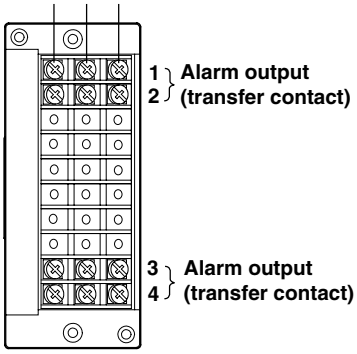
NO C NC DT100-11



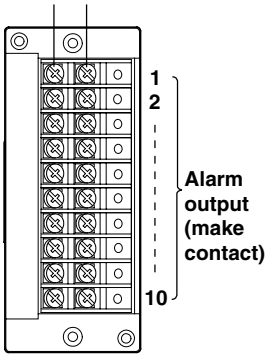
Terminal arrangement



NO C NC DT200-11



NO C DT200-21



Connecting the Retransmission Signal Lines (Retransmission Module)

Processing of Faulty Data

You cam set the output value that corresponds to abnormal measured balues, computed values, and communication input value using the dip switch of the retransmission module.

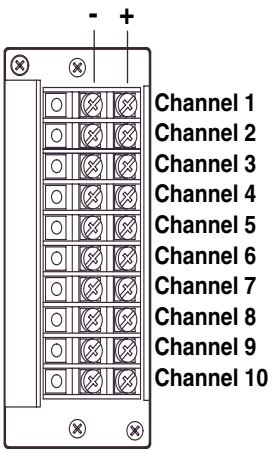
Output Type	Output Value	Switch1	Switch2	Switch3
Approx. 0 V (0.05 V or less) or approx. 0 mV (0.15 mA or less)	ZERO	OFF	OFF	–
-5% (0.8 V or 3.2 mA)	-OVER	ON	OFF	–
+110% (5.4 V or 21.6 mA)	+OVER	OFF	ON	–
Value immediately before the faulty data occurence	Previous value	ON	ON	–

Data are processed as faulty data in the following cases:

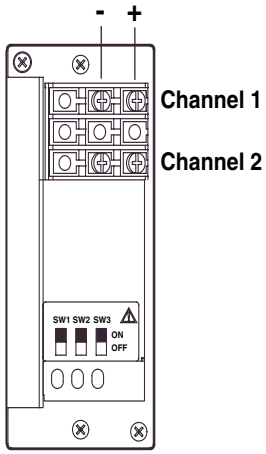
- When the power of the expanded model main unit switches OFF.
- When the measurement channel that is retransmitting experiences the following:
  The module of the corresponding measurement channel is removed from the unit.
  The power of the unit to which the corresponding channel is connected is removed.

Terminals

DT500-11



DT500-21



Wiring AC Input Signal Lines (Power Monitor Module)

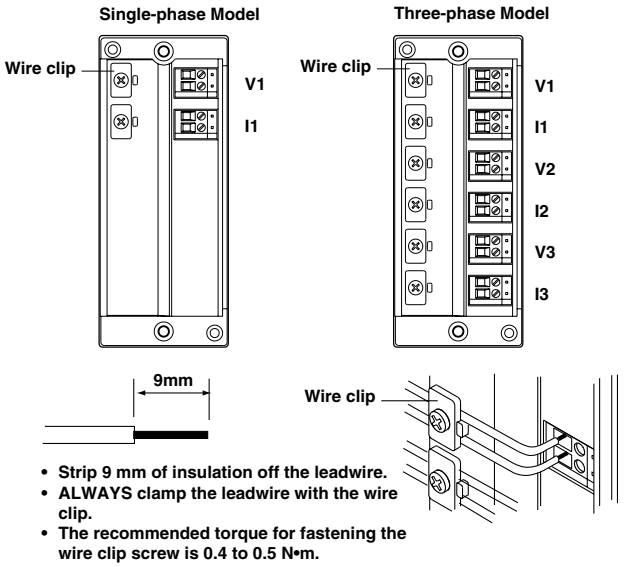
WARNING

- For hazard prevention, ALWAYS provide protective grounding before connecting measuring leadwires.
- When connecting any object being measured, ALWAYS turn off the power to the object. It is extremely dangerous to connect or disconnect interconnecting leadwires with the power to the object left on.
- Exercise utmost care to avoid connecting any current-mode circuit to a voltage-input terminal or any voltage-mode circuit to a current-input terminal. Wrong connection may result in damage to the circuit or equipment being measured or the DA100 recorder itself, as well as bodily injury.
- Fuses are not built into voltage- and current-input terminals. ALWAYS install a fuse on the interconnecting leadwire. Use a fuse that will not permit the voltage or current being measured to exceed the maximum ratings of an AC input module.
  The maximum voltage and current that can continuously be imposed on an AC input module are as follows:
  Voltage: 250 Vrms; current: 5 Arms
- To avoid electrical shock, ALWAYS attach the terminal cover in place after the completion of wiring to the terminals so that the terminals cannot be accidentally touched.

CAUTION

- In wiring, use double-insulated leadwires that have sufficient withstanding-voltage and current-carrying-capacity margins against the voltage and current being measured and meet the ratings at which they are used.
- ALWAYS clamp measuring leadwires with the wire clips to prevent the wires from being disconnected from their terminals. As the measuring leadwires, use wires 0.2 to 2.5 mm2 (AWG14 to 25) thick so they can be fastened securely with the wire clips.
- The power monitor module is a product belonging to Installation (Over-voltage) Category CAT II.

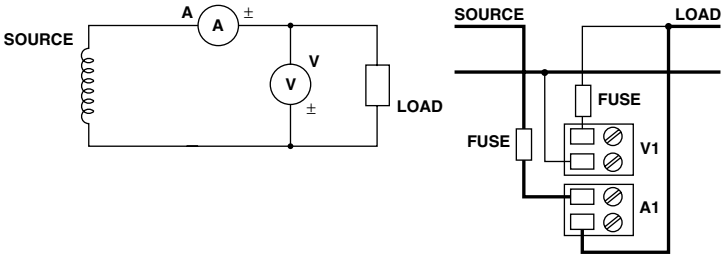
Diagram of Terminal Block



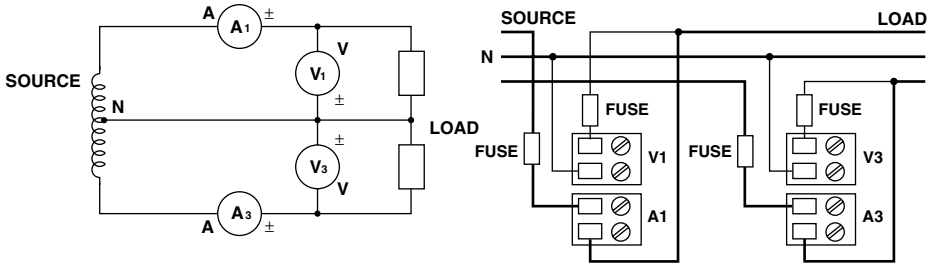
- Strip 9 mm of insulation off the leadwire.
- ALWAYS clamp the leadwire with the wire clip.
- The recommended torque for fastening the wire clip screw is 0.4 to 0.5 N•m.

Wiring Diagrams

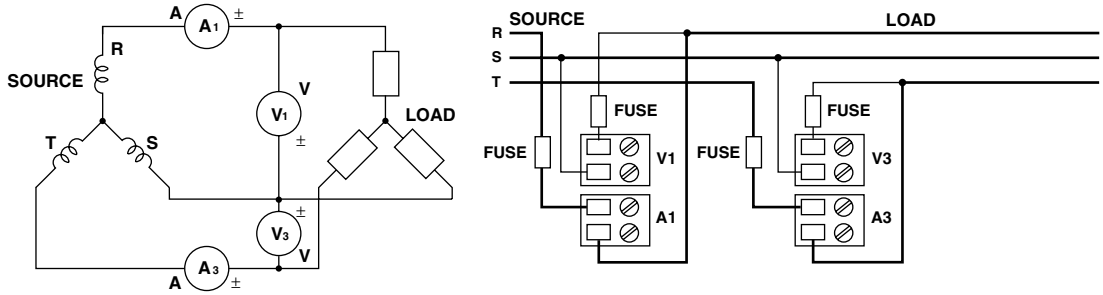
- **Single-phase Two-wire Configuration**



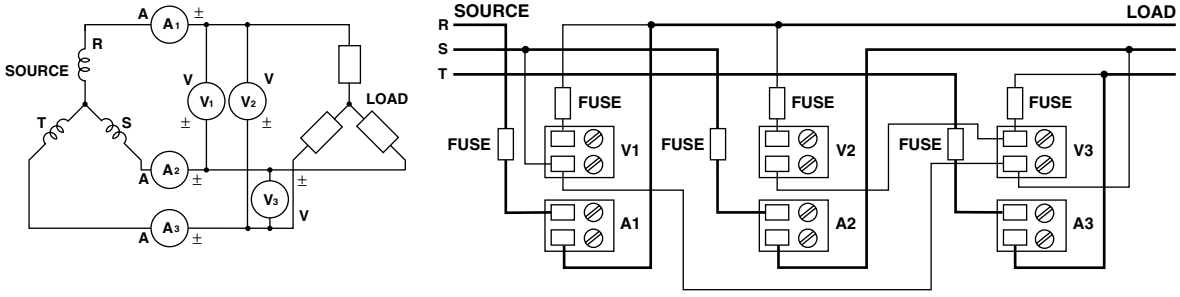
- **Single-phase Three-wire Configuration (power monitor modules for three-phase use only)**



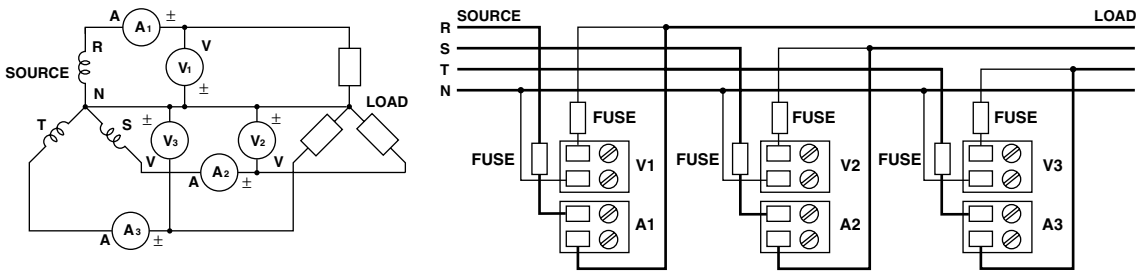
- **Three-phase Three-wire Configuration (dual-current/dual-voltage measurement; power monitor modules for three-phase use only)**



- **Three-phase Three-wire Configuration (triple-current/triple-voltage measurement; power monitor modules for three-phase use only)**



- **Three-phase Four-wire Configuration (power monitor modules for three-phase use only)**



2.7 Connecting an Extension Module to Extension Bases

Using an extension module and extension bases, you can install input modules at a location distant from the sub-unit(s). The module and bases are powered from the sub-unit and, therefore, can be located even in a place where there is no power source nearby.

Installing an Extension Base

WARNING

- For fire prevention, use extension bases in an upright position. Do not cover up the extension base's module (allow a clearance of at least 3 cm around the module).

Ambient Temperature and Humidity

Use an extension base under the following environmental conditions:

- Ambient temperature: -10° to 60°C
- Ambient humidity: 20 to 80% RH at -10° to 40°C
  10 to 50% RH at 40° to 50°C
  5 to 30% RH at 50° to 60°C
  Use the extension base in a condensation-free condition.

Note

Condensation may occur if you move the extension base from an area of low humidity to an area of high humidity or if any drastic temperature variation takes place. In addition, a measurement error will result if the DR recorder is in the thermocouple input mode. In that case, allow at least one hour for the extension base to adjust to the ambient atmosphere before using it.

Do not install the extension base where:

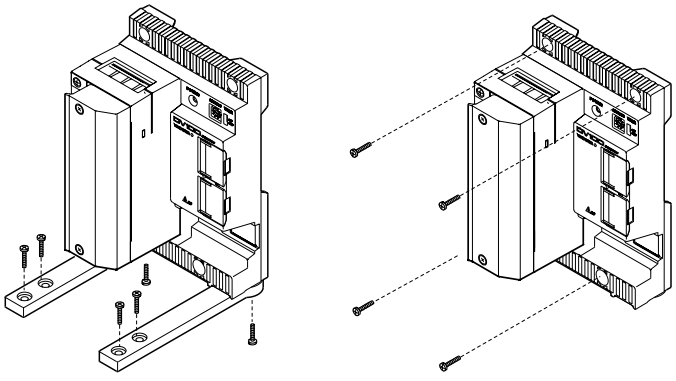
- it is exposed to direct sunlight or there is a heat source nearby;
- soot, steam, dust and/or corrosive gas is relatively abundant;
- there is a strong electromagnetic source nearby;
- there is high-voltage equipment or a power line nearby;
- it is exposed to severe and/or frequent mechanical vibration; or
- it is not positioned stably.

Desk-top or Floor Installation

Attach the two supplied shoe plates onto the extension base with two screws (4-mm screws 16 mm long, supplied as standard accessories), as shown in the figure on the left below. Then, place the extension base in an upright position. If the base is liable to fall on its side after wiring, fix the shoe plates with the four supplied screws (4-mm screws 12 mm long) using the through-holes (for 4-mm screws) of the shoe plates.

Direct Mounting on Panel

According to the figure on the right below, fix the extension base onto a panel by fastening the four corners with the supplied screws (4-mm screws 12 mm long).

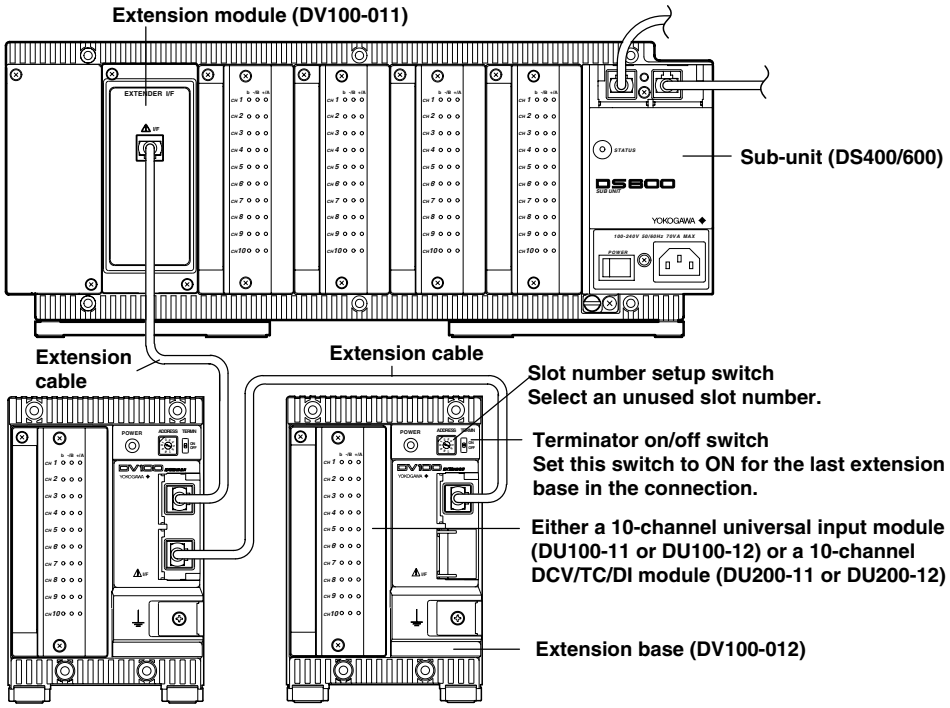


Connecting Extension Bases to an Extension Module

Verify that the power of the DS400/DS600 has been turned off before connecting the extension module/extension base.

Mount the extension module onto a stand-alone model of the DA main unit or an expandable model of the DS sub-unit. Wire the module to the extension base with an extension cable. You can wire one extension module to one of these units. In addition, you can wire a maximum of three extension bases at the same time to the extension module. It is not possible, however, to wire extension bases in such a manner that the total sum of modules already mounted on the main unit/sub-unit and the extension bases being wired exceeds the maximum number of modules (six for the DA100 main unit, four for the DS400 sub-unit and six for the DS600 sub-unit) allowed for mounting on the main unit/sub-unit.

Either a 10-channel universal input module (DU100-11 or DU100-12) or a 10-channel DCV/TC/DI module (DU200-11 or DU200-12) can be mounted onto each extension base.



Wiring Distance

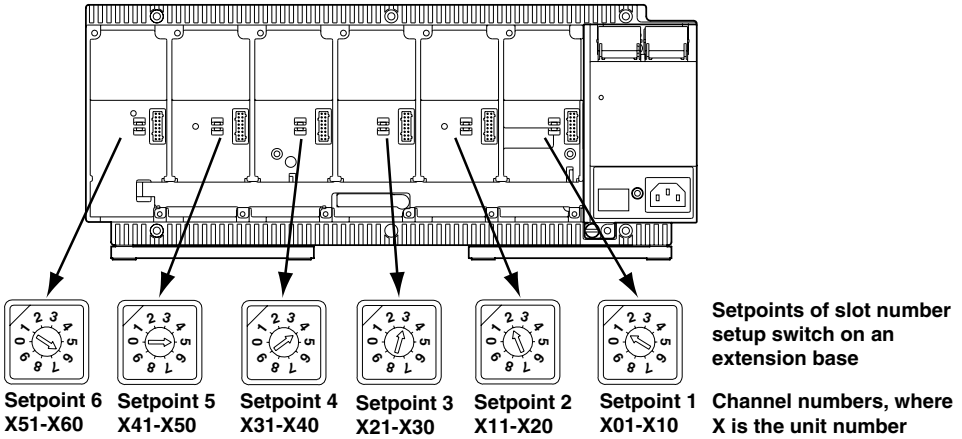
The last extension base in the connection can be located at a maximum distance of 30 m from the sub-unit.

Setting of Terminator On/Off Switch

Set the terminator on/off switch of an extension base to ON for the base that is the last in the connection. Set these switches of all other extension modules to OFF.

Setting of Slot Numbers

Select an unused slot number for each extension base. This can include, however, a slot number for an extension module. The following figure shows how the numbers you set correspond to the positions of slots and relate to channel numbers.



2.8 Connecting the Power Cord and Turning the Power ON/OFF

When Using the Accessory Power Cord

Before connecting the power supply to the DA100/DS400/DS600, make sure to comply with the following warnings. Failure to do so may cause electric shock or damage to the instrument.

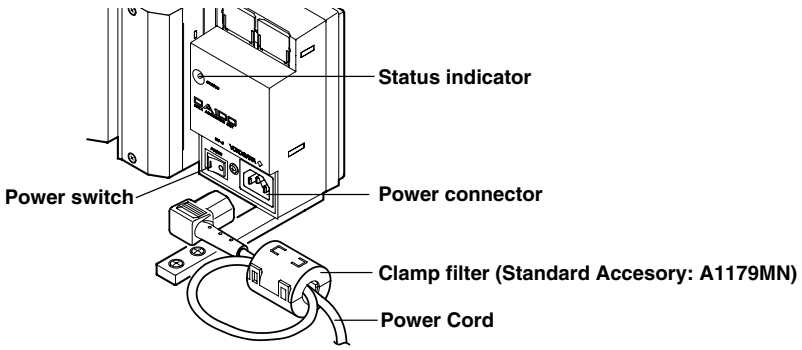
WARNING

- Connect the power cord only after confirming that the voltage of the power supply matches the rated electric power voltage for this instrument.
- Connect the power cord only after confirming that the power switch of DA100/DS400/DS600 is turned OFF.
- Only use power cords which are supplied with the DA100/DS400/DS600 by YOKOGAWA in order to prevent electric shock or fire hazard.
- Always use protective ground to prevent electric shock. Connect the accessory power cord of the DA100/DS400/DS600 to a power outlet with protective grounding. Do not use the function grounding terminal (below the power switch) as protective grounding.
- Never use an extension cord that does not have protective grounding, otherwise the protection feature will be negated.

Connecting Procedure

1 Verify that the power switch of the DA100/DS400/DS600 has been turned OFF.
2 Connect the plug of the accessory power cord to the power connector of the DA100/DS400/DS600.
3 Plug the other end of the power cord into an AC outlet that meets the following specifications. The AC outlet must be of a 3-pin type with a protective grounding terminal. Make sure to apply the clamp filter (standard accessory) to the power cord as shown below. This is to eliminate the electric emmission.

Rated supply voltage :100 to 240 VAC
Permitted supply voltage :90 to 250 VAC
Rated supply voltage frequency :50/60 Hz
Maximum power consumption:
DA100 Stand-alone type (with 6 modules connected):
in case of 100VAC input: max. 55VA
in case of 240VAC input: max. 70VA
DA100 Expandable type (with 4 modules connected):
in case of 100VAC input: max. 45VA
in case of 240VAC input: max. 55VA
DS400 Subunit (with 4 modules connected):
in case of 100VAC input: max. 45VA
in case of 240VAC input: max. 55VA
DS600 Subunit (with 6 modules connected):
in case of 100VAC input: max. 55VA
in case of 240VAC input: max. 70VA



When Using an Adapter for Direct Wiring to the Power Supply

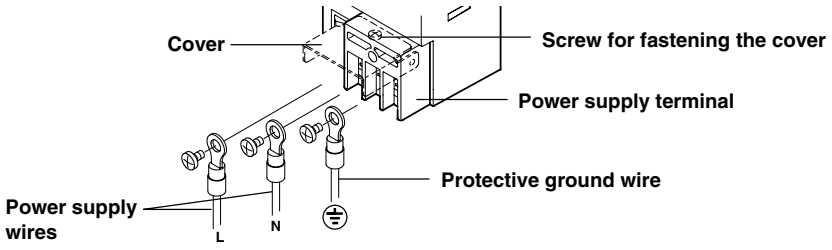
Before connecting the power supply to the DA100/DS400/DS600, make sure to comply with the following warnings. Failure to do so may cause electric shock or damage to the instrument.

WARNING

- Connect the power wires only after confirming that the power supply is OFF to prevent electric shock.
- To prevent fire, use 600V PVC insulated wire (AWG18) for power and ground wiring (cross sectional area of 0.83 mm^2 or thicker, anti-galvanic corrosion finish, insulation thickness should be more than 0.8 mm, insulation resistance ahould be more than 50MΩ Km at 20°C, approved EN60 320 (VDE0625)), or equivalent cables.
- Units equipped with screw type terminals should only be used in panel installations. Using such a unit as a floor-installation or rack-mounting is extremely dangerous.
- Before turning ON the power supply, always ground the protective ground terminal. Do not use the function rounding terminal (below the power switch) as protective grounding.
- For AC power and ground wiring, use “crimp on” lugs (for 4mm screws) with insulation sleeves. Make sure that the crimp-on tool must be one specified by the crimp-on lugs manufacture, and that the crimp-on lugs and tool must be matched to the wire size.
- To prevent electric shock, do not touch the terminals after wiring.

Connecting Procedure

1 Verify that the power switch of the DA100/DS400/DS600 has been turned OFF.
2 Connect the adapter to the power connector of the DA100/DS400/DS600.
3 Fasten the power supply wires and the protective ground wire to the power terminals. Make sure to apply the clamp filter (standard accessory) to the power wires. This is to eliminate the electric emmission.



Switching the Power ON/OFF

Pressing the “l” side of the power switch results in switching the power ON, while pressing the “O” side results in switching the power OFF.

Note

- Before turning the power ON, verify that each unit is installed properly and that the power cord is connected correctly.
- When the power switch is turned ON, but the status indicator doesn’t light up, turn the power off and verify the following . If even after verification, the indicator doesn’t light up, contact your nearest Yokogawa sales representative. Addresses may be found on the back cover of this manual.
  - Verify if the power cord is connected properly.
  - Verify if the power supply voltage lies within the range as specified on the previous page.
- When the power switch is turned ON, and the status indicator flashes in 1-second intervals, the communication module is not properly connected, and you should verify this. If the status indicator flashes in other intervals, an internal error has occurred. Turn the power switch OFF and carry out the verification as described above. If no changes appear after after some time after having turned the power ON again, contact your nearest Yokogawa sales representative. Addresses may be found on the back cover of this manual.
- When several sub-units are connected, and the power is turned off/on of one of them, the other connected sub-units which are further away from the main unit will not be recognized anymore for some time.

DA100/DS400/DS600(when using DC power terminal connecter)

This applies only to products with power supply 2 suffix code.

Follow the warnings below to avoid electric shock or damaging the instrument.

WARNING

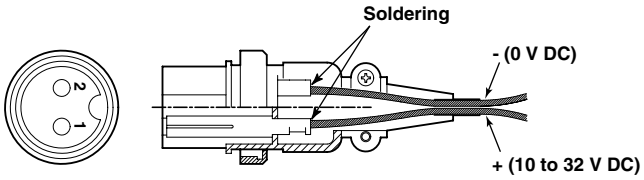
- Connect the power wires after checking that the power supply is turned off to prevent electric shock.
- To prevent fire, use wires with cross sectional area of 0.3mm^2(22AWG) or more.

CAUTION

- If you connect the + and - terminals in reverse on the DA100/DS400/DS600, the internal fuse will be blown (You cannot replace the fuse by yourself. The instrument needs servicing in this case). If there is a possibility of reversing the polarity, insert a fuse (rating shown below) in the wiring. This will lower the chances of blowing the internal fuse.
  Fuse: 250 V/T2.5 A to T4A (time lag), 20 mm glass tube fuse,
  I^2t = 12.5 to 32
  (Recommended: A1350EF (250 V/T2.5 A, I^2t=12.5: SCHURTER: FST0034.3121))

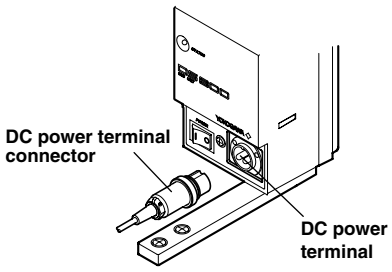
Connecting procedure

1. Check thst the power switch is turned off.
2. Connect the accessory DC power terminal connector (part No. A1105JC) to the power wire and the DA100/DS400/DS600. Use a power wire with a cross sectional area of 0.3 mm^2 (22AWG) or more.



DA100/DS400/DS600
Rated supply voltage: 12 to 28 V DC
Operating supply voltage: 10 to 32 V DC
Power consumption: About 25 VA max.

• DA100/DS400/DS600: DC power supply model



DA100/DS400/DS600(when using optional AC adapter)

This applies only to products with power supply 2 suffix code.

Follow the warnings below to avoid electric shock or damaging the instrument.

WARNING

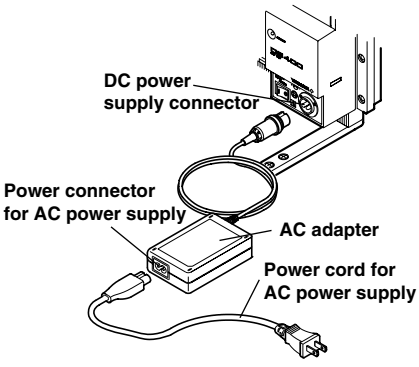
- Connect the power wires after checking that the power supply is turned off to prevent electric shock.
- To prevent electric shock or fire, always use the power cable supplied by YOKOGAWA.
- Before connecting the power cord, check that the voltage on the supply side matches with the voltage rating of this recorder.
- When not using the instrument for a long time, unplug the power cord of the AC adapter.
- Only use the AC adapter from YOKOGAWA (Model No.: DV500-00x).
- Do not put objects on top of the AC adapter or the power cord. Also, do not let heat generating objects come in contact with them.
- When unplugging the power cord, do not pull on the power cord. Always hold the plug. If the power cord becomes damaged, contact your nearest representative listed on the back cover of this manual.

Connecting Procedure

1. Check that the power switch is turned OFF.
2. Connect the AC adapter to the AC adapter jack on DA100.
3. Connect the power cord plug that came with the AC adapter to the power supply connector of the AC adapter.
4. Connect the plug on the other end of the power cord to a power outlet meeting the following specifications.
   The power outlet should be a three-pole type with a protective grounding terminal.

Rated power supply voltage: 100 to 240 VAC
Operating supply voltage range: 90 to 250 VAC
Rated supply voltage frequency: 50/60 Hz
Maximum power consumption: 90 VA
AC adapter rated output voltage: 12 VDC
AC adapter maximum rated output current: 2.6 A

• DA100/DS400/DS600



Functional grounding

When using the AC adapter, noise may be reduced if the functional ground is connected to the earth GND. Use the functional ground terminal as necessary.

2.9 Countering Noise

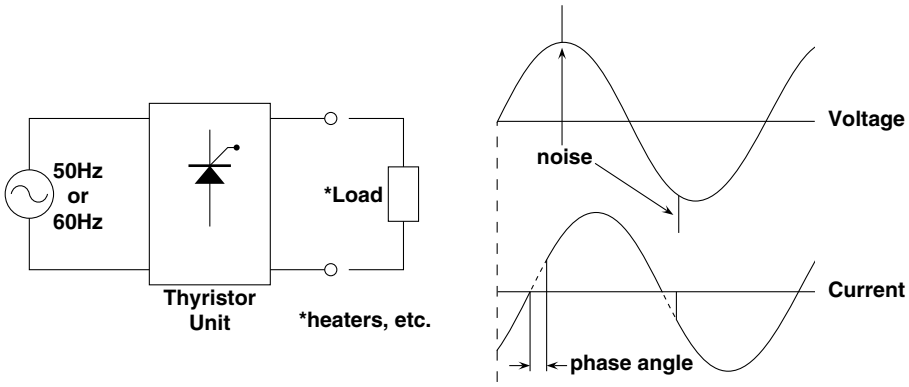
Types and Features of Noise Sources

Commercial Power Supply

It is necessary to consider both 50 and 60Hz as noise components. It is important to note that a power supply line in which a thyristor or inverter is incorporated functions not only as an "energy surplus line", but also as a "supply surplus line".

Thyristor (SCR)

A thyristor is used to control power through ON/OFF modulation of commercial power by controlling the phase angle.



Thyristor waveform

When the thyristor turns ON or OFF, a pulse noise is superimposed on commercial power supply, and its pulse width is approximately 1 µs. Accordingly, thyristor noise can be defined as follows.

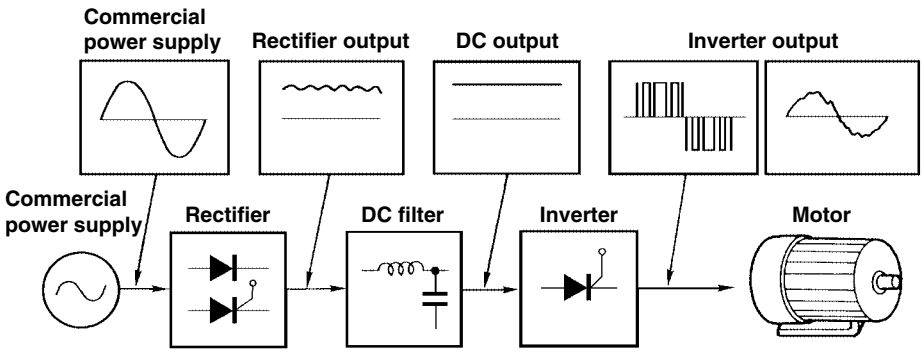
- thyristor noise = commercial power supply + pulse noise

Inverter

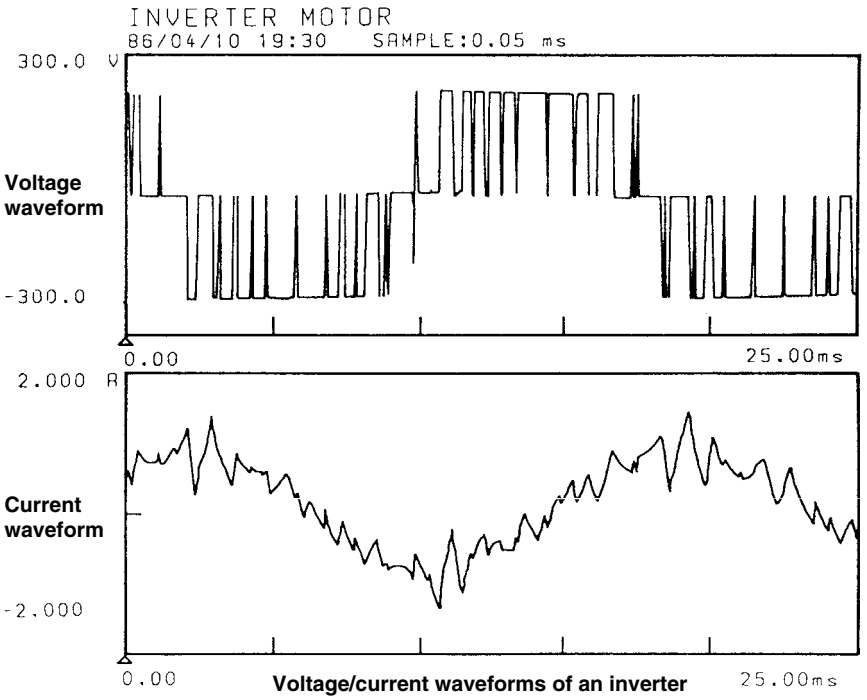
Commercial power supply is converted to direct current by a rectifier (sometimes the thyristor is used as the rectifier to stabilize direct current) and then modulated by a switching transistor and finally converted into alternating current at the desired frequency (from tens to hundreds of Hz) to drive a motor, for example. If the load to be driven is a fluorescent lamp, the frequency is tens of kHz. Accordingly, inverter noise can be defined as follows.

Inverter noise = commercial power supply + pulse noise (high density) + variable low frequency noise

Since the density of pulse noise is high compared to that of a thyristor and in addition, there is variable frequency noise, it is difficult to consider a countermeasure for inverter noise.



Principle of inverter



Voltage/current waveforms of an inverter

Relay

A relay is frequently used to amplify alarm and temperature controller outputs. However, since a counter-electromotive force (counter e.m.f.) is produced by coil inductance when the relay is turned off and the e.m.f. becomes noise, care must be taken. Due to chattering at the relay contact, tens to hundreds of kHz noise occurs mainly in bursts. Thus, the noise energy often becomes high.

Transceiver

In large-scale plants, transceivers are often used for communications between the field and the control room. Although W/G of the Japanese Electric Measuring Instruments Manufacturers Association recommends to use transceivers covering a wave band of 27MHz, smaller-sized transceivers for the 140 or 470MHz wave band are often used.

Noise Simulator

To test the immunity to pulse noise (mainly thyristor noise), a noise simulator is often used. A test noise of approximately 1kV for 0.8 μs is used synchronously with the power supply frequency. Since data acquisition equipment is often used for measurements of equipment subjected to the pulse noise test, the influence of noise must be considered.

Propagation of Noise

- Noise is propagated in the following three ways.

Conduction: noise is conducted through a power line, input wiring, etc.
Electrostatic induction: noise leaks through capacitances between wires and instruments.
Electromagnetic induction: a loop in the input line, etc. induces an AC voltage by detecting the AC magnetic field.

In real applications, the above three propagation paths are not independent of each other. Their combination propagates noise to the equipment and causes problems.

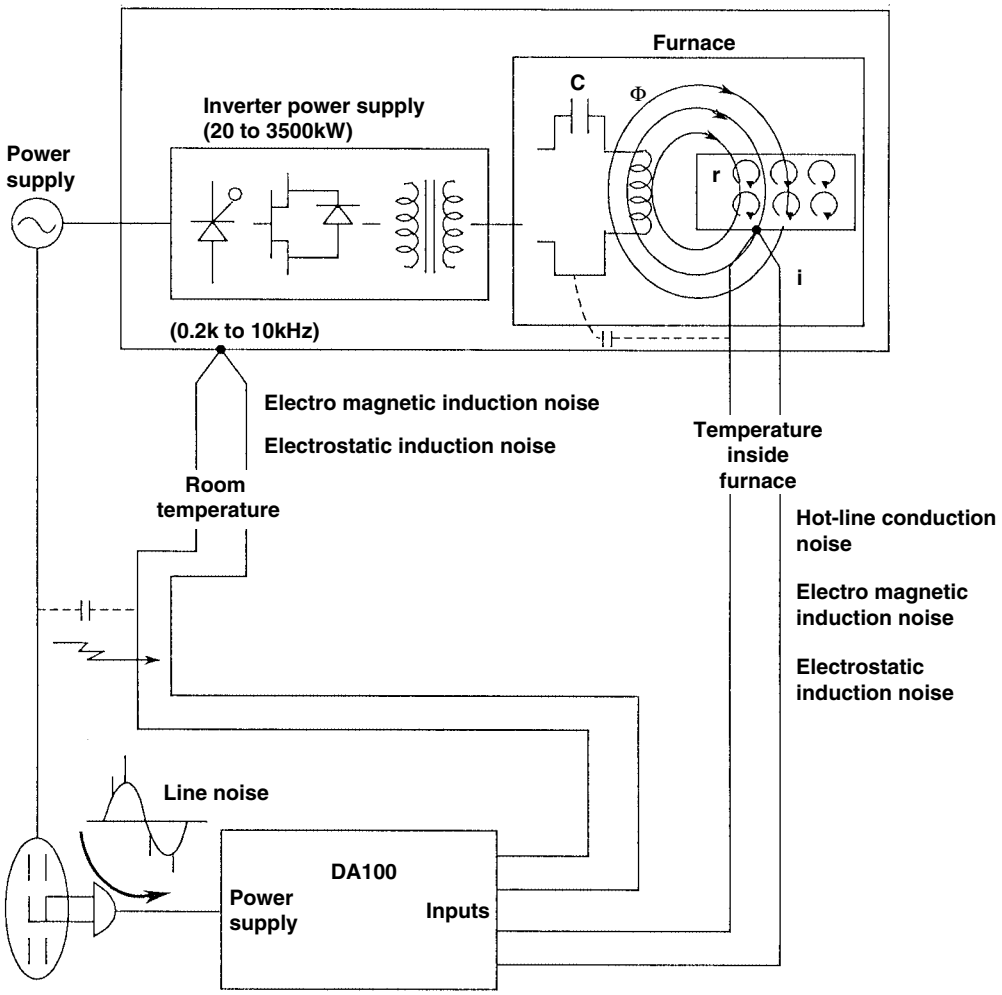
- Examples of noise propagated through each of these paths are given below.

Conduction: inverter noise, relay noise, thyristor noise, and noise caused by surface temperature measurement of a power transistor, etc.
Electrostatic induction: commercial power supply noise such as the hum of audio equipment, relay noise, etc.
Electromagnetic induction: magnetic leakage flux from a power transformer or motor, magnetic field from a high-frequency induction furnace, the rotating magnetic field of a power generator (Cu10 Ω), etc.

The figure on the next page shows the propagation paths using practical examples.

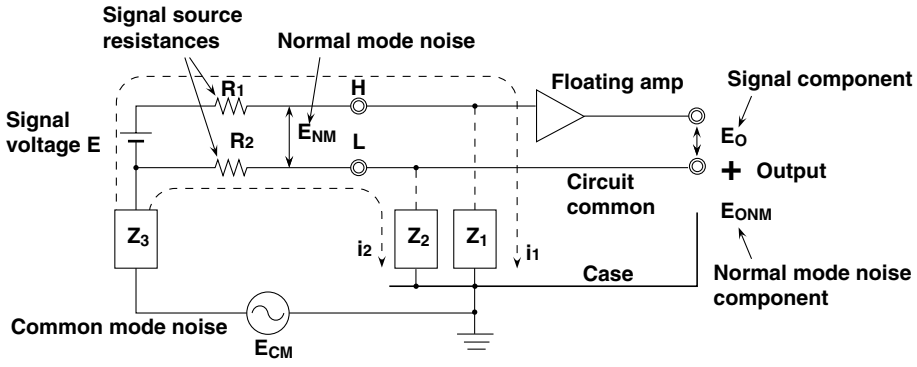
Example of a high-frequency induction furnace

* Due to electromagnetic induction, current i flows through the conductor, creating joule heat which heats the furnace.
$J=i^2r$



Basics of Anti-Noise Measures (part 1)

Common Mode Noise and Normal Mode Noise



Common Mode Noise (E_{CM})

Noise generated between the signal source and the ground of a measuring instrument. Since it is applied to both the H and L input terminals in phase with one another, it is also called in-phase voltage.

Normal Mode Noise (E_{NM})

This is an unfavorable noise that is superimposed on a signal voltage. Since it is a voltage between the H and L terminals, it is also called the line voltage, or since it is a voltage in series with the signal voltage, it is sometimes called the series mode voltage.

In the figure on the previous page, due to common mode voltage E_{CM}, noise currents i_1 and i_2 flow through the impedance to grounds Z_1 and Z_2 and coupling impedance Z_3, resulting in the generation of normal mode noise E_{NM} between input terminals H and L. Like this, common mode noise is converted to normal mode noise. The amp is equipped with a built-in filter and in case of output E_O the normal mode noise will be eliminated. This rate of conversion is called the common mode rejection ratio and expressed by the following equation.

- Common mode rejection ratio $\mathbf{(CMRR)=20Log\ \frac{E_O}{E_{CM}}(dB)}$

Since the actual CMRR is expressed using the ratio of an error component output caused by common mode noise to common mode noise, it contains the normal mode rejection ratio (NMRR) expressed by the following equation.

- Normal mode rejection ratio $\mathbf{(NMRR)=20Log\ \frac{E_O}{E_{NM}}(dB)}$

The NMRR is a value that shows the ability to reject the output error (normal mode noise component: E_{NM}) by normal mode noise. Thus, this is also a very important value which shows the resistance-to-noise characteristics of the measuring instrument.

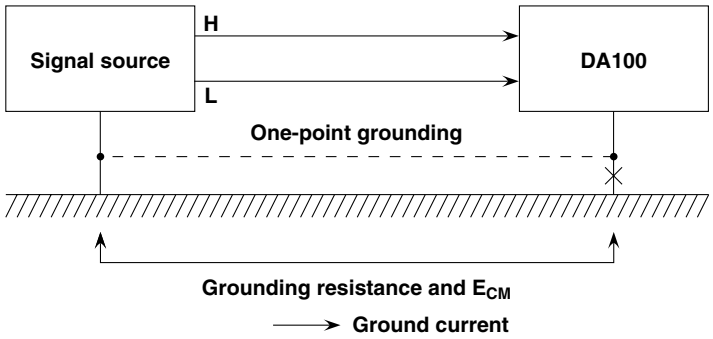
Basics of Anti-Noise Measures (part 2)

Decreasing and Increasing Impedance

As described in the previous section, conversion of common mode noise into normal mode noise causes an error in the measured output. In other words, prevention of such a conversion is the key to anti-noise measures. As can be understood from the previous section, it is important to take the following measures to reduce normal mode noise.

- reduce the wiring resistances R_1 and R_2, including the resistance of the wires.
- increase the coupling impedance of common mode voltage E_{CM}.

These are called the decrease and increase of impedance as basics of anti-noise measures.
In the above discussions, anti-noise measures have been described on the assumption that common mode noise has already been given. In real applications, common mode noise often occurs owing to grounding resistance as shown in the figure below.



In such a case, perform one-point grounding as indicated by the dotted line, as an extreme example of decreasing impedance, to equalize the potentials of the signal source and the DA100. Rejecting common mode noise in this way is the basics of anti-noise measures.

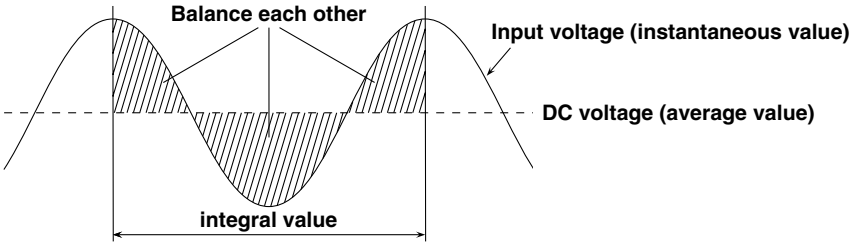
Anti-Noise Measures for the DA100

Pulse-width modulation (PWM) A/D converter

This instrument employs an in-house developed PWM A/D converter. Its two main features are:

- Superior linearity and stability achieved by the feedback effect;
- Excellent noise rejection because of the integral A/D converter.

If the integral time and noise cycle are equal, the shaded portions on the plus and minus sides balance each other and the average value becomes zero.



Normally, an integral time of 20ms (50Hz) or 16.7ms (60Hz) is selected depending on the commercial power supply frequencies. A 100-ms integral mode is added to the DA100 to achieve superior noise rejection. However, when using the 100ms setting, the smallest measurement interval is longer than in case of the 20ms or 16.7ms setting. The integral effect enables the PWM A/D converter to perform the following two functions.

- Rejection of frequency determined by the reciprocal of the integral time and frequencies which are whole multiples of that frequency;
- First-order lag filter provided with cut-off frequency proportional to the reciprocal of the integral time.

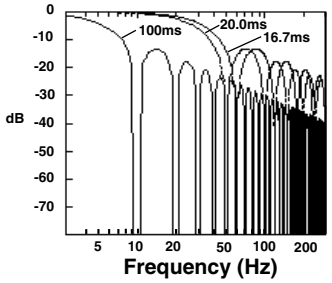
The following table compares the integral times of 16.7ms, 20ms and 100ms.

Integral time	Rejection frequency	Cut-off frequency	Remarks
16.7ms	n×60Hz	approx. 19Hz	for 60Hz
20.0ms	n×50Hz	approx. 16Hz	for 50Hz
100.0ms	n×10Hz	approx. 3.2Hz	for both 50Hz/60Hz
	n=1,2,3...		

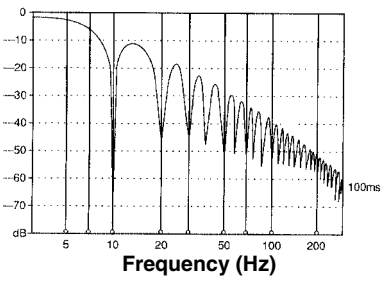
As shown in the table, the merit of 100.0-ms integration is not only that it applies to both 50 and 60Hz, but also that it provides a low cut-off frequency as the first-order lag filter and improves the noise rejection ability.

The following figure shows the calculation values of the NMRR for three integration times and an example of actual measurement of the NMRR for a 100-ms integral signal.

• Calculated values of NMRR



• Example of actual measurement of NMRR (100ms)



Noise Filter

This instrument is equipped with a low-pass filter (cutoff-frequency of 10Hz (for both 50/60 Hz), 50Hz,60Hz) which functions as a way of noise rejection. Also exponential averaging functions as a noise filter.

Anti-Noise Measures: Applications

Practical Measures

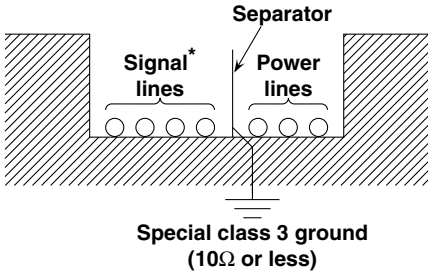
• Reducing noise itself

The basics of this practical measures dictates using the instrument in conditions where noise is suppressed as much as possible.

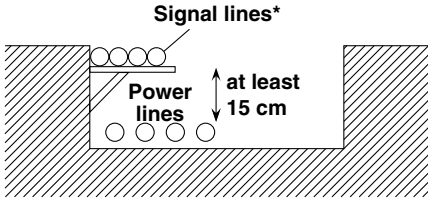
- for power lines: an increase of impedance;

Separate the power lines for noise source equipment (inverter, thyristor, etc.) from those for the measuring instrument.

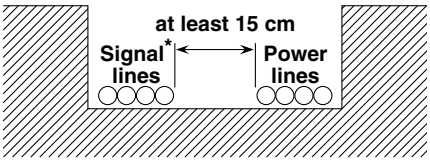
· for input lines: an increase of impedance;
Always separate the input line from the noise source lines (power and alarm lines).
Step 1 : Install a separator.



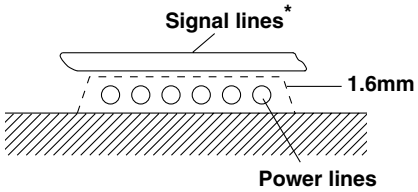
Step 2 : Keep the signal cables at least 15cm above the power lines using a bracket.
If the power lines are not shielded, the operating voltage is 220V or less, and the operating current is 10A or more, the distance between the signal cables and power cords must be 60cm or more.



Step 3 : Leave a clearance of at least 15 cm between the signal lines and power lines.
If the power lines are not shielded, the operating voltage is 220V or less, and the operating current is 10A or more, the distance between the signal cables and power cords must be 60cm or more.



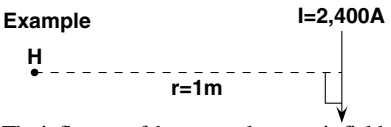
Step 4 : Lay the signal lines at right angles to the power lines.
If the power lines are not shielded, separate the signal lines and power lines where they cross using steel sheeting at least 1.6mm thick.



* Separate analog signal lines and communication cables in the same manner as from power cords.

• When there is influence from a magnetic or electrical field: an increase of impedance
Step 1 : Keep the noise source as far away as possible.

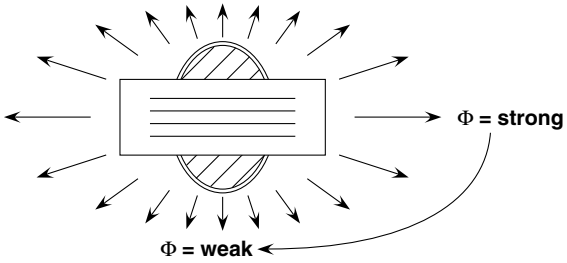
Magnetic field strength $H=\frac{I}{2\pi r}=\frac{2,400}{6}=400[A/m]$



The influence of the external magnetic field on the measuring instrument: 400A/m or less.

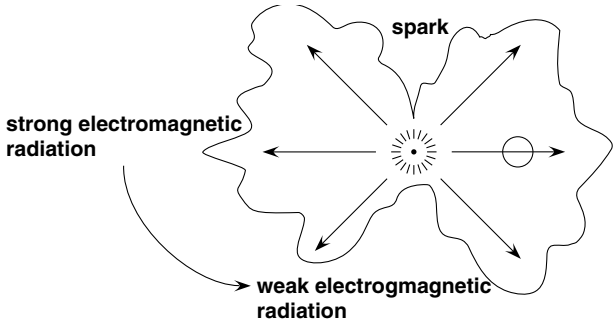
Step 2 : Change the position of the noise source.

A) Leakage magnetic flux of transformer:



Move the instrument to a location where the influence from magnetic flux is weak.

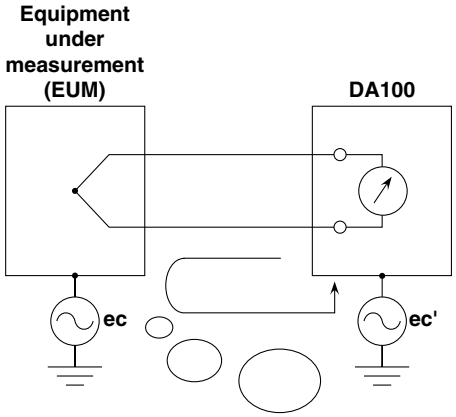
B) Sparks



Move the instrument to a location where the influence from electro-magnetic radiation is weak.

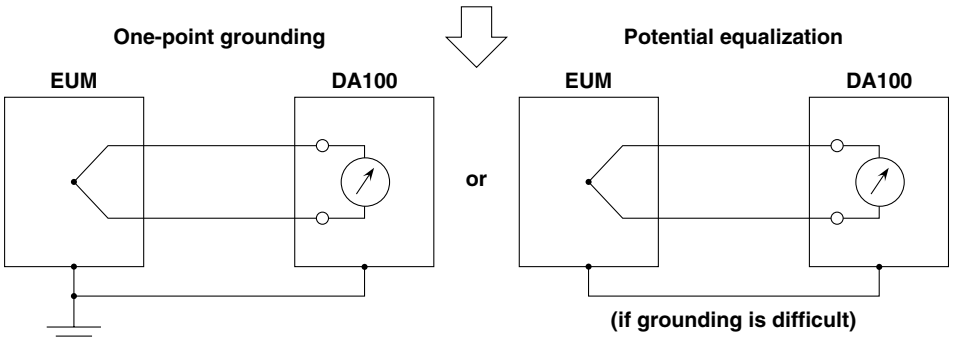
• Grounding: a decrease of impedance

The grounding method is the point of common mode noise suppression.



The difference in the potential to the ground between EUM and the DA100 may cause a ground current, resulting in noise.

Equalize the potentials to the ground so that the common mode noise becomes zero.



The basic means to obtain stable measurement is to set the circuit potential with proper grounding. Thus, potential equalization is the means to be adopted only when grounding is impossible.

• Shielded and twisted pair (prevention of electromagnetic coupling): an increase of impedance

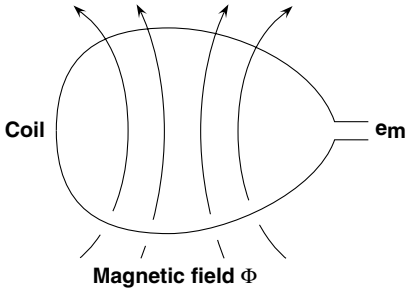
If it is difficult to keep the noise source away from the measuring instrument due to space limitations, the use of a shielded twisted pair is effective.

· electrostatic coupling can be completely cut off by shielding;

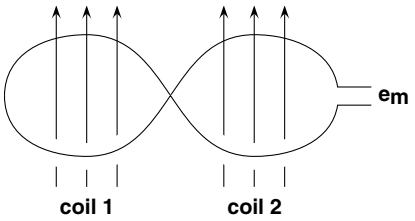
· for a magnetic field, shielding with a magnetic material (iron, permalloy, etc.) can be employed. However, there are many restrictions on this use and perfect shielding is impossible. Therefore, use of a twisted pair is preferable.

Voltage e_m induced by the coil is proportional to the area of the coil.

=> The smaller the area of the coil becomes, the smaller the noise becomes.

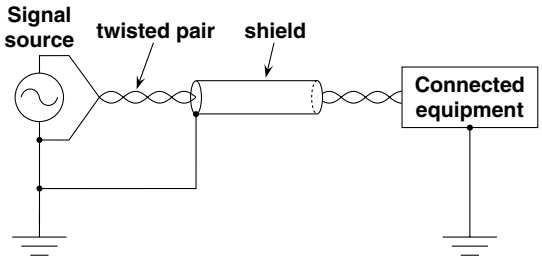


If the directions of coils 1 and 2 are reversed by twisting, as shown, if the areas of the two coils are equal, the induced voltages of the coils offset each other and total induced voltage em becomes zero.

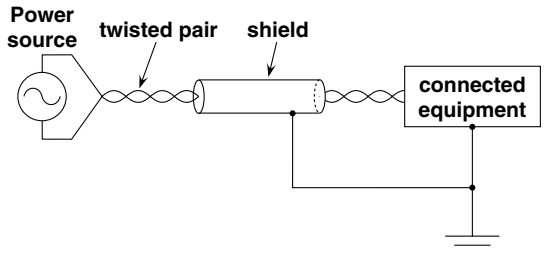


The above two principles are combined as a twisted pair.

Even though a shielded twisted pair is used, a proper grounding method is still important.



If the signal source is not grounded



Ground the signal cable shields collectively but separately from the power line ground. If the separation of grounds is impossible, use the guard terminal.

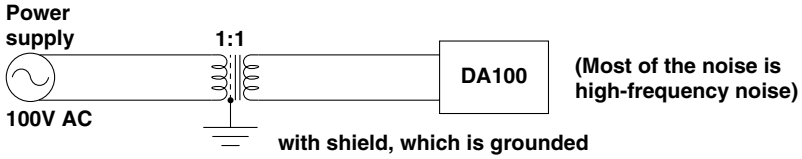
· Insertion of noise filter and noise killer

If the influence from noise cannot be eliminated by the methods described before, use noise filter or noise killer.

Power line noise rejection

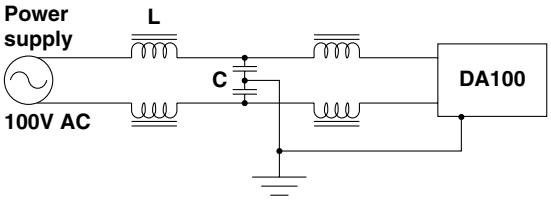
Step 1 : Insert an isolation transformer into the power line.

Increasing impedance to high frequency



Step 2 : Insert a power line noise filter (available on the market)

High frequency noise is divided by decreasing impedance to ground through C and increasing impedance through L.



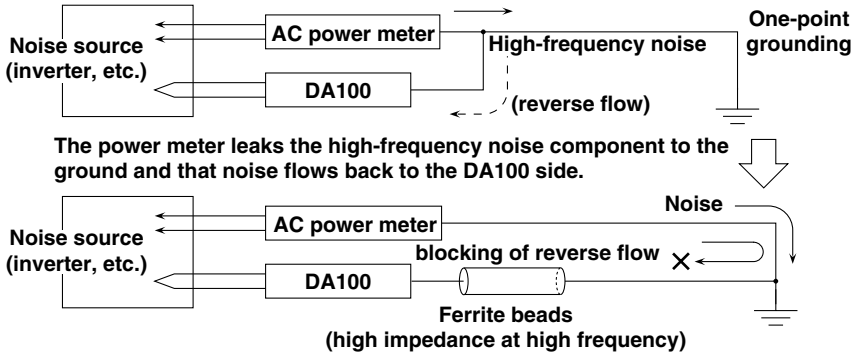
Note 1:Ground the noise filter and DA100 in common.

Note 2:Since insertion of a noise filter increases the by-pass current (regarded as leakage current), make sure that the leakage current is within the specified value.

· When the noise contains wide frequency components

While one-point grounding is effective at a low frequency, it sometimes forms a loop and has an adverse effect on a high frequency.

Ex: Connecting a power meter and DA100 grounded at one point to an inverter

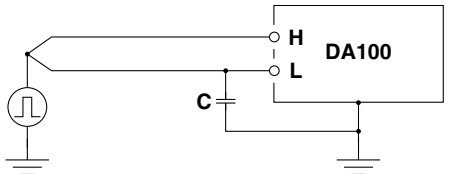


Reverse flow of high-frequency to the DA100 is thus suppressed.

· Input noise rejection

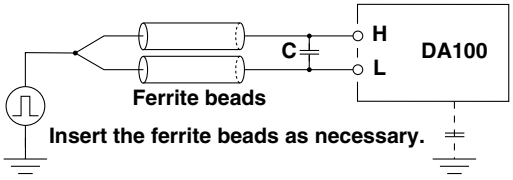
If input noise cannot be rejected by means of one-point grounding or 100-ms integration, insert capacitor or ferrite beads as they are effective in rejecting pulse noise.

Step 1 : Connect a capacitor between the L input and ground.



Use a capacitor from a hundred to thousands of pF which can withstand high voltages and must be grounded.

Step 2 : Rejection of pulse noise when grounding is impossible.

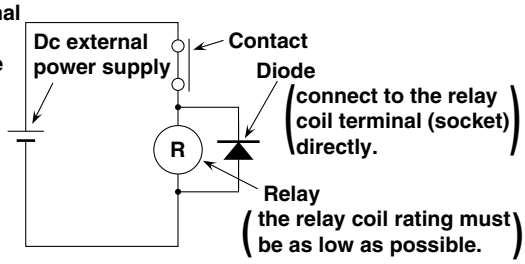


Use a capacitor from a hundred to thousands of pF.

· Relay noise suppression

<DC relay>

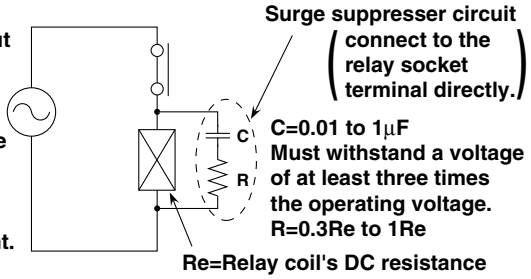
- **To prevent noise and protect the contact, connect the diode to the relay coil terminal directly.**
- **In addition to the above measure, reduce the rated voltage of the relay circuit as much as possible for higher reliability.**
- **It is necessary to choose a diode that matches the relay. Generally, a diode whose rated rectifying current is at least three times the current flowing through the relay coil must be used. And the rated reverse voltage must be at least three time the operating voltage.**



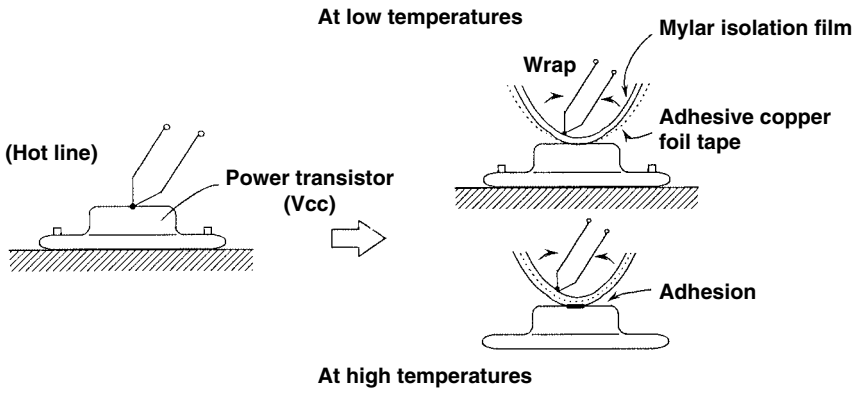
(Note) Across the relay or solenoid coil, a counter-electromotive force is produced by an inductive load. This phenomenon may damage the contact or, as the noise source, cause a malfunctioning of the equipment, and have an unfavorable effect on the entire system.

<AC relay>

- **If a relay contact is connectd to the input of the system components, apply the measure shown in the figure at the right to the relay coil. Otherwise, a counter-electromotive force produced across the coil may be induced on the contact side through the relay's internal coupling or coupling between the lines, and may cause a malfunctioning of the equipment.**

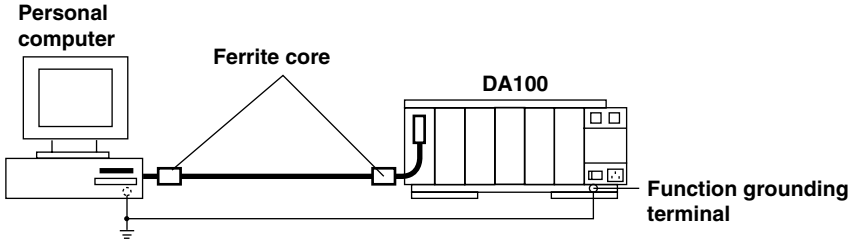


· Others (isolation from noise source: for hot line measurement)



Anti-Noise Measures for PC Connection

When connecting the DA100 to a PC, it is recommended to apply ferrite cores (e.g. ZCAT3035-1303 from TDK) to the interface cable as a noise countering measure. Apply a ferrite core on both sides of the cable as shown below, when the noise persists, apply more ferrite cores.



3.1 Diagnosis

When using the instrument for the first time, make sure to carry out the following operations to verify that no problems exist relating to the DA100 system configuration. Furthermore, in case it becomes impossible to set the DA100 or when data acquisition becomes impossible, carry out the following diagnosis.

Points to Verify Before Carrying Out this Diagnosis

Power Supply

Verify:

- that the power supply matches the requirements;
- that the power supply is properly connected.

Status Indicator

An internal error has occurred if the status indicator is flashing.

Unit/Modules

Verify:

- that the environmental conditions match the requirements;
- that all screws are properly fastened;
- that the number of connected modules and their locations are conform the specifications. (Refer to 2.3, page 2-4 for more details.)

Communication Interface

Verify:

- that the communication interface cable is properly connected;
- that the location of the communication module is correct (as it cannot be connected to a sub-unit);
- when using the GP-IB module, verify that the address setting is correct;
- when communicating by GP-IB interface, verify that the GP-IB driver has been installed;
- when using the RS-232C, RS-422-A/RS-485, ethernet module, verify that the setting parameters are correct.

Conditions for Diagnosis

Before using the instrument, make sure to carry out the following operations to verify that no problems exist relating to the DA100 system configuration.

When using the DAQ software 32

1 Start the DAQ software 32.
2 Start the self-diagnosis program by clicking the [Diagnosis] icon.
3 Carry out the self-diagnosis operations conform the DAQ Software 32 Instruction Manual (IMDP12013-61E).
4 Verify that the displayed units/modules are the same as the ones actually connected and that there are no errors.

Using the Communication Interface without using the DAQ software 32

1 Send the [CF] command to receive the system acquisition data, conform the Communication Interface manual IMDA100-11E.
2 Using the received results, verify that the displayed units/modules are the same as the ones actually connected and that there are no errors.

How to Cope with Errors

When Communication Error No. 0801 Occurs

Verify:

- that the communication format settings of the diagnosis program (such as GP-IB or RS-232C) are conform the actual communication format settings;
- that the interface cables are wired and connected properly;
- that the communication settings of the DA100 (address, baud rate) are correct;
- that the communication settings of the personal computer are correct.

When Sub-Units do not Appear on the Display (in case of the Expandable type)

Verify:

- that the power of the sub-unit is turned ON;
- that the extension cables are properly connected;
- that the unit number of the sub-unit conforms the setting of the rotary switch;
- that after initializing the system no other sub-units have been connected.

When Modules do not Appear on the Display Correctly

Verify:

- that the configuration of the modules is correct;
- that after initializing the system no other modules have been wired.

When Any of the Following Errors Occur

Error No.	Cause	Reference Page
C0	An input unit which does not match the system configuration has been connected.*1	2-4
C1	The module configuration has been altered after initializing the system	-
81	The number of connected modules exceeds the allowable number	2-4, 2-5
82	Erroneous calibration has been carried out	3-5
83	Servicing is required*2	-

*1 Verify that the style number (for hardware) and release number (for software) match the following rules;
- module's style number ≤ main unit's/sub-unit's style number.
- main unit's/sub-unit's style number ≤ software's release number.

*2 Contact your nearest sales representative; addresses may be found on the back cover of this manual.

3.2 Error Messages

The following messages might appear with the standard software.

Warning message

No.	Message
W1102	Converted data file will be overwritten. OK?
W3304	Start Initiliazeing?
W3305	Start Reconstruting?
W3451	Delete the current Project?
W3315	Stop Calibration?
W3316	Send Calibration Values?
W3317	60 mV, 200 mV have not been calibrated.Do you want to continue?
W3318	Store Calibration Values?
W3319	Abort Calibration?
W3320	Initial Balance Failed. Retry?
W3332	Close network?
W3333	Set the network address?
W3671	Please change connected hardware to SET mode.
W3672	Hardware model doesn't match software setting. Continue sending?
W3673	Style numbers don't match. Continue sending?
W3674	Hardware and Software configurations don't match. Continue sending data?
W3675	Hardware and Software options don't match. Continue sending?
W3676	Some data couldn't be read.
W3677	Some existing data were changed.
W3678	This is a reference channel.Channels refering to this channel will be changed too!
W3679	Settings of other power module channels will be changed too!
W3680	Some channels out of the copy range will be changed too!
W3681	Some channels can't be copied.
W3682	Writing operation was changed.
W3683	Following the change of temperature unit, SET (Regular) settings have been initialized.
W3684	The digital print settings of some measurement and math channels have been changed.
W3685	The relay settings of some measurement and math channels were set OFF.
W3686	Some Event/Action settings have been changed.

Error message<Common>

No.	Message/Description
E0001	Insufficient Memory.
	Exit other programs and restart, or reboot the OS and restart the program.
E0002	Insufficient Memory.Please close at once.
	Exit other programs and restart, or reboot the OS and restart the program.
E0003	Can't open shared memory.
	Exit other programs and restart, or reboot the OS and restart the program.
E0101	Please use DAQ32 launcher to open.
	Please use DAQ32 Plus launcher to open.
	Run the program from the launcher.
E0201	Can't open.No YOKOGAWA binary file.
	Cannot handle this file.
E0202	Can't open.No DARWIN binary file.
	Cannot handle this file.
E0203	No data available.
	Cannot handle this file.
E0211	Can't write to file.
	Check the directory's free space. Check that other programs are not using the file.
E0212	Can't read file.
	Check the existence of the file. Check that the file system is operating properly.

No.	Error/Corrective Action
E0213	Can't open file. Check the existence of the file. Check that the file system is operating properly.
E0214	Insufficient disk capacity. Free disk space.
E0215	No such file. Check the existence of the file.
E0216	Illegal file name. Use a different file name.
E0401	Communication error. The Logger Software cannot communicate while the setup software is communicating. Check that the DARWIN is turned ON, the communication module is being recognized by the DARWIN (DR/DC), and the cable is connected properly. In addition, check the following items according to the communication methods. For GPIB Is the address correct? Is the driver is properly installed? Is the GPIB card manufactured by NI? For Ether Is the address correct? Is the TCP/IP protocol installed in Windows? Is the Ether card properly installed? For RS-232-C, RS-422-A, and RS-485 Is the baud rate correct? Is the port (COM1 to COM4) correct? Is the address correct (RS422)? Is the PC's serial port functioning? Is the correct type of cable being used?
E0404	Can't load DLL of GPIB. Correctly install the GPIB driver.

Error message<Launcher software>

No.	Error/Corrective Action
E3401	Incorrect Password. Enter the correct password.
E3402	Passwords may not be blank. Enter the password.
E3403	Project names may not be blank Enter the project name.

Error message<Logger>

No.	Error/Corrective Action
E3001	Incorrect File type or Version!The program will use default settings because the previous settings (such as display settings) could not be loaded.

Error message<Software Configuration>

No.	Error/Corrective Action
E3301	Failed to scan. Check that the DARWIN is turned ON, the communication module is being recognized by the DARWIN (DR/DC), and the cable is connected properly. In addition, check the following items according to the communication methods. For GPIB Is the address correct? Is the driver is properly installed? Is the GPIB card manufactured by NI? For Ether Is the address correct? Is the TCP/IP protocol installed in Windows? Is the Ether card properly installed? For RS-232-C, RS-422-A, and RS-485 Is the baud rate correct? Is the port (COM1 to COM4) correct? Is the address correct (RS422)? Is the PC's serial port functioning? Is the correct type of cable being used?
E3302	Failed to reconstruct See the corrective actions for E3301.
E3303	Failed to initialize See the corrective actions for E3301.
E3312	Select all ranges that has invalid values. Even though there is a range with an invalid calibration value, that range is not selected. Select the range with the invalid calibration value and calibrate it.
E3313	Failed to calibrate. Check that the module is connected properly. Check the wiring, rated input, and etc.
E3314	For xxx is invalid. Enter the correct value.
E3331	There is no module. Or there are many modules. Several modules exist when setting up the network. Specify only one module.
E3337	The address is invalid. Properly set the combination of the IP address, subnet mask, and default gateway.
E3338	Can not set the network address. An error occurred while setting the address.
E3339	Modules not found. Set the module's dipswitch and turn DARWIN ON. Check that the cables are connected properly.

Error message<Historical Viewer >

No.	Error/Corrective Action
E3101	Data is not exist. Valid data do not exist.
E3102	Channel is not exist Valid channel does not exist.

Error message<DARWIN Hardware Configuration>

No.	Error/Corrective Action
E3631	Communication not possible during logging. Terminate Logger's communication before executing.
E3632	Communication not possible while monitoring data. Terminate Logger's communication before executing.
E3633	Connected to unkown model. Modify the system or change the settings.
E3636	Failed to send command. Some items could not be set. Check the setup data.
E3637	Can't reconstruct. Displayed when the DR stand-alone model is connected.
E3638	Initial balancing failed. Check the input, initialize, and perform initial balancing again. If it fails again, servicing is needed.
E3639	Incorrect file name! Check the file name and extension.
E3640	File operation failed. Check the free space on the PC's hard drive. Check that the hard disk is operating properly.
E3641	These data were generated by another model. Select a different file.
E3643	Failed to load data. Some data initialized. Check the setup data.
E3644	Invalid channels are included in the copy source. Check the copy source and copy destination settings.
E3645	Please enter an equation. Enter an equation.
E3646	Unknown symbol is entered. Please change equation. Check the setup data.
E3647	Invalid channel number is entered. Please change equation. Check the channel number.
E3648	Incorrect use of parenthesis. Please change equation. Check the setup data.
E3649	Grammatical error. Please change equation. Check the setup data.
E3650	Character string is incorrect. Check the setup data.
E3651	Invalid channel number. Change the channel number.
E3652	For input range, please keep CH numbers "Left < Right". Check the setup data.
E3653	Channel number is already being used! Check the setup data.

Message

No.	Error/Corrective Action
M3404	Invalid Project name.Please enter a new name.
M3405	This Project name is already being used.Please enter a new Project name.
M3406	There must be at least one unlocked Project.
M3407	Can't contain any of the following characters\n\\ / : , ; * ? " < > |
M3031	Do you want to stop recording ?
M3032	Please stop Measuring before you exit.
M3033	You must Unlock and enter Password to Exit.
M3231	Send Tags?
M3232	Send TagIDs?
M3601	Start Receiving?
M3602	Start Sending?
M3603	Reconstruct?
M3604	File is already open. Reopen will cause your changes to be discarded. Do you want to reopen?
M3605	All settings will be initialized!
M3606	SET (Regular) settings will be initialized!
M3607	Add Unit?
M3608	Delete Unit?

3.3 Trouble-Shooting

- When a message appears on the screen, first refer to the list of error messages described on page 3-4.
- When servicing is necessary, contact your nearest sales representative. Addresses may be found on the back cover of this manual.

Description	Cause	Action	Reference Page
No power-up; the status indicator does not light.	The used power supply lies outside the permissible range.	Use the correct power supply.	2-25
The status indicator is flashing in 1-second intervals.	The communication module is not configured properly.	Configure the communication module properly.	2-4
The status indicator is flashing in an interval other than 1-second.	An internal error occurred.	Turn the power OFF and ON again.	2-25
Connected sub-units are not recognized.	The power of the corresponding sub-unit has been turned OFF.	Turn the power ON.	2-25
	The extension cables of the corresponding sub-unit are not connected properly.	Connect the extension cables properly.	2-13
Connected modules are not recognized.	The corresponding module is not properly connected.	Connect the module properly.	2-4
Measurement values are not correct.	The input does not conform specifications.	Verify the input specifications.	Chapter 4
	The measurement mode is not suited for this input.	Select a suitable measurement mode.	*1
	The measurement range/span/scale setting is not suited for this input.	Select a suitable measurement range/span/scale.	*1
	Noise interference.	Apply anti-noise measures.	2-29
	Input wiring is not correct.	Wire the input properly.	2-15
	RJC settings are not correct.	Enter the correct RJC settings.	*1
	The environmental temperature is outside the specifications.	Make sure the environmental temperature matches the specifications.	2-2

*1 Refer to the User's Manual for DAQ Software 32.

3.4 About Maintenance and Calibration

Since the DA100 Acquisition Unit (hereafter referred to as DA100) has no parts which are subject to wear, periodical replacement of parts is not necessary. However, we recommend to inspect the operation conditions periodically.

About Fuse Replacement

Although the DA100 is equipped with a built-in fuse, replacement of a blown fuse may not be carried out by the customer himself. For replacement of the fuse, contact your nearest sales representative. Addresses may be found on the back cover of this manual.

About Calibration

We recommend to calibrate the DA100, as described below, at least once a year to assure the measurement accuracy.

Required Equipment

Name	Measurement	Accuracy Range	Recommended
DC Voltage Generator	0V to 50V	0.005% of setting + 1 μV	Yokogawa 9000*, 4808
DMM	0V to 50V	0.005% of setting + 1 μV	HP3458A
Decade Resistance Box	0.1 Ω to 1000 Ω	0.01%	Yokogawa 2793
DC Current Gemerator	0 mA to 20 mA	0.05% of setting	Yokogawa 7651

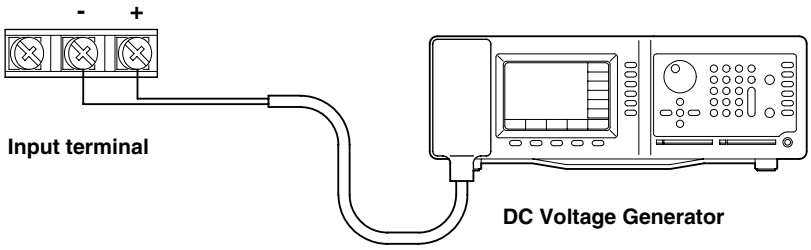
* For 0V input, it is necessary to either short the input terminals, or to monitor the output voltage using the DMM.

Calibrating Conditions

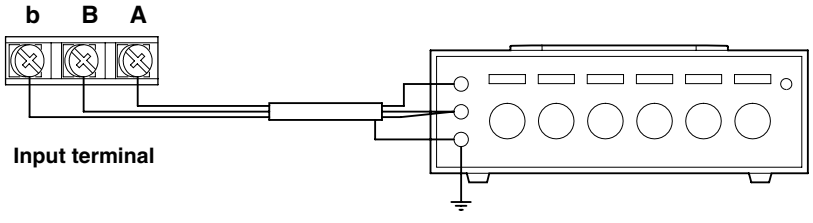
Ambient temperature : 23 °C ±2°C
Ambient humidity : 55 ±10%RH
AC power supply voltage : 100 to 240 VAC (AC power supply model)
DC power supply voltage : 12 to 28 VDC (DC power supply model)
Power supply frequency : 50/60 Hz ±1% (AC power supply model)
Warm-up time : at least 30 minutes for the DA100, and necessary warm-up time for the used equipment

Connection

DC Voltage Measurement



Temperature Measurement Using RTD

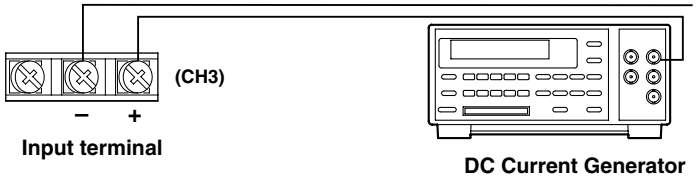


Temperature Measurement Using TC

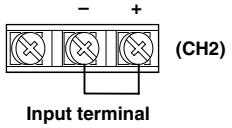
DC voltage input for DC voltage measurement substitutes for this.

DC Current measurement

Apply the 20mA to channel 3



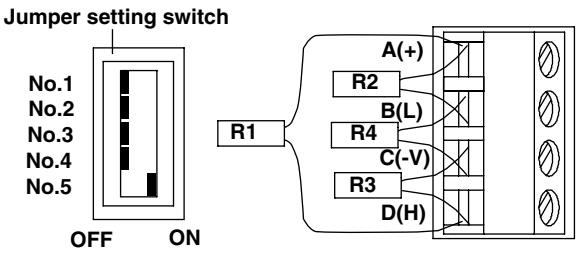
Short circuit between "+" and "–" terminal in channel 2



Strain measurement

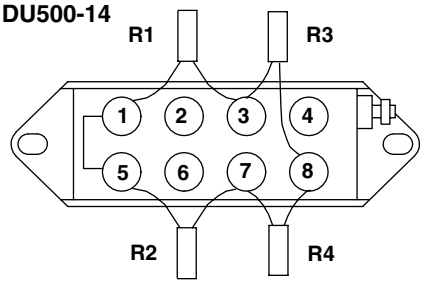
Wire the strain gauge or the bridge box to the channel 2.

DU500-12/DU500-13



No.1	No.2	No.3	No.4	No.5
OFF	OFF	OFF	OFF	ON

DU500-14



To R1 to R4, connect resisters with the specifications described below.

Calibration	Resisters R1, R2, R3	Resister 4	Accuracy
ZERO	120.000	120.000	±0.005%, ±0.3ppm/°C
2k SPAN	120.000	119.521	±0.005%, ±0.3ppm/°C
20k SPAN	120.000	115.294	±0.005%, ±0.3ppm/°C
200k SPAN	120.000	80.000	±0.005%, ±0.3ppm/°C

Voltage or Current Output Using Retransmission Module

When clibrating the retransmission module by confirming the output value, connect a DMM (a product corresponding to HP3458A) to the terminal to be calibrated.

Calibration Procedure

1 Connect the equipment as described above.
2 Verify that the calibration conditions are satisfied.
3 Start the DAQ Software 32.
4 Start the calibration program by clicking the [Calibration] icon.
5 Carry out the calibration operations (A/D adjustment) conform the DAQ Software 32 User's Manual (IMDP12013-62E).

Note

Instead of operating the DAQ Software 32, calibration can also be carried out by communication interface using the [XZ] command. For details concerning this command, refer to the User's Manual "Data Acquisition Unit Communication Interface", IMDA100-11E.

4.1 DA100/ DS400/ DS600

Style Number **DA100: S8**
DS400: S8
DS600: S8

Available Modules for the DA100 Stand-alone Type

Input modules : universal (DC voltage, TC, RTD, contact), DCV/TC/DI, mA, Power monitor, Strain, Pulse, Digital

Alarm output modules : 4-ch output (transfer contact) or 10-ch output (make contact); the number of channels can be increased by adding modules.

Communication interface modules : Selectable from GP-IB, RS-232C, RS-422-A/RS-485, and Ethernet

DI/DO modules : 2-ch alarm output (transfer contact), 1-ch fail output and 12-ch remote control input for only with /M1 opution

Extender module

· Number of modules which can be connected : 6 (of which at least one must be a communication interface module)

DI/DO module: not more than one
Input module: max. four
Input module + alarm output module + DI/DO module + communication interface module: max. six

Connecting the DA100 Expandable Type Subunits

Types of subunits

Subunit DS400: four modules
Subunit DS600: six modules

Number of subunits which can be connected

Up to six units can be connected (either DS400 or DS600)

Connection method

Using dedicated cables

Available Modules for the DA100 Expandable Type

Main unit

Alarm output modules : 4-ch output (transfer contact) or 10-ch output (make contact); the number of channels can be increased by adding modules.

Communication interface modules : Selectable from GP-IB, RS-232C, RS-422-A/RS-485, and Ethernet

DI/DO modules : 2-ch alarm output (transfer contact), 1-ch fail output and 12-ch remote control input for only with /M1 opution

Extender module

· Number of modules which can be connected: 4 (of which at least one should be a communication interface module)

Alarm output module + DI/DO module: not more than three
Input module: cannot be connected.

Subunit (DS400/DS600)

Input modules : universal (DC voltage, TC, RTD, contact), DCV/TC/DI, mA, Power monitor, Strain, Pulse, Digital

Alarm output modules : 4-ch output (transfer contact) or 10-ch output (make contact); the number of channels can be increased by adding modules.

DI/DO modules : Alarm 2-ch output (transfer contact) and fail output module

Extender module

· Number of modules which can be connected to one DS400: 4
Input module + alarm output module + DI/DO module: max. four

· Number of modules which can be connected to one DS600: 6
Input module + alarm output module + DI/DO module: max. six

Construction

Installation method

Floor mounting :Use the feet at the bottom of each unit.
Direct panel mounting :Screw the unit directly to the panel at the specified points.
DIN rail mounting :Use the dedicated mounting brackets.
Rack mounting :Use the dedicated mounting brackets.

Regardless of which installation method you use, be sure to install the units in an upright position.

Materials

Steel, aluminium alloy, plastics.

Paint color

Slate grey light (equivalent to Munsell 0.8Y2.5/0.4)
Lamp black (equivalent to Munsell 0.1PB4.6/0.2)

External dimensions

Stand-alone type main unit : approx. 422 (W) x 176 (H) x 100 (D) mm
Expandable type main unit : approx. 336 (W) x 165 (H) x 100 (D) mm
Subunit DS400 : approx. 336 (W) x 165 (H) x 100 (D) mm
Subunit DS600 : approx. 422 (W) x 176 (H) x 100 (D) mm

Weight

Stand-alone type main unit : approx. 1.1kg* (with 4 input modules + 1 alarm output module + 1 communication module installed: approx. 3.5kg)
Expandable type main unit : 0.9kg* (with 4 input/output modules installed: approx. 2.5kg)
Subunit DS400 : 0.9kg* (with 4 input/output modules installed: approx. 2.5kg)
Subunit DS600 : 1.1kg* (with 6 input/output modules installed: approx. 3.5kg)

* represents the weight of each unit without modules installed.

Input

Measurement range

Refer to 4.2 on page 4-6.

Measurement interval

Selectable from 0.5, 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60s
(with the 10-ch input module, filter: OFF, A/D integration period of 20ms or 16.7ms)
stand-alone type : max. 40ch/s (when using the accessory standard software)
expandable type : max. 300ch/500ms (when using the accessory standard software)

A/D integration period

Selectable from 20ms (50Hz), 16.7ms (60Hz), 100ms (10Hz), or auto.
However, AUTO does not function on the stand-alone DC power supply model nor on the extension type using the subunit of the DC power supply model. The factory initialization settings are set to 20ms (50Hz) for the stand-alone DC power supply model and AUTO for the extension type DC power supply model.

Number of inputs

stand-alone type : up to 40
expandable type : up to 300

Alarm Functions (the function of alarm output modules)

Number of settings

Up to four settings can be made for each channel.
Kinds of alarms: selectable from higher limit, lower limit, difference higher limit, difference lower limit, rising limit of rate of change, falling limit of rate of change.
Time interval for the rate of change alarm: Can be set to 1 to 15 times the measurement interval (common to both rising and falling limits)

Output mode

Activating/de-activating selection, AND/OR mode selection, and output hold/non-hold designation can be made (common to all channels).

Number of alarm output points

stand-alone type : 2 (in DI/DO modules) to 40 points.
expandable type : Up to 30 points can be connected to the DA100 main unit (the number of alarm points can be increased in module units). By connecting subunits, you can increase the total number of alarm points (the number of alarm points can be increased in module units).

Number of alarm output modules that can be connected

stand-alone type : up to three modules can be connected.
expandable type : up to 4 modules can be conncected to the DA100 main unit, up to 6 modules can be connected to one subunit.

Standard Computation Functions

Computation functions

Difference between input channels, linear scaling, moving average

Scaling

ranges for which scaling can be set : DC voltage, TC, RTD, contact
scaling range : –30000 to +30000
Decimal point : can be set freely
Measurement accuracy for scaling : Measurement accuracy for scaling (digits) = Measurement accuracy (digits) x Scaling span (digits) / Measurement span (digits) + 2 digits (numbers below the decimal point are discarded).

(Example)
measurement accuracy when the measured value is 5 V with the following settings: measurement range: DCV 6 V, measurement span: 1.000 to 5.000 V, and scaling span: 0.000 to 2.000
±(0.05 ×5+2)×2000/4000+2= ±3.125, measurement accuracy= ±4digits= ±0.004

Moving average

The moving average results for between 2 to 64 scans are computed.

Optional Math Function (/M1 option)

Computation types
Four arithmetical operations, SQR(square root), ABS(absolute value), LOG(common logarithm), LN(natural logarithm), EXP(exponent), statistical computation*, logical computation (AND, OR, NOT, and XOR), relational computation, exponentiation, previously-measured value reference, hold**, and reset

* Statistical computation
CLOG: Computation process of simultaneously measured values within a group (total, maximum, minimum, average, and maximum - minimum)
TLOG: Computation process of a specific channel over time axis (total, maximum, minimum, average, and maximum - minimum)
Statistical computation interval: Set by the event/action function

* *Hold
Temporary suspending of computation and temporary hold of the computed result. During statistical computation, resume the computation from the hold point after the hold is released.

Number of channels for computing (Number of channels that can be allocated for computational purposes.)

Stand-alone type: 30ch maximum
Expandable type: 60ch maximum

Computation interval

Every measurement interval (except when the computation becomes too difficult to be processed every measured interval, in which case an alarm is generated)

Significant digits during computation

10^{308}

Significant digits of the computed result

-9,999,999 to +99,999,999 (Decimal point can be set to have 1 to 4 digits on the right of the decimal point)

Input from communication interface

Digital value (ASCII numerical array) input from the communication interface can be handled as computational data

Computation start/stop

Can be controlled by communication commands and event/action function (such as remote control signal, time specified, and alarm status)

Other functions included in the math function

Remote RJC

Input type: Thermocouple (TC)
Accuracy: (Twice the measurement accuracy of the standard thermocouple input) + (temperature difference between the terminal of the remote terminal section and thermocouple section for measuring the remote terminal temperature)
Thermocouple burnout: not selectable

Event/Action function

Can controll alarm ouput, timer and math executions with the alarm status, timer, etc.

Report Function (feature of the suffix code /M3; available with models with style number 5 or higher)

Report Channels
60 channels, from R01 to R60

Types of Reports
Hourly report: Hourly (every hour) statistical information
Daily report: Statistical information for a day (starting at a specified time)
Monthly report: Statistical information for a month (starting at a specified date and time)
These types of report making can be turned on or off separately.

Output of the Results of Computing for Reports
The DA100 main unit sends the results to a communication line.

Output Formats of the Results of Computing for Reports
Hourly report: Standard format
Daily report: Standard format or enhanced format
  Standard format: results of computing daily reports
  Enhanced format: results of computing daily reports plus results of computing hourly reports*
Monthly report: Standard format or enhanced format
  Standard format: results of computing monthly reports
  Enhanced format: results of computing monthly reports plus results of computing daily reports*
The enhanced format applies to either daily reports or monthly reports only.
*: Either the average, instantaneous value or sum in each computing of a report.

Types of Computing for Reports
AVE: Average, maximum and minimum over a preset interval
INST: Instantaneous value at the time of report making
SUM: Sum and cumulative sum over a preset interval

	Sum	Cumulative Sum
Hourly report	Hourly sum	Sum over 24 hours (resets at the time to make up a daily report)
Daily report	Daily sum	Sum over a month (resets at the time to make up a monthly report)
Monthly report	Monthly sum	Not applicable

Unit Conversion (SUM only)
When inputs over a unit of time are integrated, the unit conversion compensates for any discrepancy in the unit of value arising between computed values depending on the measurement interval applied.
INTVL: no conversion; Σ (results of computing)
/sec: converted to the sum of input in seconds; Σ (results of computing) × measurement interval
/min: converted to the sum of input in minutes; Σ (results of computing) × measurement interval/60
/hour: converted to the sum of input in hours; Σ (results of computing) × measurement interval/3600
/day: converted to the sum of input in days; Σ (results of computing) × measurement interval/86400

Time to Make Report
Reference dates: 1st to 28th days of a month
Reference times: 00:00 to 23:00

Output Ranges of the Results of Computing for Reports
AVE: -9999999 to 99999999 (with the position of the decimal point dependent on the measurement and computing channels assigned as report channels)
INST: -9999999 to 99999999 (with the position of the decimal point dependent on the measurement and computing channels assigned as report channels)
SUM: seven digits for the mantissa and two digits for the exponent

Processing of Faulty Data
AVE: Faulty data are excluded from computing. Data of positive and negative overflows, however, are included in the computing of the maximum and minimum.
INST: Faulty data are included in computing.
SUM: Faulty data are excluded from computing.

Information on and Process in Case of Power Failure

- The DR recorder adds × to the time on a printout provided upon recovery from a power failure. It does not print the character, however, if it has been more than 12 hours since the power failure occurred.
- The DR recorder excludes data occurring during a power failure from its reports.
- If the DR recorder recovers from a power failure after the time to make a report, it makes a report immediately after the recovery.
- If a power failure time is longer than 12 hours, the DR recorder stops report making even if the power is restored.
  The recorder prints a report (for data acquired up to the power failure), however, immediately after it recovers from the power failure.

Format of Output via Communication

Binary

Communication Functions (the function of communication modules)

GP-IB, RS-232C, RS-422-A/RS-485, Ethernet

Input/Output Functions (the function of DI/DO modules)

2 alarm output, 1 fail output and 12 remote control input for only with /M1 option

Power Supply

Rated supply voltage
AC power supply: 100 to 240 VAC (free supply voltage selection)
DC power supply: 12 to 28 VDC
AC adapter (optional accessory): 100 to 240 VAC
Permitted supply voltage
AC power supply: 90 to 250 VAC
DC power supply: 10 to 32 VDC
AC adapter (optional accessory): 90 to 250 VAC
Rated supply voltage frequency
AC power supply: 50/60 Hz
AC adapter (optional accessory): 50/60 Hz
Maximum power consumption:

· DA100 Stand-alone type (with 6 modules connected):
in case of 100VAC input: max. 55VA
in case of 240VAC input: max. 70VA
in case of DC power supply: max. approx. 25VA
in case of AC adapter (100VAC input): max. 55VA
in case of AC adapter (240VAC input): max. 70VA

· DA100 Expandable type (with 4 modules connected):
in case of 100VAC input: max. 45VA
in case of 240VAC input: max. 55VA
in case of DC power supply: max. approx. 25VA
in case of AC adapter (100VAC input): max. 45VA
in case of AC adapter (240VAC input): max. 55VA

· DS400 Subunit (with 4 modules connected):
in case of 100VAC input: max. 45VA
in case of 240VAC input: max. 55VA
in case of DC power supply: max. approx. 25VA
in case of AC adapter (100VAC input): max. 45VA
in case of AC adapter (240VAC input): max. 55VA

· DS600 Subunit (with 6 modules connected):
in case of 100VAC input: max. 55VA
in case of 240VAC input: max. 70VA
in case of DC power supply: max. approx. 25VA
in case of AC adapter (100VAC input): max. 55VA
in case of AC adapter (240VAC input): max. 70VA

Fuse Rating (The fuse may not be replaced by the customer.)
Main Unit
AC power supply
Maximum rated voltage/current: 250 V/2 A, Type: Time-lag, Standard: IEC/VDE
DC power supply
Maximum rated voltage/current: 250 V/6.3 A, Type: Time-lag, Standard: UL/CSA
Subunit
AC power supply
Maximum rated voltage/current: 250 V/2 A, Type: Time-lag, Standard: IEC/VDE
DC power supply
Maximum rated voltage/current: 250 V/6.3 A, Type: Time-lag, Standard: UL/CSA

Normal Operation Conditions

Supply voltage

AC power supply: 90 to 250 VAC
DC power supply: 10 to 32 VDC
AC adapter (optional accessory): 90 to 250 VAC

Supply frequency

50Hz ±2%, 60Hz ±2%

Ambient temperature

· Stand-alone type main unit/expandable type main unit
when floor-mounted : 0 to 50°C
when panel-mounted : 0 to 50°C
· DS400/DS600 Subunit
when floor-mounted : 0 to 50°C
when panel-mounted : –10 to 60°C

Ambient humidity

20 to 80%RH for –10 to 40°C, 10 to 50%RH for 40 to 50°C, 5 to 30%RH for 50 to 60°C (no condensation)

Vibration

10 to 60Hz, 0.2m/s^2

Shock

not allowed

Magnetic field

400 A/m max (50/60 Hz)

Position

Mount the unit left-right horizontally or vertically, as a general rule.

Installation location

Room

Installation height

Altitude up to 2,000 m

Installation category based on IEC 1010-1

II*1

Pollution degree based on IEC 1010-1

2*2

Warm-up time

At least 30 minutes after power switch-on.

*1 Installation category is the specification of the inpuls withstanding voltage which is also called as overvoltage category.

*2 Polution degree is the level of foreign body adhesion such as the solid, liquid, and gas which decrease the withstanding voltage, 2 means general indoor atmosphere.

Standard Performance

Reference operation conditions

temperature: 23±2°C; humidity: 55 ±10% RH; supply voltage 90 to 250 VAC (AC power supply) /10 to 32 VDC (DC power supply); supply frequency: 50/60 ±1% (AC power supply); warm-up time: at least 30 minutes; when operating, the system must not adversely affect the operation of other equipment.

Effect of Operating Conditions

Ambient temperature: variation for a temperature change of 10°C: within ±(0.1% of rdg + 1 digit); ±(0.2% of span + 1 digit) for Cu10Ω

Voltage variation: within ±1 digit over the range of 90 to 250 VAC (frequency 50/60 Hz, for AC power supply) /10 to 32 VDC (for DC power supply)

External magnetic field: variation with respect to AC (50/60 Hz) and DC magnetic fields of 400 A/m: within ± (0.1% of rdg + 10 digits)

Except for the power monitor module: within ±15% of range

Signal source resistance: variation with respect to signal source resistance 1kΩ change

(1) voltage
2 V range or below: within ±10µV
6 V range or above: within ±0.1% of rdg

(2) thermocouple
within ±10µV; however it must be within ±100µV when burnout is specified.

(3) RTD
variation with respect to change of 10Ω per wire (when all wires have the same resistance value)
indication: within ±(0.1% of rdg + 1 digit)
variation in indication with respect to a difference of 40 mΩ in the resistance between conductors (max, difference between 3 wires): approx. 0.1°C (in case of Pt100)

Mounting position
Variation when the unit is mounted horizontally on a panel: within ±(0.1% of rdg + 1 digit)

Vibration
Variation when sinusoidal vibration of acceleration 0.2 m/s^2 is applied for two hours in each of the 3 axial directions over a frequency range of 10 to 60 Hz: within ±(0.1% of rdg + 1 digit)

Transportation and Storage Conditions

These refer to the environmental conditions existing during transportation and storage from the time of shipment from the factory until commencement of use, and also during transportation and storage in case of temporary non-use. If the environmental conditions are maintained within the specified range, the unit will not incur permanent damage, and can be returned to a normal working condition (re-adjustment may be required in some cases.)

Ambient temperature

–25 to 60 °C

Humidity

5 to 95% RH

Vibration

10 to 60 Hz 4.9m/s ^{2} max.

Shock

392 m/s ^{2} max (in packed condition)

Other Specifications

Clock

With calendar function; be sure to set when the power is ON.

Clock accuracy

±100ppm

System alarm

Contact output (when DI/DO is connected)

Back-up of setting parameters

Lithium battery back-up (approx. 10 years), excluding clock function (time and date are reset to 96/1/1 0:00 each time the power is turned ON.)

Insulation resistance

At least 20M Ω between each terminal and ground (at 500 VDC)

Withstand voltage

- Between AC power supply terminal and case of DA100 main unit:
  1500 VAC (50/60Hz) for one minute
- Between AC power supply terminal and the case of the subunit:
  1500 VAC (50/60Hz) for one minute
- Between DC power supply terminal and the case of DA100 main unit:
  1000 VAC (50/60Hz) for one minute
- Between DC power supply terminal and the case of the subunit:
  1000 VAC (50/60Hz) for one minute
- Between input teminal and case of DA100 main unit:
  1500 VAC (50/60Hz) for one minute
- Between output teminal and case of DA100 main unit:
  2300 VAC (50/60Hz) for one minute

EMC Conformity Standards

- Emission EN55011: Class A
- Immunity EN50082-2

IEC1000-4-2	Electrostatic Discharge 8kV(Air), 4kV(Contact)	Performance Criteria A*
IEC1000-4-3	Radiated fields 80 to 1000MHz, 10V/m	Performance Criteria A*
IEC1000-4-4	Fast Transients Power line 2kV, The others 1kV	Performance Criteria B
IEC1000-4-6	Conducted Disturbance 0.15 to 80MHz, 10V	Performance Criteria A*

* Effect on accuracy
Universal input module and DCV/TC/DI input module
±10% of range (except for 50V range)
±20% of range (50V range)
When the extension module is used
±20% of range (except for 50V range)
±40% of range (50V range)
Strain input module
±10% of range (except for 2000 με range)
±50% of range (2000 με range)
Other input module
±10% of range

4.2 Universal Input Module and DCV/TC/DI Input Module

Type, Number of Channels, Terminal Type and Minimum Measurement Interval

Kind	Type	Number of channels	Terminal type	Minimum measurement interval
Universal input module	DU100-11	10ch	screw	0.5s
	DU100-12	10ch	clamp	0.5s
	DU100-21	20ch	screw	2s
	DU100-22	20ch	clamp	2s
	DU100-31	30ch	screw	2s
	DU100-32	30ch	clamp	2s
DCV/TC/DI input module	DU200-11	10ch	screw	0.5s
	DU200-12	10ch	clamp	0.5s
	DU200-21	20ch	screw	2s
	DU200-22	20ch	clamp	2s
	DU200-31	30ch	screw	2s
	DU200-32	30ch	clamp	2s

Style Number S1

Input method

floating unbalanced input, each channel mutually isolated (channel independent)
The RTD range has a common potential (terminal b)

A/D resolution

±20000

A/D integration time

20ms (50Hz), 16.7ms (60Hz), 100ms (10Hz) or auto
However, AUTO does not function if the instrument is the stand-alone DC power supply model, or the subunit (DS400/DS600) of the DC power supply model. (Selecting "AUTO" will set the A/D integration time to 20 ms (50 Hz)).

Minimum measurement interval

Filter ON/OFF / No. of channels/1 module / A/D integration time	Low-pass filter OFF		Low-pass filter ON	
	20ms/16.7ms (50Hz/60Hz)	100ms (10Hz)	20ms/16.7ms (50Hz/60Hz)	100ms (10Hz)
10	0.5s*	4s	3s	12s
20	2s	5s	4s	15s
30	2s	6s	4s	20s

*: 2s if the power monitor module is installed.

Normal operating temperature/humidity

–10 to 60°C
20 to 80% RH for –10 to 40°C, 10 to 50% RH for 40 to 50°C, 5 to 30% RH for 50 to 60°C (no condensation)

Compensation for the reference junction

Switchable internally or externally for each channel.

Compensation accuracy for the reference junction

(measured at 0°C, where the input terminals are balanced)
Type R, S, B, W : ±1°C
Type K, J, E, T, N, L, U : ±0.5°C

Maximum allowable input voltage

2V DC or lower range, TC, RTD, DI (CONT) : ±10V DC
6V DC or greater range, DI (LEVEL) : ±60V DC

Normal mode voltage

voltage, TC : 1.2 times the rated range or less (at peak value, including 50 or 60Hz signal component)
RTD : 50 mV or lower (at peak value)

Normal mode rejection ratio

40dB or greater (50/60Hz ±0.1%)

Common mode noise voltage

250VAC rms (50/60Hz)

Common mode rejection ratio

120dB or greater (50/60Hz ±0.1%, 500Ω unbalanced, between the negative measurement terminal and ground)

Maximum noise between channels

150VAC rms (50/60Hz)

Measurement range and accuracy

Note that RTD input is not possible for the DCV/TC/DI input module.

Reference operation conditions

temperature: 23 ±2°C; humidity: 55 ±10% RH; supply voltage 90 to 250 VAC (AC power supply) /10 to 32 VDC (DC power supply); supply frequency: 50/60 ±1% (AC power supply); warm-up time: at least 30 minutes; when operating, the system must not adversely affect the operation of other equipment.

Input	Type	Measuring(digital display)		Maximum resolution
		Measurement range	Measurement accuracy	
DC Voltage	20mV	-20.000 to 20.000mV	±(0.05% of rdg + 5digits)	1µV
	60mV	-60.00 to 60.00mV	±(0.05% of rdg + 2digits)	10µV
	200mV	-200.00 to 200.00mV	±(0.05% of rdg + 2digits)	10µV
	2V	-2.0000 to 2.0000V	±(0.05% of rdg + 2digits)	100µV
	6V	-6.000 to 6.000V	±(0.05% of rdg + 2digits)	1mV
	20V	-20.000 to 20.000V	±(0.05% of rdg + 2digits)	1mV
	50V	-50.00 to 50.00V	±(0.05% of rdg + 2digits)	10mV
TC (Note that Accuracy of reference junction compensation is not considered).	R *1	0.0 to 1760.0°C	±(0.05% of rdg + 1°C) However,R,S:0 to 100°C,±3.7°C 100 to 300°C,±1.5°C B:400 to 600°C,±2°C accuracy less than 400°C is not specified.	0.1°C
	S *1	0.0 to 1760.0°C		
	B *1	0.0 to 1820.0°C		
	K *1	-200.0 to 1370.0°C	±(0.05% of rdg +0.7°C) However,K attains an accuracy of ±(0.05% of rdg. +1°C) within the range between -200 to -100°C.	
	E *1	-200.0 to 800.0°C	±(0.05% of rdg +0.5°C) However,J and L attain an accuracy of ±(0.05% of rdg. +0.7°C) within the range between -200 to -100°C.	
	J *1	-200.0 to 1100.0°C		
	T *1	-200.0 to 400.0°C		
	L *2	-200.0 to 900.0°C		
	U *2	-200.0 to 400.0°C		
	N *3	0.0 to 1300.0°C	±(0.05% of rdg. +0.7°C)	
	W *4	0.0 to 2315.0°C	±(0.05% of rdg. +1°C)	
	KPvsAu7Fe	0.0 to 300.0K	±(0.05% of rdg. +0.7K)	0.1K
RTD	Pt100(1mA) *5	-200.0 to 600.0°C	±(0.05% of rdg. +0.3°C)	0.1°C
	Pt100(2mA) *5	-200.0 to 250.0°C		
	JPt100(1mA) *5	-200.0 to 550.0°C		
	JPt100(2mA) *5	-200.0 to 250.0°C		
	Pt50(2mA) *5	-200.0 to 550.0°C	±(0.05% of rdg. +0.3°C)	
	Ni100(1mA) SAMA *6	-200.0 to 250.0°C	±(0.05% of rdg. +0.3°C)	
	Ni100(1mA)DIN *6	-60.0 to 180.0°C	±(0.05% of rdg. +0.3°C)	
	Ni120(1mA) *7	-70.0 to 200.0°C		
	J263*B	0.0 to 300.0K	±(0.05% of rdg. +0.3K)	0.1K
	Cu10 GE *8	-200.0 to 300.0°C	±(0.2% of rdg. +0.7°C)	0.1°C
	Cu10 L&N *8			
	Cu10 WEED *8			
	Cu10 BAILEY *8			
High resolution RTD	Pt100(1mA) *5	-140.00 to 150.00°C	±(0.05% of rdg. +0.3°C)	0.01°C
	Pt100(2mA) *5	-70.00 to 70.00°C	±(0.05% of rdg. +0.3°C)	
	JPt100(1mA) *5	-140.00 to 150.00°C	±(0.05% of rdg. +0.3°C)	
	JPt100(2mA) *5	-70.00 to 70.00°C	±(0.05% of rdg. +0.3°C)	
Contact	Voltage input	Off for a voltage of less than 2.4V. On for a voltage of 2.4V or more.(TTL)	Off for a voltage of less than 2.4V. On for a voltage of 2.4V or more. (TTL)	
	Contact input	On/Off of contact	On/Off of contact	

*1 : R,S,B,K,E,J,T:ANSI,IEC 584,DIN IEC 584,JIS C 1602-1981
*2 : L:Fe-CuNi,DIN43710,U:Cu-CuNi,DIN 43710
*3 : N:Nicrosil-Nisil,IEC 584,DIN IEC 584
*4 : W:W·5%RE-W·26%Re (Hoskins Mfg Co)
*5 : Pt50:JIS C 1604-1981,JIS C 1606-1986
Pt100:JIS C 1604-1989,JIS C 1606-1989,IEC 751,DIN IEC 751
JPt100:JIS C 1604-1981,JIS C 1606-1989
*6 : SAMA/DIN
*7 : McGRAW EDISON COMPANY
*8 : ranges to which accuracy applies:
Cu10 GE:-84.4 to 170.0°C,
Cu10 L&N:-75.0 to 150.0°C,
Cu10 WEED:-20.0 to 250.0°C,
Cu10 BAILEY:-20.0 to 250.0°C

Noise rejection

rejection by integration type A/D, lowpass filter, or moving averaging.

Cut-off frequency

50/60/10Hz

Input resistance

Min. 10MΩ at 2V DC or lower, thermocouple range
Approx. 1M Ω at 6V DC or higher.

Insulation resistance
Min. 20MΩ at 500V DC between the input terminal and ground.

Input bias current
max. 10nA

Dielectric strength
Between input terminals : 1000V AC (50/60Hz) for one minute
Between an input terminal and ground : 1500V AC (50/60Hz) for one minute

Input source resistance
DCV, TC : 2kΩ or lower
RTD : 10Ω or lower per line (Pt100 Ω)
5Ω or lower per line (Pt50 Ω)
1Ω or lower per line (Cu10 Ω)

Temperature coefficient
zero : 0.01% of range/ °C
full span : 0.01% of range/ °C (0.02% of span/ °C for Cu10 Ω)

Thermocouple burnout
Detected in a thermocouple range (On/Off) enabled, current of 4 μA, detectable pulse width of approx. 5ms
2 kΩ or lower is considered "normal"
100 kΩ or greater is considered "disconnected"

Detection interval for thermocouple burnout
2.5 sec. in a measurement period of 0.5 sec.
2 sec. in a measurement period of 2 sec.

Detection timing for thermocouple burnout
The burnout condition is detected at each measurement interval. However, with a 10ch universal input module connected and a measurement interval of 0.5sec, the minimum interval of the burnout detection becomes 2.5 sec.

Power consumption
Included in the main unit or the subunit to which the module is to be installed.

External dimensions and weight

Type	External dimensions(W)x(H)x(D) mm	Weight(kg)
DU100-11	approx.57x137x88	0.5
DU100-12	approx.57x137x88	0.5
DU100-21	approx.114x137x88	1.0
DU100-22	approx.114x137x88	1.0
DU100-31	approx.171x137x88	1.5
DU100-32	approx.171x137x88	1.5
DU200-11	approx.57x137x88	0.5
DU200-12	approx.57x137x88	0.5
DU200-21	approx.114x137x88	1.0
DU200-22	approx.114x137x88	1.0
DU200-31	approx.171x137x88	1.5
DU200-32	approx.171x137x88	1.5

4.3 Specifications of mA-input Module

Style Number: S5

Model Code, Number of Input Channels, Terminal Configuration and Shortest Measurement Interval

Model Code	Number of Channels	Terminal Configuration	Shortest Measurement Interval
DU300-11	10	Screw	0.5 s
DU300-12	10	Clamp	0.5 s

Method of Input

Non-balanced floating input with isolation between channels (separated channels)

Resolution of A/D Conversion

±20000

Integral Time of A/D Conversion

Manual or automatic selection between 20 ms (50 Hz), 16.7 ms (60 Hz) and 100 ms (10 Hz)
However, AUTO does not function if the instrument is the stand-alone DC power supply model, or the subunit (DS400/DS600) of the DC power supply model. (Selecting "AUTO" will set the A/D integration time to 20 ms (50 Hz)).

Shortest Measurement Interval and Cutoff Frequency

When the lowpass filter is turned off:

Cutoff frequency:	50/60 Hz	10 Hz
Shortest measurement interval:	0.5 s*	4 s

*: 2s if the power monitor module is installed

When the lowpass filter is turned on:

Cutoff frequency:	50/60 Hz	10 Hz
Shortest measurement interval:	3 s	12 s

Withstanding Voltage

Across channels: 100 VA C, 1 min
Across output terminals and ground: 1,500 V AC, 1 min (excluding DU500-14)

Normal Operating Temperature/Humidity Range

-10˚ to 60˚C
20 to 80% RH for an ambient temperature range of -10˚ to 50˚C; 10 to 50% RH for 40˚ to 50˚C; 5 to 30% RH for 50˚ to 60˚C (non-condensing)

Maximum Input Voltage

5 V DC

Maximum Normal-mode Noise Current

24 mA (peak value, including 50- and 60-Hz signal components)
Equivalent voltage of 2.4 V

Normal Mode Rejection Ratio (Equivalent Voltage)

40 dB minimum (50/60 Hz ±0.1%)

Maximum Common Mode Noise Voltage

250 V ACrms (50/60 Hz)

Common Mode Rejection Ratio (Equivalent Voltage)

120 dB minimum (50/60 Hz ±0.1%)

Maximum Noise Across Channels

150 V ACrms (50/60 Hz)

Measuring Range/Accuracy

Measured under the following standards of operating conditions:

Reference operation conditions

temperature: 23 ±2°C; humidity: 55 ±10% RH; supply voltage 90 to 250 VAC (AC power supply) /10 to 32 VDC (DC power supply); supply frequency: 50/60 ±1% (AC power supply); warm-up time: at least 30 minutes; when operating, the system must not adversely affect the operation of other equipment.

Measuring Range	Measuring Accuracy	Maximum Resolution
-20.000 to 20.000 mA	±(0.25% of rdg. + 5 digits)	1 μA

Filter
Lowpass filter or use of moving average
Cutoff frequencies of lowpass filter: 50/60 Hz and 10 Hz and frequencies of their respective integral multiples

Input Resistance
100 Ω

Insulation Resistance
Across input terminals and ground: 20 M Ω minimum (500 V DC)

Temperature Coefficient
Zero: 0.0125% of range/°C
Span: 0.0125% of range/°C

Power Consumption
Included in the value of a system's installed main unit or sub-unit

Dimensions
Approximately 57 (W) ×137 (H) ×88 (D) (mm)

Weight
Approximately 0.5 kg

Installation Category (Overvoltage Category)
CAT II (IEC1010)

4.4 Specifications of Power Monitor Module

Style Number: S5
Model Code, Use (Input Channels), Terminal Configuration and Shortest Measurement Interval

Model Code	Use (Input Channels)	Terminal Configuration	Shortest Measurement Interval
DU400-12	Single-phase (one channel each for voltage and current)	Clamp*	2 s
DU400-22	Three-phase (three channels each for voltage and current)	Clamp*, **	2 s

*: Two-terminal pressure clamping

**: Not usable as an equivalent to three modules of single-phase use

Method of Input
Transformer-isolated input, with isolation between channels (separated channels)

Method of Measurement and Computing
Digital multiplication

Measuring Ranges
Voltage: 25 or 250 Vrms

Current: 0.5 or 5 A

In three-phase measurement or single-phase three-wire measurement, the current/voltage ranges are identical between the respective phases or lines (the current/voltage ranges are set in common between the respective channels).

Measured Frequency Range
45 to 65 Hz

Wiring Methods
DU400-12: Single-phase two-wire

DU400-22: Single-phase two-wire, single-phase three-wire, three-phase three-wire (dual-voltage, dual-current), three-phase three-wire (triple-voltage, triple-current) and three-phase four-wire

Measured Data Items
For each module, a maximum of six data items can be selected from the effective voltage, effective current, active power, apparent power, reactive power, frequency, power factor and phase angle. The selected data items can then be assigned to channel numbers xx1 to xx6 to show them on the display as well as record them. Restrictions apply to the combination of selectable data items, however, depending on the method of input wiring.

Conditions of Measurement
• Measuring range for current and voltage inputs

10% of the measuring range < current and voltage inputs ≤ 100% of the measuring range

• V1 range is monitored in frequency measurement

• All measurements are done relative to the frequency on a channel for V1 and, therefore, the results of measurements are not guaranteed if the V1 input is out of the range noted above.

• If the input apparent power falls below 10% of the span, the DR recorder cannot measure the phase and power factor (negative overflow).

• A maximum of two scans' worth of data become invalid immediately after a change has been made to the measuring range and/or wiring.

Measuring Accuracy and Resolution

Reference operation conditions

temperature: 23 ±2°C; humidity: 55 ±10% RH; supply voltage 90 to 250 VAC (AC power supply) /10 to 32 VDC (DC power supply); supply frequency: 50/60 ±1% (AC power supply); warm-up time: at least 30 minutes; when operating, the system must not adversely affect the operation of other equipment.

Measured Data Item	Measuring Accuracy	Resolution
Effective voltage	± (0.5% of SPAN)	0.01 Vrms (for 25-V range), 0.1 Vrms (for 250-V range)
Effective current	± (0.5% of SPAN)	0.0001 Arms (for 0.5-A range), 0.001 Arms (for 5-A range)
Active power	± (1% of SPAN) $\phi = 0$ ± (2.5% of SPAN) $0 < \lvert\phi\rvert \leq 30$ ± (5% of SPAN) $30 < \lvert\phi\rvert \leq 80$	0.01 W (for 12.5-W, 25-W and 37.5-W spans) 0.1 W (for 125-W, 250-W and 375-W spans) 1 W (for 1,250-W, 2,500-W and 3,750-W spans)
Apparent power	± (1% of SPAN) $0 \leq \lvert\phi\rvert \leq 80$	0.01 VA (for 12.5-VA, 25-VA and 37.5-VA spans) 0.1 VA (for 125-VA, 250-VA and 375-VA spans) 1 VA (for 1,250-VA, 2,500-VA and 3,750-VA spans)
Reactive power	± (5% of SPAN) $0 \leq \lvert\phi\rvert < 60$ ± (2.5% of SPAN) $60 \leq \lvert\phi\rvert \leq 80$	0.01 Var (for 12.5-Var, 25-Var and 37.5-Var spans) 0.1 Var (for 125-Var, 250-Var and 375-Var spans) 1 Var (for 1,250-Var, 2,500-Var and 3,750-Var spans)
Frequency	±0.1Hz	0.01Hz
Power factor	± (2% of SPAN) $0 \leq \lvert\phi\rvert \leq 80$	0.01
Phase angle	±5deg $0 \leq \lvert\phi\rvert \leq 80$	0.1deg

Measuring Ranges

Measured Data Item	25 V-0.5A	25 V-5 A	250 V-0.5 A	250 V-5 A
Effective voltage Vi (i = 1, 2, 3, 13, 0)	0.00 to 25.00 V rms	0.00 to 25.00 V rms	0.0 to 250.0 V rms	0.0 to 250.0 V rms
Effective current Ii (i = 1, 2, 3, 13, 0)	0.0000 to 0.5000 A rms	0.000 to 5.000 A rms	0.0000 to 0.5000 A rms	0.000 to 5.000 A rms
Active power P1, P2, P3	–12.50 to 12.50 W	–125.0 to 125.0 W	–125.0 to 125.0 W	–1250 to 1250 W
Active power P13	–25.00 to 25.00 W	–250.0 to 250.0 W	–250.0 to 250.0 W	–2500 to 2500 W
Active power P0	–37.50 to 37.50 W	–375.0 to 375.0 W	–375.0 to 375.0 W	–3750 to 3750 W
Apparent power VA1, VA2, VA3	0.00 to 12.50 VA	0.0 to 125.0 VA	0.0 to 125.0 VA	0 to 1250 VA
Apparent power VA13	0.00 to 25.00 VA	0.0 to 250.0 VA	0.0 to 250.0 VA	0 to 2500 VA
Apparent power VA0	0.00 to 37.50 VA	0.0 to 375.0 VA	0.0 to 375.0 VA	0 to 3750 VA
Reactive power Var1, Var2, Var3	0.00 to 12.50 Var	0.0 to 125.0 Var	0.0 to 125.0 Var	0 to 1250 Var
Reactive power Var13	0.00 to 25.00 Var	0.0 to 250.0 Var	0.0 to 250.0 Var	0 to 2500 Var
Reactive power Var0	0.00 to 37.50 Var	0.0 to 375.0 Var	0.0 to 375.0 Var	0 to 3750 Var
Power factor PFi (i = 1, 2, 3, 13, 0)	–1.00 to 1.00	–1.00 to 1.00	–1.00 to 1.00	–1.00 to 1.00
Phase PHi (i = 1, 2, 3, 13, 0)	–80.0 to 80.0 deg	–80.0 to 80.0 deg	–80.0 to 80.0 deg	–80.0 to 80.0 deg
Frequency FREQ	45.00 to 65.00 Hz	45.00 to 65.00 Hz	45.00 to 65.00 Hz	45.00 to 65.00 Hz

Ranges of Indication

Measured Data Item	25 V-0.5A	25 V-5 A	250 V-0.5 A	250 V-5 A
Effective voltage Vi (i = 1, 2, 3, 13, 0)	0.00 to 26.25 V rms	0.00 to 26.25 V rms	0.0 to 262.5 V rms	0.0 to 262.5 V rms
Effective current Ii (i = 1, 2, 3, 13, 0)	0.0000 to 0.5250 A rms	0.000 to 5.250 A rms	0.0000 to 0.5250 A rms	0.000 to 5.250 A rms
Active power P1, P2, P3	–13.75 to 13.75 W	–137.5 to 137.5 W	–137.5 to 137.5 W	–1375 to 1375 W
Active power P13	–27.50 to 27.50 W	–275.0 to 275.0 W	–275.0 to 275.0 W	–2750 to 2750 W
Active power P0	–41.25 to 41.25 W	–412.5 to 412.5 W	–412.5 to 412.5 W	–4125 to 4125 W
Apparent power VA1, VA2, VA3	0.00 to 13.75 VA	0.0 to 137.5 VA	0.0 to 137.5 VA	0 to 1375 VA
Apparent power VA13	0.00 to 27.50 VA	0.0 to 275.0 VA	0.0 to 275.0 VA	0 to 2750 VA
Apparent power VA0	0.00 to 41.25 VA	0.0 to 412.5 VA	0.0 to 412.5 VA	0 to 4125 VA
Reactive power Var1, Var2, Var3	0.00 to 13.75 Var	0.0 to 137.5 Var	0.0 to 137.5 Var	0 to 1375 Var
Reactive power Var13	0.00 to 27.50 Var	0.0 to 275.0 Var	0.0 to 275.0 Var	0 to 2750 Var
Reactive power Var0	0.00 to 41.25 Var	0.0 to 412.5 Var	0.0 to 412.5 Var	0 to 4125 Var
Power factor PFi (i = 1, 2, 3, 13, 0)	–1.00 to 1.00	–1.00 to 1.00	–1.00 to 1.00	–1.00 to 1.00
Phase PHi (i = 1, 2, 3, 13, 0)	–89.0 to 89.0 deg	–89.0 to 89.0 deg	–89.0 to 89.0 deg	–89.0 to 89.0 deg
Frequency FREQ	41.00 to 69.00 Hz	41.00 to 69.00 Hz	41.00 to 69.00 Hz	41.00 to 69.00 Hz

Output Data Items of Each Wiring Method

Output Data Item	Single-phase Two-wire	Single-phase Three-wire	Three-phase Three-wire (Dual-voltage, Dual-current)	Three-phase Three-wire (Triple-voltage, Triple-current)	Three-phase Four-wire
Effective voltage V	V1	V1, V3 V13: (V1+V3)/2	V1, V3 V13: (V1+V3)/2	V1, V2, V3 V13: (V1+V3)/2 V0: (V1+V2+V3)/3	V1, V2, V3 V0: (V1+V2+V3)/3
Effective current I	I1	I1, I3 I13: (I1+I3)/2	I1, I3 I13: (I1+I3)/2	I1, I2, I3 I13: (I1+I3)/2 I0: (I1+I2+I3)/3	I1, I2, I3 I0: (I1+I2+I3)/3
Active power W	P1	P1, P3 P13: P1+P3	P1, P3 P13: P1+P3	P1, P2, P3 P13: P1+P3	P1, P2, P3 P0: P1+I2+P3
Apparent power VA	VA1	VA1, VA3 VA13: VA1+VA3	VA1, VA3 VA13: VA1+VA3	VA1, VA2, VA3 VA13: VA1+VA3	VA1, VA2, VA3 VA0: VA1+VA2+VA3
Reactive power Var	Var1	Var1, Var3 Var13: Var1+Var3	Var1, Var3 Var13: Var1+Var3	Var1, Var2, Var3 Var13: Var1+VA3	Var1, Var2, Var3 Var0: Var1+Var2+Var3
Frequency FREQ	FREQ	FREQ	FREQ	FREQ	FREQ
Power factor PF	PF1	PF1, PF3 PF13	PF1, PF3 PF13	PF1, PF2, PF3 PF13	PF1, PF2, PF3 PF13
Phase angle PH	PH1	PH1, PH3 PH13	PH1, PH3 PH13	PH1, PH2, PH3 PH13	PH1, PH2, PH3 PH13

Continuously Applicable Maximum Voltage and Current
Voltage: 250 Vrms
Current: 5 Arms
Crest Factor
3 maximum (600 Vpeak)
Maximum Common Mode Voltage
250 Vrms
Common Mode Voltage Rejection Ratio (Voltage and Current Ranges)
0.02% of span (when 250 V 45 to 65 Hz is imposed)
Input Resistance
Voltage input: 300 k Ω minimum for AC voltages
Current input: 1 Ω maximum for AC currents
Filter
Moving average
Wattage Calculation
Use of /M1 computing function
Insulation Resistance
Across output terminals and ground: 20 M Ω minimum
Withstanding Voltage
Across output terminals and ground: 2,300 V AC (50/60 Hz), 1 min
Normal Operating Temperature/Humidity Ranges
0˚ to 50˚C
20 to 80% RH for an ambient temperature range of 0˚ to 40˚C; 10 to 50% RH for 40˚ to 50˚C (non-condensing)
Power Consumption
Included in the value of a system's installed main unit or sub-unit
Dimensions
Approximately 57 (W) × 137 (H) × 99 (D) (mm)
Weight
Approximately 0.5 kg
Installation Category (Overvoltage Category)
CAT II (IEC1010)

4.5 Specifications of Strain Input Module

Style Number: S5

Model Code, Number of Input Channels, Terminal Configuration, Shortest Measurement Interval and Values of Built-in Resistors

Model Code	Number of Input Channels	Terminal Configuration	Shortest Measurement Interval	Built-in Resistor
DU500-12	10*	Clamp	0.5 s	120 Ω
DU500-13	10*	Clamp	0.5 s	350 Ω
DU500-14	10*	NDIS**	0.5 s	External

*: Requires the space of two slots.
**: Recommended by the Japanese Nondestructive Inspection Association

Method of Input

Non-balanced floating input, with isolation between channels (separated channels)

Resolution of A/D Conversion

Equivalent to reading on 20000 full scale

Integral Time of A/D Conversion

Manual or automatic selection between 20 ms (50 Hz), 16.7 ms (60 Hz) and 100 ms (10 Hz)
However, AUTO does not function if the instrument is the stand-alone DC power supply model, or the subunit (DS400/DS600) of the DC power supply model. (Selecting "AUTO" will set the A/D integration time to 20 ms (50 Hz)).

Types of Input

Signals from strain gauge or strain-gauge sensor

Connection Methods

Single-gauge, opposed-side two-gauge, adjacent-side two-gauge or four-gauge configuration
(Configured with built-in DIP switches for DU500-12 and DU500-13)

Applicable Gauge Resistance

100 to 1,000 Ω
The DU500-12 and DU500-13 modules contain 120- Ω and 350- Ω resistors, respectively.

Bridge Voltage

Fixed to 2 V DC (±5% accuracy with a correction function)

Gauges

2.00 (with scaling capability)

Balancing

Automatic

Range of Balancing

Equivalent to ±10,000 με (for single-gauge method)

Measuring Ranges and Accuracies

Reference operation conditions

temperature: 23 ±2°C; humidity: 55 ±10% RH; supply voltage 90 to 250 VAC (AC power supply) /10 to 32 VDC (DC power supply); supply frequency: 50/60 ±1% (AC power supply); warm-up time: at least 30 minutes; when operating, the system must not adversely affect the operation of other equipment.

Gauge Method	Measuring Range	Accuracy	Resolution
Single-gauge	–2000 to 2000 με	0.5% of Range	0.1 με
	–20000 to 20000 με	0.3% of Range	1 με
	–200000 to 200000 με	0.3% of Range	10 με
Two-gauge	–1000 to 1000 με	0.5% of Range	0.1 με
	10000 to 10000 με	0.3% of Range	1 με
	–100000 to 100000 με	0.3% of Range	10 με
Four-gauge	–500 to 500 με	0.5% of Range	0.1 με
	–5000 to 5000 με	0.3% of Range	1 με
	–50000 to 50000 με	0.3% of Range	10 με

The Accuracies and Resolutions of the DU500-12 and DU500-13 models, do not include the influence of the internal-and contact-resistance of the jumper setup switch.

Accuracy of Bridge Resistors
±0.01%, ±5 ppm/°C (excludes contact resistance of the jumper setup switch)
Contact Resistance of the Jumper Setup Switch
100 m Ω maximum
Input Resistance
10 MΩ minimum
Filter
Third-order sinc filter, moving-average
Withstanding Voltage
Across channels: 50 V DC
Across output terminals and ground: 1,500 V AC, 1 min (excluding DU500-14)
Normal Operating Temperature/Humidity Range
0° to 50°C
20 to 80% RH for an ambient temperature range of 0° to 40°C; 10 to 50% RH for 40° to 50°C (non-condensing)
Power Consumption
Included in the value of a system's installed main unit or sub-unit
Dimensions
DU500-12/DU500-13: Approximately 114.3 (W) × 137 (H) × 88 (D) (mm)
DU500-14: Approximately 114.3 (W) × 137 (H) × 77 (D) (mm)
Weight
Approximately 1 kg
Installation Category (Overvoltage Category)
CAT II (IEC1010)
Accessory
Bridge box: 319300 (120 Ω)

4.6 Specifications of Pulse Input Module

Style Number: S5
Model Code, Number of Input Channels, Terminal Configuration and Shortest Measurement Interval

Model Code	Number of Channels	Terminal Configuration	Shortest Measurement Interval
DU600-11	10	Screw	0.5 s*

*: The interval between data updates is fixed to one second.

Method of Input
Potential with reference to the shared voltage of the COMMON line within the same module

Types of Input
Voltage-free contact or open collector (TTL or transistor)

Measurement Modes
RATE (instantaneous count mode): Outputs the prescaled value of the count of pulses imposed over the last one-second interval of measurement.
GATE (instantaneous turn-on time mode): Outputs the prescaled values of the contact's turn-on (make) and turn-off (break) times (on = 1; off = 0) over the last one-second interval of measurement.

Note

The computing function (computational expression: TLOG.PSUM (XXX)) should be used when integrating an every-second count or turn-on time (maximum count/turn-on time: 99999999).

Input Range
0 to 6,000 pulses, or 0 to 10 pulses (if the filter is on) for voltage-free input.
Ratio of make at input: 35 to 65% at the maximum frequency (ratio of make = closed-contact time/(closed-contact time + open-contact time) × 100)
Minimum input pulse width: 60 μs (whether the contact is closed or open)

Measuring Accuracies
Reference operation conditions
temperature: 23 ±2°C; humidity: 55 ±10% RH; supply voltage 90 to 250 VAC (AC power supply) /10 to 32 VDC (DC power supply); supply frequency: 50/60 ±1% (AC power supply); warm-up time: at least 30 minutes; when operating, the system must not adversely affect the operation of other equipment.
Count: ±1 pulse (for integration, ±(1 scan + 1 second) at the start of measurement and ±(1 scan + 1.5 seconds) at the end of measurement)
Turn-on time: ±100-ppm accuracy for judgment of one-second-interval sampling; for integration, ±(1 second + 1 scan) at the start of measurement and ±(100 ppm of rdg. + 1.5 seconds + 1 scan) at the end of measurement
Module-to-module error: ±(3 seconds + 1 pulse) for count and ±(200 ppm + 3 seconds) for turn-on time

Note

It takes a maximum of 2 seconds for normal measured values to be output when the power is turned on, when the measurement mode is changed or when the setting for turning on/off the filter is changed. The DR recorder indicates a value representative of "no data" (○○○○○ on the display, or 8005H for the binary format or a faulty data value for the ASCII format in the case of output to the communication line) until the normal measured values are output.

Filter
Removes chatter of up to 5 ms (can be turned on or off on a channel basis).

Input Signal Levels
Open contact: 200 Ω maximum
Closed contact: 100 k Ω minimum

Normal Operating Temperature/Humidity Range
0° to 50°C
20 to 80% RH for an ambient temperature range of 0° to 40°C or 10 to 50% RH for 40° to 50°C (non-condensing)

Normal Operating Magnetic-field Strength
400 A/m maximum

Maximum Input Voltage
5 V DC
Signal Source Ratings
15 V DC, 30 mA minimum
Insulation Resistance
Across input terminals and ground: 100 M Ω minimum (500 V DC)
Withstanding Voltage
Across output terminals and ground: 500 V DC, 1 min (no channel-to-channel isolation)
Power Consumption
Included in the value of a system's installed main unit or sub-unit
Dimensions
Approximately 57 (W) × 137 (H) × 68 (D) (mm)
Weight
Approximately 0.3 kg
Installation Category (Overvoltage Category)
CAT II (IEC1010)

4.7 Specifications of Digital Input Module

Style Number: S8

Model, Number of Channels, Terminal Type and Minimum Measurement Interval

Model	Number of Channels	Terminal Type	Minimum Measurement Interval
DU700-11	10	Screw	05s

Input method
Floating unbalanced input, each channel mutually isolated (channel independent)

A/D resolution
±20000

A/D integration time
20 ms (50 Hz), 16.7 ms (60 Hz), 100 ms (10 Hz) or auto
(Except, auto switch does not function on the stand-alone DC power supply model or the subunit (DS400/DS600) of a DC power supply model.)

Minimum measurement interval
Low-pass filter OFF

Cut-off frequency	50/60Hz	10Hz
Minimum measurement interval	05 s	4 s

Low-pass filter ON

Cut-off frequency	50/60Hz	10Hz
Minimum measurement interval	3 s	12 s

Normal operating temperature/humidity
20 to 80% RH for –10 to 40°C, 10 to 50% RH for 40 to 50°C, 5 to 30% RH for 50 to 60°C (no condensation)

Magnetic field
400A/m max (50/60Hz)

Maximum allowable input voltage
CONT (Contact input) : ±10 V DC
LEVEL (Voltage input) : ±60 V DC

Common mode noise voltage
250 V AC rms (50/60 Hz)

Maximum noise between channels
150 V AC rms (50/60 Hz)

Action
At normal operating temperature/humidity
Voltage input (LEVEL) : Off for a voltage of less than 24V.
ON for a voltage 2.4 V or more.
Contact input (CONT) : On/Off of contact.*
*: Contact resistance ON ; 2 k Ω or less, OFF ; 100 k Ω or more

Noise rejection
Rejection by integration type A/D, lowpass filter

Cut-off frequency
50/60/10Hz

Input resistance
CONT : Min. 10 M Ω
LEVEL : Approx. 1 M Ω

Insulation resistance
Min. 20 MΩ at 500 V DC between the input terminal and ground.

Dielectric strength
Between input terminals : 1000 V AC (50/60 Hz) for one minute
Between an input terminal and ground : 1500 V AC (50/60 Hz) for one minute

Input source resistance
LEVEL : 2 k Ω or lower

Power consumption
Included in the main unit or the subunit to which the module is to be installed.

Dimensions
Approximately 57(W) x 137(H) x 68(D) (mm)
Weight
0.5 kg
Installation Category (Overvoltage Category)
CAT II (IEC 1010)

4.8 Alarm Output Module

Type, Number of outputs, Contact mode, Terminal type

Type	Number of outputs	Contact mode	Terminal type
DT200-11	4	Transfer contact (NO-C-NC)	screw
DT200-21	10	Make contact (NO-C)	screw

Style Number S1

Normal operating temperature/humidity

0 to 50 °C

20 to 80% RH for 0 to 40 °C, 10 to 50% RH for 40 to 50 °C (no condensation)

Output updating rate

every measurement interval

Contact mode

Make contact : normal open/common contact type

Transfer contact : normal open/common/normal close type

Activate/de-activate

switchable

Hold/non-hold

switchable

Reflash alarm

up to 6 contacts can be specified.

Contact capacity

250V DC/0.1A (with a resistor load)

250V AC/2A (with a resistor load)

30V DC/2A (with a resistor load)

Dielectric strength

Between the output terminal and ground: 2300V AC (50/60Hz) for one minute.

Power consumption

Included in the main unit or the subunit to which the module is to be installed.

External dimensions and weight

Type	External dimensions(W)x(H)x(D) mm	Weight(kg)
DT200-11	approx.57x137x67.9	0.3
DT200-21	approx.57x137x67.9	0.35

4.9 DI/DO Module

General Specifications

Style Number S1

Terminal type

screw

Normal operating temperature/humidity

0 to 50 °C

20 to 80% RH for 0 to 40 °C, 10 to 50% RH for 40 to 50 °C (no condensation)

Power consumption

Included in the main unit or the subunit to which the module is to be installed.

Dielectric strength

Between the output terminal and ground: 2300V AC (50/60Hz) for one minute.

External dimensions

Approx. 57 (W) x 137 (H) x 67.9 (D) mm

Weight

0.35kg

DO: Alarm output

Output update rate

every measurement interval

Contact mode

Transfer contact (NO-C-NC)

Activate/de-activate

switchable

Hold/non-hold

switchable

Reflash alarm

can be set

Contact capacity

250V DC/0.1A (with a resistor load)

250V AC/2A (with a resistor load)

30V DC/2A (with a resistor load)

DO: Failure output

Functions

The output terminal for a failure becomes de-activated when an error is detected in the system of the DA100 main unit or the DA/DR subunit which is connected to the module.

Contact mode

Transfer contact (NO-C-NC)

Activate/de-activate

not switchable

Contact capacity

250V DC/0.1A (with a resistor load)

250V AC/2A (with a resistor load)

30V DC/2A (with a resistor load)

DI: Remote contol funtion (can be used with the oputional math function)

Function

The alarm status, timer and math executions can be controlled by contact input.

Input

No voltage contact, open-collector driven by a TTL or transistor

Rated input voltage: 0 to 5 V DC (input impedance: 4.7k Ω, 5V DC pull up)

Maximum input voltage: –2 to 7 V DC

Input conditions

ON voltage: 0.5V max. (30 mA DC)

Leakage current at OFF state: 0.25 mA max.

Duration of input signal: one second or longer (input signal detection interval: approx. 0.5 s)

4.10 Communication Interface Module

Type

Type	Description
DT300-11	GP-IB
DT300-21	RS-232C
DT300-31	RS-422-A/RS485
DT300-41	Ethernet

General Specifications

Power consumption

Included in the main unit or the subunit to which the module is to be installed.

Normal operating temperature/humidity

0 to 50 °C

20 to 80% RH for 0 to 40 °C, 10 to 50% RH for 40 to 50 °C (no condensation)

GP-IB Module

Style Number S4

Electrical and mechanical specifications

conform to IEEE Standard 488-1978

Code

ISO (ASCII) code

Address

0 to 15

Functions

· Talker functions

addressable: Output of measurement values (ASCII, binary); output of setting parameters (ASCII)

· Listener functions

Setting of measurement conditions, control sof starting and stopping measurement, specifying causes of interrupts (excluding setting and control of power on/off)

Causes of interrupts

Syntax error, completion of A/D conversion and data acquisiton error (occurs only when using optional math function)

External dimensions

Approx. 57 (W) × 137 (H) × 53.8 (D) mm

Weight

0.25kg

RS-232-C Module

Style Number S8

Electrical and mechanical specifications

conform to standard EIA RS-232C

Connection method

point-to-point

Communication method

half-duplex

Synchronization mode

Synchronous mode (synchronized by a start and a stop bit)

Baud rate

150, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400 bps

Start bit

Fixed at 1 bit

Data length

7 or 8 bits, selectable

Parity

Selectable from even, odd, or none

Stop bit

1 or 2, selectable

Transfer distance
max. 15 m
Connector
D-sub 25pin
Handshaking
hardware : transmission and reception control by 'DTR'' 'RTS', 'CTS' signal enabled.
Software : transmission control by 'XON' and 'XOFF' enabled.
Capacity of receiving buffer
200 bytes
Escape sequence
for reception only
Functions
· Talker functions
Output of measurement data (ASCII, binary) and setting parameters (ASCII)
· Listener functions
Setting of measurement conditions, control of measurement start and stop (excluding the setting and control of power on/off), specifying causes of 'ESC S' (output of a status byte)
Contents of 'status'
Syntax error, completion of A/D conversion and data acquisiton error (occurs only when using optional math function)
External dimensions
Approx. 57 (W) × 137 (H) × 53.8 (D) mm
Weight
0.25kg

RS-422-A/RS-485 Module

Style Number: S8
Electrical and Mechanical Specifications
Compatible with EIA RS-422-A and EIA RS-485
Connection
1 : n multi-drop (n = 16 for RS-422-A; 31 for RS-485)
Communication
Half-duplex
Synchronization
Start-stop (by means of start and stop bits)
Baud Rates
Selected from 300, 600, 1200, 2400, 4800, 9600, 19200, 38400 bps
Start Bit
Fixed to one bit
Data Length
Selected from 7 and 8 bits
Parity
Selected from Even, Odd and None
Stop Bits
Selected from 1 and 2 bits
Connector
Six-line, screw-terminal (with 4-mm screws)
Minimum Response Time
Selected from 0, 10, 20, 50 and 100 ms
Length of Receive Buffer
250 bytes
Escape Sequence
Trigger, status call, open, close
Electrical Characteristics
SDA, SDB, RDA, RDB and SG lines, where the signal-line terminal is functionally isolated from the module's internal circuitry.

Communication Distance
1.2 km maximum
Terminating Resistor
Built-in (120 Ω, 1 W), selected with a slide switch
Dimensions
Approximately 57 (W) × 137 (H) × 68.2 (D) (mm)
Weight
Approximately 0.3 kg

Ethernet

Style number : S8
Electrical and Mechanical specifications
Conforms to IEEE802.3 (Frames are not supported.)
Communication method
Ethernet
Transmission specifications
10BASE-T (CSMA/CD, 10Mbps, Baseband)
Transmission speed
10 Mbps
Protocols
TCP, IP, UDP, ARP, ICMP
Maximum number of connections
4
Input data
ASCII
Supporting RS-232-C commands
Output data
ASCII, Binary
External dimensions
Approx 57(W) ×137(H) × 57(D) (mm)
Weight
0.3 kg

4.11 Retransmission Module

Style number: S10
Model code, number of output points, output signal, output range, terminal type

Model	Number of Output Points	Output Signal	Output Range	Terminal Type
DT500-11	10ch	1 to 5 VDC	0.8 to 5.4 VDC	screw
DT500-21	2ch	4 to 20 mADC	3.2 to 21.6 mADC	screw

Load resistance
DT500-11: 10 k Ω or more DT500-21: 600 Ω or less
Load capacitance
0.22 mF or less
Load Inductance
100 mH or less
Output accuracy (under reference operation conditions)* * *
±0.2% of Span
Calibration period
One year
Temperature coefficient
0.01% of Span/ °C
Highest resolution
DT500-11: 12 bit (approx. 1.43 mV) DT500-21: 12 bit (approx. 5.86 mA)
Normal operating temperature/humidity
0 to 50 °C
20 to 80%RH for 0 to 40 °C and 10 to 50%RH for 40 to 50 °C (no condensation)
Update interval of output values
Same as the measurement interval
However, depending on the number of modules that are connected, the specified computational expression, and the condition of the external storage medium, the output value may not be updated at the measurement interval.
Output during SKIP
DT500-11; 0.05 V or less
DT500-21; 0.15 mA or less
Output filter
First order low pass filter in 10 levels (time constant in the range 4 ms to 3 s) can be applied to the output value with respect to the changes in the measured data, computed data, and the communication input value.
Insulation resistance
Across output terminals and ground: 20 M Ω or more (500 VDC)
Withstand voltage
Across output terminals and ground: 500 VDC for 1 minute
Across channels
DT500-11: No insulation across channels (COM shared)
DT500-21: Insulation across channels (500 VDC, 1 minute)
Power consumption
Included in the value of the main unit or sub-unit.
Dimensions
Approximately 57(W) ×137(H)×68(D) mm
Weight
DT500-11: Approximately 0.35 kg
DT500-21: Approximately 0.3 kg
Installation category (overvoltage category)
CAT II (IEC1010)

4.12 Specifications of Extension Module and Extension Base

Model Codes
Extension module: DV100-011
Extension base: DV100-012

Units to Which Extension Modules Are Connected
DA100 (stand-alone model), DS400/DS600 (for expandable model of DA100)

Input Modules Connectable to an Extension Base
Universal input modules: DU100-11 or DU100-12, 10 channels
DCV/TC/DI input modules: DU200-11 or DU200-12, 10 channels

Maximum Mountable Number of Extension Modules
One each on a sub-unit

Maximum Connectable Number of Extension Bases
Up to three to each extension module. It is not possible, however, to wire extension bases in such a manner that the total number of modules already mounted on the sub-unit and the extension bases being wired exceeds the maximum number of modules allowed for mounting on the sub-unit.

Overall Length of Wiring
30 m maximum
(The maximum overall length of cable measured from the extension module to the farthest extension base)

Normal Operating Temperature/Humidity Range
-10˚ to 60˚C
20 to 80% RH for an ambient temperature range of -10˚ to 40˚C; 10 to 50% RH for 40˚ to 50˚C; 5 to 30% RH for 50˚ to 60˚C (non-condensing)

Insulation Resistance
Depends on the input module installed.

Withstanding Voltage
Depends on the input module installed.

Power Consumption
Included in the value of a system's installed main unit or sub-unit

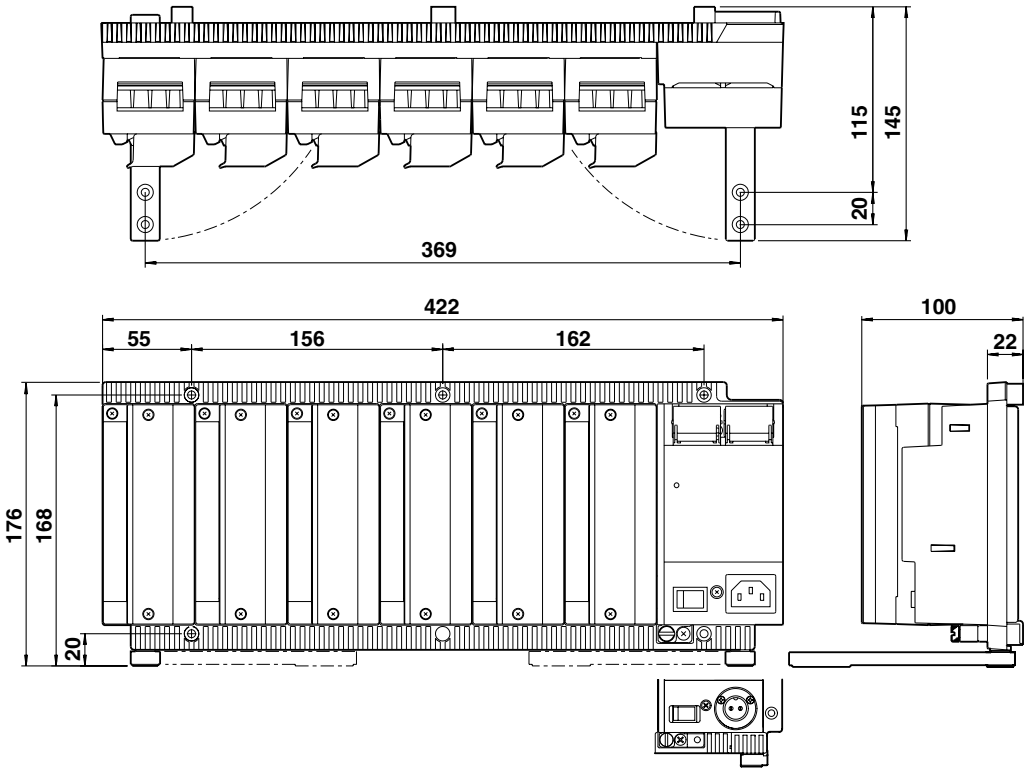
Dimensions
Extension module: Approximately 57 (W) ×137 (H) ×49.5 (D) (mm)
Extension base: Approximately 114.8 (W) ×152.7 (H) ×43.7 (D) (mm) (without shoe plates)
Approximately 114.8 (W) ×171.5 (H) ×143.3 (D) (mm) (with shoe plates)

Weight
Extension module: approximately 176 g
Extension base: approximately 345 g

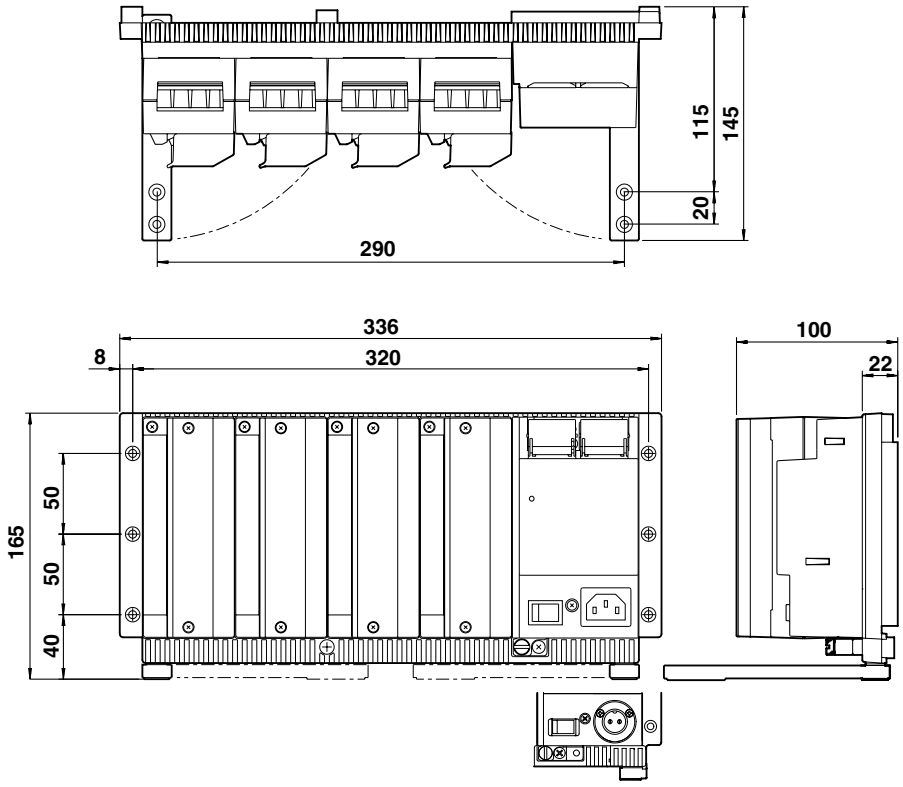
4.13 Dimensional Drawings

DA100 Stand-alone type / Subunit DS600

Unit:mm



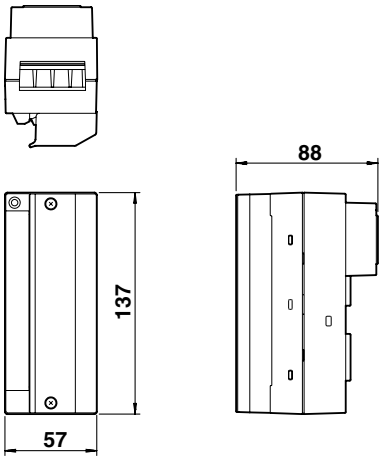
DA100 Expandable type / Subunit DS400



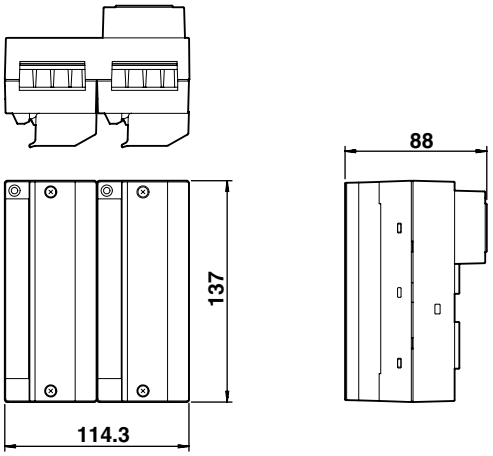
If not specified, the tolerance is ±3%. However, in cases of less than 10mm, the tolerance is ±0.3mm.

10ch Universal input module / 10ch DCV/TC/DI input module / Digital input module

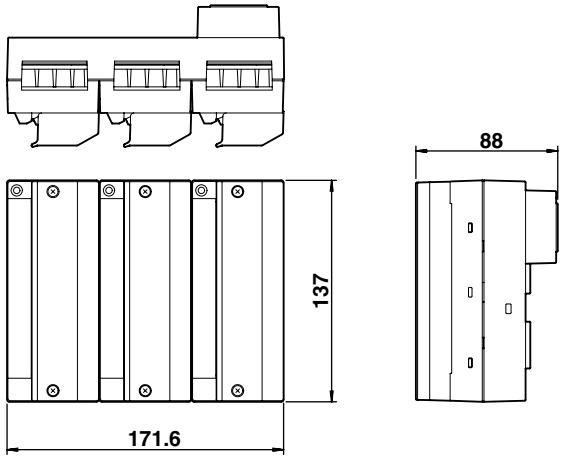
Unit:mm



20ch Universal input module / 20ch DCV/TC/DI input module



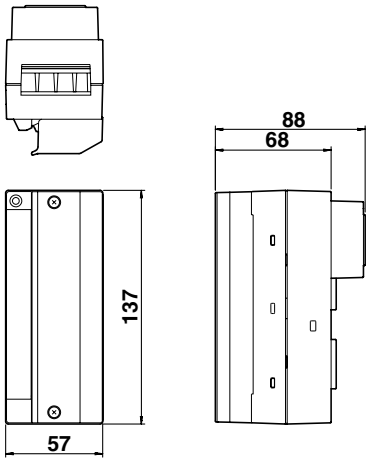
30ch Universal input module / 30ch DCV/TC/DI input module



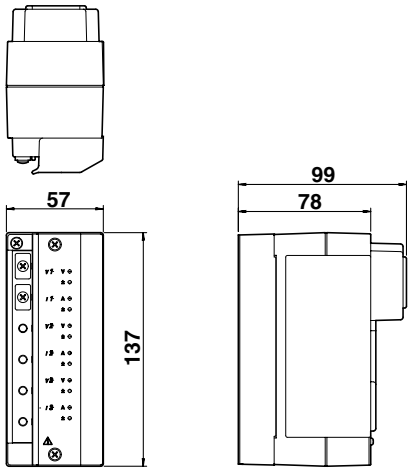
If not specified, the tolerance is ±3%. However, in cases of less than 10mm, the tolerance is ±0.3mm.

mA-input Module

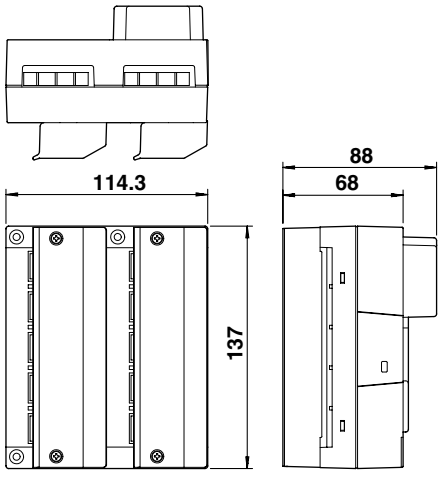
unit : mm



Power Monitor Module



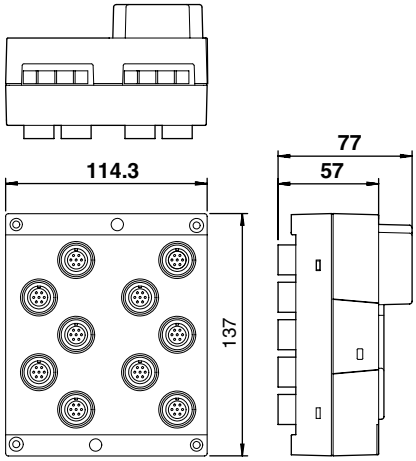
Strain Input Module (with built-in bridge resistors)



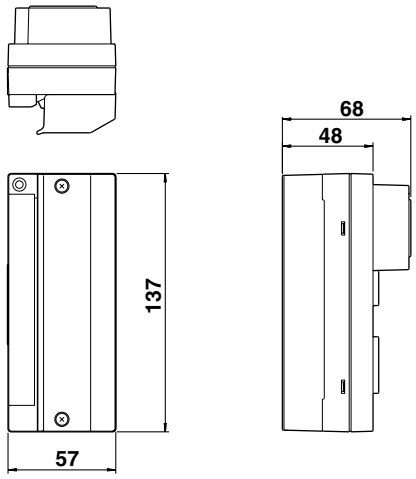
Unless otherwise specified, the dimensional tolerance is ±3% (though ±0.3% for fractions smaller than 10 mm).

Strain Input Module (with NDI terminals)

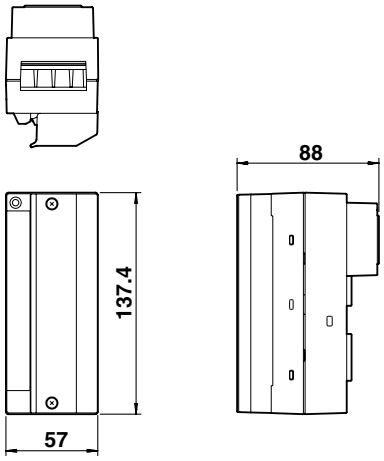
unit : mm



Pulse Input Module



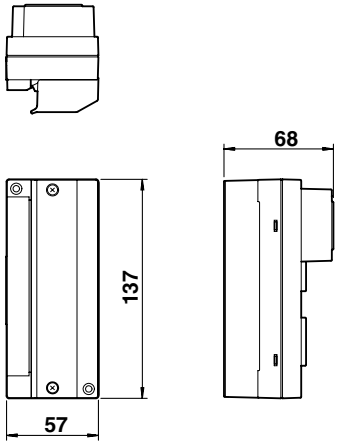
Digital Input Module



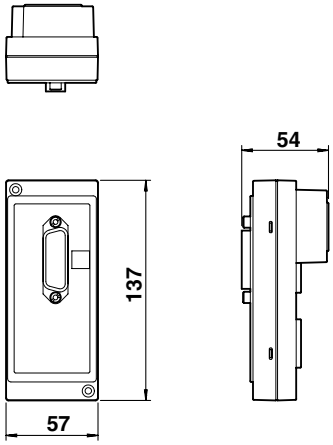
Unless otherwise specified, the dimensional tolerance is ±3% (though ±0.3% for fractions smaller than 10 mm).

DI/DO Module / Alarm output module

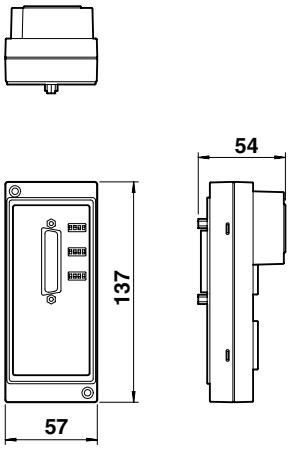
Unit:mm



GP-IB Module



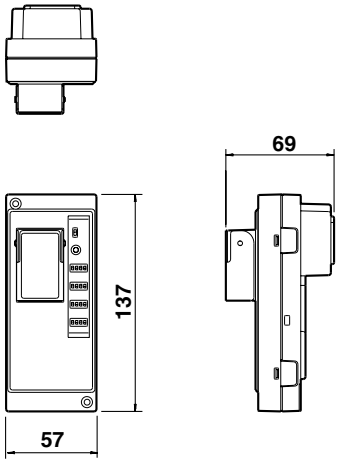
RS-232C Module



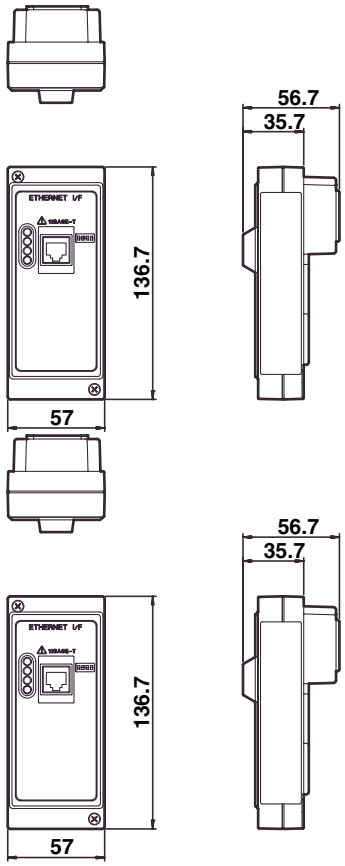
If not specified, the tolerance is ±3%. However, in cases of less than 10mm, the tolerance is ±0.3mm.

RS-422-A/RS-485 Module

Unit:mm



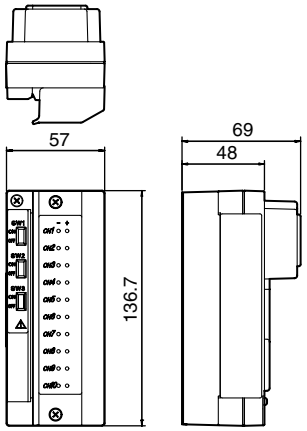
Ethernet Module



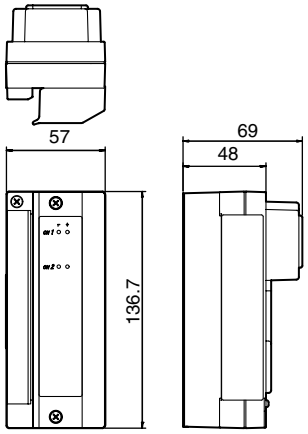
If not specified, the tolerance is ±3%. However, in cases of less than 10mm, the tolerance is ±0.3mm.

1-5 V Retransmission Module

Unit:mm



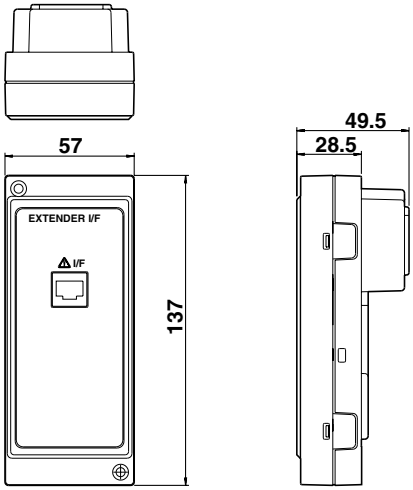
4-20 mA Retransmittion Module



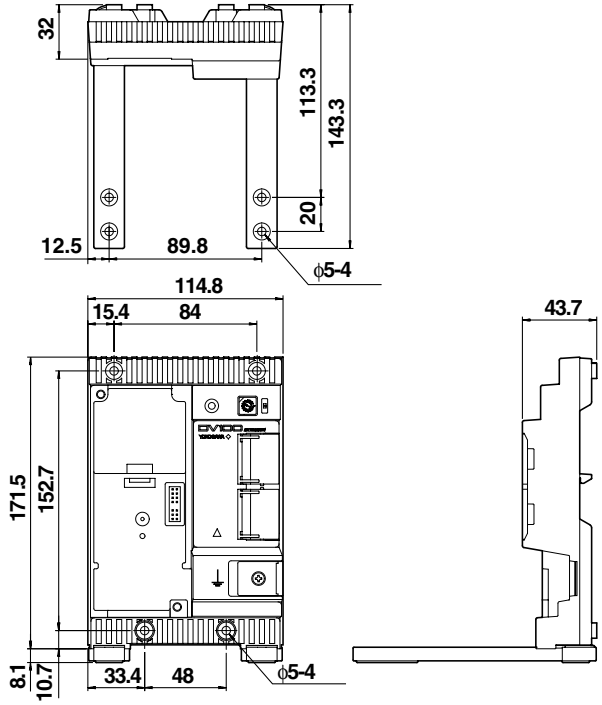
If not specified, the tolerance is ±3%. However, in cases of less than 10 mm, the torerance is ±0.3mm.

Extension Module

Unit:mm



Extension Base



Unless otherwise specified, the dimensional tolerance is ±3% (though ±0.3% for fractions smaller than 10 mm).

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